Transcendent technology and mobile ehealth

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Technology has become entwined in the lives of persons of all ages, in countries across the globe. Information and communication technologies connect individuals globally in just seconds, enabling actions previously not possible, supporting families and friends to stay connected via social media and programs such as Skype, Facetime, Appletime, and What's app. The unprecedented growth in social media supports education and training and allows for a virtual environment for recreation and fun.

These technologies are becoming so powerful that it is becoming hard to live a life without them; we design our society around them. However, not everyone is able to interact with the technology in the same way, meaning people are at a disadvantage to others. It is our failure to understand life, not technology, which is causing this disadvantage. Technological systems are most often designed to support or enhance lives of the average citizen and quite frequently for the average, well-paid, individual living in a developed country. When systems are designed outside of this, the technology is then typically designed with a notion to change, challenge or improve the lives of these people, as if they only live their lives in deficit. There is often an implicit assumption that human behaviour and society is understood and it is known how technology can be placed within it for maximum effect, without properly ever examining it. We are still incredibly technocratic and top-down in how we go about introducing technology. We need to be much more bottom-up and start with community, society and individuals, and address how and where technology fits within these respective facets, and not go finding a solution looking for a problem. Funding mechanisms and emphasis on market driven policies fuels this in the western world. To have technology that is harmonious within human life, we need to start with understanding and examining our lives.

Therefore more research is needed to expand understanding of how human behaviour connects to life and society and its fit with technology. To create and implement technology to work well with people in for example, a remote northern community above the arctic circle, developers must first understand how such communities live and where technology can support rather than hinder daily life. There is need for greater emphasis on co-production

of technology, more ethnographic work with potential users including a range of people and communities.

Contributions to this book have all highlighted the need to increase involvement from users in the design of mobile ehealth. Too often the needs of users are assumed without the existence of evidence based research and stakeholder consultation with the users first.

Techniques outlined in Ruzic and Sanfod's enable more a user-centred design approach to designing the interface between the individual and the technology. It is often posited that technology has a mind of its own as it may or it may not behave exactly in the way it has been designed and programmed. Indeed, the development and introduction of the internet may be considered an example of this. One may question whether the developers of the internet ever could have imagined it's widespread use and integration into daily life of persons across the globe. If the technology does not perform as expected then that's often believed to be a misunderstanding of the technology and its resulting interactions with individuals. It is at this interface that many of the chapters in the book are calling for the need to pause and examine. It is here where the technology, the apps, the games, the widgets, have potential to enhance or disrupt the individual's behaviour and it is here where concentration of further research is needed.

Here ethics and dilemmas meet and warrant space to identify procedures, standards and laws to ensure the interaction is favourable and non-harmful to the individual and to society. The book covers these in Chapter 5 - from Lynch and Fisk, Mantovani and Cristobek Bocos and Wiersinga. All these chapters highlight the contention in that space and offer solutions but note that solutions are not easy to reach and that one size fits all may not always be the solution.

One of the key aspects to emerge in the ehealth and mhealth debate is innovation. Technology is creating completely novel ways of how society and individuals interact with health and wellbeing. These completely new structures and ways of being mean that existing structures are challenged, contested or disrupted. Quite often completely new systems are needed to be created for the technology to become useful. In terms of regulation, Wiersinga (chapter ?) reminds us that new apps can be seen under the same guidance as medical devices in some countries and in some contexts, therefore having to meet stringent guidelines

in order for them to become used. However, they can also be seen very differently, even if they are doing the job of a medical device. Technologies can also bring together professionals like has never before been seen. The sharing of expertise matched with sharing of patient records and history must be of benefit to the individual patient, for example. But, without proper understanding of what is needed from each professional and how they operate and work together, along with legal and ethical issues of sharing information, such systems are not likely to be used to their potential. An ultimate goal of such technology is for the individual to truly understand his or her health from the ehealth and mhealth supporting systems. How such technology can enhance the user to become fully informed of their own health and able to make changes in respect of this information is championed. However, the psychology of how individuals interpret such data and how they go about acting up on such data is not yet well known. It is still not possible to understand how such systems should be designed for positive behaviour to follow. Should a system simply provide passive information for the user to interpret (e.g. steps walked, calories ingested, heart bear rate etc.) or should the system then advise the user (e.g. "you need to do more exercise today") and if so how? How should warnings be communicated? How should feedback look? Does it need to be normed at all, for example for age, gender, culture or the individual? Could future systems even go one step further and stop the user altogether from doing behaviours bad for their health?

We too often misunderstand that technology entwines with society, with communities and with groups. It is not an individual thing. Yet most of our research examines how technology impacts on individuals. Technology mediums change the nature of interactions between people. Martin-Khan and colleagues provide a description of the evolution of telehealth and note how health care systems are progressing to an era where telehealth is becoming embedded within mainstream health services as part of regular care rather than an additional add on service. It is examples such as telehealth where there is need to examine how technology based interactions work and are complementing, contrasting, or replacing face to face human contact. Telehealth challenges society to stop viewing technology as something that patches a gap or responds to a problem in someone's life or in society and instead that it is part of ensuring efficiency and quality of care from the health system. Technology can work with existing structures of society and with people, but it cannot alone solve problems without understanding how the problem arises and what the problem is in the first place. More understanding of the problem would be useful. Naturally mobile ehealth can aid this.

Technology continues to be treated as a separate entity, as a separate subject. Technology involves a sum of much more than engineering, computer programming and design. Instead, it is argued that technology be considered from a multi-disciplinary vantage point that marries computer science (technology hardware and software) with humanities, social sciences, and medicine (health promotion, behaviour change, and improved quality of life). Health and social sciences needs a take on greater role, but simultaneously, so also should the arts and humanities. Ethical dimensions of technology must be positioned within comprehension of design. People do not live their lives in silos of science and art. Instead people are immersed in a mixture, and so, therefore, must our technologies.

The chapter on the immersive technological art project, Splash, presented in Chapter 3 by Paczynski et al. highlighted how creativity and art can improve body movements; improving health and wellbeing through immersive art. The work addressing how ehealth games improve health and wellbeing, demonstrated in this book in chapters 3 and 4 by Ivory and Ivory, and Marston et al. When examining how mobile ehealth can be used as an intervention to improve health and wellbeing. , One must look beyond traditional behaviour change techniques such as the ubiquitous Linear Deficit Model which proposes that individuals suffer some form of knowledge (or skill) deficit which only needs to be replaced in order to change attitudes which also will change behaviour. The simplicity of the model is appealing, as the mobile or ehealth intervention only needs to contain information and people will change their health behaviour for the better. Indeed, it is widely used in behaviour change interventions, in particular in health and safety campaigns, but it is largely now discredited, at least in its simplest form.

Can mobile ehealth provide a better self-awareness to enact behaviour change? The introduction of quantified self can help illuminate individual problems in health and in a continuous way, something never before possible. Earlier interventions or supports are possible, but only if how to use such data is understood by the user and who has access to it and who can make a decision of what is normal and irregular is transparent. Users must be aware and able to understand what the data collected about them can mean and how they may leverage this personal information to best inform their behaviours. The chapter addressing the quantified self by Sacremento and Wanick and De Mayer is an important piece which raises such questions that in turn needs to be further elevated to the fore.

Future of Mobile eHealth

The future of the mobile ehealth and related technologies is fascinating and is evolving at a quick pace. Since the turn of the 21st Century, society has witnessed many technological (both software and hardware) developments that have transformed the way societies live their lives. For many in the Generation X cohort who grew up in the age of digital games, playing PacMac, Super Mario and Sonic the Hedgehog on PC's and respective game consoles, it is difficult to believe that within less than a decade or so, communication and gaming technologies were about to change to facilitate a different motion of interaction (for example Nintendo Wii and DS), mobile and smartphones leading onto the mobile (health) apps.

Thus in less than 20 years, younger generations such as the Millennials have borne witness to these technologies which for them are a part of every-day life and living, Such as this, social media has also played an important role in these young lives, whereby, for many retrieving and sharing information such as photographs of everyday living, communicating with friends and family through different means (e.g. sharing photographs, chatting in real-time and 'updating' one's status) or 'adding' people to your friends list who one may have met on holiday, at a festival/gig, at the pub or through education.

A question to think about is what can society and younger generations expect from industry and research in the forthcoming decades? Will accuracy and reliability of mobile apps improve which in turn will facilitate health practitioners to diagnose quicker and in a more cost-effective manner? Will the design and development of technologies and their related software be designed with the notion of target users been involved from the beginning? Will researchers and practitioners extend their exploration to ascertain the barriers and enablers to technology use and ownership by our current ageing populations with the notion of preparing for our future ageing cohorts such as the Generation X and the Millennials, who are in contrast very different to the Baby Boomer generation. Keeping in mind, for many Gen X and certainly Millennials they have grown up with technology. Technology and its related attributes are like the television, washing and iron to the Baby Boomer generation. Indeed, the importance of access to information and communications technologies for persons residing in rural communities has been equated to that of the introduction of the railroad for generations before (Ashton et al., 2013).

For older adults, the exploration of technology use is increasing in popularity (Marston, Freeman, Bishop, & Beech, 2016; Marston & Graner-Ray, 2016) with technology now being geared towards improving the quality of life of older adults, whether through applications for home support services (Marston et al., 2015), medication reminders, mirrors that display health data, medical implants, or wearable technology (European Commission: Information Society and Media, 2007). Research shows that technology can change the family situations of elderly individuals and are of utmost importance for older adults (Silverstein & Giarrusso, 2010). As described by Martin-Khan et al. in chapter XXX, the evolution of telehealth services has opened a door to improve accessibility to health care for many persons, including older adults. Technology use is a becoming routine practice for many older adults, with home computers being used to create a common interest among older and younger family members and improve family ties (Cotten, Anderson, & McCullough, 2013; Lindsay, Smith, & Bellaby, 2007).

We see through social media, personal experience and news bulletins that technology and social media can be fun and entertaining, and hopefully this notion will continue. Yet, it cannot be ignored that as a society, there is an ageing population, increasingly drawing on health and social care serbices, the need and want to maintain living independently and thus, is this where technology can really be a key player in society in the forthcoming decades. Will it be the norm to have new built housing, kitted out as 'smart homes'? As a young person, couple or family move into this new 'smart home' will it be ready for those living there to age in place, for example, door frames wide enough to allow a wheelchair to manoeuvre with ease? Will national and local governments, housing developers and contractors communicate and liaise with those who are involved in smart/home technology and design, to ensure all designs prior to 'breaking ground' are suitable for those to 'age in place' successfully. Thinking about old age is not only important for younger generations, but as society continues to age and the current and future populations reach into their 100's, the notion of technology to support 'ageing in place' should be considered.

The future of technology and ehealth in the forthcoming decades will be interesting not only for society but also for researchers, industry and health practitioners. The possibility of using and deploying technology solutions to assist varying cohorts across the lifespan needs further and extensive exploration and study, in particular using mhealth apps which have the

potential to assist users self-manage and monitor alongside their health practitioner with chronic health conditions.

Authors have noted throughout their contributions in this book, there is more than just one facet that needs exploring. Functionality, usability and acceptability requires further understanding and a coherent set of guidelines that all users can adhere by to be published. Theoretical and international studies should be explored to ascertain how different cultures and areas worldwide (developed vs developing) embrace new technological developments, or is it frugal technologies and innovations that will be suited more so to developing countries? Further exploration is needed in relation to ethics and research ethics boards (REB). Across academic institutions, public and private organizations, and across geographies, REB's vary considerably. It is important to consider from a multidisciplinary and multi-institutional perspectives how familiar REB's may or may not be with the associated research domain. Understanding and learning from bad experiences in respective studies is important to the academic community. Transparency in both successes and challenges with research should be possible.

This book has provided an insight into the current work with in the domain of mobile ehealth. A common theme for all respective authors is that more work is needed. Great opportunities exist in the development and implementation of suitable technological solutions to assist all cohorts of society. Simultaneously, it must be recognized that there is no one size fits all across the lifespan. Researchers and industry practitioners need to be mindful of the different levels of experience and ability of all involved from developers to end users. Understanding the needs and requirements of the respective target audience is crucial for designing and deploying technology. However, for mass take-up, patience and understanding what the specific technology or solution is going to bring to the person or cohort maybe more important than fancy functions and swish interfaces.

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