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### Developing evaluation of signage for people with dementia

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## Developing Evaluation of Signage for People with Dementia

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Keywords:	signage, wayfinding, dementia, world cafe, design, evaluation

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19                  8                  **Abstract**  
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21                  9                  Purpose  
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24                  10                This two-centre research study, ‘*Showing the Way*’, aimed to develop a framework for use in  
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26                  11                the evaluation of the effectiveness of signage to assist people with dementia.  
27  
28                  12                Design/methodology/approach  
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30                  13                The study consisted of two parts. Workshops held in both Sydney and Edinburgh using  
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32                  14                ‘world café’ methodology with 28 knowledgeable participants produced a pool of statements.  
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34                  15                These were subsequently used in a three-round Delphi process administered to 38  
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36                  16                participants in order to generate ideas and develop consensus content for a signage evaluation  
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38                  17                framework.  
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40                  18                Findings  
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42                  19                This process resulted in a framework consisting of Delphi statements which had a 70% level  
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44                  20                of agreement and a series of prompt questions. Both intrinsic factors and wider  
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46                  21                environmental, extrinsic factors in signage for wayfinding were identified.  
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48                  22                Research limitations/implications  
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50                  23                Limitations of this study were the small number of participants, including only four people  
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52                  24                with dementia, and the unresolved problems inherent in designing signage that may  
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1 simultaneously be universally relevant and readily understood, yet meets the idiosyncratic  
2 needs of each individual living with dementia.

### 3 Originality/value

4 As there is little prior work in this field concerning signage use by people with dementia, this  
5 framework provides an original preliminary tool that may be used in further research on  
6 evaluating signage effectiveness. In designing signage and testing its effectiveness, it was  
7 concluded that the direct involvement of people with dementia is essential.

9 **Keywords:** signage, wayfinding, dementia, design, evaluation, framework, world café

## 11 **Introduction**

12 Dementia is one of the most rapidly growing public health challenges of contemporary  
13 society with approximately 50 million people worldwide affected, and this is predicted to  
14 increase to 131.5 million people by 2050. The term dementia refers to a collection of  
15 terminal, currently largely untreatable diseases, in which cognitive functions become  
16 increasingly compromised. These include memory retrieval, capacity for new learning,  
17 communication, planning and executive function. Problems with visual perception,  
18 hallucinations and disorientation in time and place, can also frequently occur.

19 It has long been acknowledged that the design of environments in which people with  
20 dementia live can either support or exacerbate the disabling characteristics of these  
21 conditions (Judd *et al.*, 1998). In such environments, the type, design, location and  
22 characteristics of signs is critically important. To date, little research has been undertaken to  
23 evaluate how effective signage is for lessening anxiety or assisting wayfinding in people with  
24 dementia.

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This paper reports the outcomes of an empirical research project, ‘*Showing the Way*’, a joint study by the Dementia Centre, HammondCare Australia and the University of Edinburgh (2016). The first aim of this study was to assess current understanding about signage practice by exploring how people with dementia understand and use signage. The second aim was to develop a preliminary consensus about how to evaluate signage effectiveness for assisting people with dementia. The study outcomes will assist designers, architects, service providers and communities in improving signage design and use in both public and semi-private spaces used by people with dementia.

Semiotics is the study of signs, symbols and their communicative and interpretative processes (Chandler, 2007). Signs are commonly used to provide instruction, information, location and direction, for example, street signs and traffic signs. These signs require interpretation and decoding, frequently drawing on prior learned knowledge or familiarity. If a person’s ability to access or recall prior knowledge is compromised, a sign may fail to provide information or may be misunderstood. Signs also possess different intrinsic characteristics like words, pictures, colours, symbols, objects or sounds. For example, the word ‘poison’ or colour red may alert to danger. Such characteristics are usually mediated by extrinsic environmental factors including adequate lighting, contrast of letters or symbols against their background, and the environmental contexts in which they appear. A sign’s interpretation is also mediated by intrinsic factors possessed by the user. Examples include height or posture (a common disabling factor in older people with osteoporosis), visual acuity, cultural and linguistic background, literacy level, prior familiarity and the extent of fluctuating cognitive impairment. The effectiveness of a sign will therefore depend upon the creator of the sign taking these factors into account (Chandler, 2007).

Signage is a part of everyday life, mostly taken for granted, until a person ventures into new or unfamiliar locations. For people living with dementia, signage is critical in assisting

1 navigation to both familiar places and new locations. Dementia commonly results in  
2 confusion about once familiar places, daily living routines, uses of certain objects, or other  
3 cognitive or visual/spatial difficulties and comprehension may be further compromised by  
4 age-related visual, auditory or other sensory impairments (Kurrle *et al.*, 2012). In many  
5 public and some private spaces used by people with dementia, the type, location, amount,  
6 type and size of signage is mandated by regulating authorities, for example, fire exits or toilet  
7 signage in hospitals and nursing homes. However, there is little explicit evidence available  
8 concerning the basis for much of this regulation.

9 A 2000-2016 literature search was conducted using the following terms in all combinations:  
10 dementia, signage, design, benefit, orientation, creative design, impact, wayfinding, hospitals,  
11 care homes, and environment (Gresham *et al.*, 2016). Ninety-three articles of potential  
12 relevance were identified in a search of ASSIA, EBSCO, Psych info, CINAHL and Web of  
13 Knowledge databases. After refinement and review of abstracts, 29 articles spanning health,  
14 architecture and urban planning literature were identified as relevant. This review  
15 demonstrated that environmental design is increasingly being recognised as having enabling  
16 or disabling effects on both mood and function of people with dementia, although the same  
17 environment is likely to impact differently on each individual (Calkins, 2009, Hernandez,  
18 2007, Pollock and Fuggle, 2013, Marquardt, 2011). The total environment, as well as specific  
19 elements within it, may reduce or exacerbate stress (Boex and Boex, 2012), enhance quality  
20 of life (Brawley, 2001, Allen, 2009, Torrington, 2006) and assist in maintaining autonomy  
21 and individuality (Passini *et al.*, 2000).

22 There may be an assumption that signage is essential within dementia environments. For  
23 example, one study emphasised that design of signage should be familiar, legible, distinctive,  
24 accessible and promote comfort and safety (Afacan, 2013). However, numerous guidelines  
25 exist concerning principles of design for enhancing dementia care living environments but in

a study examining 10 sets of guidelines, yielding 76 principles and published between 1989-2009, found none explicitly referred to signs or signage (van Hoof *et al.*, 2010). In a survey of 30 UK aged care homes, lack of signage was a significant issue leading to restricted wayfinding, especially in relation to locating toilets (Kelly *et al.*, 2011). Furthermore, signage was identified as one of five key deficits in essential design features in aged care facilities (Hadjri *et al.*, 2012, Cunningham *et al.*, 2008). While the absence of signage may be problematic, overprovision or the use of 'dense' signs may be equally deleterious (Mitchell *et al.*, 2004). Some signs may increase confusion, be misunderstood or misdirect people who may lack discernment about the relevance of the sign to their particular circumstances. One example of this is the potential interpretation of fire exit signage as the regular exit in a dementia care environment. Therefore, understanding how signage is used and how to evaluate signage effectiveness is essential in assisting the wellbeing of people with dementia.

## Methods

### *Recruitment of participants*

Thirty-two workshop attendees were recruited from Scotland (n=15) and Australia (n=17), including four people with dementia, six family carers, eight health care professionals, eight design professionals and architects, two vision specialists and four academics. All attendees were invited to participate in subsequent Delphi rounds for which strategies were used to recruit additional participants. The Delphi method involves iterative rounds of questionnaires being sent to selected experts where each round refines statements in order to reach consensus. The response rate for returning each Delphi round questionnaire is shown in Table 1. Two 'world café' style exploratory workshops (involving small groups of participants in discussion around café-style tables) followed by three Delphi rounds were used to develop a broadly applicable classification as the basis of an evaluative framework (Slocum, 2003). The

Delphi rounds were conducted by email except for the four people with dementia, all from Scotland, who preferred to complete their Delphi questionnaires directly with one of the research team.

### *The Workshops*

World café style workshops of small groups of participants discussed a series of five pre-developed open-ended questions during a 90-minute workshop (Slocum, 2003, Elliott *et al.*, 2005). Further questions and discussion topics were recorded on post-its, paper tablecloths and white boards. After a set time, participants then moved to the next table to consider a new question, leaving a trail of responses for others to add to in order to build a collective understanding of the topic by the entire group. This format encouraged collaboration and sharing of individual interpretations of a topic, rather than seeking to reach an agreed consensus. In the Scottish workshop, an additional experiential task was set. Participants took part in a practical wayfinding task of going out in small groups to find a café and their experiences of wayfinding were fed back to the whole group. The format of both workshops was designed to elicit views, experiences and personal and professional perspectives on: 1) factors to be considered when designing signage for environments used by people with dementia; 2) identification and exploration of the measures needing consideration in evaluating signage for these environments; and 3) how to develop ways for people with dementia to be involved in the development and evaluation of signage for dementia specific environments. Five main question areas were addressed, detailed in Table 2. Both research teams transcribed and collated their own workshop data, identifying initial themes and agreeing on interpretations before the pooled data was subjected to inductive content analysis (Krippendorff, 2012) to identify main topic areas, themes and sub-themes.

### *The Delphi process*



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A Delphi study (a multi-staged survey which aims to achieve consensus on an important issue) was used to develop a general consensus on final outcomes (Keeney *et al.*, 2010, Patterson *et al.*, 2016). The research team set a 70% consensus level as measured by “agree” or “strongly agree” responses, as is consistent with other studies (Kleynen *et al.*, 2014). Round 1 consisted of 20 statements based on the four main themes emerging from the workshops. Participants were asked to respond with up to 10 short statements of their own, thus allowing some freedom of expression while also confining the responses to the main themes. Round 1 responses were subjected to content analysis to generate statements for Round 2 which consisted of 28 statements consolidated under three headings. Participants were asked to rate these statements on a five point Likert scale ranging from “strongly agree” to “strongly disagree”. Open ended comments were also invited and used to provide the statements for Round 3. Statements that failed to reach 70% consensus in Round 2 were included within the development of statements for Round 3. After Round 2, 18 of 28 statements reached consensus to be augmented by a further 10 at Round 3. These consensus statements were then combined with prompt questions to produce the evaluation framework. All stages of the process involved in developing the framework are summarised in Figure 1.

**Results**

***Workshops***

Content analysis identified five main topics:

1. Factors relating to signs. Physical characteristics including colour, contrast, texture, the amount of information conveyed, as well as location, purpose and height of signs were rated as important or very important. Familiarity (the extent to which the sign uses design features known to the person using it) and individuality (the extent to which the sign is designed for use by a particular individual) were all mentioned. Age and cultural appropriateness were

important when considering the use of words, pictures and symbols. Minimising visual clutter both within the sign itself but also within its immediate surroundings and ‘keep it simple’ in reference to style, size and direction of fonts were considered important.

2. *Factors other than signs.* Wider environmental factors, including low levels of lighting, noise and general clutter which may detract from the impact of signage were also identified. Many environments are subject to frequent changes in light levels, and alterations in light levels over 24 hours can affect the effectiveness of signage. Building design itself can ‘passively’ provide helpful orientation to assist wayfinding and orientation. Examples included colour contrast to highlight doors, or use of glass doors to see spaces beyond or cupboard contents, or the provision of multiple, consistent cues such as reinforcing a directional sign to a care home’s dining room by creating visual access to dining room tables and chairs. Signage was identified as an essential consideration at the architectural design brief stage. For example, both the number of decision points required for wayfinding between locations, and signage to provide information about the environment, should be considered.

Participants noted that an environment designed using accepted dementia design principles (e.g Cunningham *et al.*, 2008) along with effective signage where required can also enhance senses of safety, security, calm, comfort, confidence and control in moving around an environment.

3. *Fostering ways for people with dementia to be involved in the development of design.*

Workshop discussions stressed the importance of signage being tailored to individuals, however as dementia affects each person differently, the ways in which individuals understand and respond to signage is also likely to differ. Understanding the particular perceptual, sensory and physical limitations of each individual is therefore important. These idiosyncratic factors present designers and architects with a conundrum of how to ensure that signage is simultaneously both ‘universal’ and ‘individualistically inclusive’. Indeed,

participants acknowledged this challenge and asked if it is even possible for signage design to be effective at both individual and universal levels. Moreover, it is further complicated by the need for signage to be consistent, while simultaneously adapting to particular people or contexts.

4. Signage and wayfinding. The nature of symptoms of dementia was considered and the emphasis on memory loss as a cardinal sign of dementia was challenged when considering the effectiveness of signage to assist with wayfinding. Workshop participants stressed the likely significance of sensory and perceptual challenges, including visual-spatial and visual-perceptual symptoms, as well as the role of competing and distracting environmental features, such as background noise. Signs are only useful in wayfinding if the person knows what they are looking for and the process of returning from a destination needs to be considered as much as the process of arriving.

5. Approaches to evaluating signage. Participants were asked to consider how to assess or evaluate signage using methods they know of or may use, and the limitations of existing methodologies. Participants argued persuasively that people with dementia should be involved in developing and evaluating all types of signage, especially signs designed for people with dementia. Observational techniques, feedback from people within the target environment and the use of technologies were discussed as methods of evaluating effectiveness. The latter included virtual reality test environments, ‘walk-throughs’, establishing and monitoring controlled environments and the use of wearable technologies, including eye-movement tracking devices and GPS devices to evaluate the amount of movement and use of space. Participants stressed that evaluation of signage (or lack of it) should capture its impact on the person with dementia, including changes in behaviour, health, independence, the extent to which space is used, self-esteem and quality of life issues. Other simple measures such as

counting the number of wayfinding decision points to common destinations were also proposed. The timing of any evaluation was considered to be key as variations both in the environment and the users will vary throughout any 24-hour period. No current tools or instruments for evaluating signage effectiveness, other than those concerned with signage compliance requirements, were identified.

### *Delphi rounds*

Information obtained in the workshops was used in the Delphi rounds to achieve a consensus of relevant concepts which were then used in the framework. This evaluation framework was designed to form a foundation on which further evaluation and future development of effective signage for people with dementia could be based. The consensus statements are contained in Tables 3 and 4, which summarise the most important factors relating to the signs themselves, and their surrounding environments. The statements in Table 5 presents the characteristics and importance of how effective signage can aid wayfinding and navigation, and Table 6 summarises how effective signage can be evaluated. Putting this together, Figure 2 summarises the inter-relationships between the different parts of the framework. This indicates how various intrinsic and extrinsic factors combine to produce enabling dementia signage within enabling environments in which evaluation is recognized as an essential ongoing process.

Overall, the Delphi process conducted online and informed by two workshops proved to be an efficient methodology for reaching a high degree of consensus involving people with differing professional backgrounds and experience of designing and using signage to assist people with dementia. Although a high level of consensus was reached overall, some respondents found the Delphi process too restrictive. In addition, it was difficult to recruit larger numbers of people with dementia, and those that did participate in the study had

1 difficulty in engaging in the Delphi process and preferred to interact directly with a member  
2 of the research team. Statements which did not reach the 70% consensus level in the Delphi  
3 rounds concerned issues related to advocating universal signage, yet realising the intensely  
4 idiosyncratic nature of the impact of dementia on each individual affected. Overall, it is  
5 strongly recommended that with any signage, people with dementia should have  
6 opportunities to engage directly with designers and architects.

7  
8 **Discussion**

9 The project aimed to develop a framework for use in the evaluation of the effectiveness of  
10 signage to assist people with dementia function within their environment. Signage and its  
11 potential role in supporting people with dementia in their everyday lives is not well  
12 understood. Exploration in this study of tensions between aesthetics and accessibility  
13 highlighted the subjective nature and variable personal responses to signage mediated by age,  
14 culture and life experience. Signage, in all its forms, is essential to help people make sense  
15 of, or understand places, objects and their functions, which can be helpfully augmented by  
16 human guidance, especially in unfamiliar environments. Effective signage provides a sense of  
17 wellbeing by providing feelings of control and security, and reducing anxiety associated with  
18 feeling ‘lost’ and unsure of one’s surroundings. Project participants recommended there be  
19 regular audits of effectiveness based on the framework, which will need to be developed in  
20 the future. Furthermore, the experience of users of signage should be ongoing, which may  
21 include observing how people interact with the signage, ‘walking-through’ exercises,  
22 techniques for measuring emotional responses and consideration of the contexts in which  
23 signs are being used. The involvement of people with dementia in the process is crucial to  
24 any evaluation of how effective signage is.

Wayfinding is a highly complex task which requires more than signage to be successfully accomplished. It requires the whole environmental context that may include multi-sensory cues, visual and/or auditory landmarks or within the home, personally meaningful possessions. People with dementia will respond to some or all of these aids or cues in their own individual ways. This study confirmed the view expressed by Marquez *et al.* (2017) who suggested that the ability to perform this highly complex spatial navigational task can be enabled or compromised by many factors, including signage (Marquez *et al.*, 2017).

## Conclusion

This study aimed to develop a framework that would aid in evaluating the effectiveness of signage to assist people with dementia. This was achieved by using exploratory world café workshops and a Delphi process to reach consensus statements regarding signage in environments in which people with dementia live and use. These results identified many unresolved issues and should be considered as a preliminary study. The resultant framework would benefit from further refinement to evaluate its utility by being tested in various general and specific contexts in which people with dementia navigate and live. Reconciling individuality and universality of signage, consideration of how to accommodate cultural variations, achieving a balance between aesthetics and effectiveness, and the use of interactive signage all require further investigation. Any evaluation of the effectiveness of signage should consider both intrinsic characteristics and the wider, or extrinsic environment in which the signage is situated. The diversity of people living with dementia and the varied environments they inhabit generate considerable complexity in designing signage that will actively support their abilities and reduce their disabilities. Testing the utility of the evaluation framework through involving people with dementia in real world situations is now required.

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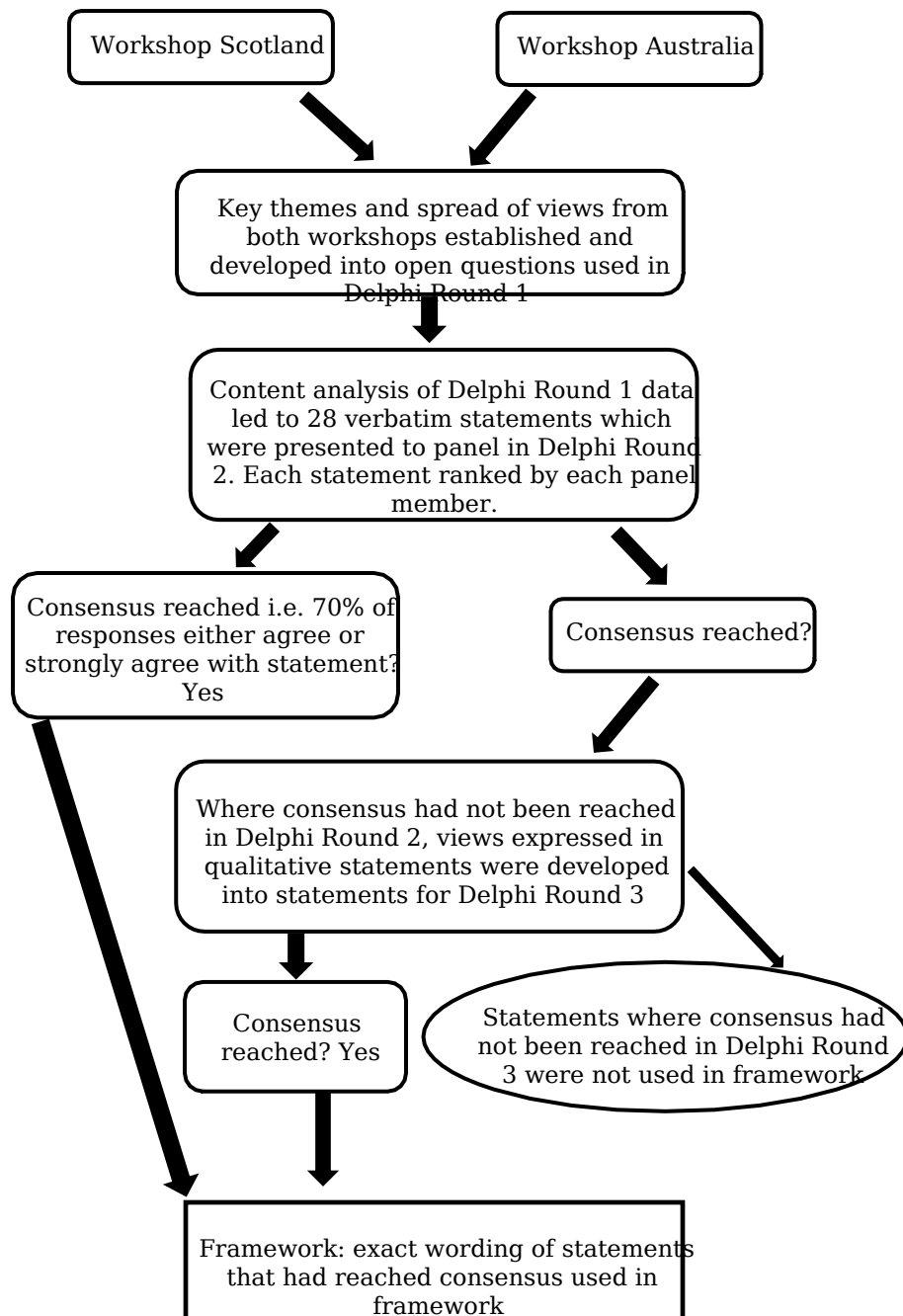


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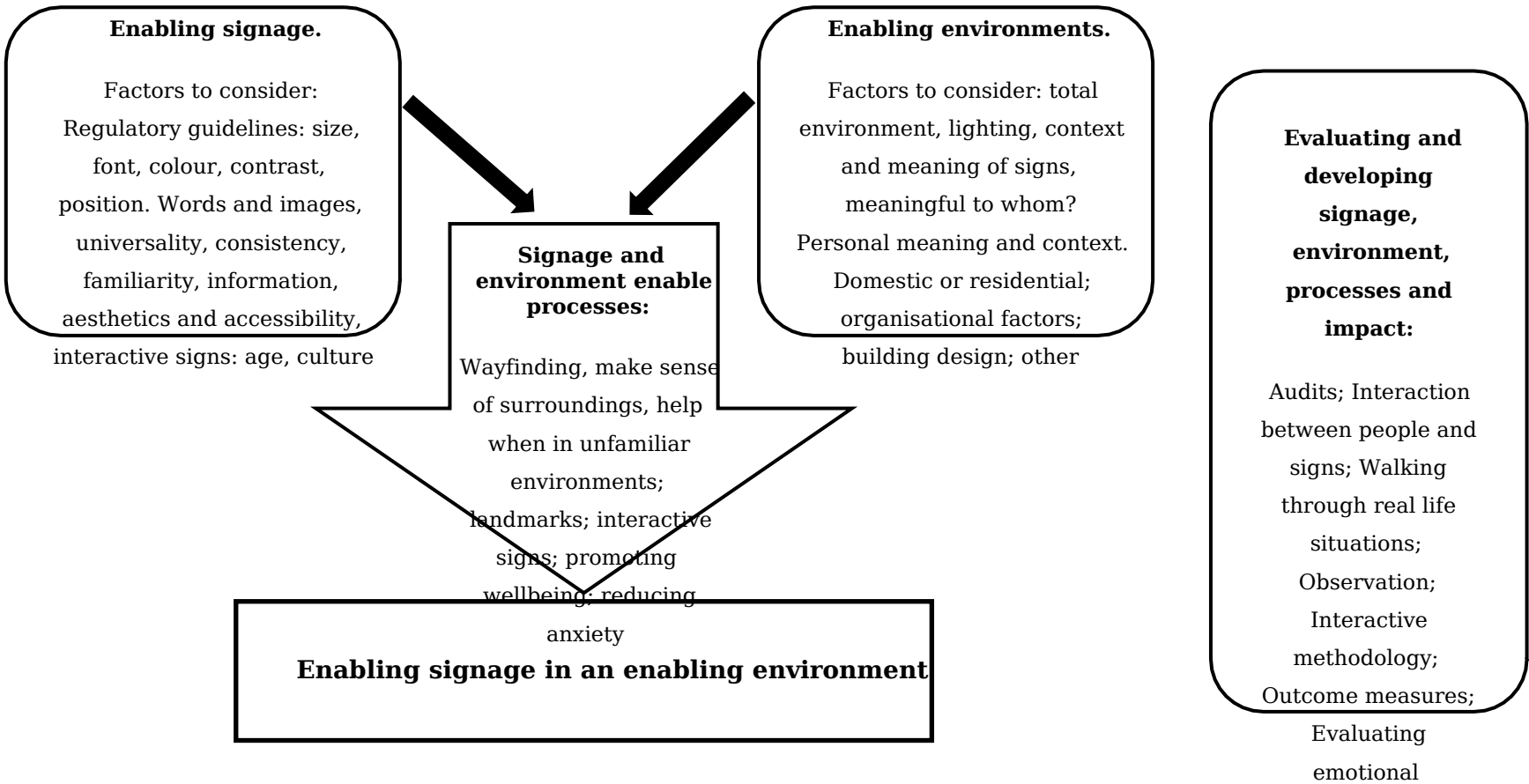


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**Figure 1** Flowchart of framework development



**Figure 2**The development of a provisional framework of enabling signage in an enabling environment

**Table 1.** Delphi participation rate

	Delphi 1	Delphi 2	Delphi 3
Questionnaires distributed	76	38	31
Completed questionnaires returned	38	31	30

**Table 2.** Question areas addressed in workshops

	Questions
1	If we were designing signage for environments where people with dementia live, what would we need to think about? Prompts concerned physical elements e.g. colour, size, font, use of images, elements relating to the impact of signage on wayfinding and orientation.
2	Thinking about an environment for people with dementia with which you are familiar, what signage is used? How effective is it? In what ways is the signage disabling for people with dementia and what makes it disabling?
3	If we were putting newly designed signage into an environment for people living with dementia and wanted to evaluate the difference it made, what would we need to monitor in order to decide how effective it was in helping people with dementia?
4	What approaches (methods) would work best when exploring how effective the signage was?
5	What are the limits of existing approaches (methods) to evaluating signage features?

**Table 3.** Taxonomy part one: factors relating to signs

<b>Factor</b>	<b>Consensus Delphi Statement</b>
Words and images	Words and images should both be used in all signs in public places
Universality	Signs should be universally understandable – able to be understood by anyone, anywhere
Consistency and familiarity	Consistency and familiarity in signs assist a person with dementia to memorise and recognise them
Interactive signs (e.g. responsive technology)	The usefulness of interactive signs will depend on the age, culture and cognitive ability of the user
Aesthetics	Whether a sign is aesthetically pleasing is subjective. Age, culture and life experience will all have an impact. Whether or not a sign is aesthetically pleasing is far less important than clarity – but if it can also look good, then that is a win/win.
Accessibility	The key thing is that the sign should be easily understandable by the person with dementia and appropriate for those also whose sight is poor.
Volume of information	If there is too much information, signs and pictures/photos can seem to be ‘trees lost in the forest’

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**Table 4.** Taxonomy part two: factors relating to environments

Factor	Consensus Delphi Statement
Total environment	Signage is only one consideration in helping people find their way
Lighting levels	Good lighting can make signs more effective
Personal meaning and context	There are some locations where it is more appropriate to have signs that have a meaning that is personal to a particular person
Domestic vs residential	There can be a conflict between the desire to provide a domestic environment and the need for signage
Organisational factors	The preferences of designers, managers and staff can take priority over the needs of people with dementia
Building design	Good design of a building can reduce the need for signage
Other cues	People use other cues to find their way e.g. smelling food in a dining room or an open door showing destination they want

**Table 5.** Taxonomy part three: processes enabled by signage and environments

Process	Consensus Delphi Statement
Wayfinding	Signage is the main tool to assist in wayfinding
Making sense of the world	Signage helps us make sense of the world when we are in unfamiliar environments
Landmarks	Some people navigate easily with landmarks while others rely on street signs and don't notice or memorise landmarks – this is independent of cognitive impairment
Interactive signs	People with dementia can be capable in becoming familiar with interactive signs
Promoting wellbeing	Having helpful signs in an environment can promote feelings of wellbeing
Reducing anxiety	Signs that help people find their way reduce anxiety



**Table 6.** Taxonomy part four: evaluating and developing signage

Approach	Consensus Delphi Statement
Audits	Regular audits of signs should be undertaken in environments where people with dementia live. In residential care, staff should spend more time with residents rather than doing audits.
People’s interactions	How people interact with a sign helps us to understand its effectiveness
Walking through	Walking through real life situations with people with dementia allows them to be involved in evaluation
Observation	Using observational techniques allows a wide range of people with dementia to become involved in evaluation of signs
Context	The context of a sign should be considered when measuring its effectiveness
Interactive methodology	A more interactive methodology will allow a person living with dementia to be involved in evaluating signs
Outcome measures	Outcome measures should be developed for common signs
Emotional responses	Techniques that allow us to measure emotional responses are essential