

Self-rated importance and performance of current home environment by older people

Ching-Show Lin PhD^a

Hsiu-Ju Lee MSc^a

James L. Fozard PhD^a

^aDepartment of Gerontechnology and Service Management, Nan Kai University of Technology, Taiwan; E: davidlin@nkut.edu.tw

C-S. Lin, H-J. Lee, J.L.Fozard. *Self-rated importance and performance of current home environment by older people*. *Gerontechnology* 2016;14(4):218-223; doi:10.4017/gt.2016.14.4.009.00

Background Most older people prefer to stay at their current home for the rest of their lives. With age-related loss of physical function, the existing design of their current housing environment may no longer meet their needs. **Aim** This study aims to investigate the self-rated importance of the safety and convenience of housing and evaluate the performance of their current home relative to those features. **Method** A 29 items questionnaire was administered to 385 residents 65 years and older. Using an importance-performance analysis (IPA), respondents rated the perceived importance of 29 attributes of barrier-free housing and rated the perceptions of their houses' performance. **Results** The ratings of the attributes in their current home were lower than the rated importance of the attributes. An IPA quadrant grid identified attributes that were both high in importance and performance, for instance, stairs design; low in both, for instance, entrance without threshold; high in performance but low in importance, for instance, height of kitchen sink; and low in performance but high in importance, for instance, smoke detector are installed in kitchen. **Conclusion** The current residential environment for older people to live safely needs modifications.

Keywords: aging in place, accessible home, Importance-Performance Analysis (IPA)

Population aging in Taiwan is primarily due to low fertility and a prolonged life span. Persons 65+ constituted 7% of the total population in 1993, and 12% at the end of 2014¹. The proportion of the elderly in Taiwan is not significantly in contrast with the developed countries. However, its rate of increase is projected to be one of the fastest in the world. Near 40% of the population will be over age 65 in Taiwan in 2050.

The changes in family structure indicated not only a greater proportion of households with aged members, but fewer chances for the elderly to live with their adult children. According to the recent five waves of the Report of Senior Citizen Condition Survey in Taiwan from 2000 to 2013, the proportion of the elderly who are living alone and living only with a spouse has been rising, while the proportion living with adult children has been falling in recent years. Most older people in Taiwan prefer to stay at home for the rest of their lives². At a similar survey, most Americans aged 65+ agree they want to stay at home as long as possible³.

Housing in later life acquires new meanings for older people as a result of the long duration of living in the same home, familiarity, and processes of attachment⁴. The older people living

in accessible homes, who perceive their home as useful and meaningful on a behavioral level, and who think that others are not responsible for their housing situation are independent in daily activities, have better well-being, and suffer less from depressive symptoms⁵. As people age, housing modifications become important to compensate for and assist in their adaptation to declining functional capacity in order to maintain a sense of well-being and independence in daily life³.

Because of the significant heterogeneity of aging, the housing requirements for aging in place are highly variable. One approach for specifying housing requirements for senior-friendly housing in Taiwan is the Guidelines and Space Standards for Barrier-Free Home Design issued by the Ministry of Interior. This paper attempts to identify both the perceived importance of attributes of barrier-free housing by older persons in Taiwan and the performance of barrier-free residential space in their homes (IPA model). By identifying the needs, desires and expectations of different housing segments, the government, construction industry and interior designer will be in a better position to promote the senior house policy to cater for their target customers to achieve the goal of aging in place.

Home environment performance

METHODOLOGY

The study used a quantitative approach to design a questionnaire evaluating the importance and performance of home environment attributes. We then employed Importance-Performance Analysis (IPA) to compare the respondents' perceptions of these attributes and provide the weaknesses and strengths about the home environment among the respondents.

Sampling method

Using a convenient sampling approach, the respondents were recruited at community care centers, active aging learning centers, evergreen academy, old people's club and older people's voluntary organizations. We used face to face interview with the illiterate respondents to complete the questionnaire. All respondents were enrolled after informed consents were obtained. A total of 385 questionnaires were collected (*Table 1*). Respondents who completed the questionnaire were given a piece of soap as a gift.

Questionnaire design

The questionnaire included two main sections. The first section of the questionnaire consisted of 29 barrier-free home attributes, for which respondents were asked to indicate the perceived importance of the attributes when they live in a house, and their perceptions of actual house performance. These 29 home attributes (*Table 2*)

Table 1. Demographic characteristics of respondents (n=385)

Variable	Value	n	%
Gender	Male	186	48.3
	Female	199	51.7
Age	65~69	156	40.5
	70~74	101	26.2
	75~79	74	19.2
	>80	54	14.1
Education level	Illiterate	71	18.5
	Elementary	164	42.6
	Junior high school	52	13.5
	High School	59	15.3
	>College / university	39	10.1
Perceived economic condition	Poor	25	6.5
	Bad	166	43.1
	Fair	187	48.6
	Rich	7	1.8
Perceived health condition	Worse	12	3.1
	Bad	37	9.6
	Fair	184	47.8
	Good	112	29.1
	Excellent	40	10.4

were identified based on Guidelines and Space Standards for Barrier-Free Home Design issued by the Ministry of Interior⁶. The items addressed the Entrance, Corridors, Stairs, Room design, Bathroom and Toilet, and Kitchen. The questionnaire was structured so that each home attribute was rated using a 5-point Likert scale, ranging from 1, least important to 5, most important, in the Importance part, and from 1, strongly disagree, to 5, strongly agree, in the Performance part. The second part of the questionnaire was designed to elicit demographic information about the respondents (*Table 1*).

Data analysis

In this study, descriptive statistics including simple frequencies and mean ratings were computed on the respondents' demographic and on the 29 attributes.

To assess the reliability of the measures, Cronbach's Alpha was calculated to test the stability of variables retained in each factor, and only those variables having coefficients greater than or equal to 0.50 were considered acceptable and a good indication of construct reliability⁷.

IPA has become a popular managerial tool that has been broadly used to identify the strengths and weaknesses of products and services in various industries⁸. As a result, we employed IPA to compare the respondents' perceptions of the derived attributes. In this study, factor means of the perceived importance and performance of each factor were calculated and plotted into a graphical grid. Cross-hairs (vertical and horizontal lines), using the mean values of the importance and performance parts of IPA, were calculated to separate the derived factors into four identifiable quadrants (*Figure 1*).

The data was then presented on a grid where each attribute was plotted according to its perceived importance and performance. The two-

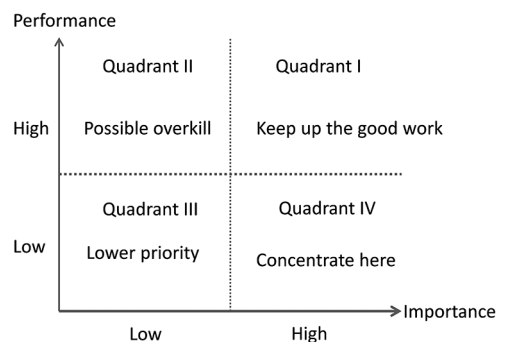


Figure 1. Importance-Performance Analysis (IPA) map

Home environment performance

Table 2. Mean rating and standard deviation (SD) on the 5-point Likert scale of importance and performance of home space (n=385), with 1 signifying least important (Importance) or strongly disagree (Performance) to 5, most important or strongly agree

Variables	Mean±SD	
	Importance	Performance
A-Entrance space design	4.07±0.69	3.28±0.92
A1 No steps in entrance	4.05±0.96	3.31±1.10
A2 No thresholds in entrance	3.99±0.89	3.18±1.16
A3 Enough spaces in entrance to turn around for wheelchairs	4.08±0.74	3.23±1.14
A4 Easy to open and lock doors	4.15±0.80	3.41±1.09
B-Corridor design	4.15±0.57	3.33±0.88
B1 Corridor space can make wheelchairs move smoothly	4.11±0.80	3.29±1.07
B2 No thresholds in door entrance connecting with living room, bedroom, bathroom and kitchen	4.08±0.82	3.19±1.13
B3 All corridors are clear, no stacking things	4.21±0.73	3.48±1.11
B4 All corridors have no surface eruption	4.11±0.79	3.48±1.07
B5 All corridors are flat and anti-slip	4.22±0.73	3.22±1.11
C-Stairs design	4.24±0.60	3.49±0.86
C1 Stairs height is appropriate	4.21±0.76	3.51±0.99
C2 Stairs edge is anti-slip	4.24±0.73	3.28±1.16
C3 Handrail of stairs is appropriate	4.18±0.74	3.52±0.99
C4 Light in stairs is appropriate	4.33±0.73	3.65±1.10
D-Room design	4.08±0.69	3.13±0.92
D1 A parents' bedroom on first floor	4.39±0.75	3.47±1.27
D2 A bathroom next to parents' bedroom	4.06±0.87	2.80±1.18
D3 Sliding doors	3.78±0.97	3.12±1.05
E-Toilet and bathroom design	4.00±0.68	2.85±0.90
E1 Bath and shower stall are separated in bathroom	3.88±0.95	2.89±1.17
E2 No threshold in bathroom entrance	3.87±0.90	2.91±1.13
E3 Anti-slip floor in bathroom	4.32±0.72	3.24±1.20
E4 Anti-slip chair in bathroom	3.92±0.93	2.60±1.09
E5 Handrails in bathroom	4.04±0.89	2.71±1.14
E6 Enough space for wheelchairs to move in bathroom	3.97±0.96	2.76±1.19
F-Kitchen	4.10±0.56	3.19±0.79
F1 Floor in kitchen is anti-slip	4.26±0.67	3.36±1.06
F2 Height of table in kitchen is appropriate	4.11±0.73	3.49±0.94
F3 Enough space under table in kitchen for wheelchairs to enter	3.77±0.89	2.83±1.07
F4 Height of kitchen cupboard is appropriate	4.04±0.74	3.26±1.04
F5 Height of kitchen sink is appropriate	4.08±0.72	3.52±0.96
F6 Gas stove has safety switches	4.28±0.80	3.26±1.21
F7 Smoke detectors are installed in kitchen	4.14±0.90	2.62±1.25

dimensional grid displayed the performance of attributes on the vertical axis from high (top) to low (bottom) and the importance of attributes on the horizontal axis from high (right) to low (left). Figure 2 illustrates the resultant graphical representation of the data that produced the four quadrants.

The four identifiable quadrants are: 'Concentrate here', 'Keep up the good work', 'Low pri-

ority' and 'Possible overkill'. In the 'Concentrate here' quadrant, attributes are perceived to be very important to respondents, but performance levels are seen as fairly low. This sends a direct message that improvement efforts should concentrate here. In the 'Keep up the good work' quadrant, attributes are perceived to be very important to respondents, and at the same time, the respondents seem to have high levels of performance in relation to these activities. In

Home environment performance

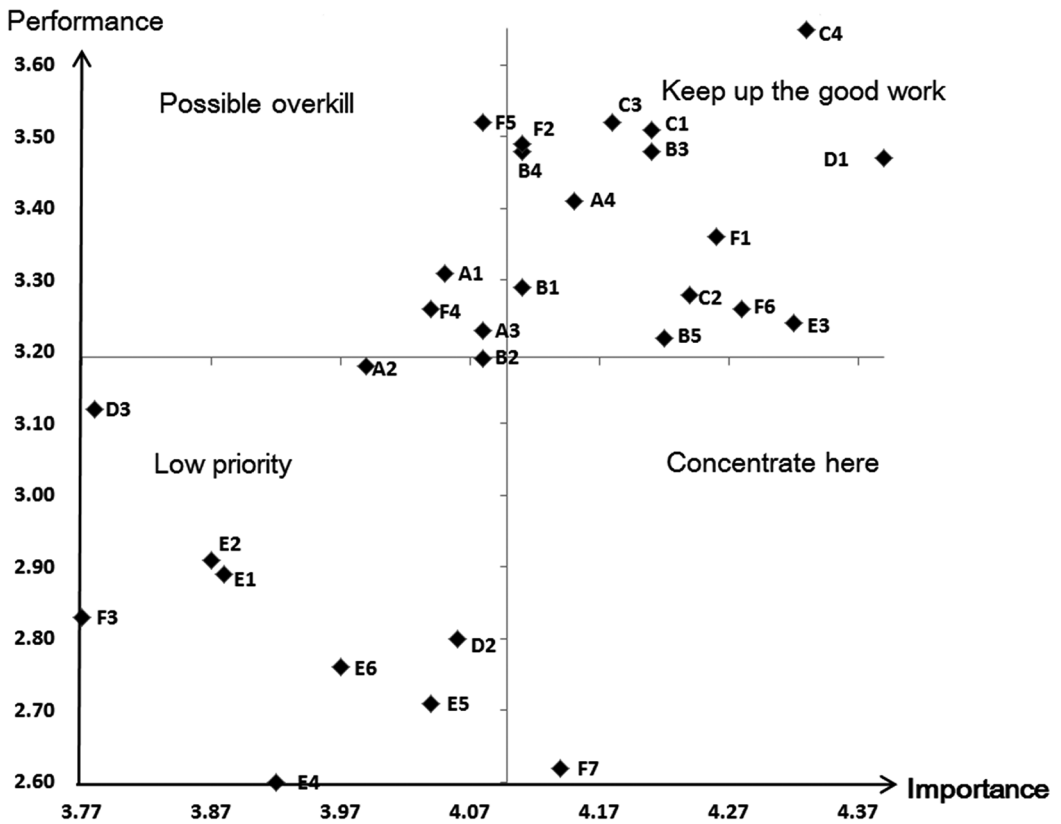


Figure 2. The Importance-Performance grid of home space; The X-axis represents the perception of importance, the Y-axis the related perceived performance; Table 2 explains A1 to F7

the 'Low priority' quadrant, attributes have low importance and low performance. Although performance levels may be low in this quadrant, respondents are not overly concerned since the attributes in this quadrant are not perceived to be very important. Limited resources should be expended on this 'Low priority' quadrant. Lastly, the 'Possible overkill' quadrant contains attributes of low importance, but of relatively high performance. Respondents are satisfied with the performance of the attributes, but could consider present efforts on the attributes of this quadrant as being overutilized⁹⁻¹¹.

Paired sample t-tests were performed to find whether any significant difference existed between the respondents' perceived importance and perceptions of performance of these attributes.

RESULTS

Demographic characteristics

A total of 385 respondents completed the questionnaire (Table 1). The gender of the respondents is almost the same (Male 48.3%, Female 51.7%). 42.6% of the education background of respondents is elementary. The majority of the

respondents were aged between 65 and 69. 48.6% of the respondents were in fair economic condition and 43.1% of them were poor. 47.8% of the respondents were healthy.

Importance-Performance Analysis

Reliability analysis (Cronbach's Alpha) was conducted to test the reliability and internal consistency of each factor. The results showed that the Alpha coefficients of the six factors ranged from 0.61 to 0.85, well above the minimum value of 0.50 that is considered acceptable as an indication of reliability for basic research⁷.

Table 2 shows the mean scores of the importance and performance of home space. It showed that the mean scores of A, B, C, D, E, F constructs reached importance level (mean >4). However, the mean scores of the performance of these constructs was less than 3.5. These constructs needed to be improved. The data was then transferred to the IPA grid presentation shown in Figure 2. The X-axis represents the perception of importance scores. The Y-axis represents related perceived performance scores. The four quadrants are constructed based on the mean scores of the IPA ratings¹². The mean importance rating

for the pooled data was 4.10 and the mean performance rating was 3.19. The mean IPA ratings derived from our data provided the grid cross-hairs presentation on which the four quadrants were identified.

Figure 2 illustrates the results of the IPA grids. 1 factor was identified in the 'Concentrate here' quadrant, 14 in the 'Keep up the good work' quadrant, 10 in the 'Low priority' quadrant and 4 in the 'Possible overkill' one. The following provides some meaningful insights about the quadrant presentation.

Keep up the good work

Fourteen attributes were identified in this quadrant (Figure 2). These attributes were considered high importance and satisfactory performance.

Stairs (C), with a mean rating of 4.24, appears to be the top importance for the respondents. This sends a meaningful message to house owners, who should concentrate on these attributes and keep up the good work. Falling is the leading cause of accidental death worldwide and is a major cause of personal injury, especially for older people¹³. The economic impact of falls is critical to family, community, and society. Healthcare impacts and costs of falls in older age are significantly increasing all over the world¹⁴. For the safety aspect, the stairs have to have handrails, be anti-slip and with enough lighting in order to prevent falling.

Corridors (B) is the next important factor as perceived by the respondents. The results showed corridors without threshold, surface eruption and stacking things were important. The perceived performance of these attributes was better than the other aspects.

Possible overkill

This quadrant identified four attributes including 'No steps in entrance (A1)', 'Enough spaces in entrance to turn around for a wheelchair (A3)', 'The height of the table in the kitchen is appropriate (F2)' and 'The height of the kitchen sink is appropriate (F5)'. The attributes are low in importance while relatively high in performance. And, the results showed the respondents were satisfied with these attributes. The residents should pay more attention on the other aspects.

Low priority

This quadrant identified 10 attributes including 'No thresholds in entrance (A2)', 'No thresholds in door entrance connecting with living room, bed room, bathroom and kitchen (B2)', 'Bathroom in parents' bedroom (D2)', 'Sliding doors (D3)', 'Bath and shower stall are separated in bath room

(E1)', 'No threshold in bathroom entrance. (E2)', 'An anti-slip chair in bathroom (E4)', 'Handrails in bathroom (E5)', 'Enough space for wheelchairs to move in bathroom (E6)', 'Enough space under table in kitchen for wheelchairs to enter (F3)'. Although the results showed the respondents did not perceive these attributes as important, this does not mean the house owners should reduce their efforts to improve the facilities. On the contrary, coping with the decline of physical function, modifying these items, being basic facilities especially for older people, is important.

Concentrate here

The 'Concentrate here' quadrant only captured a single factor - 'Smoke detectors are installed in the kitchen (F7)'. This factor is the top priority to be improved. The study speculated that most houses of the respondents may be old fashioned and did not follow the new architectural regulation when they were built. Therefore, the older people would like to live safely, and therefore smoke detectors should be installed in the kitchen.

t-tests on IPA results

To assess significant differences between the perceived importance and performance on the six home design factors among respondents, a paired sample t-test was conducted. The results revealed that all 29 attributes were found to be statistically significant between importance and performance aspects ($p < 0.05$).

CONCLUSION

The respondents perceived 29 attributes of the housing environment as important, but they were not satisfied with the performance of them. With the decline of their physical function, the house should enable older people to live independently and safely. In very old age in particular, the relationship between housing and health is significant, because older people have an increased vulnerability to environmental challenges^{15,16}.

Using IPA, this study has compared the importance and performance of the 29 attributes of a housing environment, as perceived by older people. The IPA grids have illustrated that 'Smoke detectors are installed in kitchen' fell into the 'Concentrate here' quadrant; whereas 'Threshold in the entrance', 'Threshold connecting corridors with living room, kitchen and bathroom, bathroom in parents' room', 'Sliding doors', 'Bath and shower stall are separated in bathroom', 'No threshold in bathroom entrance', 'Anti-slip chair in bathroom', 'Handrails in bathroom', 'Enough space for wheelchairs to move in bathroom', 'Enough space under table in kitchen for wheelchairs to enter' fall into the 'Low priority' quadrant. These attributes should be the top priority

to improve. Especially, falls are the leading causes of fatal and non-fatal injuries for older people. Falls threaten seniors' safety and independence and generate enormous economic and personal costs. Creating an accessible housing environment is the first step to decrease the incidence of falls and make older people move safely. Generally, older people are thrifty and would not like to modify their homes. Filial piety is a key virtue in Chinese culture. Children should be encouraged

to modify their parents' home for their healthy aging and well-being. On the other hand, these requirements of home modification also provide a business opportunity for builders.

In this study, the history of falling of the study participants was not collected. As a result, the relation between falls and housing environment design may be investigated further in our future research.

References

1. Population during Month or Year; <http://sowf.moi.gov.tw/stat/month/m1-09.xls> [in Chinese]; retrieved October 3, 2015
2. Report of Senior Citizen Condition Survey; www.mohw.gov.tw/cht/DOS/DisplayStatisticFile.aspx?d=47398&s=1 [in Chinese]; retrieved October 3, 2015
3. AARP. Beyond 50.05. A report to the nation on livable communities: Creating environments for successful aging 2005; Washington: AARP
4. Oswald F, Wahl HW. Housing and health in later life. *Reviews of Environmental Health* 2004;19(3/4):223-252
5. Oswald F, Wahl HW, Schilling O, Nygren C, Fänge A, Sixsmith A, Sixsmith J, Széman Z, Tomsone S, Iwarsson S. Relationships between housing and healthy aging in very old age. *Gerontologist* 2007;47(1):96-107; doi:10.1093/geront/47.1.96
6. Guidelines and Space Standards for Barrier-Free Home Design; www.cpami.gov.tw/chinese/filesys/file/chinese/publication/law/lawdata/10108108561.doc [in Chinese]; retrieved October 3, 2015
7. Nunnally JC. *Psychometric Theory* 1967; New York: McGraw Hill
8. Raymond KS, Chu TC. An importance-performance analysis of hotel selection factors in Hong Kong hotel industry: a comparison of business and leisure travelers. *Tourism Management* 2000;21(4):363-377; doi:10.1016/S0261-5177(99)00070-9
9. Martilla J A, James JC. Importance-performance analysis. *Journal of Marketing* 1977;41(1):77-79
10. Hawes JM, Rao CP. Using importance-performance analysis to develop health care marketing strategies. *Journal of Health Care Marketing* 1985;5(4):19-25
11. Matzler K, Bailom F, Hinterhuber HH, Renzl B, Pichler J. The asymmetric relationship between attribute-level performance and overall customer satisfaction: a reconsideration of the importance-performance analysis. *Industrial Marketing Management* 2004;33(4):271-277
12. Hemmasi M, Strong KC, Taylor SA. Measuring service quality for strategies planning and analysis in service firms. *Journal of Applied Business Research* 1994;10(4):24-34
13. Fact sheet 344: Falls. World Health Organization. October 2012; retrieved October 3, 2015
14. WHO Global Report on Falls Prevention in Older Age; www.who.int/ageing/publications/Falls_prevention7March.pdf; retrieved October 3, 2015
15. Iwarsson S, Nygren C, Slaug B. Cross-national and multiprofessional inter-rater reliability of the Housing Enabler. *Scandinavian Journal of Occupational Therapy* 2005;12(1):29-39; doi:10.1080/11038120510027144
16. Iwarsson S, Sixsmith J, Oswald F, Wahl HW, Nygren C, Sixsmith A., Szeman Z, Tomsone S. The ENABLE-AGE Project: Multi-dimensional methodology for European housing research. In Wilkinson N, Hurol Y, editors, *Housing research methodologies*. Mersin: Urban International Press; 2005; pp 70-90