

# Research Statement

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**Research Interest:** Ubiquitous Computing – Ubiquitous Health – Internet of Things – Mobile Computing – Human Computer Interaction – Digital Social Care

Connected Health (CE) or technology enabled care is the joint term for ubiquitous health, m-health, and e-health services. CE involves the convergence of health technology, media and mobile telecommunications and is increasingly seen as an integral part of the solution to many of the challenges facing the health, social care and wellness sectors, especially in enabling more effective integration of care [1] [2].

My research is focused to improve people's ability to self-manage their health and wellbeing. I firmly believe in the use of information technology for the elderly and disabled people in order to improve their social inclusion thus leading them towards independent living [3]. My research directly aims at improving the quality of life and enhancing the social inclusion of different communities of society with the advent of technology [4] [5].

## Graduate Research

### Research Problem

People with manipulative and locomotive disabilities represent a large fraction of the population classified as impaired, including the elder, injured and other health related issues. Wheelchairs have evolved in order to maintain their mobility, autonomy and independence in the society. Despite important achievements in accessibility in current society (e.g. Streets adapted for wheelchairs, or public transportation adapted with ramps and elevators), people with motor disabilities still lack independence in daily activities to improve their quality of life. Shopping is one example, where users cannot access products on shelves beyond their arm length. Due to this barrier they often need personal assistance or support to complete all the necessary steps in the shopping activity. However, wheelchair users may prefer to shop individually (that is, without the assistance) in order to maintain their independence and privacy. Currently, around 1% of the world population uses wheelchair [6] [7].

### Research Contributions

I have worked with the disabled people i.e. wheelchair users and blind people in order to design, develop and evaluate interfaces towards their independent living. I have successfully designed, developed and evaluated interaction methods using different ubiquitous technologies. The interaction methods and interfaces empowered wheelchair users and blind people to carry out certain tasks, for example shopping, independently and autonomously without requiring the

assistance or help of others. My dissertation contributed towards the Digital Social Care of disabled people and successful completion of the Spanish and European Union funded projects. The projects that were successfully accomplished are: **racerCaixa – Independent Shopping Experience for Visually and Mobility Impaired** and **PIGALL – Haptic and Locomotor Guiding of Blind People Inside a Retail Store**. The projects involved interdisciplinary and industry collaborations. Based on my research findings, I have published papers in prestigious conferences.

### **Research Problem**

Now a day's healthcare industry is growing enormously due to the increase in the elderly population and the decline in birth-rate. The healthcare becomes a big issue due to lack of medical doctors and offline healthcare. Offline healthcare is much expensive and its mostly one to one communication, if we use information and communication technology in healthcare we can bring pivotal changes in the healthcare industry. Also healthcare is coming under immense pressure to improve the quality of services given to patients via prevention and post-operative care.

### **Research Contributions**

There is a paradigm shift from need based health care to preventive based healthcare also called social care. This comes at a time when there is a need to curtail growth in healthcare spending fueled by elderly populations, the prevalence of obesity, diabetes, and chronic heart and lung diseases. People who are suffering from any chronic disease think that they are not the active part of the community. During my stay at Kyung Hee University, Korea I have worked on Ubiquitous Health Technologies in order to maintain public health and help them to preempt diseases. I had successfully defended my thesis from Biomedical Engineering department, KHU in Ubiquitous and m- Health. I have participated in the successful execution and completion of healthcare project funded by Korean government.

The theme of my Master thesis was “to help people live well and age well by preempting diseases”. I have worked on the design and implementation of a healthcare system that helps people to evaluate current health status. On the basis of current health status, we recommend certain exercises or activities to improve their health status. We had successfully deployed our healthcare systems in three main cities of South-Korea, where everyday hundreds of people use them. My research resulted in publications and successful completion of the following projects: **u-Health Hub: A Public Healthcare IT Infrastructure, Korea and East West Neo Medicinal u-Lifecare Research Center (uLCRC) – Information Technology Research Center, Project**. These projects were accomplished in close collaboration with the industry. My research findings resulted in the high impact publications.

## **Industry Collaboration**

I believe in the mechanism of channelizing the academic research into the society through industry. I have collaborated with the industry to bring my research findings into practice. With the help of industry my research findings and systems are currently available to the general public as services and products. I have intensively collaborated with the **The Health and Information Systems (HIMS), Korea** and **Keonn Technologies S.L., Spain**, during my graduate research. I have provided the solutions to the emerging problems faced by industry. For instance, offline retail is facing a big challenge from e-commerce. I have contributed towards the bringing of online commerce features to the physical offline shopping stores.

## **Future Research**

My future research will follow the same pattern of applied research, in strong collaboration with the industry. I will lead my research under the paradigm of Internet of Things.

## **Healthcare, Digital Social Care, Internet of Things and Smart Cities**

The evolving field of Internet of Things (IoT) holds a great prospective to meet unmet demands of healthcare. However, to become a valid approach in clinical practice, IoT technologies demands research, development, testing, and trials, since these systems are planned to be a part of both hospitals and natural environments such as homes.

Patients and providers both stand to benefit from IoT carving out a bigger presence in healthcare. Some uses of healthcare IoT are mobile medical applications or wearable devices that allow patients to capture their health data. Hospitals use IoT to keep tabs on the location of medical devices, personnel and patients.

The analysis of data obtained through wearable devices or smart phones, combined with electronic medical records, diagnostic information gathered through imaging equipment, monitors and handheld personal devices will enhance the decision making powers of professionals and enables patients to take a more active role in managing their personal health. These innovations are transforming not just the care of the chronically ill, but those who are and want to remain healthy. IoT can be used to supplement patient treatment through remote monitoring and communication, and to keep track of patients as they move through a healthcare facility.

My future research will make use of connected sensors under the domain of IoT. These connected sensors can be in the form of smart phones, wearable health gadgets, etc. By employing IoT, I will build a platform for self-adaptive healthcare services. Both clinicians and patients will benefit from the provided healthcare services and platform. Additionally, it will provide the base for epidemiological studies.

## References

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