COM 417 Final Project

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1. Introduction

Singapore's society today is facing and increasingly ageing population. In fact, a Business Times article compared Singapore's ageing society to a ticking time bomb (Shiao, 2017). When one ages, a plethora of issues related to the ageing experience of the elderly surfaces. The team's proposed new communication technology aims to tackle two such issues, namely social isolation and loneliness and also the medical health of these older adults.

According to Bailey (2017), older adults commonly experience social isolation as a result of living alone. Older adults often find themselves living alone in their later years as their children move out to start their own families. Furthermore, older adults are likely to lose their spouses as they age, therefore losing one of their primary sources of social support. When living alone is coupled with the grief felt from losing their spouses, this may be a significant cause for loneliness that is experienced by the elderly (Sahu & Gupta, 2016). Socially isolated elderly often face difficulties in daily activities such as consuming their prescribed medicine on time. As a result, this will have a negative impact on their health.

The following paper will discuss the issues that older adults commonly face as a result of social isolation, existing technologies which gives rise to the innovation of the team's proposed new communication device and its features. The paper will also discuss how this device addresses these issues that older adults commonly face and how this new communication device has a competitive edge over other existing similar technologies.

2. Issue Identification

2.1 The rise of elderly population living alone

Elderly is defined as a chronological age of 65 years old or older (Orimo, Ito, Suzuki, Araki, Hosoi & Swabe, 2006). According to WHO (n,d), it is estimated that the total elderly population in South East Asia region will increase from 142 million to more than 242 million by 2025. A rapid increase in elderly population signifies a greater importance in tackling ageing issues. Ageing well is one of the important aspects in maintaining a quality of life for elderly. In the context of Singapore, it was forecasted in 2016 that there will be 610,000 people above the age of 65 (Tai & Yong Chuan, 2016). In addition, the population of elderly living alone is predicted to increase from 35,000 to 83,000 by 2030 (Hwee Pink, 2016). However, there are only a project capacity of 6,200 centre-based daycare and 10,000 home-based care services (Tai & Yong Chuan, 2016). This raises the issue of elderly population living alone, as there will not be enough daycare and nursing homes to cater to the overwhelming increase in Singapore's ageing population. Hence, there must be a development of inclusive elderly care and services to reach independent living for our elderly (Malla, 2014).

2.2 Problems elderly might face when living alone

There are problems that elderly might face when living alone. Elderly who lives alone have little to no contact with anyone. This gives rise to the problem of social isolation for them. According to Gale (2018), social isolation is defined as having minimal contact and involvement in social activities, as well as living alone. The lack of contact between the elderly and their social

environment has detrimental effects, as it affects both their psychological and physical well-being.

2.3 Psychological Well-being

As a result of social isolation, the psychological wellbeing of older adults will be negatively affected. A study done by Wong and Vebrugge (2009) in Singapore found that all isolated elderly will experience depression and loneliness. To the point that they perceive little to no hope for a better future and are just trying to live out their days. Furthermore, there is a possibility that social isolation results in suicide among elderly. The social isolation that elderly experience feeds depression and suicidal tendencies, as well as exacerbate their physical health (Lim, Han, & Cunico, 2017). It is found that elderly population in Singapore is increasing steadily, resulting in an expected rise of suicide. According to Rashith (2018), 129 elderly took their own lives last year, raising the proportion of elderly suicides to 35.7% from 25%. The rise in elderly suicide cases can be attributed to their overwhelming feeling of loneliness and pain caused by social isolation (Rashith, 2018). Therefore, elderly living alone who are experiencing social isolation has a negative impact on their psychological well-being, that might eventually lead to them taking their own lives to end their pain.

2.4 Physical Well-being

When it comes to their physical competence, many socially isolated older adults face difficulties and a decline in their physical abilities (Carstensen & Fremouw, 1988). A decline in their physical capabilities may limit their ability to perform instrumental activities of daily living such

as feeding, clothing themselves and remembering to consume their medication on time. Not consuming proper meals will affect their nutrition levels and it predisposes older adults to issues with malnutrition. Furthermore, being socially isolated puts them at a higher risk for malnutrition (Chwang, 2012). Older adults may also be physically incapable of consuming medicine which is an essential part of the ageing process since older adults are more prone health diseases due to a decline in their health in the later years of their life. According to Anderson (2013), a study done by National Institutes of Health reported that 40% of older adults aged 65 and older take five or more prescription medications, while 90% take at least one prescription. It also reported that incorrect medications were taken by at least 55% of the older adults. This overwhelming number of elderly consuming incorrect medications is a cause for concern. It might result in overdosing or medical complications in serious cases. With the decline in their physical ability, older adults living alone might face difficulties consuming medications correctly and on time. Hence, these factors will affect their physical well-being significantly.

2.5 Existing Technologies

There are several existing technologies that aims to resolve the issues elderly face when living alone. Firstly, elderly that are living alone often face the issue of consuming medications incorrectly and not taking their pills on time. Hence, there is a medication dispenser and reminder put in place to counter this problem. One of such existing medication dispensing service is the Philips Automated Medication Dispensing Service. This system dispenses up to sixty cups of medicine and six doses per day. It also has an alert notification that sounds when there are missed doses, dispenser errors and loss of electricity. Other technologies regarding the

Medicinal dispensing also only incorporates the basic function of fulfilling medicinal management and does not go beyond that. (Fabricius & Jørgensen, 2007)

Secondly, elderly living alone often struggle with loneliness. They do not have the companionship that they desire. To tackle the issue of loneliness, there is a SHINESenior technology put in place to ensure that there is always a Care Line operator present around the clock for the elderly to request a chat whenever they want to (Choo, 2018). On top of this feature, the SHINESenior also developed a door sensor trial to track motions of the elderly person living alone. If there are no motion detected for more than 24 hours, the community will check on the elderly to ensure their safety and wellbeing.

2.6 Shortcomings of Existing Technologies

However, there are shortcomings to this medication dispenser. According to Jie Ying (2017), there were cases of elderly who have stopped using the medical dispenser because of a few reasons. One reason why many elderly do not like the idea of having the medical dispenser is because they felt that they were being disturbed by the alarm when it alerts them. This results in a hindrance in their daily activity, hence they are not keen in using this device. Secondly, the medical dispenser only alerts the elderly but not the caregiver or doctor. As a result, the maximum potential is not achieved. According to Weintraub and Coluuci (2015), without a familiar other voice, it may be difficult to get the elderly to adhere to the regular consumption of daily medication. In short, the current existing medical dispensers do not go beyond the basic medical dispensing needs. There are more things that can be done regarding elderly care and

more services that could be leveraged on, for example the elderly careline by SHINESenior Technology.

3. Technology Proposal

3.1 Technology Purpose

The team aims to target ageing population by proposing a new technology. The technology, named BOB, aims to help isolated elderly to cope with their everyday lives. BOB comes with a tagline, "Be Our Buddy". The purpose of this technology is to assist the elderly and provide as much assistance as possible for them to live independently.

3.2 Introducing BOB

The name 'BOB' is simple and easier for the elderly to pronounce. The 'O' in the logo is replace with a human-like robot which represents BOB the dispenser. The font makes it fun and friendly too.

4. BOB Functions

BOB provides multiple functions from dispensing medicine to interactive "buddy button". BOB's functions are as below.

4.1 Medicine and Hot Water Dispenser

The main feature of BOB would be to dispense the right amount of medicines at the right time. Firstly, it would be able to store up to 9 types of medicinal pills, with amount worth up to 90 days of consumption. When dispensed, a smart board holding the cup of medicine will detect if there is any consumption of medicine by measurement of weight. Correspondingly, it would also contain formulas that are easy to program using the arduino board that would dispense the accurate amount of pills the elderly would need. It also comes with a water dispenser for a more convenient process when consuming medicine. It can dispense hot and room temperature water. This will prevent any mishap from boiling water and it makes hot water accessible at any time, regardless of the volume of water needed.

4.2 Customisable Voice Alert System and Buddy Buttons

Secondly, BOB would also contain a voice record system that would allow the user's family or primary caregiver to record their speech for up to 5 seconds. The recorded speech would serve the purpose of reminding the isolated elderly to consume their medications and meals on time. Using the record system, family or caregivers can also input positive messages to encourage the elderly. This could also help the elderly with depression cope with their medical condition. There will also be standard messages pre-recorded in BOB. Furthermore, the medical dispenser would also also have customisable settings for screen and alert tones. Additionally, the medical dispenser would also include call buttons which will be called "buddy button". At one push of the button, elderly is able to be connected to a call center dedicated to interacting with elderly. There will also be an additional two buttons for emergency purposes, to contact the hospital and

caregiver. They will be hidden in a compartment to prevent elderly from pressing the buttons by accident.

4.3 Website

BOB will be synchronised to the website for doctors and hospital to access patients' information. The website interface uses the color yellow as it is associated to joy and happiness. Yellow will evoke pleasant and cheerful feelings. Light yellow is also associated with freshness, intellect and, joy. The website is clear and simple to use with a few icons to represent the features. (Refer to appendix 9.2 for website interface) The website will provide the following functions.

4.3.1 Patient's Information Patients that uses BOB will be connected to their personal doctor or community doctor. It will provide patient's medical history and relevant information.

4.3.2 Data Analytics Data recorded from BOB such as patient's consumption of medicine timings will be recorded to aid in treatment and diagnosis.

4.3.3 Input of Medicine Information Once a patient is issued their medicine, doctors or nurses can input information of their medicine consumption for it to dispense appropriately. Information includes the type of medicine, the number of times required to take daily, the number of medicine to take at every interval. This reduces any error of issuing medicine.

4.3.4 Chat with Family/Caregiver A chat function will be included so that family or caregiver can make inquiries if there's any doubts or clarifications needed. Doctors can reply when convenient. This makes the whole process more convenient for both parties.

4.4 Mobile Application

A mobile application will be available for family or caregivers to download. Each BOB will be link up to 3 accounts. The mobile application interface will be similar to the website interface, using the colour yellow and icons to represent the features. It will linked to the phone notifications to alert family/caregiver at any time. (Refer to appendix 9.1 for mobile application interface) The mobile application includes the following functions.

4.4.1 Data Analytics. Data such as the timings of medicine consumption will be recorded. Any unusual activities for example, not consuming the medicine on time will be send to the family/caregiver's mobile as a notification alert. The data will also help during consultation with the doctor.

4.4.2 Chat with Doctor. Similar to the website chat function, family or caregiver will be able to communicate with the doctor at any time. As doctors' schedule are usually packed and inflexible, message communication will be helpful due to asynchronicity. Messaging feature will also be more convenient as compared to phone calls for short and simple enquiries.

4.4.3 Settings and Customisation. This function allows family or caregivers to customise their sound alert for BOB. This also includes any relevant settings for BOB such as the input of numbers for BOB.

4.4.4 Bobbers Community Forum. Community members that uses BOB will be called "Bobbers". Bobbers are a community in similar situation. Anyone involved such as doctors, family, caregivers can input questions for the community and anyone can involved and help one another. Relevant tips and recommendations can be shared to the community to create an inclusive community where people help and support one another in various ways.

4.5 BOB's Appearance

BOB will be in a cube shape, 30x30x30cm. It will be fitted against a wall at eye level. (Refer to appendix 9.3 for the visual representation)

BOB's left side involves the communicative aspects which are the buddy buttons and intercom system. There will be three big buddy buttons with a visual icon or picture for the various uses. This will make it easier for elderly to recognize the right buttons. The three buttons directly contact the community hotline, hospital's line and family/caregiver's line. The two buttons calling the hospital and family/caregiver are indented to prevent the elderly from pressing on it by accident.

The front view of BOB will be the medicine dispenser. There will be a small LED screen with a dispenser. It will be fitted with a smart board at the bottom that will measure the weight of the medicine when dispense to take note of any unusual activity. There will be a number pad and some buttons at the side of the screen for manual programming but it will be hidden with a cover to prevent any confusion of buttons for the elderly.

The right side of BOB features the water dispenser. The two buttons on the top provides both hot and room temperature water. There will be a stand for the cup. BOB will have to be installed and connected to the water system and electricity.

5. Competitive Edge

The key competitor edge compared to other medicine dispenser is the communicative and interactive function. BOB adopts a 360 degree approach accompanied with media convergence to make the medical dispenser a more all-rounder assistant to the elderly, emphasizing on convenience at the touch of your hands.

6. Technical Aspects

BOB requires Global System for Mobile Communication (GSM) to digitize and reduce data to send it to the mobile application and website. An intercom system will also be used for voice communication. In addition, an arduino board will be required for the programming of data to connect all the devices together. Moreover, it will help to determine the amount of medicine to be dispensed. Lastly, the water dispenser uses a filter, transformer and regulator to dispense

water, while being connected to the arduino board. The cost of producing BOB is relatively low, as all materials used are affordable.

7. BOB Objectives

The main objective of BOB is to assist isolated elderly with their daily lives. This serves to make independent living much easier for them. There are four functions of BOB, which includes: easy medicinal management, data-enabled human driven, interactional functions and personal medical data analytics.

7.1 Easy Medicinal Management BOB aims to help the isolated elderly on taking their daily medication through easy dispensing of the right amount of medication and daily reminders. It also keeps track for the elderly the type of medication they are consuming. Beside the consumption of medication, BOB goes one step further and gives the elderly the luxury of preference for hot or cold water especially when consuming their medication.

7.2 Data-enabled, Human driven In the paper, Data-enabled, Human driven refers to the humanising of technology. The team aims to incorporate a human touch to BOB through functions such as recording and using the voices of people they are familiar with. With the element of the human-touch, BOB would be able to make the isolated elderly feel less lonely and be more connected to BOB.

7.3 Interactional Functions BOB aims to alleviate the loneliness of isolated elderly through its interactive elements by having the "Buddy Button" that connects the elderly to an elderly interaction care center. Additionally, BOB allows the elderly to receive video calls which could potentially solve the geographical differences between the elderly and his loved ones. Furthermore, Through asynchronous communication BOB aims to allow the caregiver and doctor have more direct communication. In addition, the BOB phone application would allow the caregiver and doctor to interact and clarify any ambiguity.

7.4 Personal Medical Data Analytics BOB intends to aid the elderly through providing the elderly with emergency signals to the primary caregivers when there are unusual activities such as failure to consume their daily medication on time. Additionally, BOB will contain the statistics regarding the elderly's consumption of medication.

8. Conclusion

The issues that arise from an ageing population are highly prevalent in our society today. Due to the increase in elderly population, there are not enough elderly care and services to cater to the growing needs of the elderly. As a result, there will be a rise in elderly who are living alone. Elderly living alone are susceptible to social isolation. This has a detrimental effect on elderly's psychological and physical well-being, particularly their physical competence. Therefore older adults may have trouble with medical consumption. To alleviate these issues, the team proposed a new technology with the aim of assisting elderly with managing their own medication. The

team hopes to assist elderly in achieving independent living and improve the ageing experience of elderly.

The team came up with the idea for a new technology. BOB primarily acts as a medicine dispenser with additional features with the intention of making it a trustworthy assistant to socially isolated elderly. BOB aims to provide care for the elderly through four ways namely easy medicinal management, data-enabled human driven, interactional functions and personal medical data analytics.
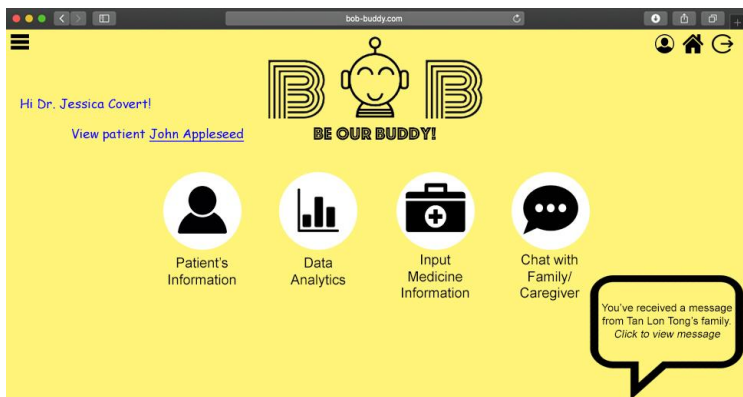
In conclusion, BOB is multi-functional unlike other medicine dispenser available on the market. The many useful and unique functions are all tied in and market at a comparative pricing, giving it a much more competitive edge. BOB, inspired by elderly, for elderly.
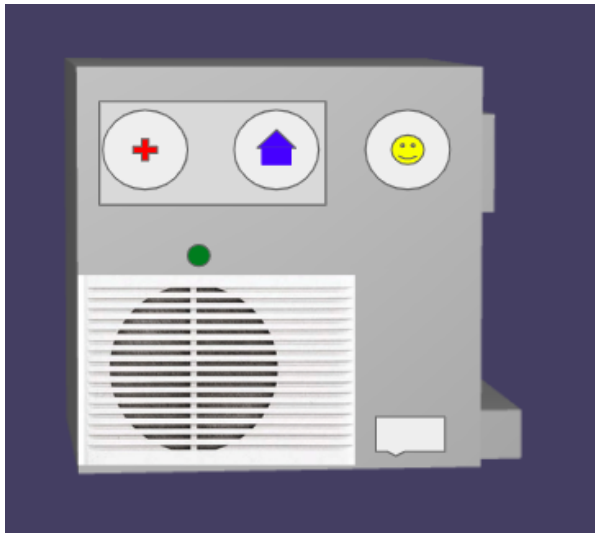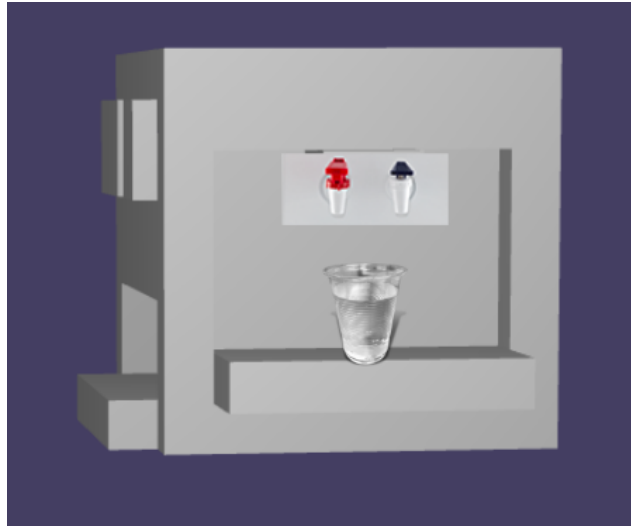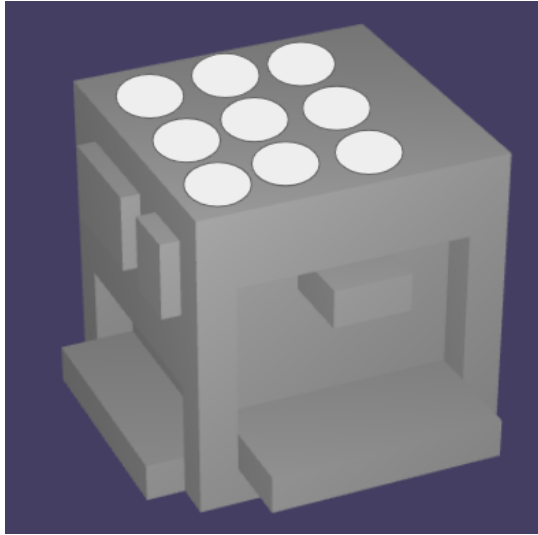
9.0 Appendix

9.1 Mobile Application Interface
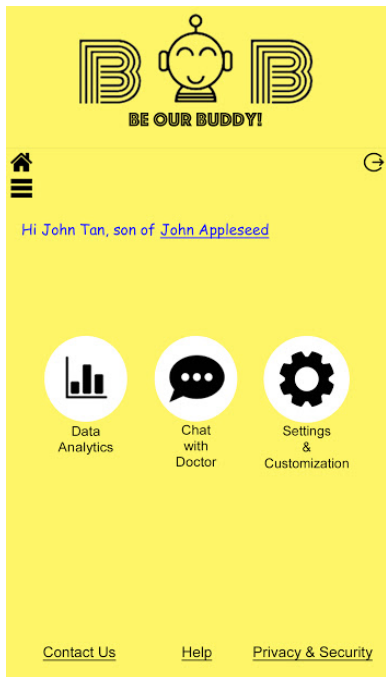
9.2 Website Application

Miscellaneous

You and your group/partner are challenged to design a form of new communication technology. I want you think about an issue—can be anything from an intrapersonal to interpersonal to a global issue. Your job throughout the semester will to be to collect and synthesize data providing evidence of your issue and then propose a new form of technology to combat this problem.

Your paper should be about 10 to 12 pages (not including a title page, with headings for each section, double-spaced, 12pt Times New Roman, APA format—don't forget to cite your sources in text and include a reference section).

Due: 21st November by 8:30am on ublearns

Articles on current technologies:

https://www.straitstimes.com/singapore/health/new-tech-for-old-folk-to-live-at-home-safely

https://www.allegroliving.com/blog/7-innovative-technologies-for-older-adults/

https://blog.ioaging.org/technology/smart-technology-to-help-seniors-live-independently/

https://www.theseus.fi/bitstream/handle/10024/105853/Kolehmainen_Millicent.pdf?sequence=1

SMART Device for Older Adults

Be Our Buddy!

Problems Elderly face when living alone:

- Mental health—Loneliness, forgetfulness (to eat medicine, pay bills or go to appointments), dementia, depression…

- Physical health—eyesight, mobility, well-being…

- Social isolation—whether the person is integrated into a community or regularly checked on by his/her relatives or a caregiver which may lead to depression

- Nutrition—whether the person takes his/her meal regularly…

- Environment—Elders are more impacted by their surrounding environment such as sudden and severe temperature change

Technology Proposal [Shanice, Afiq, Yong Fang] (4-5 pages)

Explain the new communication technology that you have developed.

·   What is the technology? Provide details.

  - A device that will

    ○ Dispense medicine with hot water available for consumption

    ○ Remind meal times and medicine times (Customisable alert sound)

    ○ Store emergency contact numbers (eg. family, friends, hospital, hotline number feature) at the touch of a button

    ○ Store 90 days of medicine

· What does it the actual technology look like? What is the logo?

· How does it function?

· How is this better than the existing technologies? Use research to support your claims.

(uses Arduino)

BOB Functions:

- Store 9 different types of medicine

- Dispense medicine with hot water available for consumption

- Program dispense of medicine through mobile application

- Remind meal times and medicine times (Customisable alert sound)

- Store up to 3 emergency contact numbers (eg. family, friends, hospital, hotline, community care centre number feature) at the touch of a button

- Video and call features linked to mobile application

Application Functions:

- Chat function between doctors and caregivers

- Statistics of medicine consumptions readily available

- Easy programming for doctors by inputting medicine consumption data

- Receive alert when unusual activity detected (no consumption of medicine)

- Receive video call when emergency button is press

- Customisable settings for screen and alert tones.

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