Connected Care for Elderly Persons Suffering from Dementia

D5.3

Summary Report: Location Related barriers

Classification: Internal

History of changes

Date	*Version*	*Editor*	*Change description*
January 2012	1.0	Ranjit Bassi and Keith Quillin (BRE)	Draft document
February 2012	2.0	Ranjit Bassi and Keith Quillin (BRE)	Final document

Table of contents

1. Introduction

This report looks at assessment and quantification of location-related barriers,for assisted living solutions and identification of steps needed to overcome them. It looks at the barriers in developing the MeMo-Net solution. This report completes D5.3.

2. Factors affecting delivery of Assisted Living Technology

There are several factors which affect the delivery of Assisted Living Technology. Figure 1 shows a simplified process for assigning technology to meet a need.

First, there is the level of need. This is the initial driving factor, and needs to be assessed before any solution can be attempted. This leads to a choice of Assisted Living Category of Care.

Secondly there are some pragmatic limitations to be considered, and these are primarily economic, the location of the patient, and the availability of technology.

Once all these have been considered, a solution can be recommended, the Service Level, at which the point the patient's needs can be addressed as closely as possible.

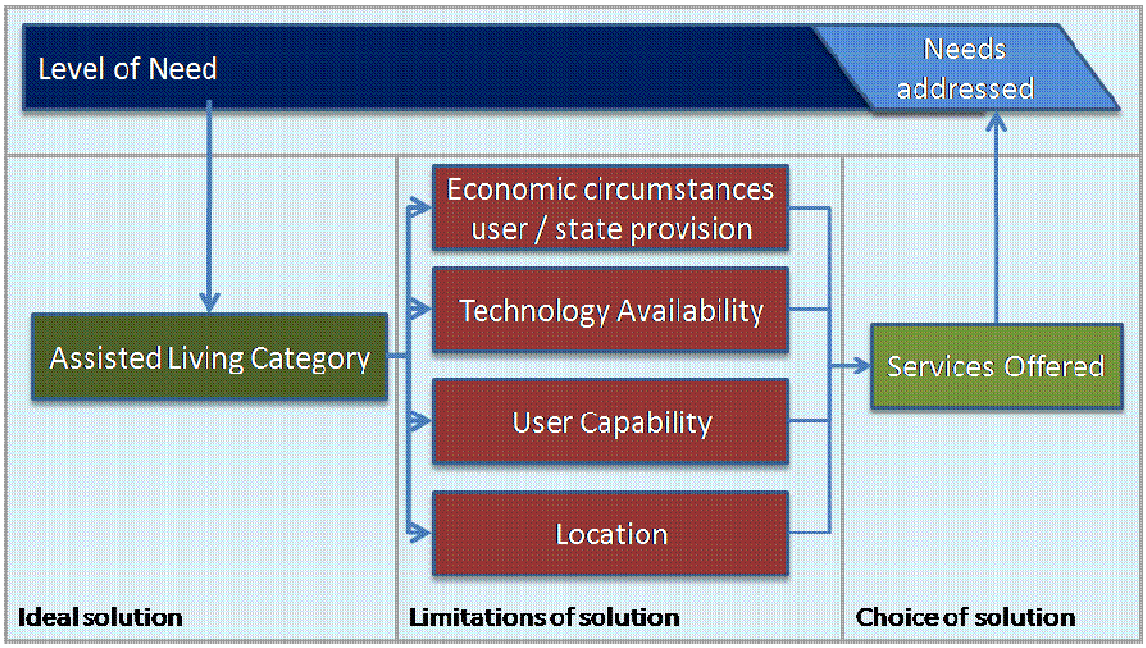

Figure 1 Factors affecting the addressing of users' needs through Assistive Technology.

Clearly the impact of Assistive Technology will be dependent the second step, i.e. the availability of solutions, and it is here that work needs to focus to increase the impact.

Level of Need: Closely related to Category of Care, we can nevertheless consider Assistive Technology appropriate to a Level of Need defined with reference to a person's lifestyle and state of health.

Assisted Living Category: The ideal Assisted Living solution that best meets a need is generally described in terms of "TeleCare", "TeleHealth", "TeleMedicine" and other terms.

Limitations to Solutions: While a solution may be identified by an assessment as meeting a patient's needs, there are at present a number of limiting factors which affect the choice of which actual solutions are offered:

- **Economic Circumstances**: While this topic is not a major component of this report, this section briefly discusses the limiting nature of economic circumstances on the uptake of Assisted Living technologies.
- **Location for Healthcare**: Assistive technology will differ to some extent according to the location in which it is to be used.
- **Technology Availability**: While many things may be measured and monitored, controlled and assisted by technology today, there are clearly many improvements and new areas that need to be developed.
- **User Capability**: Desiging technological solutions that work is straightforward enough if we consider only the problem to be solved. But such solutions need to be designed by also considering the people who have to use the technology, who may not be as dextrous, sharp of mind or interested in gadgets as the designers themselves.

Service Level Offered: Different services will be offered according to economic, business, need, and circumstances.

3. Location-related barriers

Locations for Healthcare

Location 1: Traditional Institutional Settings

Of course ultimately the traditional setting for healthcare was the home. Before the advent of highly intensive care regimes involving large numbers of patients, it was normal for sick people to endure their illness at home and under the care of extended family. Partly as a result of the development of wartime field hospitals and partly as a result of the professionalization of care over the last two centuries, care for the sick has become an institutionalised phenomenon. The results of this were dramatic: medical care at last became a positive rather than a haphazard affair, and to provide these services effectively in an age of poor communications and to make the best use of professionals' time the services were centralized in hospitals and health centres.

But modern medical care has become a victim of its own success: the expectation of populations has been that medical science will eventually and increasingly provide a cure to every disease, including that of ageing itself. These demands lead to a spiralling cost of healthcare, largely as a result of providing hospitals. As people live longer, they acquire new disabilities and illnesses, and demand that medical services deal with these too. And medical science is able to keep people alive longer so that diseases that were once killers now become manageable conditions, resulting in costs associated with providing care.

As medical science reduces the severity of health conditions, the more the sufferers are able to lead normal lives. Traditional care settings (hospitals and health centres) would become more like prisons for people who need long-term care. The aim for such people should be to provide the care they need in their normal environments, so that they can lead their longer lives in as close to normal conditions as possible.

Location 2: Home

"Normality of life" for most people would be the ability to live at home and take part in work and leisure activities as if they had no health problems. The first step in moving away from hospitalisation for people with long-term conditions (LTCs) must be to allow them to live at home. But if their LTC requires regular monitoring or intervention then that must be transferred from its traditional setting to the home as well.

Technology has now more than ever made this a realisable ambition. As more homes are connected to global communications services, it becomes possible to bring the world to the home. This has taken off dramatically in that to access many services a person need hardly leave their front door: All manner of goods and services may now be ordered online and delivered promptly. Literally a world of information is available to anyone with the right equipment and access.

There is no reason why this ability cannot be extended to providing healthcare services.

Location 3: Work

As medical science normalises people such that they can live with LTCs away from hospital and in their own homes, then the next logical step is to allow them to become economically active by working. Sometimes this can be done from home, but for mainstream employment opportunities this will mean providing the healthcare services they need at their places of work.

For largely commercial reasons, the world of work has preceded the home in its access to online goods and services. Therefore providing assisted living for employees presents fewer technical challenges to businesses that are already largely operating online. This will vary enormously however, especially for businesses that do not operate in standard office environments.

Providing non-IT Assisted Living services for employees is already becoming normal (e.g ramps and lifts for disabled access, adapted furniture etc.). Further than this, employers will increasingly need to accommodate the TeleCare and TeleHealth facilities that their staff begin to expect at home. This may involve simply allowing communications access for employees' own or prescribed systems. There may be additional Quality of Service considerations when interfacing such telehealth systems with busy networks in a business environment..

Removal of Location-related barriers

The way to remove Location as a Limiting factor is to integrate the service provision across the whole range of possible locations. In effect this means "anywhere operation".

To avoid becoming prisoners in hospital, home or work settings, people with LTCs will ultimately want to be able to lead fully normal lives through the assistance that their technology affords them. This will mean extending access to services to anywhere a fully healthy person may expect to go.

This is much more of a technical challenge, but one which is already being addressed in non-healthcare markets through mobile phone and satellite navigation technologies. extension of these technologies will allow ubiquitous healthcare and assisted living to be realised.

Achievement of this goal is often described as "Ambient Assisted Living" in that the service is considered to be all around the patient and always available, i.e. ambient.

A number of funded projects are making progress in this area both on the European level and national levels. (AAL, UK ALIP projects).

4. Other Barriers

Economic circumstances

- **Differing provision** -The choice of technology will be highly dependent on the ability of someone to pay for it. When the solutions are purchased by private individuals, electively by the end-beneficiaries themselves or by friends or relatives, then retail price and personal economic circumstances will be dominant. Clearly in locations where there is state provision such as the UK, then provision is limited by such things as budgets, policy, level of demand, return on investment. This is a much complex matter than private market supply and demand, however there are some advantages in terms of national policy directing the move towards adopting technology, and state-funding may invest in the infrastructure more readily than, say, insurance-based schemes. Even in state-funded healthcare regimes, private elective purchase is normally also an option where end-users perceive real benefit.
- **Return on investment** -State-funded investment is complicated by the division of budgets and responsibilities among various trusts and authorities. The presence of detailed performance targets can lead to distortions in behaviour that prevent adoption. In insurance-based healthcare systems, the payback may be quicker to realise than in state-funded schemes, because annual profits will show the effect of reduced claims; premiums can be adjusted to incentivise adoption by policy-holders, and

Removal of Economic circumstances as a Limiting Factor

It is not the purpose of this report to examine economic factors in any great detail, except to make two important points about design:

- Cost is always going to be the major issue. Therefore products must be designed with mass market mentality, and in a cost-sensitive area such as public health provision, suppliers that maintain a high-margin approach are likely to remain low-volume and remain in niche markets, failing to make the transition from 2nd Generation to 3rd Generation. Products must be designed to low unit cost.
- Scalability is paramount. Lack of scalable design can prevent solutions from making the transition from niche markets to mass markets. In this domain, in a market dominated by SMEs, it is essential that these SMEs make strong relationships with mass infrastructure providers to ensure the scalability of their solutions. Initiatives such as Continua Health Alliance, and standardisations bodies form part of this picture.

Availability of Technology

Removal of Availability of Technology as a Limiting Factor

A number of research topics are underway globally to advance the science of monitoring to remove such factors as the invasiveness of some sensing techniques. A patch that is worn preferable to a box that is carried for example; optical spectroscopy techniques external to the skin are preferable to invasive blood-sampling techniques, etc. Still further, a camera that is able to observe a patient falling is preferable to a fall-detector the patient must carry at all times. A simple cry for help is preferable to wearing a pendant alarm that may be forgotten, damaged or out of range. A highly successful example in recent years is the ability to measure blood-oxygen levels and heart-rate with only a clip-on probe.

Beyond knowing how to design assistive technology is the barrier of delivery and installation. This can only be solved once the economic circumstances and business models are right for suppliers to engage and providers to purchase solutions.

Timescale: ongoing and continuous improvement expected.

User capability

One of the objections most encountered to Assisted Living technology is that the likely beneficiaries would be unable to use the technology. Reportedly 70% of the current users of TeleCare solutions are suffering from some form of dementia. In any case those needing Assisted Living are often older and unaccustomed to technology, and less able to learn how to use new products, whereas those designing technology are generally younger, comfortable with technology and capable of learning and exploring new ideas.

Removal of User Capability as a Limiting Factor

The answer to this Limiting Factor is in better design:

- Designers need to be aware of the capabilities of their end-users.
- Research needs to be done into how people respond to and use technology.
- Commissioners need to look for solutions that are simple to operate
- Products need to incorporate expert or smart techniques that remove the need for patient interaction.

Designing with older people in mind is a theme of current research. Yet a perennial challenge is seeing real products emerging.

Timescale: It can be expected that solutions to this Limitation will appear gradually in products over the forthcoming 2-5 years, as suppliers seek to address their target market with attractive solutions. Connecting these suppliers

with ongoing research should be encouraged, as should funding of the necessary research.

5. MeMo-Net Solution

Summary of MeMo-Net Solution

The MemMo-Net system consists of the following hardware and software components:

- Philips Net TV that provides a user interface for a digital corkboard
- A digital corkboard application
- A set of sensors that monitor the behavior and the activities of the assisted person
- A medication dispenser
- Intelligent RFID tray
- A dementia diary that documents daily activities for the assisted person
- A middleware platform that integrates all of the data

The high level components of the system are depicted in the following figure:

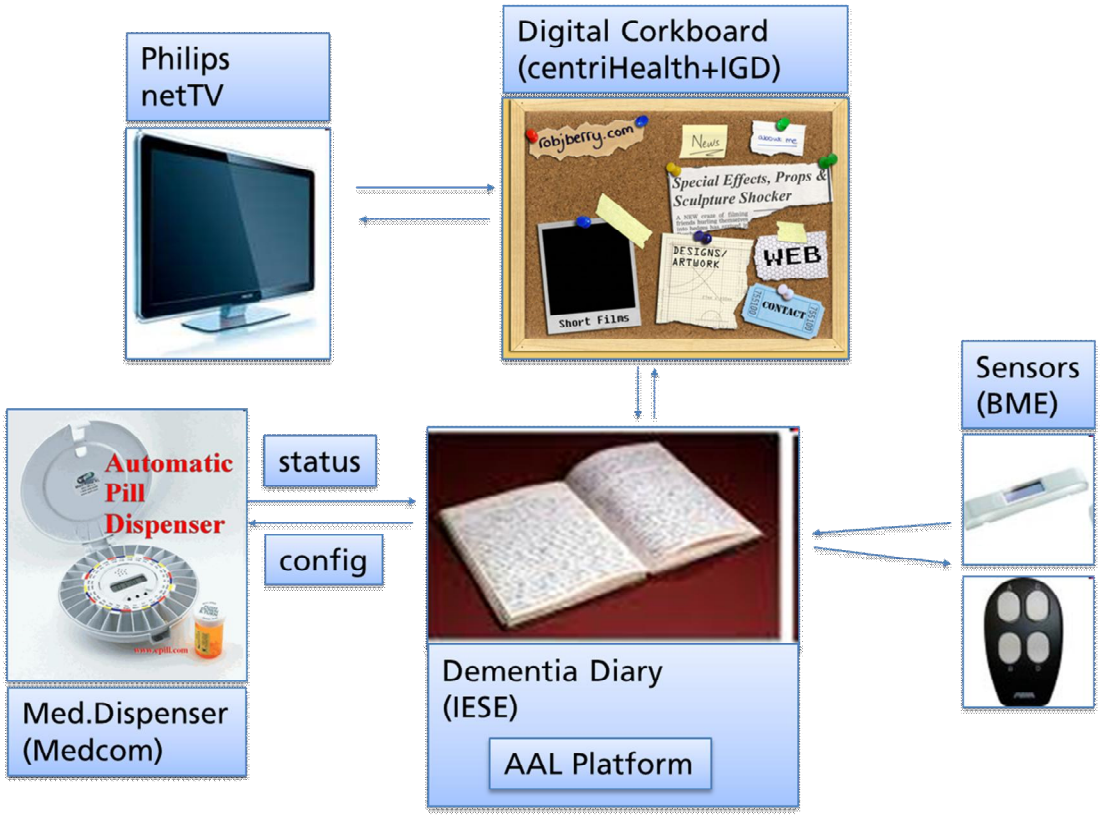

Figure 2 Components of the CCE MeMo Net Solution

6. Activities of WP3 to 5 to develop the MeMo-Net Solution

The focus for the effort has been to demonstrate a model of user-focused dementia assisted living based on digital integration. In particular the effort has included:

- Deploying assisted living personal devices, condition and environmental monitors within a simulated home environment involving an illustrative persona derived from the work package 1 output.
- Utilising an established media device as the TV that will be familiar to most users
- Making use of off-the-shelf technology products and solutions to deliver low cost technology enabled outcomes
- Embedding the use of these products and solutions within a model for assisted living based on an information platform that supports the user's overall health, care and wellbeing suffering from dementia.
- Demonstration of solutions and service delivery that can be customised to meet the particular needs of individual users and which have the capability to be upgraded to incorporate additional sensors and services to respond to changes in medical and physical condition, requirements for enhanced social care and in response to personal preferences and simple consumer choice
- Solutions that are not dependent on special expertise and knowledge on the part of users or their carers
- Delivering a practical demonstration of a prototype version of an integrated, scalable and low cost approach to the delivery of technology based support for those living with long term conditions and dementia. This has included provision for data share with their family, carers and health and social service professionals and has included links to databases and analysis software
- Demonstrating the robustness and quality of the associated data gathering, handling, analysis and distribution
- Demonstrating data transfer through a range of media devices and utilising the "cloud" to deliver anywhere, anytime connectivity and service delivery
- Demonstrating compatibility with other health record provider records and services
- Establishing through work package activities a thorough appreciation of the residual technical impediments to the free flow of data within an assisted living system that is focused around the needs of the user
- Demonstrating the commonality of approach to achieve the EU ambitions for assisted living whilst establishing an infrastructure that is equally capable of supporting mainstream lifestyle, wellbeing functionality along with a range of digitally enabled built environment services

7. Key Messages from the work of WP3 to 5 regarding barriers to developing assisted living solutions

The key messages include the following:

- There are no significant gaps in the technology requirements to collect, process and stream real time data and information
- A range of established media and communication devices can readily be used to connect the user, their family, carers and health and social care professionals depending on their particular preferences and resources
- Home-based users can be connected with expert online systems that can analyse, trend, alert and present data to the full range of stakeholders.
- It is relatively straightforward to customise the mechanisms for the collection and distribution of data and also the sharing of outputs to meet the particular needs of the user, their family and their carers. There is absolutely no valid technical reason for there to be only one standard solution on offer. The key message is that the service system can be built around the requirements of the “customer” in precisely the same way that consumer goods and services need to place the customer at the centre of their operation if they are to flourish in a demanding market place. For the health and social service sectors this approach will come as a breath of fresh air.
- There are no significant impediments to the subsequent upgrade or modification of the service solutions that can be made available to users. There is certainly no need to replace kit on the basis that it is obsolete
- Data gathering from domestic environments can be of sufficient quality and robustness for the purposes of delivering health care
- The potential for data analysis and distribution to be of sufficient quality and resilience to be acceptable for the purposes of supporting telehealth and possibly telemedicine.
- The absolute criticality of industry wide adoption of open access standards to ensure that interface complications do not arise with regard to connection with multiple health record systems and disparate systems to collect and stream/receive data. The key message is that impediments to the free flow of data always arise at the interfaces. A common standards approach is a vital ingredient of a genuinely open access system and market. There is no place for proprietary systems within the context of a scalable, low cost, adaptable system for general application.
- Secure and private access to online databases was not addressed within the project, but is being addressed in other projects. Secure technologies exist to connect the general public to secure databases, such as are widely used in the banking sector, and ways need to be found to draw on this expertise in the health sector, where privacy and security are of similar public interest.
- The potential for the merging of telecare systems with telehealth and even telemedicine systems is recognised in the project. Such a merging will deliver enormous public benefit. Within the project, these somewhat artificial legacy boundaries were encountered; to some extent the project has begun to show ways of breaking them down.

- The project did not address the subject of regulatory framework, which is being addressed elsewhere. The work has shown however that there is no technical reason why regulated and non-regulated systems cannot co-exist. However the clear boundaries of regulatory interest will have to be incorporated in any fully integrated public healthcare delivery system.
- There needs to be a business model for the MeMO-Net solution and its components, which is dealt in D7.4

8. Compatibility issues and other technical issues associated with the delivery of MeMo-Net components and solution

The integration of the different components required the attendance to several compatibility issues as well as the fulfillment of non-technical requirements.

Compatibility issues were based around the use of different operating systems, programming languages and protocols.

CCE integrates off-the-shelf technology (software and hardware) applied in different application areas (TV in entertainment, pill dispenser in health care, sensors in environmental control). The challenge is to integrate these technologies to allow information exchange and communication. CCE approach is the dementia diary backend using state of the art and application independent information exchange and communication technology.

The use of different operating systems and the availability of device drivers for the respective systems required a planning phase on which hardware will be interfaced to which system component.

Different application components also communicate using specific protocols (like HL7, XML-based messages, ZigBee, etc.) and different communication technologies, which needed to be integrated.

Furthermore, non-technical requirements needed to be fulfilled:

CCE's target group are people with mild dementia and their caretakers. The supporting technology has to fulfill non-technical requirements to get accepted by the envisioned users. From the requirements elicitation arose that the qualities efficiency, maintainability, portability, reliability, usability and desirability are the most important ones that have to be fulfilled. CCE approaches to these requirements are a careful system design and the use of reliable and maintainable system components

A specific issue is providing a system with a user interface suitable for the target users of CCE. These persons have specific requirements on look and feel of the user interface. E.g. using a calendar for reminder services requires that a calendar looks like a calendar they are using now. CCE took a careful approach designing the user interface and evaluates the result during the piloting phases of the project.

Also, components have been ordered from different suppliers from all over the world and their procurement needed to be coordinated.

9. Conclusions

There are no technical barriers in developing MeMo-Net as a scalable commercial solution. The major barrier to the adaptation of the MeMo-Net as a commercial offering is the acceptance of the solution by people with dementia and their carers and a robust business model.