



# Huawei Tech4City Proposal

## Team ICon

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Note: Sections with \* are highlighted in our demonstration video to better illustrate their ideas. The video can be accessed via the link in this proposal, or directly viewed at a lower resolution from our submission in Agorize.com.

# Selected Theme and Related Social Problems

Our team is focusing on the theme of neighbor, in particular, to tackle the lack of inclusivity of elderly in our society. In today's ever-changing world, our silver generation invariantly finds themselves facing a myriad of aging-related issues, mainly in the technological and healthcare aspects of their life.

## **Technological Exclusion of Elderly\***

Video Demonstration (00:29 - 01:00)

To begin, the generally low digital literacy observed amongst senior citizens threatens their inclusion in society by decoupling them from the increasingly digitized world. The elderly usually take longer to learn new technologies around them (Jones & Bayen, 1998). Given our society's current rate of technological adoption, which affects all aspects of our life from automated ticketing machines in cinemas to manless cashier counters in convenience stores, our senior citizens could be excluded from a greater number of technology-based services in the future. An apt example would be that of Golden Village cinema (Ming) which has opted to gradually replace manual ticketing counters with machines, with at least two local Golden Village cinemas now having only automated ticketing machines. This makes basic activities such as movie-going a daunting task for many elderly, who may be unfamiliar with the new technology. We believe that the reason for the current gap in digital literacy does not lie with the prevalent belief that elderly are reluctant to accept new technologies (Vaportzis), but rather with the design of contemporary mainstream technologies, which fail to consider the elderly's physical and mental constraints. A suitable example would be the design of mobile devices (Yusof 28-31), with their small button designs which are difficult for the elderly to use, and unnecessary menu options which may be too small to see.

## **Healthcare Exclusion of Elderly\***

Video Demonstration (00:00 - 00:29)

Besides the technological landscape, the current healthcare landscape in Singapore also lacks inclusivity towards many elderly who wish to maintain a certain degree of autonomy in life while aging, due to the lack of intermediate forms of medical assistance (Lin). The healthcare needs of our senior citizens fall on a spectrum, as not all of them require institutionalized medical care, which usually comes at the cost of their dignity and autonomy (Lothian 668-670). Especially in the face of polypharmacy, many of them simply need a variety of quality-of-life services, such as reminders for them to take different kinds of medicines at different times in a day, which are lacking in the current healthcare landscape in Singapore. This leads to a dilemma for the elderly - sacrificing the comfort and autonomy of living at home or losing the external healthcare assistance. As a consequence, many elderly in Singapore choose to either live independently or have periodic visits from caretakers (Asokan, 2020), but rarely can they reap the benefits of both.

In conclusion, we believe that both the current technological and healthcare landscapes lack inclusivity towards elderly Singaporeans, which can severely threaten their quality of life.

## Proposed Solution

### ICon - AR Smart Glasses

In order to address the above mentioned issues, we propose ICon - a pair of augmented reality (AR) smart glasses with both elderly-friendly design and multi-functional software.

### Elderly-Friendly Design

#### *Physical Appearance*

The physical design of ICon bears great resemblance to a normal pair of spectacles. Considering that spectacles are already widely adopted by the elderly as an assistive tool, smart glasses are more suited as a medium of assistive technology in communities dealing with old age (Jumreornvong 59-63).

#### *Realtime Prompt\**

Video Demonstration (01:44 - 01:49)

A particular perk of smart glasses is that they are usually worn all the time like normal spectacles. Coupled with the realtime AR cues that will be explained in depth later, the elderly can consistently benefit from the full range of functionalities of smart glasses. This is in contrast to smartphones, which may often get misplaced or forgotten to be used in situations where they could help, especially for elderly with psychiatric disorders such as dementia.

#### *Heads-up Interaction\**

Video Demonstration (01:52 - 02:09)

Furthermore, the worsening dexterity (Niamh 95-118) and dryer skin (Fender) that come with age make the usage of touch-screen based technologies less ideal to the elderly. That is where smart glasses triumph over such technologies, by adopting an entirely different method of user interaction. Simple and intuitive actions, such as nodding and turning one's head, can be captured as user inputs which could replace motions elderly find challenging to perform, such as pressing or swiping. Not to be forgotten is the deteriorating eyesight of the elderly. Many seniors find the applications on smart devices difficult to use, due to their small font size and icons (Huang et al. 62-69). Smart glasses resolve this issue by having information directly presented in front of the user's eyes. We can further cater to the needs of elderly consumers by

increasing the font size used in ICon's UI, resulting in greater usability through more readable text (*Display content clearly on the page* 2016). The paradigm shift in terms of usage provides smart glasses a competitive edge over its smartphone counterpart, especially for elderly consumers.

## **Multi-Functional Software**

We adopted a two-pronged approach to improve the quality-of-life for elderly users. Firstly, we considered the fact that current and emerging public technologies in our society today are intrinsically difficult for the elderly to pick up on their own (*Why do many seniors have trouble using technology?*). For this, we proposed "Glassify", an ICon feature that can make it easier for the elderly to learn how to use new technologies in our society. Secondly, we recognised the need for assistive healthcare technology that can enable the elderly to both live with autonomy, and have round-the-clock access to medical assistance. Therefore, we proposed another built-in software feature, "PHA", which can help elderly combat polypharmacy.

### *Glassify\**

Video Demonstration (01:44 - 02:09)

Glassify is a built-in ICon software that serves as a one-stop solution to homogenize the various methods of user interaction with new technologies into a format conveniently structured and familiar to the elderly. We will first create QR codes for various kinds of public technologies that will lead the scanners to their mobile version, then we will attach the QR codes to the respective technologies. The smart glasses would be capable of identifying QR codes attached to them, which would prompt the users to open the corresponding mobile application for interacting with that particular technology (Cathay Cineplexes for example). Coupled with the elderly-friendly method of interaction the glasses offer, the UI of the mobile application will also be redesigned into a format suited for the elderly, making it much easier for the elderly to learn about emergent technologies through ICon.

Moreover, the AR functionality of ICon enables real-time cues to be projected onto the glasses' lens. This reminds the users when, where, and what exact technologies ICon can help them with.

### *Personalized Healthcare Assistant (PHA)\**

Video Demonstration (01:17 - 01:44)

PHA is another built-in software that helps the elderly stay independent in the face of polypharmacy. Consider a visit to the hospital by an elderly. After the consultation, the elderly will head to the pharmacy. Based on the medication collected, the pharmacy will upload all prescription information onto the smart glasses for the elderly through PHA. This can be performed through the scanning of a QR code printed on the medication itself. As a result, the smart glasses will be updated on the type and quantity of medication provided, as well as when to take the medication. Using this

information, the smart glasses will alert the elderly when they are supposed to take the medication accordingly. Furthermore, PHA would also be able to inform the elderly of the correct dosage and appropriate warnings (e.g. for drowsy medication). Additionally, the smart glasses can also alert the elderly when they need to schedule their next appointment with the doctor. This can be based on their own personal schedule or simply based on detecting a low quantity of remaining medication. This framework handles the problem of elderly forgetting to take their medication or forgetting to schedule an appointment.

PHA does not stop at simply being a digital reminder. Using AR, a virtual “landmark” can be created at where the user has placed their medication. Thereafter, once the alert pops up for the user to take their medication, an AR navigation system would direct the elderly to their medication. This handles the issue of the elderly forgetting the location of their medication at home.

In summary, PHA would allow the elderly to stay informed of what are the side-effects of their drugs, when to take their medication, how to take their medication and where their medication is stored. It can also remind users to schedule and go for their follow-up checkups.

## **Huawei Eyewear and ICon**

Two members in this team have previously participated in another Hackathon sponsored by Huawei earlier this year, which required participants to develop applications on Huawei Eyewear (our submissions back then were totally different from this competition). One member went on, after winning the Hackathon, to help with the organization of another round of the same Hackathon, out of personal interest to gain more insights into the current development of smart eyewear. Both experiences greatly enriched our understanding of smart eyewear, and consequently made us wonder about its potential application in our society.

From our experiences with Huawei Eyewear, the existing versions of the smart glasses may not be compatible with our “Glassify” functionality, due to the lack of visual display on the lens of the product, shutting down any AR related ideas. However, we do believe that it is possible to implement “PHA”, or at least part of its ideal functionality, on the current Huawei Eyewear. The scanning of QR codes from the prescription could be done using a mobile device, which then stores all the relevant prescription data in the device. In this case, the smart glasses’ main role is to serve as an effective reminder that can remind the elderly users when to take their medicines, what kind of medication to take etc, through audio reminders and light vibration based prompts, out of consideration of their health.

This proposed functionality is similar to the existing health-related feature on Huawei Eyewear, which primarily focuses on the health of the cervical spine of the users. Through built-in sensors, Huawei Eyewear can keep track of the position of the user’s head, and prompt the user to exercise his neck when he has remained sedentary for too long.

However, this implementation still revolves around smartphones as the central piece of technology, which as we have discussed before, is less than ideal in helping the elderly users. Thus, we believe that the full potential of ICon can only be realized with AR smart glasses, to truly empower the elderly to confidently navigate around the increasingly digitized world and triumph over polypharmacy, to live their lives to the fullest.

## Execution plan

### Institute of Mental Health (IMH)

We plan to first sell ICon to IMH in bulk. Then, IMH can have the authority to sell or rent the smart glass to patients at subsidized rates. The direct distribution of ICon to IMH helps avoid any financial strains on the individual. This comes in the form of IMH providing subsidies through government programs to offset the cost for the less fortunate. It also helps to distribute the cost burden for the consumers. Furthermore, it can help to mitigate manpower shortages and save travel costs for healthcare workers, as the primary care dependencies now fall onto the smart glasses. The various features and implementation of the glasses will also reduce the risk of medical defaults by patients. For example, the reminder and consultation features on the glasses can prompt the users, when appropriate, to remind them of their relevant follow-ups.

### Unique Selling Proposition

From our research, we found that 83% of young adults are myopic, with eyesight worsening with age (*Singapore's Eye Health* 2020). Moreover, the existence of myopia is more prevalent amongst elderlies. The widely accepted usage of glasses in modern society lends to greater ease of adoption by the elderly. This makes for a seamless adoption and transition for the elderlies to our newly devised technology, as it will be perceived as something that they can both benefit from, and be comfortable with. In conclusion, we believe that ICon has a much stronger appeal to elderly consumers over other conventional technology-based solutions, such as mobile phones.

### Stakeholders' Perspectives

- 1.) As an elderly, I find many mobile applications difficult to use.
- 2.) As an elderly, I realize that the sense of direction within most existing technologies is not guided.
- 3.) As an elderly, I feel that the format of applications and User Interfaces are not necessarily suited to my needs.
- 4.) As a seller, we attempt to improve user guidance between the elderly and their surrounding technology.
- 5.) As a seller, we seek to help the elderly combat polypharmacy through AR cues and audio reminders.

- 6.) As a seller, we would like to improve the interaction between the elderly and the interface.

### Future Plans\*

Video Demonstration (02:09 - 02:18)

In the future, we are considering working with more local government bodies who would be willing and capable of purchasing ICon in bulk and distributing them to the local elderly population in need. We are also considering selling the software “Glassify” and “PHA” to patients and/or their family members who already possess compatible smart glasses, which could significantly save their costs if they already own the hardware. Furthermore, another potential future development would be to include a new navigation feature on ICon, equipped with emergency outdoor navigation, to guide the elderly back home safely if they forget their way back, which could significantly help the elderly diagnosed with early stages of psychiatric issues, such as dementia. Additionally, we can also help the users set up a one-time connection to Wireless@SG, which will connect ICon automatically to public Wifi when visiting common places like hawker centers, MRTs and community centers. The purpose of this is to keep the database from the smart glasses updated, potentially allowing us to keep track of a patient’s history in terms of number of defaults, missed alerts, etc.

We also consider the potential addition of other peripheral functions to the glasses that can benefit the elderly consumers, such as AR chatting applications that can connect elderly users across space and time, making it possible for seniors, who are fragile or even bedridden, to easily engage in immersive interaction with their real life friends over ICon. This idea stems from the research finding that social interaction is one of the most cost-effective ways to prevent the development of psychiatric disorders such as dementia. (Charvat)

## **Ultimate Social Value**

There are three main social benefits. For the elderly, they are able to make use of prevalent public technologies through Glassify. This increases the range of public services that they can use and benefit from, as the complications of new technologies are alleviated, increasing the ease of access and efficiency of using said technologies. As a direct consequence, there would be an increase in the quality-of-life and greater inclusivity experienced by the elderly.

Furthermore, the elderly can enjoy an autonomous lifestyle yet still benefit from round-the-clock medical assistance via PHA. With functionalities of ICon focusing on their individual pain points, elderly will be supported by technology, allowing them to be more independent. This means that they would not require to stay at a professional

healthcare institution. Instead, they are capable of staying in the comfort of their own home. Hence, this provides the elderly with an alternative to home-visiting caretakers and staying at professional healthcare institutions, thus giving them more healthcare options as they age.

Not to be forgotten is the benefit to the healthcare industry. ICon could alleviate the existing strain on the manpower resources of professional healthcare centers (Siang, 2022). Since ICon offers round-the-clock medical assistance and monitors for any emergency situation, caretakers no longer need to constantly visit them for the same purposes. Healthcare workers' job focus could also gradually shift from taking care of the elderly, which could often feel menial, monotonous, and unilateral, to spending quality time with them instead. This provides senior citizens, especially those living alone, with greater emotional support. Hence, this builds a stronger and more equal bond between the elderly and their caretakers, contributing to a more inclusive society.

## Demonstration Video

[https://drive.google.com/file/d/1eoGSNbEsEcAIG8rZFjRQT-eG\\_fBPZpLn/view?usp=sharing](https://drive.google.com/file/d/1eoGSNbEsEcAIG8rZFjRQT-eG_fBPZpLn/view?usp=sharing)

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