

**IS615 – Digital Transformation Strategy**

**Year: 2023-2024 Term 1**

**Project Proposal -**

**QUANTUM LEAP - DEMENTIA**

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**TEAM G**

Aruna Deepthi POTHININDI

Diana KULESHOVA

Kieman TAN Yujian

Kruti CHANDRASEKHAR

NANN Tin Nwe Aye

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# BUSINESS CONTEXT

Quantum Leap aims to understand and assist individuals living with dementia by developing innovative digital solutions for the challenges faced by both patients and caregivers. Our goal is to achieve a delicate balance between providing effective caregiving for caregivers while upholding the key principles of independent living, dignity, and safety for dementia patients. Firstly, we aim to reduce the stress experienced by caregivers and provide optimal support for patients, in face of challenges such as the patient's reluctance to engage and the caregiver's physical limitations. Additionally, leveraging technology plays a crucial role in freeing up caregivers' time and attention, allowing them to focus more on providing effective care. It is also imperative to implement affordable solutions that ensure seniors receive sufficient social interactions, preventing any sense of neglect without significant financial burden. The development of Bluetooth devices and IoT solutions tailored for dementia patients is also necessary to facilitate safe and independent living. Moreover, effective communication channels and support networks for caregivers and volunteers to easily access resources and assistance. Lastly, improving social connections and enabling interaction with family and friends are essential parts of our proposal to support both caregivers and dementia patients.

# BUSINESS PROBLEM ANALYSIS

**“How to empower dementia patients to live independently and safely with dignity?”**

After a thorough examination of dementia patients, their families, and caregivers, it's evident that stimulating independence, safety, and dignity for patients presents a formidable challenge. Additionally, enabling a harmonious balance between caregiving duties and personal or professional obligations adds another layer of complexity for caregivers.

**Dementia Patients** - Based on our analysis, several key findings have emerged regarding the challenges faced by individuals living with dementia. Firstly, memory lapses are a common occurrence, particularly concerning recent activities such as medication schedules, necessitating vigilant monitoring to prevent accidental double dosing. Emotional and physical support are paramount, as patients often require patience and assistance with daily tasks due to reluctance and fear when left alone. While a desire for independence persists, many patients rely heavily on external aid for their activities. Moreover, dementia significantly impairs decision-making abilities and memory, resulting in a reduced quality of life. Safety concerns also loom large, with compromised motor skills increasing the risk of falls and subsequent physical injuries.

**Caregivers** - Caring for dementia patients presents caregivers with significant physical and emotional stress. They require both physical stamina and mental resilience to provide adequate support to patients who may struggle with mobility and cognitive challenges. Caregivers cannot afford to leave patients unattended for day-to-day activities, as there is a risk of wrong consumption of food or medication without supervision. Effective time management is paramount, involving ensuring timely consumption of medication and meals, as well as staying vigilant for cues indicating the patient's wakefulness or need for assistance. Additionally, caregivers may experience social isolation, as they are unable to leave patients alone outdoors or take breaks for rest while fulfilling their caregiving duties. This sense of confinement and the constant demands of caregiving contribute to the overall burden experienced by caregivers of dementia patients.

# BUSINESS CAPABILITIES & IT CONTRIBUTION

**Objective 1 -** Maximize patient adherence and caregiver satisfaction through reliable reminder delivery, user engagement, and efficient task completion facilitated by the QuantumCare App's Daily Events Assistant and VoiceBot integration.

**Solution 1 - Virtual Assistant cum Customized Vocal Reminders Device (VoiceBot):**

Daily Events Virtual Assistant, a feature within the QuantumCare App, empowers caregivers and dementia patients to schedule day-to-day activities effortlessly. Integrated seamlessly with our VoiceBot device via Bluetooth technology, this innovative solution ensures alerts set within the app are spoken out and aloud at the patient's location. By installing the VoiceBot in the patient's residence, individuals receive timely reminders for tasks such as meals and medication, providing crucial support even if alerts are missed on their mobile devices or tablets.

**Objective 2 -** Empowering dementia patients in Singapore to lead independent and safe lives through technology, aiming to reduce incidents of patients losing their way home to below 50 patients per year.

**Solution 2 - Virtual Volunteer Call Center service with GPS locator via App (HelpLink) -**

Introducing a comprehensive app feature aimed at enhancing volunteer call center operations, raising awareness among volunteers on how to provide verbal support to patients from the comfort of their location, and improving patient care. Our new feature streamlines call center activities while also encouraging volunteers to register for free, and patients & caregivers to register with membership. We've incorporated the call center number into patient contacts, enabling a quick dial feature and providing education on its usage, particularly during challenging situations. When a patient initiates a call, the app generates instant notifications, allowing available enrolled volunteers to pick up the call through a call routing system. They can then listen to the patient's situation and offer guidance. Additionally, this feature integrates GPS technology to track the caller's location, making it easier for volunteers to identify and provide immediate support, bringing peace of mind to caregivers as well.

**Objective 3 -** To increase dementia awareness in Society, provide best practices in caregiving, facilitate caregiver onboarding, seek community support, and enhance information accessibility through integration with WhatsApp.

**Solution 3 - E-learning/Information Platforms & WhatsApp Chat-commerce (CareHub)**

The E-learning platform features Dementia Awareness Modules, Video Lessons on Best Practices, caregiver onboarding, and Community support forums. Interactive modules enhance understanding of dementia, and video tutorials cover caregiving techniques. A structured onboarding program for new caregivers that guides them through the basics of dementia care, legal and financial planning, and how to access community resources. Secure forums allow emotional support and information sharing. Integration with WhatsApp streamlines access for patients, caregivers, volunteers, and anyone interested in the awareness of dementia.

**Objective 4 -** Develop devices to facilitate safe & independent living for patients while relieving caregiver's time, attention, and stress in providing necessary care.

**Solution 4 - Expansion of IoT device suite in QuantumCare (LeapMedi)**

Additional IoT-enabled devices can be adapted to QuantumLeap’s existing suite of IoT solutions or QuantumCare App, to expand remote oversight of a dementia patient’s daily activities. This enables both caregivers and patients, as remote monitoring alleviates the need for constant attention and grants confidence to caregivers for patients to live independently and safe. An additional device for illustration and adaptation is an IoT enabled pill dispenser that allows remote dispensing and tracking of medicine consumption. When scheduled timeslots for medication are pre-programmed, pills are dispensed and an alarm will sound to alert patients for consumption. Facial recognition can be built-in to ensure the patient has consumed the required doses. The camera also enables live video-conferencing built-in directly via the proposed QuantumCare app should assistance be detected and required. Should the sensors not detect activity, an alert can be triggered to caregivers to remind patients via other channels. There will be two versions of this device that work in tandem to address needs both at home and outdoors with synchronized dosage requirements.

**Objective 5 -** To promote social interaction among seniors and offer caregiver support via virtual platforms and buddy-matching initiatives.

**Solution 5 - Virtual Social clubs (Care Connect)**

An integrated Virtual Meetups Platform within the app that facilitates the creation and joining of virtual social clubs based on interests, languages spoken, and the care receiver's dementia stage. This could include book clubs, music appreciation groups, or hobby-based gatherings. An Activity Calendar for organizing and participating in virtual events, such as holiday celebrations, group exercises, or art classes. The calendar could suggest activities and allow caregivers to RSVP, encouraging regular participation. An algorithm-based matching system (Buddy Program Matching) to pair caregivers with peers in similar situations for mutual support. Buddies can share experiences, collaborate, and provide companionship through regular check-ins.

# SUPPLY

**Technical Expertise-**

Mobile app development involves multiple stages of SDLC, encompassing backend, frontend, UX design, database, and cloud storage elements. Backend development can be done using open-source technologies like Node.js or Golang for server-side operations, as we handle unstructured data transactions from IoT , Bluetooth and GPS data in mobile. Databases such as MongoDB can handle data storage in this scenario. Additionally, we need to utilize streaming services like Kafka to collect data from IoT devices. For frontend development, languages like Vue.js can be relied upon as they offer seamlessness and better support in the open-source community. UX design tools such as Sketch or Figma can help in crafting intuitive and visually appealing user interfaces. Cloud storage services like Azure can provide services like DB management and Notification services for enabling App notifications with scalability options.

**Outsourcing-**

Software Development - Quantum Leap can capitalize on cost-effective outsourcing to countries like Indonesia, India, or the Philippines for backend and frontend development, under the supervision of in-house leads and quality analysts. Additionally, partnering with computer engineering university graduates in Singapore for term projects and recruiting interns from local universities can infuse fresh perspectives and talent into the app's development process and benefit them by giving them an opportunity. By combining these strategies, Quantum Leap can efficiently utilize quality manpower while balancing the cost and benefit of the project.

**In-house-**

**Software Development** - Given that Quantum Leap is already providing smart solutions, they can leverage their existing team or recruit new team members like the Technical Lead cum Project Manager, and Quality Analyst to supervise and perform quality checks for the QuantumCare App, as this new App has an opportunity to evolve with new requirements in the changing environment.

**Device Development** - As Quantum Leap has proficiency in crafting smart devices, for the VoiceBot device, we can enhance any of the existing Quantum Leap’s Bluetooth devices with voice output capabilities. Alternatively, we can create a new Bluetooth device specifically for the VoiceBot. Additionally, Quantum Leap aims to develop a Smart IoT Pills Box that integrates hardware components and IoT sensors to monitor medicine usage effectively.

# KPIs

**Solutions provided to reduce caregiver contact time with dementia patients:**

This (VoiceBot, LeapSuite) frees up time for caregivers to partake in social activities while promoting dementia patients to live safely and independently.

**Reduce cases of dementia patients losing their way home to below 50 patients annually:**

QuantumCare aims to decrease dementia-related missing persons cases to below 50 from 127 in 2021, with HelpLink speeding up patient identification and retrieval.

**Achieve adoption and penetration of QuantumCare for both caregivers and dementia patients:**

Ensure QuantumCare adoption with both caregivers and dementia patients to gradually establish market presence as the de-facto mobile application solution in the dementia arena.

# COST ANALYSIS

**COST**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** |
| **Category** | **Cost** | **Total Cost** | **Total Cost** | **Total Cost** | **Total Cost** | **Total Cost** |
| Outsource | 1 x Backend Developer- $4000/month x 3 months | $24,000 | - | - | - |  |
| 1 x Frontend Developer(UI) - $4000/month x 3 months |
| In-House (Development, Operations & Maintenance) | 1 x Tech Lead cum PM x $5000/month x 3 months | $87,000 | - | - | - | - |
| 1 x Quality Analyst x$4000/month x 3 months |
| 1 x Jr FullStack Developer x $3500/month x 10months | $36,864 | $ 37,749 | $ 19,327 | $19,791 |
| 1 x Jr Quality Analyst x $2500/month x 10months |
| Data Cost | 450TB x Azure DB Service x $0.2/month | $ 4,290 | $ 4,290 | $ 4,290 | $ 4,290 | $4,290 |
| Azure Notification Hub-Standard x $267.50/annum |
| Device Cost | LeapMedi - 920 units x $50/unit | $73,600 | $85,606 | $ 164,836 | $ 247,820 | $334,691 |
| VoiceBot - 920 units x $30/unit |
| Miscellaneous |  | $ 10,000 |
| **Total Cost** |  | **$ 198,890** | **$ 126,760** | **$ 206,875** | **$ 271,437** | **$ 358,773** |

**Note –** Considering the Average Inflation rate on cost @ 2.40% from Year 1 onwards.

**REVENUE**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Total** |
| **Cost** | $ 198,890 | $126,760 | $ 206,875 | $ 271,437 | $ 358,773 | $ 1,162,735 |
| **Revenue** | $ 358,432 | $358,432 | $606,648 | $ 854,864 | $ 1,103,080 | $ 3,281,456 |
| **Investment Gain** | $159,542 | $231,672 | $ 399,773 | $ 583,427 | $744,307 | $ 2,118,721 |
| **ROI** | **82.22%** | | | | |  |
| **Annualized ROI** | **12.75%** | | | | |  |

# RISK AND MITIGATIONS

|  |  |  |
| --- | --- | --- |
| **#** | **RISK** | **MITIGATION** |
| R1 | In instances where the Dementia patient may inadvertently leave their mobile phone behind and forget due to their challenging situation, QuantumCare app unfortunately wouldn't be able to assist. | Given the well-known risk that dementia patients often misplace their phones, we strongly advise caregivers to ensure that the patient's phone is consistently kept within close reach. Additionally, caregivers can leverage VoiceBot service to set notifications at regular intervals, prompting patients to locate their phone within the household. This proactive approach not only helps mitigate the stress and frustration associated with misplaced items but also empowers patients to maintain independence and control over their belongings |
| R2 | As this app involves various user roles such as patients, caregivers, and volunteers, data privacy could be a concern since the data will be collected, tracked, and utilized to populate information into several features within the QuantumCare app, such as HelpLink and CareHub. This data collection might prompt questions about how this data will be utilized by Quantum Leap and the level of security it would maintain if stored on any public cloud services | Quantum Leap needs to come up with a robust mitigation plan for this risk, including implementing data encryption protocols during transit and storage. Moreover, Quantum Leap should strictly adhere to all relevant data protection regulations as per the Singapore Government's PDPA, etc. Regular audits and penetration tests need to be conducted on the app to rectify vulnerabilities. Additionally, stringent access controls should be implemented while using public cloud systems to enhance data security. Above all, staff need to be trained on data privacy best practices. |
| R3 | There's a significant likelihood that users, particularly patients, might experience confusion when faced with multiple features on the app dashboard. This confusion could stem from uncertainty about which feature best addresses their specific needs. | This app necessitates a user-centric design, structured around distinct user roles such as patients, caregivers, and volunteers. Upon login, the app dynamically populates features relevant to the user's role, ensuring a personalized and intuitive experience. Moreover, offering users the flexibility to select features based on their interests and needs further enhances usability and engagement. This customizable approach not only simplifies navigation but also empowers users to access functionalities that are most beneficial to them, enabling a more inclusive and user-centric platform. |

# CONCLUSION

With the aging population in Singapore and the increased dementia risk associated with age, it is inevitable that dementia patients will rise exponentially within the next decade. With the proposed solutions, Quantum Leap may solidify its position as the dominant ecosystem provider for Singapore’s dementia landscape and establish itself as the market leader with both patients and caregivers.

# APPENDIX

**Appendix 1 – VoiceBot Manufacturing Cost**

|  |  |
| --- | --- |
| **Items** | **Cost (SGD)** |
| Microcontroller or Development Board | $8 |
| Bluetooth (BLE) | $4 |
| Speaker | $8 |
| Misc | $10 |
| **Total** | **$30** |

**Appendix 2 – LeapSuite Manufacturing Cost**

As QuantumLeap’s current LeapCare also leverages on IoT solutions, software maintenance and long-term operations are assumed to rely on existing infrastructure and not incur additional costs.Specific to IoT enabled medicine boxes, the following key components are required to enable the functionality desired:

|  |  |
| --- | --- |
| **Component** | **Cost** |
| RL78/G13 Microcontroller | $2.796 |
| WeMos ESP8266 Wifi Module | $6.93 |
| Mobile Application (to leverage LeapCare) | Not Applicable |
| Buzzer | $2.23 |
| Clock Display | $7.65 |
| LED Light | $6.15 |
| Camera for Facial Recognition | $18.67 |
| Casing, Assembly, Miscellaneous | $5.574 |
| **Total** | **$50** |

The above are non-exhaustive and any additional cost (per unit) are to be considered under “Miscellaneous”. Given the background context of QuantumLeap and existing supply chain capabilities in China, it is assumed that cost per component may potentially be lower than above quotes from local suppliers.

**Appendix 3 – Cost & Revenue - ROI**

A screenshot of a calculator

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**Appendix 4 – Risk Matrix**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | **Likelihood** | | | | |
|  |  | **Rare** | **Unlikely** | **Possible** | **Probable** | **Almost**  **Certain** |
| **Business**  **Impact** | **Severe** |  |  |  | **R2** |  |
| **Large** |  |  |  | **R3** |  |
| **Moderate** |  |  |  | **R1** |  |
| **Small** |  | **R2** |  |  |  |
| **Significant** |  | **R3** | **R1** |  |  |

**Appendix 5 – Prototypes**

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**Appendix 6 – Cost & Revenue Calculations**

**YEAR 0 – COST & REVENUE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year 0** | | | | |
| **Role** | **Units** | **Cost/Month(SGD)** | **No.of Months** | **Total Cost(SGD)** |
| **Option A- Intern (one-time cost)** | | | | |
| Backend Developer - Intern | 1 | $ 1,000.00 | 3 | $ 3,000.00 |
| Frontend Developer(UI) - Intern | 1 | $ 1,000.00 | 3 | $ 3,000.00 |
|  |  |  |  | **6000** |
| **OR** | | | | |
| **Option B-Outsource (one-time cost)** | | | | |
| Backend Developer | 1 | $ 4,000.00 | 3 | $ 12,000.00 |
| Frontend Developer(UI) | 1 | $ 4,000.00 | 3 | $ 12,000.00 |
|  |  |  |  | **$ 24,000.00** |
| **In-House(Development, Operations & Maintenance)-Upto 1 Years** | | | | |
| Tech Lead cum PM | 1 | $ 5,000.00 | 3 | $ 15,000.00 |
| Quality Analyst | 1 | $ 4,000.00 | 3 | $ 12,000.00 |
| Jr FullStack Developer | 1 | $ 3,500.00 | 10 | $ 35,000.00 |
| Jr Quality Analyst | 1 | $ 2,500.00 | 10 | $ 25,000.00 |
|  |  |  |  | **$ 87,000.00** |
| **Data Cost - Upto 1 Year** | | | | |
| Azure DB Service - 450 TB | 450 | $ 0.20 | 12 | $ 1,080.00 |
| Azure Notification Hub-Standard | NA | $ 267.50 | 12 | $ 3,210.00 |
|  |  |  |  | **$ 4,290.00** |
| **Device Cost** | | | | |
| **Device** | **Units** | **Cost/Unit (SGD)** | | **Total Cost(SGD)** |
| LeapMedi | 920 | $ 50.00 | | $ 46,000.00 |
| VoiceBot | 920 | $ 30.00 | | $ 27,600.00 |
| Miscellaneous |  |  |  | $ 10,000.00 |
|  |  |  |  | **$ 83,600.00** |
| **Total Cost** |  |  | **Min-Option A** | **$ 180,890.00** |
|  |  |  | **Max-Option B** | **$ 198,890.00** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Dementia Patients  in Singapore as on 2021** | **92000** |  |  |  |
| **Year 0** | | | | |
| **Year 0** | **Total Cost(SGD)** | **Units Sale per year** | **Unit Price/Year (SGD)** | **Revenue(SGD)** |
| QuantumCare App Membership (Assuming 1 in 100 will purchase) | $198,890.00 | 3680 | $59.90 | $220,432.00 |
| VoiceBot (Assuming 1 in 100 will purchase) | 920 | $50.00 | $46,000.00 |
| IoT Device (Assuming 1 in 100 will purchase) | 920 | $100.00 | $92,000.00 |
| **Revenue** |  |  |  | **$358,432.00** |
| **Investment Gain** |  |  |  | **$159,542.00** |
| **Return on Investment (ROI)** |  |  |  | **80.22%** |

**YEAR 1 – COST & REVENUE**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year 1** | | | | | |
| **Role** | **Units** | **Inflation Rate** | **Cost/Month(SGD)** | **No.of Months** | **Total Cost(SGD)** |
| **In-House(Development, Operations & Maintenance)** | | | | | |
| Jr FullStack Developer | 1 | 2.40% | $ 3,584.00 | 6 | $ 21,504.00 |
| Jr Quality Analyst | 1 | $ 2,560.00 | 6 | $ 15,360.00 |
|  |  |  |  |  | **$ 36,864.00** |
| **Data Cost** | | | | | |
| Azure DB Service - 450 TB | 450 |  | $ 0.20 | 12 | $ 1,080.00 |
| Azure Notification Hub-Standard | NA | $ 267.50 | 12 | $ 3,210.00 |
|  |  |  |  |  | **$ 4,290.00** |
| **Device** | **Units** |  | **Cost/Unit (SGD)** | | **Total Cost(SGD)** |
| LeapMedi | 920 | 2.40% | $ 51.20 | | $ 47,104.00 |
| VoiceBot | 920 | $ 30.72 | | $ 28,262.40 |
| Miscellaneous |  |  |  |  | $ 10,240.00 |
|  |  |  |  |  | **$ 85,606.40** |
| **Total Cost** |  |  |  |  | **$ 126,760.40** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year 1** | | | | |
| **Year 1** | **Total Cost(SGD)** | **Units Sale per year** | **Unit Price/Year (SGD)** | **Revenue (SGD)** |
| QuantumCare App Membership (Assuming 1 in 100 will purchase) | $126,760.40 | 3680 | $59.90 | $220,432.00 |
| VoiceBot (Assuming 1 in 100 will purchase) | 920 | $50.00 | $46,000.00 |
| IoT Device (Assuming 1 in 100 will purchase) | 920 | $100.00 | $92,000.00 |
| **Revenue** |  |  |  | **$358,432.00** |
| **Investment Gain** |  |  |  | **$231,671.60** |
| **Return on Investment (ROI)** |  |  |  | **182.76%** |

**YEAR 2 – COST & REVENUE**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year 2** | | | | | |
| **Role** | **Units** | **Inflation Rate** | **Cost/Month(SGD)** | **No.of Months** | **Total Cost(SGD)** |
| **In-House(Development, Operations & Maintenance)** | | | | | |
| Jr FullStack Developer | 1 | 2.40% | $ 3,670.02 | 6 | $ 22,020.10 |
| Jr Quality Analyst | 1 | $ 2,621.44 | 6 | $ 15,728.64 |
|  |  |  |  |  | **$ 37,748.74** |
| **Data Cost** | | | | | |
| Azure DB Service - 450 TB | 450 |  | $ 0.20 | 12 | $ 1,080.00 |
| Azure Notification Hub-Standard | NA | $ 267.50 | 12 | $ 3,210.00 |
|  |  |  |  |  | **$ 4,290.00** |
| **Device** | **Units** |  | **Cost/Unit (SGD)** | | **Total Cost(SGD)** |
| LeapMedi | 1840 | 2.40% | $ 52.43 | | $ 96,468.99 |
| VoiceBot | 1840 | $ 31.46 | | $ 57,881.40 |
| Miscellaneous |  |  |  |  | $ 10,485.76 |
|  |  |  |  |  | **$164,836.15** |
| **Total Cost** |  |  |  |  | **$206,874.88** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year 2** | | | | |
| **Year 2** | **Total Cost(SGD)** | **Units Sale per year** | **Unit Price/Year (SGD)** | **Revenue (SGD)** |
| QuantumCare App Membership (Assuming 2 in 100 will purchase) | $206,874.88 | 5520 | $59.90 | $330,648.00 |
| VoiceBot (Assuming 2 in 100 will purchase) | 1840 | $50.00 | $92,000.00 |
| IoT Device (Assuming 2 in 100 will purchase) | 1840 | $100.00 | $184,000.00 |
| **Revenue** |  |  |  | **$606,648.00** |
| **Investment Gain** |  |  |  | **$399,773.12** |
| **Return on Investment (ROI)** |  |  |  | **193.24%** |

**YEAR 3 – COST & REVENUE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year 3** | | | | |
| **Year 3** | **Total Cost(SGD)** | **Units Sale per year** | **Unit Price/Year (SGD)** | **Revenue(SGD)** |
| QuantumCare App Membership (Assuming 3 in 100 will purchase) | $271,436.97 | 7360 | $59.90 | $440,864.00 |
| VoiceBot (Assuming 3 in 100 will purchase) | 2760 | $50.00 | $138,000.00 |
| IoT Device (Assuming 3 in 100 will purchase) | 2760 | $100.00 | $276,000.00 |
| **Revenue** |  |  |  | **$854,864.00** |
| **Investment Gain** |  |  |  | **$583,427.03** |
| **Return on Investment (ROI)** |  |  |  | **214.94%** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year 3** | | | | | |
| **Role** | **Units** | **Inflation Rate** | **Cost/Month(SGD)** | **No.of Months** | **Total Cost(SGD)** |
| **In-House(Development, Operations & Maintenance)** | | | | | |
| Jr FullStack Developer | 1 | 2.40% | $ 3,758.10 | 3 | $ 11,274.29 |
| Jr Quality Analyst | 1 | $ 2,684.35 | 3 | $ 8,053.06 |
|  |  |  |  |  | **$ 19,327.35** |
| **Data Cost** | | | | | |
| Azure DB Service - 450 TB | 450 |  | $ 0.20 | 12 | $ 1,080.00 |
| Azure Notification Hub-Standard | NA | $ 267.50 | 12 | $ 3,210.00 |
|  |  |  |  |  | **$ 4,290.00** |
| **Device** | **Units** |  | **Cost/Unit (SGD)** | | **Total Cost(SGD)** |
| LeapMedi | 2760 | 2.40% | $ 53.69 | | $148,176.37 |
| VoiceBot | 2760 | $ 32.21 | | $ 88,905.82 |
| Miscellaneous |  |  |  |  | $ 10,737.42 |
|  |  |  |  |  | **$247,819.61** |
|  |  |  |  |  |  |
| **Total Cost** |  |  |  |  | **$271,436.97** |

**YEAR 4 – COST & REVENUE**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year 4** | | | | | |
| **Role** | **Units** | **Inflation Rate** | **Cost/Month(SGD)** | **No.of Months** | **Total Cost(SGD)** |
| **In-House(Development, Operations & Maintenance)** | | | | | |
| Jr FullStack Developer | 1 | 2.40% | $ 3,848.29 | 3 | $ 11,544.87 |
| Jr Quality Analyst | 1 | $ 2,748.78 | 3 | $ 8,246.34 |
|  |  |  |  |  | **$ 19,791.21** |
| **Data Cost** | | | | | |
| Azure DB Service - 450 TB | 450 |  | $ 0.20 | 12 | $ 1,080.00 |
| Azure Notification Hub-Standard | NA | $ 267.50 | 12 | $ 3,210.00 |
|  |  |  |  |  | **$ 4,290.00** |
| **Device** | **Units** |  | **Cost/Unit (SGD)** | | **Total Cost(SGD)** |
| LeapMedi | 3680 | 2.40% | $ 54.98 | | $202,310.14 |
| VoiceBot | 3680 | $ 32.99 | | $121,386.08 |
| Miscellaneous |  |  |  |  | $ 10,995.12 |
|  |  |  |  |  | **$334,691.34** |
| **Total Cost** |  |  |  |  | **$358,772.55** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year 4** | | | | |
| **Year 4** | **Total Cost(SGD)** | **Units Sale per year** | **Unit Price/Year (SGD)** | **Revenue(SGD)** |
| QuantumCare App Membership (Assuming 4 in 100 will purchase) | $358,772.55 | 9200 | $59.90 | $551,080.00 |
| VoiceBot (Assuming 4 in 100 will purchase) | 3680 | $50.00 | $184,000.00 |
| IoT Device (Assuming 4 in 100 will purchase) | 3680 | $100.00 | $368,000.00 |
| **Revenue** |  |  |  | **$1,103,080.00** |
| **Investment Gain** |  |  |  | **$744,307.45** |
| **Return on Investment (ROI)** |  |  |  | **207.46%** |

# REFERENCES –

1. City of Good. (2022, April 5). Dementia Colabs Public Report. Retrieved from <https://cityofgood.sg/wp-content/uploads/2022/04/Dementia-Colabs-Public-Report-5-April-2022.pdf>
2. Calculator.net. (n.d.). ROI Calculator. Retrieved from <https://www.calculator.net/roi-calculator.html?beginbalance=122%2C890&endbalance=183%2C908&investmenttime=length&investmentlength=1&beginbalanceday=2024-03-17&endbalanceday=2028-12-31&x=Calculate#calresult>
3. Cytron Technologies. (n.d.). Wemos D1 Mini ESP8266 Development Board. Retrieved from <https://sg.cytron.io/c-wireless-devices/p-wemos-d1-mini-esp8266-dev-board>
4. Digi-Key Electronics. (n.d.). Seeed Technology Co., Ltd - 114992266. Retrieved from [https://www.digikey.sg/en/products/detail/seeed-technology-co.,-ltd/114992266/12396967?utm\_adgroup=&utm\_source=google&utm\_medium=cpc&utm\_campaign=PMax%20Shopping\_SG\_High%20Performing%20Prodcuts&utm\_term=&productid=12396967&utm\_content=&utm\_id=go\_cmp-20033881620\_adg-\_ad-\_\_dev-c\_ext-\_prd-12396967\_sig-Cj0KCQjwqdqvBhCPARIsANrmZhME0Zso-\_zfg5NXqswvGxevtd5DHKEFXU19LfPmM\_B9jiyEKfibSzYaAshrEALw\_wcB&gad\_source=1&gclid=Cj0KCQjwqdqvBhCPARIsANrmZhME0Zso-](https://www.digikey.sg/en/products/detail/seeed-technology-co.,-ltd/114992266/12396967?utm_adgroup=&utm_source=google&utm_medium=cpc&utm_campaign=PMax%20Shopping_SG_High%20Performing%20Prodcuts&utm_term=&productid=12396967&utm_content=&utm_id=go_cmp-20033881620_adg-_ad-__dev-c_ext-_prd-12396967_sig-Cj0KCQjwqdqvBhCPARIsANrmZhME0Zso-_zfg5NXqswvGxevtd5DHKEFXU19LfPmM_B9jiyEKfibSzYaAshrEALw_wcB&gad_source=1&gclid=Cj0KCQjwqdqvBhCPARIsANrmZhME0Zso-_zfg5NXqswvGxevtd5DHKEFXU19LfPmM_B9jiyEKfibSzYaAshrEALw_wcB)
5. Element14. (n.d.). Seeed Studio Buzzer Module 2.3 kHz 85 dB. Retrieved from <https://sg.element14.com/seeed-studio/107020000/buzzer-module-2-3-khz-85-db-3/dp/3932147?gad_source=1&gclid=Cj0KCQjwqdqvBhCPARIsANrmZhNXBTk08vxStSoozy3b3zysc3FR0rZPpBoYVCDzCpkinuimeDEFP2gaAsxHEALw_wcB&mckv=_dc|pcrid||pkw||pmt||slid||product|3932147|pgrid||ptaid||&CMP=KNC-GSG-SHOPPING-PMAX-OTHER-CATEGORY>
6. Element14. (n.d.). Seeed Studio Arduino Board 4 Digit Display. Retrieved from <https://sg.element14.com/seeed-studio/104030003/arduino-board-4-digit-display/dp/4007811?gad_source=1&gclid=Cj0KCQjwqdqvBhCPARIsANrmZhOOHzKufNKbXO-BqNmraoTmTNArbblz5idhSA3G36PdNkYTCpnsKOAaAsy6EALw_wcB&mckv=_dc|pcrid||pkw||pmt||slid||product|4007811|pgrid||ptaid||&CMP=KNC-GSG-SHOPPING-PMAX-OTHER-CATEGORY>
7. JobsDB. (n.d.). Internship developer jobs in Singapore. Retrieved from <https://sg.jobsdb.com/j?sp=search&trigger_source=serp&q=internship+developer&l=singapore>
8. Microsoft Azure. (n.d.). Storage - Blobs Pricing. Retrieved from <https://azure.microsoft.com/en-gb/pricing/details/storage/blobs/?ef_id=_k_dcc8b3010e79183e78a6d6f74af82fa0_k_&OCID=AIDcmm9uk3nhei_SEM__k_dcc8b3010e79183e78a6d6f74af82fa0_k_&msclkid=dcc8b3010e79183e78a6d6f74af82fa0>
9. Microsoft Azure. (n.d.). Notification Hubs Pricing. Retrieved from <https://azure.microsoft.com/en-us/pricing/details/notification-hubs/>
10. Mouser Electronics. (n.d.). Seeed Studio Grove - Water Sensor. Retrieved from <https://www.mouser.sg/ProductDetail/Seeed-Studio/101020472?qs=y6ZabgHbY%252BzS%2Flb2wUgzcw%3D%3D&mgh=1&gad_source=1&gclid=Cj0KCQjwqdqvBhCPARIsANrmZhP2EKf2X0pmmT-BT65t8DClvR7rQlz9I5pR8B9obHO5p7UBf7aDa6kaAgbtEALw_wcB>
11. Renesas Electronics Corporation. (n.d.). Smart Medicine Box Reference Design. Retrieved from <https://www.renesas.com/us/en/products/microcontrollers-microprocessors/rl78-low-power-8-16-bit-mcus/smart-medicine-box-smart-medicine-box-reference-design>
12. RS Components. (n.d.). STM32F103CBT6 ARM Cortex M3 microcontroller. Retrieved from <https://sg.rs-online.com/web/p/microcontrollers/2615969>
13. Statista. (n.d.). Software developers salary annual Indonesia. Retrieved from <https://www-statista-com.libproxy.smu.edu.sg/statistics/726512/software-developers-salary-annual-indonesia/>
14. Statista. (n.d.). Smartphone users in Singapore. Retrieved from <https://www-statista-com.libproxy.smu.edu.sg/statistics/494598/smartphone-users-in-singapore/>
15. Statista. (n.d.). Inflation rate in Singapore. Retrieved from <https://www.statista.com/statistics/379423/inflation-rate-in-singapore/>
16. Statista. (n.d.). Singapore: Smartphone usage by age group. Retrieved from <https://www-statista-com.libproxy.smu.edu.sg/statistics/1266889/singapore-smartphone-usage-by-age-group/>
17. Statista. (n.d.). Total global dementia affected population forecast. Retrieved from <https://www-statista-com.libproxy.smu.edu.sg/statistics/471423/total-global-dementia-affected-population-forecast/>
18. Straits Times. (n.d.). When grandpa can't find his way home: How to help those with dementia. Retrieved from <https://www.straitstimes.com/singapore/when-grandpa-can-t-find-his-way-home-how-to-help-those-with-dementia>
19. City of Good. (2022, April 5). Dementia Colabs Public Report. Retrieved from <https://cityofgood.sg/wp-content/uploads/2022/04/Dementia-Colabs-Public-Report-5-April-2022.pdf>
20. World Health Organization. (n.d.). Global Dementia Observatory. Retrieved from <https://www.who.int/data/gho/data/themes/global-dementia-observatory-gdo>
21. Ministry of Health Singapore. (2023, June 9). Speech by Mdm Rahayu Mahzam, Senior Parliamentary Secretary, Ministry of Health, at the Launch of Inclusive Customer Experience: Making a Difference for Persons Living with Dementia Training Programme. Retrieved from <https://www.moh.gov.sg/news-highlights/details/speech-by-mdm-rahayu-mahzam-senior-parliamentary-secretary-ministry-of-health-at-the-launch-of-inclusive-customer-experience-making-a-difference-for-persons-living-with-dementia-training-programme-on-9-june-2023#:~:text=Dementia%20currently%20affects%20more%20than,increase%20to%20152%2C000%20by%202030>.