

# “It gives me a sense of independence” – Findings from Ireland on the use and usefulness of assistive technology for people with dementia

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**Abstract.** This work reports Irish data emerging from the ENABLE study which trialled assistive technologies in the homes of people with dementia across five European countries and assessed their use and usefulness. The aim of this paper is to report findings on i) whether new prototype technologies could be used and were considered useful by people with dementia and their primary caregivers, ii) whether any technical difficulties were experienced by families while trialling these products, iii) whether these technologies could be better refined, and (iv) whether these products would be financially viable on the open market. Findings showed that in general, most devices trialled were used and were considered useful by people with dementia. Apart from the night lamp, each of the other devices trialled was also used and considered useful by most primary caregivers. With the exception of the night lamp which was an entirely passive device, other devices often needed a carer present to remind the person with dementia to use the product. This occurred in about 50% of cases trialling the calendar, 33% trialling the telephone, and 80% trialling the locator. Caregivers were willing to pay most for devices which they considered useful and which required active participation, such as the picture telephone and the item locator.

## 1. Introduction

Whilst a burgeoning body of literature now exists on technology and physical disability [1] much less is known about the role assistive technology plays in supporting people with a cognitive impairment to live independently at home [19]. Whilst in the area of dementia care, assistive technologies are known to hold promise [16], it is also acknowledged that to be effective, the specific needs and preferences of individuals must be accounted for. However, there are difficulties understanding the specific needs of people with dementia and gaining insight into the challenges they experience, since traditionally there have been ethical and logistic problems associated with conducting research in this area [11,12]. Accordingly, there is limited in-

formation on which to base the appropriate design of assistive technologies [19].

Dementia is a clinical syndrome characterised by impaired memory, impaired judgement, the inability to learn, a high level of stress, and an acute sensitivity to the built and social environment [18]. For those diagnosed at an early stage, several losses and difficulties can occur [14], but as the disability advances, more serious problems and challenges can arise. These include difficulties in negotiating the environment and in completing activities of daily living, such as dressing, preparing meals, finding things, taking medication, remembering telephone numbers and moving about at appropriate times [13]. Such difficulties can be frustrating for the individual and can create enormous strain for family caregivers [9].

Cognitive assistive technologies that can help both the individual and his or her caregiver, will no doubt play a key role in future dementia care [18], yet relatively little is known about their use and usefulness. The Astrid Guide [19], produced some 6 years ago, was

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the first attempt to bring together information about the potential of such technologies, yet, as its name suggests, it was merely a guide, and although successful in raising professional and public awareness, the guide was not based on users' or caregivers' experiences. There is also the issue of what Marshall describes as '*technophobic health care professionals*' [20], a phenomenon, which in her view, further acts as a barrier against technology being used effectively in dementia care since professionals can themselves remain somewhat circumspect about their use. Hence, to provide legitimate proof of benefit we need to test assistive technologies to evaluate their usefulness in promoting independent living.

This study attempted to narrow the gap in the literature by evaluating the use and usefulness of assistive technology for Irish people with dementia living at home. The paper reports Irish data emerging from ENABLE, a European funded five country study, involving the UK, Ireland, Norway, Finland, and Lithuania [8]. Four key research questions are addressed in this paper, namely –

- i) Are new assistive technologies used and considered useful by people with dementia and their caregivers?
- ii) What kind of technical difficulties are experienced?
- iii) How can these technologies be further refined to address the unique needs of people with dementia?
- iv) How much are caregivers prepared to pay should technologies become commercially available?

## 2. Materials and methods

### 2.1. Research methods

An exploratory descriptive design was used to investigate the four key research questions explored in this paper. A mixed methods approach was used in ENABLE; the individualistic nature of problems experienced by people with dementia and the fact that five different products were being evaluated in Ireland led to a qualitative approach being used in order to collect rich, detailed and in-depth information. A quantitative approach was also used in order to collect more systematic information on issues such as socio-demographics, whether products were used or not, and how much family caregivers were prepared to spend should the products become commercially available (for a detailed description of the methodology, see [8]).

### 2.2. The sample

Purposeful criterion sampling was used [22], and participants (N = 34) were recruited from a number of Dublin based hospital, health, and social care facilities, including the National Memory Clinic at St. James Hospital (n = 12), the Day Centre at St. Patrick's Hospital (n = 7), the Alzheimer's Society of Ireland (n = 7), St. James Hospital Department of Medicine for the Elderly (n = 5), its Occupational Therapy Department (n = 2), and the Alzheimer's Society of Ireland Dementia Day Care Centre (n = 1).

### 2.3. Procedure

In February 2001 ethical approval was granted from St. James Hospital and the Federated Dublin Voluntary Hospitals (Joint Research Ethics Committee) for the Irish assessment study to commence. Recruitment through health care professionals began with the distribution of information sheets to interested clients. A letter was also sent to potential clients clarifying inclusion/exclusion criteria, requesting involvement, and explaining in greater detail the project.

### 2.4. Informed consent

Once caregivers gave verbal consent by telephone and before product installation, written informed consent was also sought. This required caregiver and care-receiver to agree or disagree with the following statements:

- i) I have looked at the information letter
  - ii) I have had the chance to talk about the project
  - iii) I know enough about the project now
  - iv) I understand that it is my decision to take part or not
  - v) I understand that if I take part I can stop at any time
  - vi) I understand that the interview will be taped and I can stop this at any time
- Participants were each reminded that they could withdraw from the study at any stage and that this would not affect any other health or social care services received. Confidentiality of all data was assured. All participants in Ireland gave informed consent. In the transcriptions of interviews pseudonyms were used to ensure this.

## 2.5. Inclusion and exclusion criteria

Following discussions with partner countries, several inclusion and exclusion criteria were formulated. Inclusion criteria required that participants would have: i) a diagnosis of mild or moderate dementia according to ICD-10, with preference for AD, VD, or a mixture of both types [30], ii) be aged 50 years and over, iii) have an MMSE score of 12 or over [17], iv) have good nutritional and general health. v) have a primary caregiver willing to participate and either co-resident or in frequent contact with the relative [26], vi) provide informed consent [8], vii) live in close proximity to researchers, and viii) be deemed to benefit from the technology. The exclusion criteria out-ruled those: i) with a major psychiatric disorder, ii) involved in other drug/clinical trials, and iii) likely to be accepted into long-term care within 3 months.

## 2.6. Dropouts

In Ireland 34 families were initially recruited to the study, however, two people later withdrew before assessment commenced. Before the follow-up period of three months, another 12 respondents had withdrawn, leaving a total sample of 20 people. In most cases withdrawal was due to technical problems with the devices ( $n = 8$ ), or because of admission to long-term care ( $n = 2$ ), or due to problems adjusting to products ( $n = 2$ ). Dropouts were not included in the analysis as it was felt that these participants could not accurately report on the use and usefulness of products because they did not fully evaluate the products for the set period of time.

## 2.7. Data collection instruments

A comprehensive semi-structured questionnaire was designed to collect baseline and follow-up data. Elements of the questionnaire relevant to this paper included socio-demographics issues, including carer employment status, and questions regarding the use and usefulness of the product both from the individual's perspective along with from the perspective of the primary caregiver. Methods to assess costs and benefits at a micro and macro level were developed. A unified questionnaire was constructed based on the selection of recommended guidelines and validated scales. In addition, the cost-benefit methodology also helped to design this section of the questionnaire investigating use and usefulness. These questions were developed within the ENABLE project. Finally, an open-ended question regarding willingness to pay for products was also included as part of the cost-benefit schedule.

## 2.8. Data analysis

All quantitative data was analysed using version 11 of SPSS for Windows and descriptive statistics such as frequency tables were used. Interviews were recorded and open-ended questions and answers were transcribed into Microsoft Word for Windows, and amounted to 33,954 words. This qualitative data was thematically analysed. This was conducted with cross checking to ensure inter-rated reliability [25, p. 144–145]. Iterative processes ensured rigour in both data collection and analysis [15].

## 2.9. Products

Products trialed consisted of:

*The Automatic Night & Day Calendar* – This product displayed the time of day (e.g. morning, afternoon, or night) and the correct day and date. Its main aim was to promote night-time day-time orientation and prevent wandering or calling caregivers at night.

*The Lost Item Locator* – The aim of this device was to reduce time wasted searching for lost items and the stress this causes.

*The Automatic Night Lamp* – The lamp gradually faded on and off as the person got in and out of bed. The aim of this device was to prevent falls at night, thus reducing anxiety for the person with dementia and for caregivers. It also facilitated orientation.

*The Gas Cooker Device* – This safety device regulated the heat of the cooker by turning off the appliance if pans overheated. The device was designed to prevent fires and food from burning caused by an unattended cooker. It was designed as a safety device and to reduce anxiety.

*The Picture Button Telephone* – The aim of this device was to facilitate communication and reduce anxiety.

Except for the picture button telephone, which was available on the market, all other devices were developed as part of the ENABLE project.

## 3. Results

### 3.1. Sample description

Table 1 describes the main socio-demographic characteristics of the sample of people with dementia: The sample consisted of 7 men and 13 women whose mean age was 72 and 74 respectively. Twelve people with de-

Table 1  
Socio-demographics of the person with dementia (N = 20)

		n	%
Gender	Male	7	35
	Female	13	65
Age	60–70	4	20
	70–80	12	60
	80–90	3	15
	> 90	1	5
Person with dementia lives	With co-resident	12	60
	Alone	8	40
Diagnosis	Alzheimer's disease	17	85
	Mixed dementia	2	10
	Vascular dementia	1	5
MMSE Score*	12–20	8	25
	20–25	8	50
	25–29	3	20
Annual income	< 15,000	11	55
	15,000–25,000	5	25
	25,000–30,000	1	5
	30,000–35,000	1	5
	> 40,000	2	10

\*Data is missing for one case.

Table 2  
Socio-demographics of the caregiver (N = 20)

		n	%
Gender	Male	5	25
	Female	15	75
Age	34–51	6	30
	51–61	4	20
	61–75	6	30
	75–79	4	20
	Relationship to person with dementia	Spouse	9
	Child	7	35
	Sibling	2	10
	Other	2	10
Employment Status	Employed	6	30
	Unemployed	14	70
Does carer get state allowance?	YES	1	5
	NO	19	95

mentia were married and lived with their spouses or other relatives, whilst 8 lived alone. Most had Alzheimer's disease (n = 17), two had mixed dementia (Vascular and Alzheimer's disease), whilst one had Vascular Dementia. All participants had a mild to moderate dementia, with a mean Mini-Mental State Examination (MMSE) score of 22 (range = 12–29). Over half (n = 11) had an annual income of less than €15,000. The remainder had an annual income of between €15,000–€40,000.

### 3.2. Caregivers description

Table 2 describes the socio-demographic characteristics of the sample of caregivers: The 20 caregivers consisted of 5 men and 15 women, whose mean age was

65 and 57 respectively. Nine were spouses (6 wives and 3 husbands), 7 were children (6 daughters and 1 son), 2 were siblings, 1 was a daughter-in-law and 1 was a friend. Six caregivers were employed and 1 received a caregivers' allowance.

#### 3.2.1. Are new technologies<sup>1</sup> used and considered useful by people with dementia and their caregivers?

Table 3 details the products tested in the Irish trial; whether people with dementia used the product and

<sup>1</sup>The three participants who tested the gas cooker monitor withdrew from the study before three months and are therefore not included in Table 3.

Table 3  
The use and usefulness of products tested at T3

Device		Calendar (N = 6)	Telephone (N = 6)	Lamp (N = 6)	Locator (N = 11)
Dropouts		0	0	3	6
Was the product being used at T3 according to the person with dementia?	YES	6	6	3	3
	NO	0	0	0	2
Was the product being used at T3 by the person with dementia according to the carer?	YES	6	6	2	1
	NO	0	0	1	4
Did the person with dementia find the product useful?	YES	6	6	3	5
	NO	0	0	0	0
Was the carer using the product at T3?	YES	4	5	0	3
	NO	2	1	3	2
Did the carer find the product useful?	YES	6	6	2	5
	NO	0	0	1	0
Did the carer need to prompt the person with dementia to use the product?	YES	3	2	0	4
	NO	3	4	3	1

whether they found them useful three months (T3) after installation. It also displays the caregivers' perception of whether their relatives were using the products and whether or not they had to prompt them to do so:

#### *The night and day calendar*

The table shows that one of the most useful devices trialed in ENABLE was the night and day calendar. Amongst the six people with dementia who tested it, each claimed they used it and found it useful. Data show the device was also useful for carers with four out of six claiming they used the calendar and each stating the device was useful. The rich qualitative data collected in the in-depth interviews, clearly conveys the usefulness of the calendar in promoting orientation, fostering independent living, and providing a sense of reassurance:

*'It's the best thing I've ever got, I don't have to ask Deirdre (caregiver) what day it is. It gives me a sense of . . . independence', I don't have to be running to Deirdre.'* (Respondent 6, person with dementia.)

*'You're relieved when you discover it's only mid-day instead of midnight'.* (Respondent 3, person with dementia.)

*'The calendar only makes a small difference to our lives, but it is useful'.* (Respondent 1, caregiver.)

Table 3 also shows that the person with dementia's account of the usefulness of this product was highly consistent with the caregivers' report. However, in three out of six cases, caregivers needed to remind their relatives to use the product (see Table 3).

#### *The picture button telephone*

The picture telephone was another useful product trialed in ENABLE (see Table 3). Results showed that six

people with dementia had the phone installed and, after three months, all six reported they were still using it and found it useful (see Table 3). For the caregiver, data shows that the picture-button telephone was also most useful, with five out of six caregivers claiming they themselves were still using the product three months after its installation, and each reporting they considered it useful (see Table 3). The qualitative data demonstrate the way in which the picture telephone promoted independence, fostered better communication, and reassured the person with dementia and the caregiver:

*'I feel reassured knowing the phone is there as buttons on the other house phones are too small for me to use. It's very useful, you press and you get it straight away, you don't have to remember the numbers'.* (Respondent 15, person with dementia.)

*'It's brilliant, very handy. It's being used often, very handy. We're using the first six pictures; he's (the person with dementia) finding it very useful. I'm (the caregiver) also using it, it makes me lazy. He can get me now when he needs to, it has reduced worry and stress a little bit'.* (Respondent 15, caregiver.)

*'I'm very pleased with it, my little toy, it's the one thing I can use. I'm slow at all sorts of other things'.* (Respondent 16, person with dementia.)

Like in the case of the calendar, Table 3 shows that the participants' account of the picture telephone use correlated well with primary caregivers' accounts. In this case, 2 out of 6 people with dementia had to be reminded to use the product.

#### *The automatic night lamp*

Amongst the six families who agreed to test the night lamp, three dropped out of the study during the three month follow up period (two due to technical difficul-

ties, and one other dropped out since the person with dementia entered long-term care). Of the remainder, all three people with dementia claimed they used the lamp and found it useful. Data analysis shows that the lamp had least utility for caregivers. No caregiver was using the product three-months after its installation (see Table 3). Whilst its use for the person with dementia included improved orientation and reassurance, from the caregivers' perspective, its use was limited as the qualitative data reveals:

*'I can see potential there, but the lamp isn't being used that often.'* (Respondent 14, caregiver.)

Table 3 shows that the participant's account of their use of the lamp correlated poorly with caregivers' perception of its use.

#### *The lost item locator*

In contrast with the calendar and the telephone, the item locator performed poorly in terms of its use by the person with dementia. Data analysis shows that amongst the 11 people who tested it, six had withdrawn from the study after three months, (four due to technical difficulties). Of the remaining five, only three said they used the item locator (see Table 3), and three of these five families continued to experience technical difficulties with the device. Although of no great benefit to the person with dementia due to the complexity of its user interface, the data shows that many caregivers found the item locator useful in terms of its time saving capacity and its potential to reduce the stress associated with locating commonly lost items:

*'Its good for me, not for her (the person with dementia) so much. Usually it would take me an hour and a half to find things, now it only takes a few minutes.'* (Respondent 11, caregiver.)

Table 3 also shows that three carers reported that they themselves used the item locator and all five saw potential for its use even though two were not using it due to technical problems. Table 3 also shows a discrepancy between caregivers and care-receivers perceptions of the use of the item-locator. The table shows that four out of five caregivers reported having to remind their relatives to use the product.

#### *The gas cooker monitor*

The gas cooker monitor (not shown in table) achieved least success in terms of use and usefulness, with all three participants who trialed the device withdrawing from the project during the three month follow-up period. This was due to major technical difficulties and adjustment problems with the device.

#### 3.2.2. *What kind of difficulties (technical or otherwise) were experienced with the products?*

Data showed that the the gas cooker monitor, the night lamp, and the item locator were technically the most problematic devices tested in the Irish assessment study with two out of the three cooker monitors, four out of the six lamps, and seven out of eleven locators experiencing technical difficulties.

##### *The gas cooker monitor*

In terms of the gas cooker monitor, in one extreme case, gas began to leak from the adjusted cooker and consequently it had to be removed and the cooker replaced. In another case, the caregiver reported that the changed appearance of the cooker, (due to the installation of new knobs and sensors), made the person with dementia reluctant to use it anymore. Another unforeseen problem witnessed with this device was that the gas would cut out at the mains when the device was activated.

##### *The automatic night lamp*

The major problem with the lamp was that even after the sensors were replaced, they still often failed to automatically switch on and off, a phenomenon that understandably caused much frustration:

*'It goes off all the time. When it didn't go off I had to get out of bed to turn it off'* (Respondent 14, caregiver.)

##### *The lost item locator*

Like the lamp, the item locator was also unreliable and failed to always work efficiently. In some cases it was reported that the tag volume was inaudible, and in another case the tags failed to correspond with the picture on the wall panel:

*'I arrived at my mother's house one day last week and she was sitting beside the locator as the number one tag continuously went off. The locator keeps switching to tag one and the batteries run down very quickly. We haven't been able to use it since, it's a lifesaver and I dearly miss it when it's not working!'* (Respondent 11, caregiver.)

##### *The picture button telephone*

The picture telephone was an efficiently designed product with only some initial pre-test problems. The phone also had some preliminary technical problems which resulted in all telephones being returned to the manufacturers and re-installed with a tone and pulse

facility to enable them to function in all types of networked areas.

#### *The night and day calendar*

The night and day calendar was another well-designed product. Initially, however, there were some minor problems involving translation (the product had been originally designed in Norway), and all calendars were adjusted. Following this, no further technical difficulties were experienced.

#### 3.2.3. *How can technologies be refined to address the unique needs of people with dementia?*

Participants were questioned about how the technologies they trialed could be further refined to better address the memory loss problems and safety needs of people with dementia.

#### *The night and day calendar*

In terms of the calendar, suggestions for its improvement included, four people with dementia who mentioned that a clock could be incorporated into its design and one family caregiver recommending that a display panel showing the current year should also be included:

*'Include the year or if there could be a clock incorporated'. (Respondent 2, caregiver.)*

Two other people with dementia said that the writing on the display panel could be enlarged and made clearer:

*'Yes, print either black on white or white on black, it would be more clear. The lines on that are a little ineffective, you'd like to read it straight away and not be worrying what it says'. (Respondent 3, person with dementia.)*

*'I don't really think so, if the text was all straight, maybe if the writing was bigger'. (Respondent 5, person with dementia.)*

#### *The lost item locator*

In relation to the item locator, three out of the five participants who tested it suggested that the tags should be reduced in size and that the volume should be made louder:

*'The tags could be smaller, neater, more streamlined; they're too big, you can't use them on glasses. Also, the volume or pitch of the tags could be easier or louder to hear.' (Respondent 7, caregiver.)*

In general, caregivers found the design of the item locator complex and sometimes stigmatising for a person with dementia. For example, in one case a lady with dementia was prone to removing the panel box and hiding it in her hand-bag as she did not wish to be reminded of her memory loss problem. In another similar case, the person with dementia felt embarrassed having her items tagged and would try to hide them. Most caregivers reported that their relatives had difficulty remembering how to activate the locator since it required new learning:

*'My mother finds it difficult to use, the finger formation needed to press it, it would be better with a button. I showed her five times how to use it, on one occasion for 35 minutes. My mother kept pressing the green light instead of the picture. It's confusing for her with the light and the picture'. (Respondent 10, caregiver.)*

#### *The picture button telephone*

Only one recommendation was made for the modification of the telephone, which was that more pictures should be displayed on the panel, thus increasing the number of accessible contacts for the person with dementia:

*'You have nine pictures, maybe twelve pictures would be better'. (Respondent 18, caregiver.)*

#### *The automatic night lamp*

No suggestions were forwarded on how the lamp could be improved besides the obvious need to repair all of the technical difficulties already experienced.

#### 3.2.4. *How much are caregivers prepared to pay should products become commercially available for purchase?*

Table 4 shows the range of prices family caregivers were willing to pay for products should they become available on the open market, and the average price at the time of the research family caregivers were willing to pay for the product: Despite the fact that only one caregiver claimed their relative still used the item locator three months after its installation, carers were willing to pay most (€30 to €200) for this product (median = €50). In terms of cost effectiveness, the telephone rated well, with all six caregivers who tested it claiming they were willing to pay between €60 to €120 for it (median = €50). In terms of the night and day calendar,

Table 4  
Carer's willingness to pay for the product

Device		Calendar (N = 6)	Telephone (N = 6)	Lamp (N = 3)	Locator (N = 5)
Was the caregiver willing to pay for the product?	YES	5	6	1	4
	NO	1	0	2	1
How much was the caregiver willing to pay for the product?	Median	€22.50	€50	–	€50
	Range	€17 – €75	€60 – €120	€30	€30 – €200

five out of six caregivers<sup>2</sup> were willing to pay between €17 to €75 for this device (median = €22.50). Not surprisingly, the automatic night lamp, which was least used by caregivers due to extensive technical difficulty, understandably had the lowest economic value placed on it. Only one caregiver was willing to pay €30 for this product.

#### 4. Discussion

Our results show that according to participants with dementia and their primary caregivers, all of the calendars (n = 6) and picture telephones (n = 6) allocated for the ENABLE trial were being used by the sample three months after their installation and each was considered useful to both the participant and his or her primary caregiver. Results on the use and usefulness of the lamp and the item locator were more equivocal. For example only half the sample who had a night lamp installed (n = 3) and one third of those with an item locator installed (n = 3) reported they were using the devices three months after their installation. The item locator however appeared to have greater utility for the primary caregiver, a finding which may be related to the complexity of its design and interface and its potential to be stigmatising to a person with dementia.

Our findings demonstrate that the use and usefulness of the five products tested was largely determined by their technical capacity. Devices that had high levels of technical difficulties such as the item locator and the night lamp had the lowest level of use and were perceived as least useful. Conversely, devices such as calendars and telephones, that had low levels of technical difficulty, had the highest level of use and few dropouts. Overall, our findings demonstrated that the night and day calendar and the picture telephone were the most successful devices trialed in the Irish

assessment study in terms of use and usefulness by both people with dementia and caregivers.

Our results indicate that the actual/visual design of the assistive technology being trialed and its familiarity to an older person with dementia may be another factor influencing use and usefulness since in this study, it seems that products already familiar to older people, such as telephones, night lamps, and night and day calendars,<sup>3</sup> were used more often and considered more useful by people with dementia than new unfamiliar products such as item locators and cooker monitors.

Whilst this may be the case, it must also be remembered that the products most familiar to these people were also those same products which were less faulty and had fewer technical problems. It is therefore difficult to extrapolate the real reasons why these products were more popular than others. Product familiarity therefore may be only one of several different reasons explaining our results.

Items that are unfamiliar to people with dementia (especially as the disease progresses) are often problematic and misunderstood. Bozeat and his colleagues claim that people with dementia are more at ease and respond better to familiar objects even in the face of severely damaged conceptual knowledge [2]. The unfamiliar design of the item locator seems to have been a major deterrent for the person with dementia using it. The locator also required an adjustment to change [13] and new learning on the part of people with a cognitive impairment [21], something we know is difficult, given the nature of the disability.

Other findings show that the use of assistive technology was in some cases influenced by the availability of a caregiver willing to remind the person about the product. For example, a large majority (80%) of those trialing the item locator, half of those trialing the calendar and about a third of those trialing the telephone, each needed a family caregiver present to demonstrate product use. Our findings support results from the literature [3]. Cash for example in her work, showed

<sup>2</sup>The respondent unwilling to pay for the device in this case was the person with dementia; her caregiver died during the study and the respondent was unwilling to pay for the device even though she found it useful.

<sup>3</sup>Although the calendar was a new technology, its design was familiar as the device was set into a picture frame.



that the item locator was most successful where there was a caregiver present to support its use. In this context, where people with a more advanced dementia live alone, they may be somewhat disadvantaged since they have nobody available to prompt, or to assist them with a new device. These people may be better suited to more passive devices or to having assistive technologies installed at a much earlier stage in the course of the illness.

Several technical difficulties with products were experienced at the commencement of the ENABLE trial some of which were which were easily resolved. However in the case of the item locator and night lamp, these technical problems persisted which meant that these products were not always reliable for either the individual or for primary caregivers and hence our findings about their use and usefulness must have been adversely influenced by the inefficiency of their performance. In fact the technical problems with the gas cooker monitor resulted in each of the three participants withdrawing from the study. Future work in this area should ensure that, prototype products should be more fully refined and pre-tested on a sample of cognitively intact people before being trialed in the homes of people with dementia. Ideally, technologies should be installed by engineers familiar with dementia, and should be reviewed on a regular basis [27]. Periodic review is needed so that batteries can be replaced in certain products, since the batteries needed to operate the lost-item locator seemed to run out in a relatively short space of time, and other products with finite lives could be replaced (this would be particularly relevant if products were rented out) [27].

The suggestions made by both people with dementia and their primary caregivers as to how the respective technologies tested could be further improved to address complex needs need to be cautiously considered. Whilst we need to listen to and respect the views, of people with a dementia and their primary caregivers, particularly about matters of direct relevance to their day to day life and in this context, suggestions made (about the size of tags placed on items likely to go astray, the shape of cooker knobs, the size of font on the night and day calendar) should all be given serious consideration in the future design of assistive technologies, other suggestions made about incorporating clocks and year numbers into calendar format may need further discussion in Focus Group debate as they could result in the product appearing very cluttered and confusing. The real challenge in designing dementia-specific technology is to create a product that appears simple and

familiar to an individual yet works efficiently and effectively.

Finally our results about the out of pocket expenses caregivers are willing to incur for the purchase of assistive technologies need careful consideration. Our findings showed that carers were willing to pay most (up to £200) for the item locator despite its technical problems and its low usage by their relatives. Our results also showed that there was a very significant price difference between what caregivers were prepared to pay for products and what their current commercial price is. The only product for which carers were prepared to pay more than the retail costs was the picture button telephone. These findings are important since all of the products tested in ENABLE have application for people who are cognitively intact. If the devices were produced commercially for the population at large, their financial cost would presumably be considerably less than those experienced here; for example, the cheapest device, the picture button telephone, was not developed within the project but was already available on the open market [5].

Our findings on the economic cost of technologies, suggest that what caregivers are willing to pay for products did not necessarily correlate with the current retail cost of these products and it must be remembered that, apart from the picture telephone, the retail cost of all the technologies installed in ENABLE far exceeded the amount caregivers were willing to pay [5]. The cost of the night and day calendar was €219 [5, p. 19], but the average cost a caregiver was willing to pay was €35, the automatic night lamp cost €135 but caregivers were only willing to pay an average of €30 for the product, and the gas cooker monitor cost €900 with an additional €100 for installation and training costs (all participants testing this product dropped out and hence data regarding the amount the caregiver was willing to pay for the product was not collected). In terms of the item locator, its actual cost was €150 but caregivers were only willing to pay an average of €75. Interestingly, the only product for which carers were prepared to pay more than the retail cost was the picture button telephone which cost €37 but which carers were willing to pay an average of €95 for [5].

Finally, the ENABLE assessment study in Ireland raised much public and professional awareness about the potential assistive technology has for promoting independent living. However, technology-related services for people with dementia in Ireland, is a hugely under-developed area. Some questions which need addressing therefore in the Irish context include: who

should take responsibility for the funding, resourcing, assessment, distribution, monitoring, and maintenance of these technologies? Should hospital departments or social services supply these technologies? Should technologies be freely available or should they be loaned or purchased? The experience of Welfare States such as Finland and Norway, where technical aids are leased out through municipalities and where devices can be returned to a Central Distributing Agency when no longer useful, could provide an excellent starting point for Ireland to develop social policy initiatives in this area [7]. Ireland could learn much from Norway, where technologies are already financed through taxation and are purchased, stored, distributed, and available in each of the 19 municipalities [10]. We need to keep the issue of assistive technology for older people on the national agenda. Practitioners, health service professionals, and voluntary groups such as the Alzheimer Society of Ireland and the Carers Association, need to collectively lobby the Government for more positive action to be taken in this area.

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