Towards Technologies for Promoting Nutritional Health in Older People with Dementia Living in Their Own Home

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I would like to dedicate this thesis to my beloved family, teachers, and mentors who have helped me to become the person I am today.

Declaration

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Abstract

Dementia compromises older people's ability to maintain good nutrition, which in turn hinders their capacity to live in their homes for longer. Thus, they need significant support to maintain their nutritional health, often through care workers, especially when living with limited or no family support. However, with the rapid growth of the older population, the burden on care workers continues to increase, resulting in an urgent need to consider ways to assist people with dementia to maintain their nutritional health as well as their care workers to provide better support for their clients. Through a cross-disciplinary study, this thesis investigates how technologies can be used to promote nutritional health in older people with dementia living in their own homes. This involves an in-depth qualitative descriptive study and two technology development demonstrations.

Understanding needs prior to technology development is crucial for technologies to be effective, accepted by users and able to reach their desired maturity; however, this necessitates greater research investment. This thesis presents, for the first time to the best of the researcher's knowledge, a qualitative descriptive study with the aim of obtaining an holistic perspective of needs for technologies promoting nutritional health in older people with dementia living in their own home, involving focus groups with 27 care workers who provide care to older people with dementia, recruited from four leading aged care providers. Eight categories emerged from synthesising the care workers' voices. These categories provide deep, reliable insights useful for designing nutritional health-promoting technologies. In particular, nutritional health challenges faced by older people with dementia and challenges faced by care workers when providing nutritional health assistance to their clients demonstrate the demand and need for technological assistance and opportunities for developing technologies to promote nutritional health for the target cohort. Furthermore, this thesis proposes important elements need to be considered in technology development in the form of eleven technology design considerations.

Based on the formulated design considerations, two technology development demonstrations are presented. Firstly, poor fluid intake is identified as a significant problem and therefore, recognising fluid intake related primitive human motions using

batteryless Radio Frequency Identification (RFID) technology is investigated. To this end, a *smart cup* to collect fluid intake data is designed and experiments are conducted with young (30.7 ± 1.6 years) and old (69.0 ± 4.6 years) participants. The promising results demonstrate the feasibility and efficacy of recognising short distance, short duration natural fluid intake gestures using batteryless RFID technology for the first time to the best of researcher's knowledge. Secondly, a study that focuses on an architecture, Home of Things for Ambient Assisted Living—HoTAAL, suitable for facilitating the development of a collaborative environment, having heterogeneous technologies that can have seamless integration with each other as well as humans is conducted. It is expected that such an infrastructure would allow the development of a broad range of innovative technological applications to promote the nutritional health of older people with dementia. A demonstration of providing meal preparation assistance employing HoTAAL with three kitchen appliances was conducted. Additionally, possible technological applications based on HoTAAL architecture are described for several scenarios extracted from the focus group findings.

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