

# **The Social and Psychological Aspects of Smart Home Technology within the Care Sector**

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## INTRODUCTION

*Everything has become an operation, everything has to have a function and a use.*

(Fromm 1995, 24)

Technological innovations within the home are nothing new. The introduction of the radio, through to the current rise of computer technology have affected the way in which people interact with their environment and between each other. The advent of 'smart' technology for the home has been welcomed by the minority and shunned by the majority, being perceived as unreliable and too 'sci-fi'. Orwellian conceptions of the home as a locus of extended social control, no doubt, also affect the acceptance of technology into the fabric of the house. Alienation from this form of technology might have also arisen as a by-product of the way it has been introduced and marketed (Edge, et al, 2000). Many people with disabilities and older persons might feel that they are not included in discussions on technology, as it is perceived as irrelevant to their needs. There is little doubt in the mind of the author that this pessimistic view will decrease and acceptance will occur when the technology no longer holds the associations and values associated with the sci-fi label and is used within the care field appropriately. This paper considers how the technology can be used in the provision of extending care for people with disabilities or older people. It considers the efficacy of approach and its potential consequences.

The observations within this paper stem from undertaking a number of workshops and consultations on the use of smart home technology within the social care field. Within these consultations, certain common themes evolved from the discussions that the author attempts to address herein. Most frequently, the issues centred on the relationship between technology and the person with disabilities.

## ASSISTIVE TECHNOLOGY AND THE CARE SETTING

*The use of technology appears to present dramatic compromises in social activities, role definition, and identity.*

(Gitlin, 1995)

Many authors have considered the individual in relation to the effects of disability on quality of life. Clearly, there is a necessity for the person to be perceived as being real and not '*in relation to*' things such as technology. Technology is often also considered from the scientific communities' dispassionate stance where its efficacy is judged against whether it performs operationally, according to set rules that can be quantified and judged. This quantifying of operations belies the fact that technology affects the individual who encounter it in a number of ways. We are all affected by technology every day, from the cars on the road through to the television or radio programmes we consume (Burley 2000, Dewsbury, et al 2001). By perceiving technology from an operational position, it is easy to neglect the person consuming or using the technology.

Assistive technology connotes adaptations to enable people to lead a better quality of life. As Story et al (1998, 10) suggest:

*The label, "assistive technology," was applied to devices for personal use created specifically to enhance the physical, sensory, and cognitive abilities of people with disabilities and to help them function more independently in environments oblivious to their needs.*

Sutherland (1999, Vol 2, 6-7) extends the definition, whilst offering a note of caution:

*...Assistive technology... ...includes communications equipment such as telephones and alarms, equipment to aid mobility, personal and domestic care, 'smart homes' and telemedicine/telecare. They can answer problems of communications, mobility, manipulation, orientation and cognition. Some will answer more than one problem, e.g. an alarm for both communication and security, and may greatly enhance the quality of life. However, they cannot take the place of social interaction.*

Hence, the purpose of Assistive technology (AT) is to provide assistance, without being a replacement for personal care and attention. It is unsurprising that in the age of greater cost benefit analysis, and greater strains on limited resources that health authorities tend to heed

this advice seeing personal qualities as outweighing the logistics of financial considerations. Often preference is given to options that enable the quality of life of a person to be increased whilst retaining a regular care worker whose visits provide social communication and interaction. Isolation is a major problem for any person who is older or has a debilitating disability (Marshall 2000). People who are incapacitated in some way are at the mercy of others to provide the simple basic needs that Maslow (1943) so poignantly observed over one half of a century ago. People who do not have disabilities should not need to be concerned with food, shelter or human contact as they are part of everyday life. It is therefore essential that people with disabilities are not given substandard care packages that do not meet their needs in all areas: social, psychological, physical, social and emotional. Similarly, care packages should not be over technologised so that the person is reduced to being the slave of technology.

## THE TECHNOLOGISATION OF NEEDS

*Visions of what technology can do for the elderly are rarely based on any comprehensive understanding of needs and in some cases are blatant technology push.*

(Quigley and Tweed 2000)

Can technology meet human needs? Can the technology act as a method of reducing the levels of a person's dependency? The marketing of the technology has been traditionally ignored the care sector. Therefore, the answer is not trouble-free. As Baum (1997, 138) suggests:

*If AT were viewed at the disability and societal limitations level, it would be more obvious that the application of technology overrides barriers by supporting independence and self-reliance and provides opportunity for self-sufficiency ... Is community independence not the ultimate purpose of AT?*

Baum perceives that AT can meet needs and act as a method of increasing community independence of which there is little doubt, but how does the person interact and perceive the technology? Lupton and Seymour (2000, 1852-1853) suggest that the interplay between technology and the individual is far from straightforward:

*Any human body using any form of technology may be interpreted as in some way adopting prostheses to enhance its capacities. Nearly everyone in contemporary western societies has developed a close dependency on technologies to function in everyday life, such as using spectacles to see clearly or a car to achieve greater mobility. As this suggests, the category of 'disability' is not fixed, but rather is fluid and shifting, a continuum rather than a dichotomy... In the process, it has implications for the ways in which people with disabilities construct selfhood and interact with others. By augmenting or substituting particular bodily functions and transcending time and place, new technologies offer people with disabilities the possibility of facilitating entry and participation into previously inaccessible activities and domains. Computer technologies, for example, may lessen the importance placed on physical prowess and allow greater entree into the workplace for people with disabilities. As such, they may go some way towards redressing the disabling features of many work environments.*

Therefore, technology augments bodily functions and facilitates entry and participation into previously inaccessible domains, the technology itself enables the person to interact with their surrounding in a new sense. Technology can enable the person to engage and participate in activities that would have been previously impossible. The dichotomous 'disability' might indeed be a shifting concept, but the evidence from Seymour (1998, 184) is that:

*People with disabilities have the potential to be amongst the major beneficiaries of the technological revolution.*

Because

*The positive attributes of technology...contributed to an integral aspect of selfhood and bodily experience: the opportunity to engage more easily in social relationships...technologies were valued for allowing them to tame the disorderly aspects of their bodies and thus to facilitate social integration. They [the people in her study] drew an important distinction, however, between the technologies they considered more 'normalising' and others, which they saw as marginalising or stigmatising*

(Lupton and Seymour, 2000, 1857)

Technology can play an important part in assisting people in their daily lives. The possible problem that arises from the technologist approach is that needs can be obviated by its use unless undertaken by professionals who have expertise in the technology and in assessing need. With the future unification of the community care assessment procedure, it is a concern whether the technology will be misplaced or overused. In either of these cases, the person who has been assessed will not have their needs appropriately met by the imposition of technology.

Technology that does not function properly is extremely confusing and distressing to everybody, but exceptionally so for people with dementia and their carers.

(Bjorneby 2000, 37)

It is essential that training in needs assessment include the use of new technology within its remit in order to allay any misunderstandings or misplaced technology.

*Too often, the knowledge and experience of the consumer is neglected, resulting in needlessly complicated or even useless devices. As always, time, budget constraints and medical factors must be integrated into the formula for success.*

(Bazinet, 1995, 329)

## SMART HOMES AND SOCIAL CARE

Smart technology is not the Holy Grail of the system of care for older people in the new millennium. But used sensitively alongside person centred care it can be a vital and valuable companion in a journey that will bring a happier, more fulfilling life to those of us about to join the silver generation

(Burley, 1999)

Although AT can be seen as extending the options that are provided to people, where do smart homes fit in to the equation? Smart homes (automated homes, networked homes, intelligent homes) are homes that contain devices that are able to operate complex tasks that are pre-programmed either into the devices themselves (via a bus line) or through a computerised operating system (X10). A bus line is a small cable that runs through the house in addition to the convention mains wiring. Its function is to send messages to and from the devices so that they can communicate with each other (bi-directional protocol). Allen & Dillon (1997) and Gann, et al (1999) demonstrate that the ability of two-way communication between devices within the bus line is more effective than the one-way computer driven system and is therefore essential to be used for people with disabilities who rely on robust and reliable systems.

A smart home can enable the person by assisting in daily routines and enabling the individual to achieve tasks, they might not have previously been able to achieve. Tasks can range in levels of complexity from simple tasks such as turning on or off lights through to fully automating the majority of electrical systems within the house. Although the last 'extreme' example might only ever be considered for severely cognitively impaired people who are likely to endanger themselves within the domestic setting if left unattended for any time.

*Smart homes for people with disabilities and older people can provide empowerment, independence and most importantly, choice. Smart homes can be offered as an alternative to residential care, allowing the person to choose to stay at home, which for some individuals is essential for their happiness and well being.*

(Dewsbury and Edge 2001)

Through the CUSTODIAN<sup>1</sup> project (DE4004) the design and development of smart homes were able to be analysed and developed to meet specified needs of people with a wide and diverse range of needs. Translating the needs into devices proved to be relatively simple for a person with a basic knowledge of the hardware. The complexity of the derived solutions lay not in the selection of devices but in determining how the devices were to behave in relation to each other. The software developed within this project attempts to facilitate this process by

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<sup>1</sup> For more information on CUSTODIAN see: <http://www.custodian.org.uk> or <http://www.rgu.ac.uk/subj/search>

the fact that a number of different scenarios are available to the user with preconfigured devices that can be modified to the specific needs of the person for whom the design is being undertaken. Through the design of the smart homes that were undertaken as a result of this project the technology was put to the ultimate test with a specified design for real people that were built and lived in as their home. It was through this experience that the conclusion was arrived at that AT and smart homes exist on the same continuum and smart homes extend the range of services and domestic support that is offered to the person with disabilities.

*The reality is that the home, even without intelligence is not so much bricks and mortar, but increasingly a series of personal care services. With the advent of the smart home the range of services that the home provides may be about to undergo a radical change.*

(Edge, et al, 2000, 7).

## THE TECHNOLOGICAL COSTS AND THE BENEFITS

The cost of smart home technology is consistently the question that appears to be the stumbling lock in the introduction of the technology. There does not appear to be clear and concise data from which to extrapolate cost information (Sutherland 1999). The manufacturers of devices can give a quotation for a selection of devices, but this is not all that is required. Each installation can cost differing amounts if the building is retrofitted as the installation costs will differ by a number of variables such as the ease of installation, the type of walls, whether the rooms are prefabricated etc. In new build houses, the ability to cost is easier and if all the houses are the same, within a project, then a baseline cost can be derived. Due to the fact that smart home technology has been marketed and used predominantly in larger buildings such as office blocks, shops and for the rich and famous, prices have not been calculated for one off smaller installations of the type that occur in the social care settings. It is only when the technology becomes used regularly over a number of years within the social care sector that a picture of the real cost of the technology will become clear.

The smart home installations that the CUSTODIAN project designed and had installed cost between £13,000 and £15,000, but this may not be truly representative of other installations, but can act as a bull park figure for future guesstimates to be drawn. Through the work carried out on the project, a baseline minimum for an installation could be perceived to be around £5,000 for the basic bus line installation with a minimum of devices. As Bazinet (op cit) suggests, often the protocols of the institutional environment outweigh the efficacy of the system design. Other issues such as acceptability of the use of smart home technology and lack of outcome studies in relation to the technology impede its general acceptance. As Sutherland S (1999, Vol 2 p6-7) observes:

*Issues of feasibility are around those of cost and production on a large scale, the degree of subsidy and the contribution of the public sector, the fact that some equipment is bulky and expensive, and the lack of accessibility. On acceptability much depends on the perception of the person – for example mobile phones are very acceptable and do not have a stigma. In general, there is satisfaction with some types of AT such as alarms but sometimes a reluctance to use them. However this may change in the future, with a new generation of older people who are more accustomed to electronic devices. There is little evidence about acceptability to carers or service providers. On outcomes, one cannot generalise but some have the potential to restore mobility, give greater independence and save lives as well as improve the quality of life. There is not a great deal of data on costs but the development of a market in the EU would undoubtedly bring prices down.*

(Sutherland, 1999)

Acceptability of carers and service providers can only come as a result of a technological push into the area of social care. Clearly, the rigidity in evidence-based approaches is impeding the acceptance of the technology as the rationale for acceptance is too rigid to allow for the benefits to be demonstrated. The manufacturers of the technology are also to blame as they have not seen the social care market as realistic previously and therefore have not undertaken the necessary research and development into the area (Gann, et al, 1999, Marshall, 2000). The Joseph Rowntree Foundation (JRF) commissioned a survey on attitudes to smart homes after the development of the Gann, et al (1999) study. The JRF findings were not too surprising and offer a small amount of hope to the reader.

*With the infant Smart Homes and other associated high-technology markets changing so rapidly, any predictions for their future are highly uncertain. Nevertheless, this research does identify reasons to be optimistic that a mass consumer market for Smart Homes type technology could develop if the market grows and prices fall appropriately. There appears to be significant consumer interest in the concept, which could be unlocked at the right price. Unsurprisingly, the Smart Homes idea is most attractive to more pro-technology consumers, including the so-called 'early-adopters' vital to the early development of high-technology markets. But, in addition, the Smart Home also could appeal to a broader range of consumers because of its potential safety and security benefits. If a market does develop, it seems less likely to come from impetus in the building, construction or property sectors. The greater opportunity for growth in the use of Smart Homes technology appears to be from its addition to the burgeoning array of consumer electronics - especially home entertainment and personal communication systems - and initial demand from the more technology-literate early-adopter households.*

Pragnell, Spence, & Moore, 2000, The market potential for Smart Homes, YPS ISBN 1 84263 010

The most important study on costs and benefits of technology was undertaken by Quigley and Tweed. Their findings, although generalist and predominantly qualitative, demonstrate that the technology is of significant value and should not be tested in terms of cost/benefit from a monetary position, but rather should be seen in qualitative terms. They concede that savings are likely, but see this as a side issue to the more important enhancements to the quality of life and quality of care provided with this form of assistive technology.

*The costs and benefits to a person's quality of life are more important than the financial cost. Any system, no matter how costly that improves quality of life is probably worthwhile. The financial benefits of such a system will be recuperated in due time as the costs of care and hospital expenditure drop. Any system that does not improve quality of life will in the long run prove costly financially because not only is there the expense of the installation but there will be a continued need for high level of care for the individual.*

*It is in the interest of care providers and housing authorities to install and maintain such systems. It would be unreasonable to expect an old age pensioner to purchase assistive technology, as this would prove a financial strain. It may be possible for the users to contribute in some way e.g. deduction from their pension or deductions in benefits.*

(Quigley G, Tweed C, 1999, 5)

Through the new unified assessment procedure, there is the faint hope that smart homes could be made an agenda and used regularly when appropriate. The concern relating to who is to pay could no longer be an significant issue with a centralised budget. Maybe there is light at the end of the tunnel. Resources alone cannot get smart home technology introduced into the social care arena. Education must play an important part. The assessors must be trained in the use and appropriateness of the technology and the purchasers should be made aware of the value in real terms of its use. Moreover, the installers and commissioners of the equipment need training in understanding and translating needs into device configurations.

## The Future

The Orwellian vision that began this paper is required to be reassessed. Technology does not have to be something that *de facto* controls people but can and should be used by people to control their own lives. There are no easy answers concerning how to achieve a shift in attitude and perceptions towards technology. Possibly, by the fact that the technology exists, and is being used by some forward thinking health authorities will impact on those who have not considered it to date, trickling down. Most importantly, the technology is required to be used correctly. There is no point in providing substandard technological solutions if it possibly will endanger or debilitate potential users.

Through CUSTODIAN, the technology has been given the opportunity of being used in the 'real world' and has had some very encouraging results. One home that was designed for a person with severe disabilities whose prognosis was poor, has achieved a remarkable recovery<sup>2</sup>. As a disabled person who lives with the technology, she feels she has been empowered, and she retains a quality of life that she would not have otherwise have had. Smart home technology allowed this person to make a choice whether to remain at home with

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<sup>2</sup> For more information on this person see: <http://www.smartthinking.ukideas.com/Sigma.htm>

her loved ones or whether to have other arrangements made. The technology has also helped her husband to cope with his wife's disabilities. It is difficult to suggest that all the rehabilitative effects are technologically derived as being at home must play an important factor in itself, but there are significant psychological and social changes for the best.

Smart homes are not something to be scared of, just as computers and televisions no longer are to be feared. Over time, technology becomes accepted as the norm and is taken up by the majority of society. Like all technology, if it does not work it is not taken up, but smart homes clearly do work. If you ever travel to Sweden it is likely that the majority of buildings you visit will contain a bus line, as Sweden has embraced this technology directly. You might not be aware that the technology is present, because the ideal technological solution is in the background, it does not make itself overt. How many times do you look at a light switch and consider its qualities? It is taken for granted. When you enter a room, the lights will gradually come on and will turn themselves off once you have exited. It is subtle. Maybe if the technology were more obvious it would stand a better chance of being accepted? It is difficult to know.

## **SOME TENTATIVE GUIDELINES FOR SMART HOME TECHNOLOGY IMPLEMENTATION WITHIN THE SOCIAL CARE SECTOR**

As a means of attempting to facilitate the introduction of smart home technology, it is useful to consider a few things. Below is a list of guidelines, which have been developed not as an exhaustive list of do's and don'ts, but rather as a few ideas to consider. In undertaking a list of guidelines, it is noted that any list should not be a static prescription. Guidelines need to evolve just as the needs of people modify daily. The following guidelines have been developed by the author through working in the area of smart home technology within the social care field and are designed to be judicious in nature.

1. A long-term view of a person's condition should be undertaken in the assessment. If a person's condition is to degenerate slowly than the technology will be useful for longer.
2. Assessments and judgements should consider how the person is to interact with the technology from a psychological, emotional, physical and social perspective.
3. Assessments should not just consider what the technology can do for the person but what it can do for all stakeholders.
4. Seeing technology as enabling and empowering is essential to the design process, whilst it is important to recognise that inappropriate design is disabling and unempowering.
5. Specifying devices to meet the needs of stakeholders must also include specifying how the devices will interact with each other.
6. Technology requires regular maintenance and it is essential that the system is regularly checked to ensure it still meets the needs it was designed to meet and the costs for this are put into any designs.
7. Technology should not be considered predominantly in terms of being cost saving or a labour saving intervention; social exclusion should not result from the design.
8. Technology should not be seen as the panacea for all ills in the world, whilst it should be considered in all assessments.
9. The implementation of the user needs assessment by professionals requires that appropriate technology be used in the correct manner, with the correct devices undertaking the correct functions when and if they are supposed to do so.

10. The long-term efficacy of the technological design should reflect the needs of all stakeholders, the person(s) with disabilities, carers, and others.
11. Undertaking a full user needs assessment is critical to determine if technology is appropriate to meet the needs of the person.
12. Training is essential for assessors and for installers and maintenance personnel. Everyone who encounters the technology should understand what it is supposed to be doing and be able to assess if it is not performing appropriately.

## References

Allen B, & Dillon B, (1997), *Environmental Control and Field Bus systems: A study of field bus systems and their potential environmental control application for people with disabilities*, Central Remedial Clinic, Dublin, Ireland.

Baum C, *Achieving effectiveness with a Client Centred Approach* in Gray D, Quatrano L & Lieberman M, (eds), (1998), *Designing and Using Assistive Technology: The human interface*, Paul Brookes Publishing, Baltimore, 138.

Bazinet G, *Assistive Technology* in Karan O, & Greenspan S (eds), (1995), *Community Rehabilitation Services for People with Disabilities*, Butterworth-Heinemann, USA, 329.

Bjørneby S, 2000, Signpost: 'Smart Houses': Can they really benefit Older People? Vol 5, No2, October 2000.

Burley R, 2000, Care Beyond Walls, A paper presented to the RIBA Health Client Forum Symposium 'The Good Life\_ Creating Better Environments For Older People', April 2000.

Burley R, 1999, Smarter Housing and Care for the Silver Generation, A Paper presented at the *Department of Trade and Industry Healthcare Seminars*, Singapore and Tokyo, October 1999.

Dewsbury G & Edge M, 2001, Open House International: *Designing the Home to Meet the Needs of Tomorrow ... Today: Smart technology, health and well-being*, Summer 2001.

Dewsbury G, Taylor B & Edge M, , *Designing Safe Smart Home Systems for Vulnerable People*, in Proctor R, & Rouncefield M (eds) (2001) *Dependability in Healthcare Informatics, Proceedings of the First Dependability IRC Workshop, Edinburgh March 22-23<sup>rd</sup>, 2001*, Lancaster University, ISBN 1 86220 109 9.

Edge M, Taylor B, Dewsbury G & Groves M (2000) *Seniors Housing Update: The Potential For 'Smart Home' Systems In Meeting The Care Needs Of Older Persons And People With Disabilities*, Vol 10, No 1, August 2000, ISSN: 1188-1828.

Fromm E, 1995, *The Essential Fromm: Life Between Having and Being*, Constable and Company, London.

Gann D, Barlow J & Venables T, 1999, *Digital Futures: Making Homes Smarter*, Chartered Institute of Housing, Coventry.

Gitlin L, 1995, *Generations: Journal of the American Society of Ageing: Why Older People Accept or Reject Assistive Technology*, 19,1.

Lupton D, & Seymour W, 2000, *Social Science & Medicine: Technology, selfhood and physical disability*, 50, 1852.

Maslow A, 1943, *Psychological Review: A theory of human motivation*, 50, 370-396.



Marshall M, 2000 *Astrid: A Social & Technological Response to Meeting the Needs of Individuals with Dementia & their Carers*, Hawker Publications, London.

Pragnell, Spence, & Moore, 2000, *The market potential for Smart Homes*, YPS ISBN 1 84263 010.

Quigley G, & Tweed C, 2000, *Added-value services from the installation of assistive technology for the elderly*, Queen's University of Belfast, Research report EPSRC GR/M05171.

Quigley G, & Tweed C, 1999, *Cost benefit analysis for assistive technologies*, Queen's University of Belfast, Research report on EPSRC GR/M05171.

Seymour W, 1998, *Remaking the Body: Rehabilitation and Change*, Routledge, London.

Story M, Mueller J & Mace R, 1998, *The Universal Design File: Designing for people of all ages and abilities*, The Center for Universal Design, NC State University.

Sutherland S (1999) *With Respect To Old Age: Long Term Care- Rights and Responsibilities*, The Stationary Office, UK.