

PROCUREMENT AND RISK SHARING

Full Paper

AN INVESTIGATION INTO THE LINK BETWEEN HEALTH CARE FACILITY DESIGN AND SERVICE PROVISION

Chris Landorf

School of Architecture and Built Environment, The University of Newcastle
chris.landorf@newcastle.edu.au

Associate Professor Lorraine Sheppard

School of Allied Health, The University of South Australia
lorraine.sheppard@unisa.edu.au

Jan Van Emden

School of Allied Health, The University of South Australia
jan.vanemden@unisa.edu.au

ABSTRACT

Health facilities represent a significant investment in infrastructure and national wellbeing. Health facilities also represent a unique and complex building type that involves many user groups and consultants, a concentrated use of engineering services, and intense twenty-four hour a day use. In common with other large infrastructure projects, the construction of a major health facility is a relatively infrequent and significant event that generally requires the application of complex briefing strategies and non-traditional procurement methods. This has the potential to decrease the efficiency of the design, documentation and construction process, and increase the unpredictability of project outcomes unless each new project is systematically recorded and that data used to inform future projects. This is not presently the situation.

This paper will describe the preliminary results of an Australian Research Council Linkage-Project conducted in conjunction with Helping Hand Aged Care Inc., Delfin Lend Lease and Spotless Services Limited. The research project used a multiple embedded case study research method to develop a comprehensive picture of the relationship between procurement processes, the post-occupancy provision of health services, and resident quality of life in three aged care facilities. The evidence presented will include a description of the research method and summary of the data collected through documentary analysis, observational studies and self-report surveys from two of the facilities used in the study. As with recent research into office environments (Leaman and Bordass, 2000), the findings indicate a strong link between the design of the physical environment and the capacity of service providers to provide efficient and effective health care. The findings further suggest that both the briefing and documentation phases are critical factors in the development of efficient and responsive physical environments. The research ultimately aims to provide economic benefits through improved worker productivity and a reduction in post occupancy alterations to the physical environment. The authors also intend to extend the research into studies of major hospital facilities.

Keywords: health service quality, building performance and productivity

AN INVESTIGATION INTO THE LINK BETWEEN HEALTH CARE FACILITY DESIGN AND SERVICE PROVISION

1. INTRODUCTION

In 1976, 9 per cent of the Australian population was aged 65 years or older. In 1996 this age group had increased to 12 per cent of the population or 2.2 million people. One in five of these were aged 80 years or older. By 2016, this group will represent 16 per cent of the population, some 3.5 million people. One in four will be 80 years or older (ABS, 1998a). As Australia's population ages, the number and proportion of people in this 80 years and over 'older old' age group will increase. People aged 85 years or more are projected to increase from 1.2 per cent of the population or 224,000 people in 1998, to 2.0 per cent or 440,000 in 2021, and 3.8 per cent of the population or 920,000 people by 2041 (ABS, 1998b). As older persons tend to be high users of health services, it is anticipated that this ageing population will have a significant impact on the Australian health budget over the next fifty years. Although only 12 per cent of the population, people aged 65 years and over currently account for about 35 per cent of expenditure on health (Bishop, 2000). This is per capita approximately four times higher than the rest of the population. They are admitted to hospital more often and they stay longer (AIHW, 1998a). A specific aspect of this expenditure is residential aged care. The Federal Government spent \$2.7 billion in 2000 for 132,000 people in residential aged care facilities (ABS, 1998b). Given the high capital investment and need for more and increasingly flexible residential care facilities, it is vital that design standards are developed that meet the expanding needs of aged Australians.

This paper will describe the preliminary results of an Australian Research Council Linkage-Project conducted in conjunction with Helping Hand Aged Care Inc., Delfin Lend Lease and Spotless Services Limited. The paper will initially outline the research method used to develop an understanding of the relationship between procurement processes, the post-occupancy provision of health services, and resident quality of life in three aged care facilities. The paper will then provide a summary of the data collected through documentary analysis, observational studies and self-report surveys from two of the facilities used in the study. Preliminary findings indicate a strong link between the design of the physical environment and the capacity of service providers to provide efficient and effective health care. The findings further suggest that both the briefing and documentation phases are critical factors in the development of efficient and responsive physical environments. The research ultimately aims to provide economic benefits through improved worker productivity and a reduction in post occupancy alterations to the physical environment.

2. BACKGROUND

Residential care is available for older people who are no longer able to live at home. There are two main types of residential aged care in Australia, nursing home (high) and hostel (low) care. Generally, nursing homes have provided 24 hour nursing care and accommodation services, while hostels have provided accommodation services and assistance with daily tasks such as dressing and bathing. Since October 1997, residential care services have been administered and funded under one system. While some nursing homes and hostels will continue to specialise in high care, low care or dementia, an increasing number of facilities offer the full continuum of care, and allow residents to remain in one place as their care needs increase (Bishop, 2000). The target national high care place rate in 1998 was 40 places per 1,000 persons aged 70 years and over. The projected growth in the 85 years and over group means that more residential care will be needed over the next forty years (AIHW, 1998b).

Design of residential facilities has evolved from the past 'institutional' model to a more 'domestic' approach. Home-like architecture and interior finishes, decentralised layouts

and a flexible regime of care, aim to create an environment that promotes independence in all aspects of a residents' daily life (Russell and Sauran, 1991). Home-like environments provide all the support needed in terms of staff, physical aids and disability access but create a more domestic environment in which people feel familiar and empowered (SRFAC, 1997). This move to home-like environments resulted from a combination of the Federal Government's *Aged Care Act 1997*, which dictated new standards for residential aged care buildings, and the increased frailty of new admissions to residential care. As older people have a mixture of care requirements, a method of housing them in the same building is needed where new facilities catering for low or medium levels of care are designed in anticipation of future higher levels of care. People may keep their room for the rest of their life and receive extended services as their dependency increases (Quayle, 1999). The increasing variation in care provision was recognized with the introduction in 2002 of a separate classification for aged care facilities in the Building Code of Australia (BCA). Aged care facilities were previously classified as either Class 1b – Hostels, or Class 9a - Health Care Buildings (ABCB, 1996), neither of which adequately addressed variations in the level of care actually provided in the majority of facilities. In addition to the provisions of the BCA, an Australian certification program for residential care facilities has been developed to ensure high quality care for the receivers of aged care services. The *Certification Procedures for Residential Care Services* was introduced in 1997 and revised in 1999 (CDHAC, 1999). The procedures focus on the physical quality of residential aged care buildings in addition to service quality. Access to Commonwealth funding is a strong incentive for service providers to achieve certification.

Even though residential care facilities are a considerable economic cost to Australia, and demand for these facilities is expected to increase, evaluation of residential care design and its role in enhancing the quality of living and work environments is scant. That the quality of a living environment can significantly impact on psychological and physical well-being, and the corresponding cost of health care, is not being disputed (Coulson, 1997; Schwarz, 1997) but it is apparent that the issues that define a quality living environment are yet to be adequately established. Research has commenced to understand the microenvironment, including lighting, acoustics, colour, pattern and room size (Calkins, 1988; Harr and Kasayka, 2000; Teresi et al, 2000) but there is little published research on the evaluation of less quantifiable design issues (Coulson, 1997). This includes the capacity of a physical environment to be progressively adapted to changing care needs and the role of physical environments in supporting or inhibiting the provision of quality care. Although some design guidelines exist and form part of the building accreditation framework, further research is required to evaluate the use of these guidelines and to anticipate future developments (Albert and Logsdon, 2000). The situation is compounded by the fact that architects are not generally paid to undertake post-occupancy evaluations of their design work, and many treat post-occupancy evaluation information as commercial in confidence. This seriously reduces the understanding of the effectiveness of design innovation and limits a broader contribution to the design body of knowledge that might provide economic and social benefit to other areas of the health care sector.

3. RESEARCH AIMS

The research project described in this paper is significant because of the considerable and growing capital investment in aged care facilities, and health care facilities in general. The implications of inappropriate design are expensive post-occupancy modifications to newly completed facilities, excessive operational costs, reduced staff productivity and inadequate service provision. The research aims specifically to:

- a) identify and describe the issues that impact on residential care design
- b) develop design strategies that improve the capacity of the physical environment to:
 - progressively adapt to changing resident care needs, and
 - support the efficient and effective provision of quality care, and
- c) inform certification and design standards.

4. RESEARCH STRATEGY

The research project adopted a five stage research strategy shown in Figure 1. The strategy will be applied to the following three case studies, the first two of which have been completed and the preliminary results are described later in this paper:

- Case Study 1 – an 83 bed residential care facility at Mawson Lakes, Adelaide. The project was purpose built and completed in 2003.
- Case Study 2 – a 98 bed residential care facility at Ingle Farm, Adelaide. The project was completed in 1994 and involved the adaptive re-use of former education buildings.
- Case Study 3 – eight independent living units at North Adelaide. The project is currently under construction and due for completion in late 2004.

All facilities are managed by Helping Hand Aged Care Inc. with outsourced linen services currently being provided at Mawson Lakes and Ingle Farm by Spotless Services. Spotless Services have the capacity to provide additional services including catering should further outsourcing be considered appropriate. Mawson Lakes is a major a Delfin Lend Lease community development in Adelaide's northern suburbs. Analysis of the North Adelaide independent living units will help to identify additional issues that impact on the provision of services to people in their own homes. As mentioned above, this phase of the project is yet to be completed.

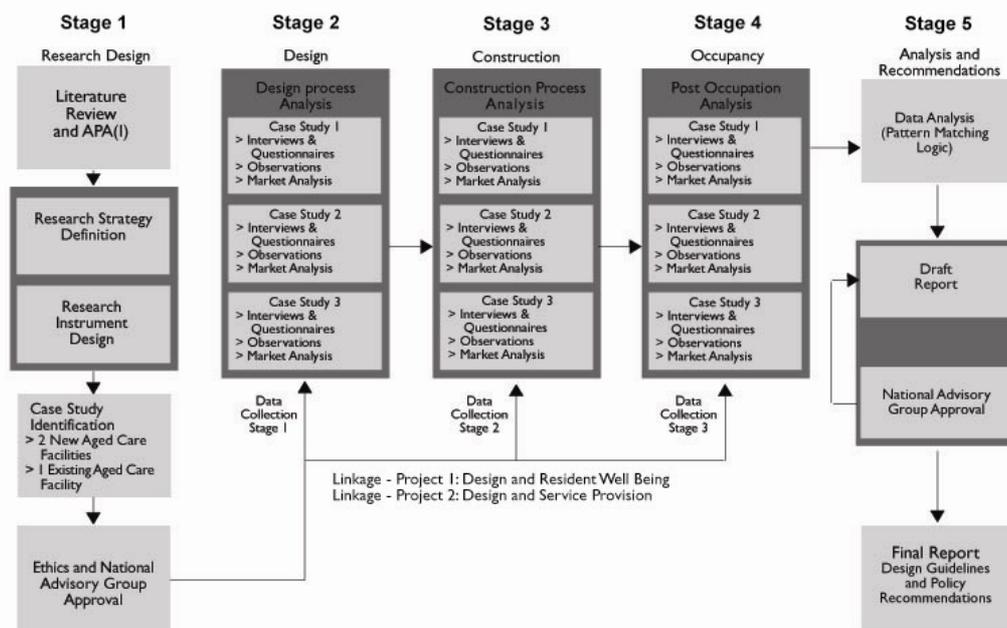


Figure 1: Research Strategy

4.1 RESEARCH FRAMEWORK

4.1.1 Conceptual Framework

Building projects are complex and multi-dimensional in their technical and managerial dimensions. They involve the coordination of a variety of building industry professionals pertinent to a particular building type, statutory authorities that administer legislative requirements, and client bodies, generally expert in their particular field but not necessarily experienced in building procurement. As a response to this complexity, the project uses a descriptive and exploratory approach combining qualitative and quantitative measures in a multiple embedded case study. Case studies are best suited to projects that attempt to investigate inter-related phenomenon in changing real-

life contexts where it is difficult to isolate the phenomena being studied from its context (Yin, 1994). The use of multiple cases enables specification of the population, control over extraneous variation, and definition of finding generalisation limits (Eisenhardt, 1989). Embedding the case study enables consideration of a variety of stakeholder views. The use of multiple sources enables data and significant issues to be triangulated within a broader context (Denzin and Lincoln, 2003; Yin, 1994; Patton, 1990). The project also uses a variety of data collection techniques outlined as follows:

- *Document analysis* – document analysis involves the review and interpretation of written texts within a defined understanding of their immediate context (Denzin and Lincoln, 2003). Two types of documents were analysed, documents regulating the aged care industry such as governmental and agency policy, and statutory legislation, and more specific architectural documents relating to each case study. The architectural documents included meeting agendas and minutes, design briefing letters and documents, design drawings and contractual correspondence. A registered architect undertook the analysis of the architectural documents because of their technical specificity. The document analysis was used to determine the principle factors impacting on the design and construction process, and to establish formal and informal communication structures.
- *Structured observations* – structured observation is where certain activities or physical evidence are selected for observation and recording. This allows a limitation on the activities or physical evidence being observed, and a clear definition of them prior to the start of data collection (Denzin and Lincoln, 2003; Kane, 1985). Direct as against participant observation, involves the researcher as passive observer recording the defined behaviour pattern or physical evidence. Direct observation was used to determine work activity patterns in designated spaces, and physical adaptation and patterns of wear at each case study site. This was used to augment evidence from the document analysis in relation to decision-making during the design, construction and post-occupancy stages. This was also used to augment self-report survey data in relation to design efficiency and effectiveness.
- *Self-report surveys* – interviews and questionnaires are forms of self-report survey used to determine the feelings and opinions of research participants on an identified topic (Stewart and Shamadasani 1990). Semi-structured interviews were used together with a questionnaire that included structured and open-ended questions. With the semi-structured interview, all respondents were asked a series of pre-determined questions. Unlike a structured interview however, the semi-structured interview allowed for some elaboration around each question and concluded with an open-ended question (Denzin and Lincoln, 2003). Interviews were conducted with case study staff and residents, visiting service providers and architects. All interviews were taped, transcribed and studied for recurrent themes leading to summative findings.

The use of a variety of multiple sources of evidence increases the research validity by providing for further detailed triangulation of results (Denzin and Lincoln, 2003; Gillham, 2000; Yin, 1994). Final design guidelines and recommendations are yet to be developed but this will occur within a soft systems framework, an action research methodology that assumes any recommended interventions will take into consideration the multitude of interacting systems surrounding the problematic situation being investigated (Checkland, 1999).

4.1.2 Sampling Framework

Two residential aged care facilities and eight independent living units were considered a representational sampling of the total number of aged care facilities constructed each year in South Australia. The two residential facilities are of similar size and constructional complexity but vary in age (one new and purpose built the other existing and an adaptive re-use). The two residential facilities also vary in location, design parameters and the management structure applied to the procurement process.

4.2 RESEARCH METHOD

4.2.1 Stage 1 – research design

Stage 1 established the academic and management frameworks for the project. This involved an examination of current aged care legislation and design guidelines together with an analysis of recent national and international literature to situate the project within the current research and practice environment. A National Advisory Group was established to provide advice on the research direction and to assist in the dissemination results. Appropriate case studies were also identified as part of this stage and the various research instruments designed.

4.2.2 Stage 2 – evaluation of the design process

Stage 2 of the project initially identified the various parties with a stake in the final outcome of each case study's design process. Stage 2 also considered the impact of the legislative guidelines, government policies and funding parameters identified in Stage 1 on the design process for each case study. The patterns of communication and decision-making developed during the design stage were then assessed and a 'rich picture' of the relationships between stakeholders and other factors constructed (Checkland, 1999). Data collection methods included document analysis and semi-structured interviews with aged care facility managers and architects.

4.2.3 Stage 3 – evaluation of the construction process

Stage 3 of the project used similar document analysis and self-report techniques employed in Stage 2 to analyse and evaluate the construction stage of each case study. The documents analysed included those relating to the contract administration of each case study. For various reasons, the document analysis in both Stage 2 and 3 for the two residential care facilities was limited to those documents held by the client organisation. Semi-structured interviews with facility managers and architects were used to further clarify the roles and structures assumed during the construction stage.

4.2.4 Stage 4 – post-occupancy evaluation

Stage 4 used similar data collection techniques as Stage 2 and 3 to measure outcomes of the design and construction process in terms of the match between the original design brief and the end product. The documents analysed included those relating to facility accreditation and management processes, and to maintenance schedules, building alterations and/or repairs undertaken since occupation of the facility. Two types of structured observation were undertaken. The first involved a physical survey of the building fabric to record any post-occupancy variations to the original design and signs of unusual wear or failure of the building fabric. The second involved a descriptive survey and tracking study of user behaviour patterns to reveal circulation paths and patterns of use (Sanoff, 1994). Both the document analysis and the structured observations were used to determine areas where an unsuccessful match between the design brief and end product had occurred, or where changed care requirements had resulted in a formal physical intervention to amend a perceived problem. Two self-report techniques were also used in this Stage. Interviews were used to establish general user perceptions of the physical environment and questionnaires were used to further clarify and expand on these perceptions (Leaman and Bordass, 2000). The structure of the self-report surveys was determined by analysis of the key observations established in the previous document reviews and observational studies. Only those capable of giving informed consent participated in the surveys. Participation was also voluntary. Semi-structured interviews were conducted with facility residents, staff, visiting service providers, managers and architects. The questionnaire was administered to facility staff and visiting service providers.

Similar Stage 2, 3 and 4 analysis is yet to be conducted on the eight independent living units in North Adelaide.

4.2.5 Stage 5 – analysis and recommendations

Stage 5 draws on the data collected in Stages 1, 2, 3 and 4 to develop design guidelines and recommendations for changes at the policy level to support improved productivity and quality of life in residential aged care facilities. On completion of the eight independent living units in North Adelaide, the data will be analysed using pattern-matching logic which relies on the initial development in this case of rival theoretical propositions about the link between policy and design outcomes. Each rival explanation will involve the definition a pattern of predicted independent variables with the independent variables that make up each rival explanation being mutually exclusive (Yin 1994). The draft guidelines will:

- a) establish critical design parameters impacting on the efficiency and effectiveness of residential aged care facilities, and
- b) provide a basis for the management of the briefing process between users, design consultants, statutory authorities and contractors during the design and construction phases.

A program of workshops with design consultants and aged care professions will be used to test the guidelines and develop recommendations for changes at the policy level. The recommendations will be presented at a forum of key industry stakeholders and following consensus, a set of key recommendations and design guidelines for the provision of residential aged care facilities will be developed. The recommendations will feed into future health and aged care policy development and the procurement of design and construction services for aged care facilities.

5. RESULTS

5.1 DOCUMENT ANALYSIS

A review of the client held documents relating to the design and construction of the Ingle Farm and the Mawson Lakes residential care facilities was undertaken during April and May 2004. Documents for the older Ingle Farm facility were considered to be too incomplete for any meaningful analysis. Documents for the Mawson Lakes facility were also incomplete but they presented a more substantial picture of the relationship between the client (Helping Hand Aged Care Inc.) and the architect. They more specifically provided an indication of the areas of the facility that required the most development and amendment throughout the design and construction process. A total of ninety-four documents were recorded as relating to elements that had the potential to promote or inhibit physical flexibility and/or service provision. The documents were dated from 14 June 2001 to 21 May 2003 and included general correspondence, minutes of design and site meetings, and building contract related correspondence including requests for information, instructions and notices. Content analysis revealed that the dominant design elements were *access*, the *kitchen* and *laundry*. The occurrence of each document type is summarised in Table 1.

Table 1: Number and Location of Design Element References

Design Element	Document Type				Total
	General Correspondence	Design Minutes	Site Minutes	Contract Notices	
Access	3	14	2	2	21
Kitchen	2	12	1	2	17
Laundry	2	5	1	0	8

5.2 STRUCTURED OBSERVATIONS

Observational studies of the kitchens at Ingle Farm and Mawson Lakes were conducted on 17 March 2004 and 15 April 2004 respectively. Both studies were undertaken during the peak activity period between 8.45am and 1.45pm when work flow patterns for each individual working in the space was recorded at fifteen minute intervals. Delivery access was considered to be poor at Ingle Farm in particular in terms of security and direct access. Food is prepared in the kitchen at Ingle Farm and plated up in remote serveries while at Mawson Lakes, food is prepared and plated up in the main kitchen. In terms of layout, cooking equipment is arranged against a wall at Ingle Farm. Like the wall benches, equipment is not mounted off the wall and therefore difficult to clean behind. Cleaning under benches is also difficult. Floor mounted kettle drum boilers are deemed to large and rarely used. Bench space is perceived to be adequate but island benches and additional utensil racks were added after the initial fit out. The kitchen was generally clean and well maintained but mobile trolleys cluttered the area during food service and post-lunch dishwashing and cleaning. The Ingle Farm kitchen layout and an example work flow pattern are shown in Figure 2.

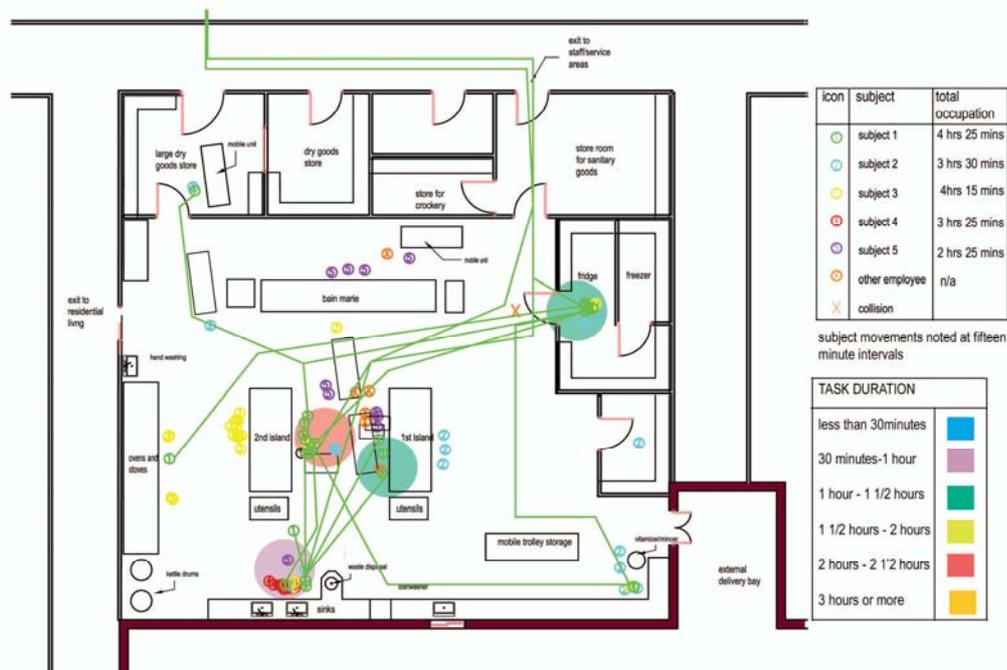


Figure 2: Ingle Farm Kitchen Layout and Example Work Flow Pattern

At Mawson Lakes, cooking equipment is arranged against a central fire wall. As with Ingle Farm, cleaning behind the equipment and benches is difficult. Difficulty was observed for most staff when preparing food because of a lack of bench space. Of the number of sinks provided only 3 were used regularly during the observation duration. The kitchen was generally clean and well maintained but again becoming cluttered with serving trolleys during food service. The Mawson Lakes kitchen layout and an example work flow pattern are shown in Figure 3.

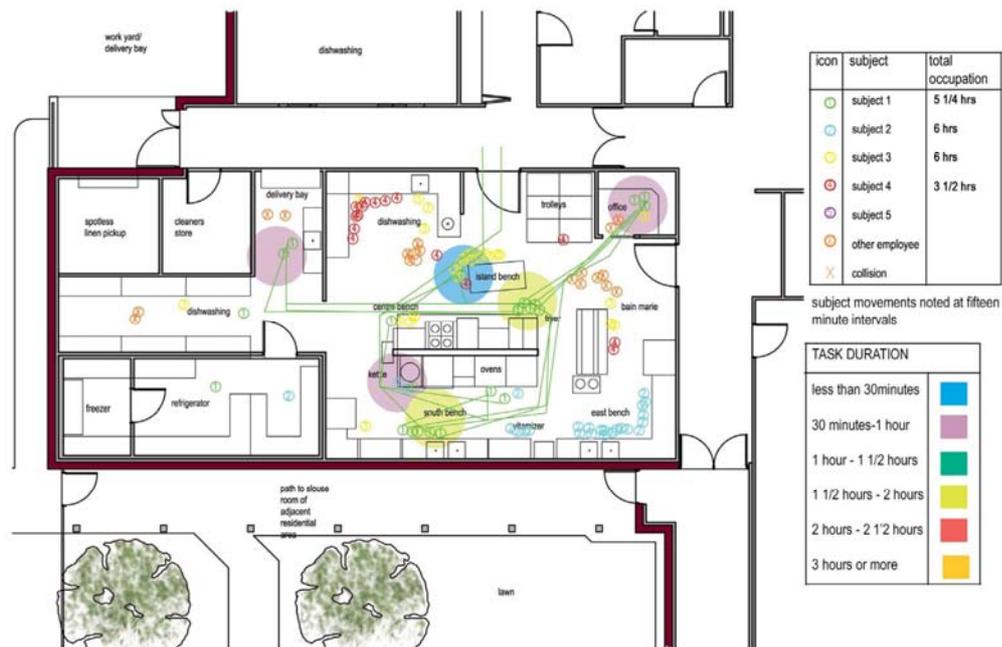


Figure 3: Mawson Lakes Kitchen Layout and Example Work Flow Pattern

5.3 SELF-REPORT SURVEYS

Two types of self-report survey were conducted between November 2003 and May 2004. The first involved thirty-nine semi-structured interviews conducted with nine residents, sixteen staff, five managers and seven visiting service providers at the two residential aged care facility case studies. Two architects involved in residential aged care facility design were also interviewed. Content analysis of the factors that each respondent thought were important in residential aged care facility design revealed a number of key concepts. The dominant themes that emerged were the overlapping concepts of *functionality*, *flexibility* and *consultation*.

Functionality was defined as fitness for purpose in relation to those design elements that have the potential to promote or prohibit physical flexibility and/or service provision. Functionality as it affected service provision was considered more important than general aspects of design such as interior finishes. Design flexibility was a recurrent theme often linked to functionality. This combination was particularly evident for residents and managers who were looking to personalise space and to maximise the capacity for ageing in place respectively. Consultation was the third major concept. A lack of consultation was linked to perceived problems associated with design functionality. This concept was associated primarily with nursing and logistics staff who felt they had expertise that was not utilised. Managers, who had been more involved in the consultation process, considered that a formal post-occupancy evaluation would be a useful management tool. The architect respondents also commented that clients tended to assume that their architect was familiar with the requirements of the building type and that there were standard design responses to the building type. The key concepts are summarised in Table 2.

Table 2: Interview Summary

Interview Group	No.	Key Concepts
Residents	9	<i>Functionality</i> – more concerned about service provision than facility design <i>Design flexibility</i> – desire to personalise space and to have sufficient space for personal possessions <i>Socialising flexibility</i> – option to socialise or not
Staff (Nursing)	9	<i>Functionality</i> – design for efficient work flow patterns and sufficient space for larger pieces of equipment <i>Security</i> – sufficient security especially after hours <i>Privacy</i> – needed for administration duties and breaks
Staff (Logistics)	7	<i>Functionality</i> – design for efficient maintenance and work flow patterns <i>Consultation</i> – sufficient consultation during design stage <i>Storage</i> – sufficient space for maintenance equipment
Management	5	<i>Finance</i> – expensive to build and operate <i>Design flexibility</i> – accreditation and ageing in place <i>Consultation</i> – post-occupancy evaluation needed
Visiting Service Providers	7	<i>Functionality</i> – building legibility/navigability, sufficient space, equipment and parking
Architects	2	<i>Consultation</i> – client assumes the architect is familiar with the building type <i>Quality/cost</i> – limited by the project budget

The second self-report survey involved a questionnaire administered to eight respondents working in the kitchens at Ingle Farm and Mawson Lakes. There were four male and four female respondents with ages varying from under twenty to under fifty. Seven respondents spent between 21 and 40 hours per week in the kitchen. One worked less than ten hour per week in the kitchen. Respondents were asked to rate the quality of environmental factors (light, sound, temperature, air flow and humidity) and practicality of use against a five point Likert scale. An open-ended question calling for any additional comments was also included. There were no significant trends evident in the responses and none of the participants responded to the open-ended question. The results of the environmental questionnaire are summarised in Table 3.

Table 3: Questionnaire Summary

Location	No.	Environmental Factor	Results				
			very poor 1	2	3	4	very good 5
Ingle Farm	5	natural light			2	1	2
		artificial light		2	1	2	
		noise level			2	1	2
		temperature		1	2	2	
		fresh air flow			3	1	1
		humidity			1	4	
		practicality		1	1	1	2
Mawson Lakes	3	natural light	2		1		
		artificial light			1	1	1
		noise level			3		
		temperature		1		1	1
		fresh air flow		1		2	
		humidity		1	2		
		practicality				1	2

6. DISCUSSION

The preliminary results presented in this paper indicate a number of useful themes for future aged care and broader health facility design. Firstly, access, the kitchen and the laundry appear to be design elements that dominate the design stage of the procurement process. The research indicates that these are critical to the capacity of the final built product to support efficient and effective service provision. Secondly, specific aspects of building functionality and flexibility such as storage, spatial personalisation and design for work flow efficiency, are perceived to be important design elements by residents and staff. Finally, consultation is considered to be essential to the development of a facility that supports the efficient and effective provision of aged care services. The initial communication between client and architect, and architect and staff as the design brief is developed, would appear to be a critical aspect of the consultation process. The Mawson Lakes document analysis revealed that the majority of communication related to three dominant design elements – access, the kitchen and the laundry. Of further significance is that the majority of the client-architect communication occurred during the design stage. This would indicate the importance of defining design issues early to avoid later costly contract amendments. Client and architect experience with the design process and building type would also appear to be an important factor in achieving this early resolution of potential design problems though the research would also indicated that further consultation with staff might enhance this. The client and architect for the Mawson Lakes facility had previously worked together. The architect also had previous experience with the building type. A further factor that is that a post-occupancy evaluation carried out on one site only, might not immediately uncover design inefficiencies. Nothing in the self-report surveys indicated significant differences between the two sites. Only through comparisons of the evidence gathered through the observational studies were design deficiencies detected at Ingle Farm for example. It would appear that a formalised approach to the conduct of post-occupancy evaluations which can then be shared across facilities and fed back into the briefing process is critical to improving the capacity of residential aged care facilities to support service delivery.

The project has limitations in that it is based on a relatively small sample making it difficult at this point to draw consistent generalisations that might be applied to other new facilities. Differences were apparent in the efficiency of the kitchen and allied health areas. Staff at Mawson Lakes for example spent less time undertaking critical activities in the kitchen such as dishwashing. The clarity of the work zones and walkways at Mawson Lakes also improved the efficiency of staff measured in terms of specific task duration. Deeper exploration of decision-making structures is necessary however to more fully understand the results of the design development process. The project is also limited by the breadth and depth of data gathered. The document analysis for example was limited to those documents held by the client organisation. Documents held by both the client and the architect should be reviewed in future to provide a better understanding of communication processes and the project history. Of particular interest is the impact that client and architect experience has on design briefing. Detailed study of areas such as dining rooms, reception spaces and laundries were also not undertaken as part of this project.

7. CONCLUSION

The increasing number of older people in the Australian population will lead to greater demand for residential aged care. Trends also indicate that this demand will increasingly be for flexible facilities that enable ageing in place. This research project represents an initial exploration of those design factors that have the potential to promote or inhibit physical flexibility and/or service provision in residential aged care facilities. This paper has presented a description of the research method, and a summary of the data collected through documentary analysis, observational studies and self-report surveys from two residential aged care facilities. The preliminary findings affirm recent research into office environments (Leaman and Bordass, 2000), that indicate a strong link between the design of the physical environment and the capacity of service providers to provide efficient and effective health care. The research has identified a number of elements as potential problem areas in terms of design complexity and end user satisfaction. The findings further suggest that the briefing phase in particular is critical in the development of efficient and responsive physical environments. By identifying these design issues, this research aims to provide economic benefits through improved worker productivity and a reduction in post-occupancy alterations to residential aged care facilities. The authors also intend to extend the research into studies of major hospital facilities.

ACKNOWLEDGEMENTS

We would like to thank our industry partners, Helping Hand Aged Care Inc., Delfin Lend Lease and Spotless Services Limited, and the Australian Research Council for their support of this project. We would also like to thank Sonya Montgomerie and Susan Collins for their research assistance, and the staff and residents at Mawson Lakes and Ingle Farm.

REFERENCES

- Albert, S. and Logsdon, R. (2000), *Assessing Quality of Life in Alzheimer's Disease*, New York: Springer Publishing Company.
- Australian Bureau of Statistics (1998a), *Australian Demographic Trends 1997*, Canberra: AGPS.
- Australian Bureau of Statistics (1998b), *Population projections 1997 to 2051*, Canberra: AGPS.
- Australian Institute of Health and Welfare (1998a), *Australia's Health 1998: the sixth biennial health report of the Australian Institute of Health and Welfare*, Canberra: AIHW
- Australian Institute of Health and Welfare (1998b), *Nursing Homes in Australia 1996–1997: a statistical overview*, Canberra: AIHW.
- Bishop, B. (2000), *The National Strategy for an Ageing Australia: world class care discussion paper*, Canberra: Commonwealth of Australia.
- Australian Building Codes Board (1996), *Building Code of Australia 1996*, Canberra: ABCB.
- Commonwealth of Australia (1997), *Aged Care Act 1997*, Canberra: AGPS
- Commonwealth Department of Health and Aged Care (1999), *Certification Procedures for Residential Aged Care Services*, Canberra: CDHAC.
- Calkins, M. (1988), *Design for Dementia: planning environments for the elderly and the confused*, Maryland, USA: National Health Publishing.
- Checkland, P. (1999), *Soft Systems Methodology: a 30 year retrospective*, New York: Wiley.
- Coulson, I. (1997), Evaluation of Physical Environments in Dementia Care Units, *Australian Journal on Ageing*, 16 (4): 203-207.
- Denzin, N.K. and Lincoln, Y.S. (2003), *Collecting and Interpreting Qualitative Materials*, 2nd Ed., Thousand Oaks, CA.: Sage Publications.
- Eisenhardt, K.M. (1989), Building Theories from Case Study Research, *Academy of Management Review* 14: 532–550.
- Gillham, B. (2000), *Case Study Research Methods*, London: Continuum.
- Harrison, A. and Landorf, C. (2000), Change Management through Design, Nutt, B. and McLennan, P. (eds), *Facility Management: Risks and Opportunities*, Oxford: Blackwell Science, 2000.
- Harr, R. and Kasayka, R. (2000), Power of Place, *Nursing Home Long Term Care Management*, 49 (6): 30-32.
- Kane, E. (1985), *Doing Your Own Research: basic descriptive research in the social sciences and humanities*, London: Marion Boyars Publishers.
- Leaman, A. and Bordass, B. (2000), Productivity in Buildings: the killer variables, Clements-Croome, D. (ed), *Creating the Productive Workplace*, London: E & FN Spon.
- Patton, M.Q. (1990), *Qualitative Evaluation and Research Methods*, Newbury Park, CA: Sage.
- Qualye, S. (1999), Growing Old Gracefully, *Australian Doctor*, December 1999, 47-48.
- Russell, C. and Sauran, V. (1991), Independence and Autonomy in Hostel Accommodation: some sociological and social policy questions, *Proceedings of the Annual Conference of the Australian Association of Gerontology*, 26: 111-114.
- Sanoff, H. (1994), *Research Methods in Design*, New York: Van Nostrand Reinhold.
- Schwarz, B. (1997), Nursing Home Design: a misguided architectural model, *Journal of Architectural and Planning Research*, 14 (4): 343-350.
- Stewart, D. and Shamadasani, P. (1990), *Focus Groups: theory and practice*, Newbury Park: Sage Publications.
- Teresi, J., Holmes, D. and Ory, M. (2000), Therapeutic Design of Environments for People with Dementia: further reflections and recent findings from the National Institute on Aging Collaborative Studies of Dementia Special Care Units, *Gerontologist*, 40 (4): 417-421.
- Supported Residential Facilities Advisory Committee (1997), *Supported Residential Facilities Act 1992, Guidelines and Standards*, 2nd Ed., Adelaide: SRFAC.
- Yin, R. (1994), *Case Study Research*, Thousand Oaks, CA.: Sage Publications.