Applying Combined Hierarchical Analysis and Extension Methods for Siting Senior Day-Care Center

M.Y. Ku*, J. J. Jiang, H. P. Tsai, T. J. Ku, C. M. Kuo
Department of Industrial Engineering National Chin-Yi University of Technology Taichung Taiwan, 41170 (guumy@ncut.edu.tw)

Abstract - A Senior Day-Care Center similar to daycare facilities that allows aging seniors to enjoy daytime living when their adult children are working and return home after office hours will enable a more harmonious family life between the aging parents and their adult children. In this research, the AHP (Analytic Hierarchy Process) theory is applied to calculate the weight of various relevant factors that affect the site selection of a proposed Senior Day-Care Center based on responses from experts to questionnaires so that important affecting factors can be identified. The Extension Excellence Evaluation Method (EM) was then used to select, compare and analyze several appropriate sites. The evaluation model comprises four facets including transportation, community environment, living functions and public facilities. The research results reveal that either the AHP or the EM method is capable of offering better answers.

Keywords - AHP, EM method, Senior Day-Care Center, Site selection

I. INTRODUCTION

"Aging Population" is a world-wide problem to be faced by all developed nations; longer life-span leads to the problem of providing proper cares for seniors. Statistical data published by Directorate-General of Budget, Accounting and Statistics, Executive Yuan, R.O.C in 2011 show that the age of about 1.5 million citizens or 7.1% of total population in Taiwan exceeded 65 years in 1993. The senior population, reached 2.5 million in 2010 or 10.5% of the total population, has increased by 1 million in 17 years. Hence, Taiwan is officially considered as an “Ageing Society” so that proving the seniors with a safe life with dignity and their adult children with a worry-free environment is a dream to be pursued by every family.

The concept of nursing homes like those popular in developed nations such as the US that provide 24-hour assisting live-in services is not commonly accepted in the Chinese society. Hence, a senior center that functions like day-care nursery under-aged children to care for seniors during daytime allowing them to learn, rest and associate with one another is a most appropriate future tendency in Taiwan. It is similar to the “senior center” that popular in most US cities but provides more programmatic caring for seniors to alleviate caring burdens to their adult children during daytime. Seniors can be well cared for physically and mentally during daytime instead of being left alone at home while their adult children are working. The location for establishing such a senior day-care center directly affects the willingness of seniors and their family to use the facility and the sustainable management of the center as well. In this research, the factors that affect the siting of an appropriate center to care for ageing seniors are studied so that the center will be established at a location to entice seniors and ensure sustainable management for a win-win situation.

II. LITERATURE REVIEW

The available literature on the definition, investigation and siting of the center will be reviewed in order to provide more insight information on the siting of a proposed Senior Day-Care Center in Taiwan.

A. Investigation on the day-care Seni Day-Care Center:

In this section, the definition of senior day-care center, the importance of siting such a center and other relevant information are reviewed:

1) Definition of Senior Citizen

Article II of Senior Citizen Welfare Act promulgated by the Department of Social Affairs (The Ministry of Interior, Executive Yuan, ROC) [2] stipulates that seniors be defined as those with ages exceeding 65. Lin (1995) [3] pointed out that about 70%- 80% of seniors living in Taiwan are considered the “golden group” because they have good health with the ability to care for themselves.

In this research, the golden-group seniors that cannot be cared for by family members are targeted for conducting the studies.

2) The Senior Day-Care Center

Liao (2010) [4] has defined the senior day-care center as a facility that serves healthy seniors to take care of their daily living and provide various recreational activities such as gardening, exercise, education and social contact.

Ding (2012) [5] has also proposed the concept of “senior day-care center” based on day-care centers for children with the objective of providing day care for seniors as for children. Thus, seniors may congregate at a centralized location fully equipped for living, recreational and social activities. He advocates that the center will allow adult children to work without worries about their senior parents during daytime and also provide seniors with a dignified living during the temporary absence of their adult children.

In this research, the ”senior day-care center” is defined as “a facility that targets healthy seniors with self-caring ability to provide daytime assistance, nursing and caring with emphases on sound mental health allowing them to enjoy companionship and recreational activities, leisure daytime living and education (e.g. senior class, gardening, and various recreational activities). After office hours, the seniors will return to their own homes to enjoy family...
living so that they will have a safe living with dignity and superior quality.”

3) Importance of the proposed senior day-care center

Ou (2009) mentioned that the closing of a senior day-care center in Chingshui township in Taichung county, Taiwan was caused by the failure of conducting market survey for satisfying the need of customers and that the concept of senior day-care center had not been accepted by the general public then.

Tseng (1997) stated that changes of family structure in Taiwan under the tendency of having fewer children in a family cause a heavy burden for the younger generation to care for the ageing population. On average, the number of working people to provide for every senior is dropping from 10 in 1992 to 7 in 2010, and is estimated to be 3 in 2030. Hence, establishing senior day-care centers is becoming an important future tendency.

B. Studies on site selection for locating the senior day-care center

As early as in 1909, Weber [6] developed the concept and theory to solve the problem for siting manufacturing plants.

1) Relevant theories for selecting location

According to Chapman and Walker (1991) [7], the theory for locating industries can be classified into the following four categories:

1. Normative industrial location theory: It is also known as Neoclassical Approach that emphasizes cost-minimization analysis, regional market analysis and profit-maximization analysis.

2. Behavioural Approach: Because many assumptions used in the normative industrial location theory do not conform to the real-world situation, a school of using questionnaire to carry out analyses merged in the 1960s by targeting industrial location for conducting empirical research.

3. Geography of Enterprise: Kong (1992) [8] proposed the theme concept for the school of industrial geology based on “how much industries are capable of improving and utilizing their surrounding environment.” The conclusion is that the siting strategy is as important as the investing strategy; increasing products or making new products by industries is the cause, and selecting the location is the result.

2) Importance of site selection

Fu (2008) [9] stated that the siting strategy has a profound impact on the facility of an organization; a correct siting policy leads to prosperity for the organizational facility. Liu and Cheng (2000) [10] proposed that selecting the location will affect production and management cost, future expansion and development of plant, as well as environmental and ecological impacts. An enterprise survives by providing services to satisfy customers using the most economic method. A good location will bring prosperous business, sustainable development and profits to industries and investors whereas a poorly selected location will cause excessively high costs. The business is thus difficult to manage for maintaining profits; it is eventually bankrupted.

3) Pitfall for selecting location

Inappropriate location will cause numerous unnecessary obstacles but mistakes in selecting location are frequent to cause more production cost. Fu and Meng (2004) [11] cited the common reasons for making the mistakes as:

1. Lacking thorough investigation and ignoring factors that need to be considered.

2. Making decisions subjectively based on personal feeling by managers or persons in charge instead of objectively based on observations and facts.

3. Moving plants by unwilling top officials or managers from a traditional but well-constructed location into a relatively new and better location.

4. Plant being moved to an already crowded region or soon to be over-industrialized region.

5. Preferring structures that are readily available but their design does not comfort to the specifications and needs of the plant in question to cause difficulties for efficient and cost-effective operations in the future.

6. Selecting a location that is less expensive but ignoring the availability of qualified personnel available in the area because of lower cultural level and poorer education for the local residents.

C. The AHP (Analytical Hierarchy Process) method

AHP was proposed by Thomas L. Saaty in 1977 [12] in systemizing complicated problems so that weighing factors that are objective to individuals and cannot be quantified originally can be resolved at various levels, quantified and evaluated. Hsiao (2009) [13] stated that the AHP method uses hierarchical structures to organize various factors and adopts as much as possible all opposing concepts so that well-arranged hierarchical systems can be developed for a complicate project in order to compare factors with different scales.

1) Basic assumptions and procedures of AHP

Satty (1977) proposed the following basic procedures for using AHP to conduct decision analyses:

1. Decision making standards and preparing the hierarchical structure for a project,

2. Determinant matrix based on the weight ratio values of factors,

3. Analyses of the determinant matrix to obtain weight vectors with emphasis on examining the determination of the matrix uniformity and solving the weight vectors,

4. Hierarchical integration of the weights for alternative plans, and

5. Final decision making to select the base decision plan or categorize various plans into different classes