An Analysis of the Priorities in Senior Industry
by Using Fuzzy AHP

최인규*, 김선영**

본 연구의 목적은 다음의 4가지로 구체적으로 제시될 수 있다. 첫째, 고령친화산업이 우선적으로 추진되어야 할 분야에 대한 관련 선행연구 및 이론적 논의를 중심으로 도출하고, AHP기법을 이용하여 노령친화산업의 분야별 상대적 중요도를 파악하고자 한다. 둘째, 이러한 노령친화산업의 우선순위를 도출한 중요도 값을 퍼지집합이론에 적용하여 노령친화산업에 대하여 평가할 수 있다. 셋째, 개별 노인관련산업들은 이러한 분석과정을 통해서 자기와 관련된 고령친화산업에 대한 종합경쟁력을 확인하고 개선점을 찾는데 있다. AHP기법을 활용하여 고령친화산업들의 각 분야들에 대한 상대적 중요도 분석결과 조사대상자의 응답자 중 의료·요양분야에의 '장기요양전문시설 확충(치매전문병원이나 요양원 등)'이 0.138672로 복합가중치 및 우선순위가 가장 높게 나타났다. 그리고 의료·요양분야에서의 '노인전문 건강용품·기구 공급 확충(0.121392)', '노인전용 전문병원 확충(0.092016)' 등의 순서 복합가중치 및 우선순위가 전체의 1,2,3위가 의료·요양분야로 높게 나타났다. 반면에 주거·시설분야에서 '노부모 부양을 위한 3세대 동거주택 공급확대'가 전체 중요도에서 우선순위가 가장 낮은 것으로 나타났다. 결론적으로 노령친화산업의 분야별 중요도 및 순위분석이 가능해지므로 인해 우수한 경쟁력을 갖춘 분야들은 이를 유지하고, 상대적으로 낮은 경쟁력을 갖춘 분야들을 구체적으로 제시가 할 수 있다. 또한 도출된 경쟁력지표를 통해 국가나 지방자치단체의 노인친화산업 관련 정책수립이나 집행에 있어서 정책효과를 향상시키는 데 기여하고자 한다.

키워드: 고령친화산업, 퍼지집합이론, AHP

Ⅰ. Introduction

Because raising the standard of living and developing health-care make the average span of a people's life increased, a rate of senior citizen is growing more and more. Like this, Korean society is quickly transforming into an "Aging Society, which is shown by the demographics of Korea.

---

* 제1저자, ** 교신저자.

National Statistical Office reported July, 2008, there were 5,016,000 older people : Korea is changing into an ″Aging Society′. According to NSO, this comprise about 10% percent of older people in the general population. Therefore around 2026, Korean Society will enter a super-aged society that has the rate of senior citizen more than 20 percent.

Especially, the rate of senior citizen in Korea is growing faster than other country. When it is compared with countries with the rate of senior citizen such as U.S.A, U.K, Germany and Sweden, Korean society has been becoming faster and faster. For example, it takes France about 115years, USA about 75 years and Germany and UK about 45 years to comprise from 7% to 14% of senior citizen in the general population. However, Korea is predicted to take 22 years to enter a super-aged Society. This meaning is that unlike other developed nations, Korea is not fully prepared to deal with the ageing population.

Therefore, it′s necessary to plan to make policies for senior citizens in the context of higher taxes needed to fund pension and health systems for them. There are many silver industries for senior citizens. It is wonderful to have such a service because a nation is rapidly moving toward an aged society with the senior citizens rising sharply. We think we should know industries related to senior citizens exactly. In this point, it′s important to estimate how much competition has Senior Industry.

Nowadays, most of studies on Senior Industry are focused on how to improve health care and senior welfare or analysis about potential in industries related to senior. As a result, it seems that it′s lack to study related to competition and Priority of Senior Industry. Without analyzing Industrial Competitiveness based on Practicality, it would be difficult to make a proper policy.

This research purpose is to show following. The Meaning and Concept of senior industry

Most of all, Based on theoretical Approaches, I find the Meaning and Concept of senior industry and define what senior industry is, what has meaning in korea and we use AHP to derive prioritizing in senior industry. Especially we focus on Relative Importance of this field. Secondly, we estimate senior industry using Fuzzy sets. Thirdly, we find it that each of senior industry has strengths and weaknesses and how to reinforce Competitiveness in this field. Consequently, based on these studies, we suggest policy Implications to apply to develop and promote senior industry.

II. A Theoretical Approach of Senior Industry

1. Background and types of senior industry

1) Background of senior industry

The number of elderly people in a County is to cause many problems in quantitative and qualitative aspects(Sung, Do-Kyung, 2008: 1282). In 2000, Korea transformed aging society, which has more than 7.1% of persons aged 65 or over out of its entire population. Maybe around 2018, Korea will enter super aged society, which has more than 20% of persons aged 65 or over out of its entire population[1].

The reason is a prolonged average life span due to Progress of Society such as Advances in Health Care and hospital services, strengthening National Health Insurance and an extremely low birth rate.

<center><Table 1> Aging Trends</center>

Year	elderly population	Initial elderly population (65-74 years old)	mid-elderly population1) (75-84years old)	latter-elderly population2) (over 85years old)
1970	991	741	150	101
1980	1456	1050	228	178
1990	2195	1500	393	302
2000	3395	2303	918	173
2007	4810	3165	1356	289
2010	5357	3338	1646	373
2015	6381	3725	2122	533
2020	7701	4489	2442	770

※ National Statistical Office(2007. 11).

  footnote : 1) 1970, 1980, 1990 : 75 -79 years old 2) 1970, 1980, 1990 : over 80 years old.
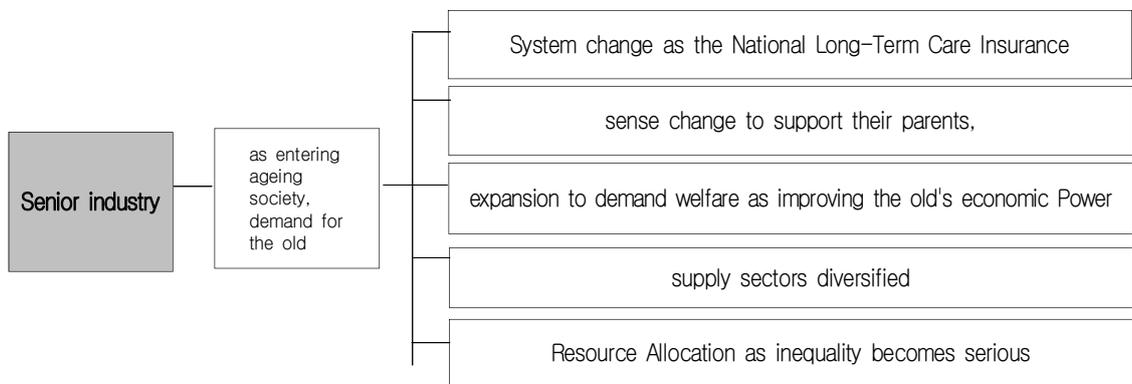
This aging phenomenon accelerated has effect on many field such as welfare. Firstly, in welfare aspect, because it makes social demand such as social security and Medicare and the health care program increased, Supporting senior citizens becomes a social issue like a tax increase that has a chance to make social conflict. Secondly, in labour, the workforce is shrinking due to increasing ageing population. This makes pattern of employment changed and finally our economy slowed.

---

1) Classification of an aging society (UN definition), according to an aging society (of the total population aged 65 or older population, more than 7% to 14% less than the ratio, aging society (aged society) than the 14% to 20% less, oldest community (super-aged society) has been classified as a 20%(http://www.donga.com/fbin/output?n=200704240144, DongA Newspaper)

Thirdly, senior industry related to silver industries such as housing, entertaining, designing old age and so on. Lastly, culture for the old which is different from existing culture is formed. For these reasons, proper policies for rapidly moving toward an aged society with the elderly population rising sharply are demanded.

These reasons made senior industry appeared in Korea. In other words, to enter ageing society happen with problems related increasing the old. Secondly, it's to increase to build up infrastructures like welfare Facilities for the Aged and to change welfare system for the old such as the National Long-Term Care Insurance. Thirdly, traditionally in Korea it's nature that one's family was under obligations to support their parents, but because nowadays it's not nature, the old need supporting by their society and this causes welfare service facilities to be expanded. Fourth, for changing welfare policies, supply sectors diversified and paid services in certain kinds of sectors expended cause senior industry to became prevalent(Jeong, Yun-Mo, 2007: 49-51). Lastly, among generations, it's necessary to need equity and Resource Allocation as inequality becomes serious

When simplified, above worlds written is like <Figure 1>.

<Figure 1> Background of senior industry

2) Expected effectiveness in senior industry as welfare system for senior citizen

The central government whose finance is limited, in policies of senior area doesn't have ability to support the general sentiment of the old and the special needs of some of the old. So from the government's standpoint, to reduce the financial burden. That's the sort of senior industry the central government usually outsource to share the social responsibility. In this case it's not important whether private organizations like NGO, company and so on participating in senior

industry, having variety of business purposes, shoulder the entire cost. or the part cost.

Social issues of the old are considered as a complex crisis.[2] Based on the concept of the social solidarity for the old helps the old to solve their problems and to satisfy their need, senior industry is needed to be systematized and supported. Anyway these things seem to have social welfare characteristic because government intervenes to protect the rights and interests of the old citizens(Moon, Hyun-Sang et al, 1996: 28)

Senior industry could contribute as job creators. This expected effectiveness could be causes of development strategy for promoting innovative small and medium-sized businesses(SME) creating jobs, especially for females and senior citizen and expanding domestic consumption Finally, there's high chances that korean economic development, which is possible to form a virtuous circle structure. With nice products and promotion idea for Asians related to the old's need in senior industry, it can be possible for people living in aging society to have high quality life that has meaning more than economic value(Chon, Kyoung-Hye. 2008: 21-2).

The following <Table 2> shows expected Effectiveness predicted by aging and future Society Commission.

<Table 2> Expected effectiveness of the eight strategic industries in aging society

strategic industry	contents
1.Nursing Industry	Care of family burden and social and cultural · relieve anxiety of the people and facilities to create jobs by expanding the community to harness new growth.
2.Mechanical Engineering Industry	Domestic market and exports to increase active alone or elderly couples (41% of all elderly households) move to block the nursing facility to ensure a healthy life in the community.
3.Information Industry	Welfare and cultural quality of life for the old, widening of inter-generational understanding, positive outlook on life affects the formation, etc., through the Internet for health information and services through the health care system, high-efficiency low-cost structure and the key role in transforming, high added value of information and communications infrastructure through the creation of new business opportunities and strengthen industrial competitiveness and economic growth is expected to cause a big effect.
4.leisure Industry	Leisure industry cluster in a certain areas for the old by building and enabling local industry to attract lonely seniors enrich their lives through healthy recreational improve the quality of life of older adults.

---

2) The meaning of a complex crisis is that there exist many negative factors such as disease, sense of loneliness and role loss and so. Generally, the more serious it occurs when our society goes to aged society having latter-elderly population, so social solidarity to protect the old is needed.

<Table 2> expected effectiveness of the eight strategic industries in aging society(continue)

strategic industry	contents
5.Financial Industry	Social insurance in the center of the social security system supplemented by appropriate private sector role to ensure adequate preparation for aging has the effect of the domestic financial companies gain competitive advantage by securing new growth opportunities, and internationalization of financial activities can be promoted.
6.Housing Industry	By providing appropriate housing for the old to prevent accidents, improve the quality of life of elderly and health care contribute to sound fiscal and public rental housing for the elderly to promote stable housing for the elderly are multiple.
7. Oriental Medicine industry	Improve the health of the elderly, herbal industry, industrial competitiveness through the expansion of infrastructure and contribute to job creation.
8.Agriculture Industry	Suitable for the elderly in the agricultural sector by providing jobs and living conditions in rural areas to guard the health and the environment, you can find a rewarding retirement life is a field. In addition, the model provides a professional job for retirees and the elderly in urban and rural areas, the problem can be solved at the same time effects.

※ Source: Aging and Future Society Commission(2005).

3) Features and types of senior Industry

Aging and Future Society Commission(2005) shows there are many features such as an industrial feature, a consumer's feature, a baby boom generation's feature senior Industry. Hanrim Uvi.(2005) reported that senior industry be suited for SME that is ability to be labor-intensive, interactive among firms in a region and have the mutual relationship with other regions. It added, also something the most important is to protect the old's life quality based on the market force. Senior industry as based on these viewpoints is like following. Firstly, essentially even though those who will benefit have to bear the cost, it's nature that this industry field is based on public interest in society. Secondly, even though partially each of senior industry is utterly fragmented, actually, the whole industry for the old coheres with related industries. Thirdly, as there is an interrelationship between health-care and Medical -Welfare, industrial form related shows the Relationship between facility and service. Lastly, regional Characteristics in this is so obvious focused on th old having a little social-geographical mobility(Sung, Do-Kyung, 2008: 1284-5).

The types of senior industry is detailed as the old's need, their need depends on social changes, the features of welfare for the old and the old's capability and sense. In this paper, Senior industry, therefore, is classified like <Table 3> as following.

<Table 3> The types of senior industry

field	sector	contents
Housing · Facility	the long-term Living house	Silver Town, APT for the old, Three Generations House
	House for Care	Charging Facility for the old, Elderly with Dementia,
	the short-term living house	Day Care Center for the old
	Care in House	General service, Protection Board Home Visits, Cleaning, Laundry, Bathing
Healthcare · Nursing facilities	Dining Services	Adults used food home delivery, The delivery of Geriatric menu, Food and home delivery of corrosion
	Care Product Distribution	Care Product Rental
	Health Care	Elderly Health Screening Center, health care centers, home visit check, Health Medical Center, Geriatric Clinic, Alzheimer's disease drugs
	Travel	For silver the travel agency, for the only elderly travel club
	Sports	Gateball courts and ancillary facilities, golf courses, tennis courts, a senior for a swimming pool, marina promenade
	Health Facilities	Fitness, Yoga Club
	Recreational Facilities	Nursing and rest areas, health centers
leisure · culture	Hobby	Singing classes, horticulture classes, handicrafts, Social dance classes, Folk Medicine, Play club
	Entertainment	Play facilities, outdoor venues, tourist farms, dude ranches
	Religious Facilities	Religious lesson
	Education	Old universities, cultural courses, computer training, a multipurpose hall, specialized lab open, Open University
Pension · Income	Emergency Communication Services	Home safety, emergency communications services people living alone, no
	Relief Services	Relief Services
	Career Development for the old	Job placement, temporary staffing, retraining for older
	Career information for the old	Professional magazine, retirement guidance, membership clubs
	Communion service	Wedding arrangements services
	Social services	Youth Consultation and so on

※ Source: revised from Jeong(2007: 52).

2. Theory on AHP and FUZZY

1) AHP(AHP: Analytic Hierarchy Process)

AHP invented by T. L. Saaty who is a professor of business, the University of Pittsburg in USA, is suited for estimating Weights of Decision-Making and prioritizing among policy alternatives when there exist many kinds of goals and decision-makers(Lee, 2006: 9). AS AHP based on one's intuition more than theory is a flexible technique to make decision, which is nice to accept factors including objective assessment as well as subjective assessment, understanding logic of AHP is so useful and easy that some problems stratified are solved. Hierarchy used in AHP is a type of structural system and it is used to classify standards to decide or to make decision as giving relatively simple hierarchical approach possibility from difficult and complex problems through classifying and defining fuzzy sets configuring whole system.

AHP modeling process to solve problems related to decision-making is like following. This

involves four phases, namely, structuring the decision problem, measurement and data collection, determination of normalized weights and synthesis-finding solution to the problem.

<Table 4> AHP process

step	contents	note
1	Decision problem into a hierarchy of interrelated decision elements shall be selected for classification and decision-making hierarchy.	
2	Comparison of the element relative to the decision to collect input data.	Evaluation is integrated into the geometric mean value.
3	To obtain The importance of decision elements, to review CI and CR	CI=(λmax−n)/(n−1) CR=(CI · RI)×100%
4	Reviews are subject to the ranking of the alternatives, decision-making to achieve a combination of changes relative to total weight.	

In AHP, to estimate Weights of Decision-Making and to prioritize among policy alternatives and to test validity, just under 0,2 of the respondents is set a standard.

2) Fuzzy sets

Fuzzy sets by Zadeh, a professor of California Uvi, 1965 is a mathematical theory that shows vagueness such as human′ recognition, thought, language, judgment and so on through mathematical process based on mathematical and quantitative theory(Choi, 2004: 18-19).
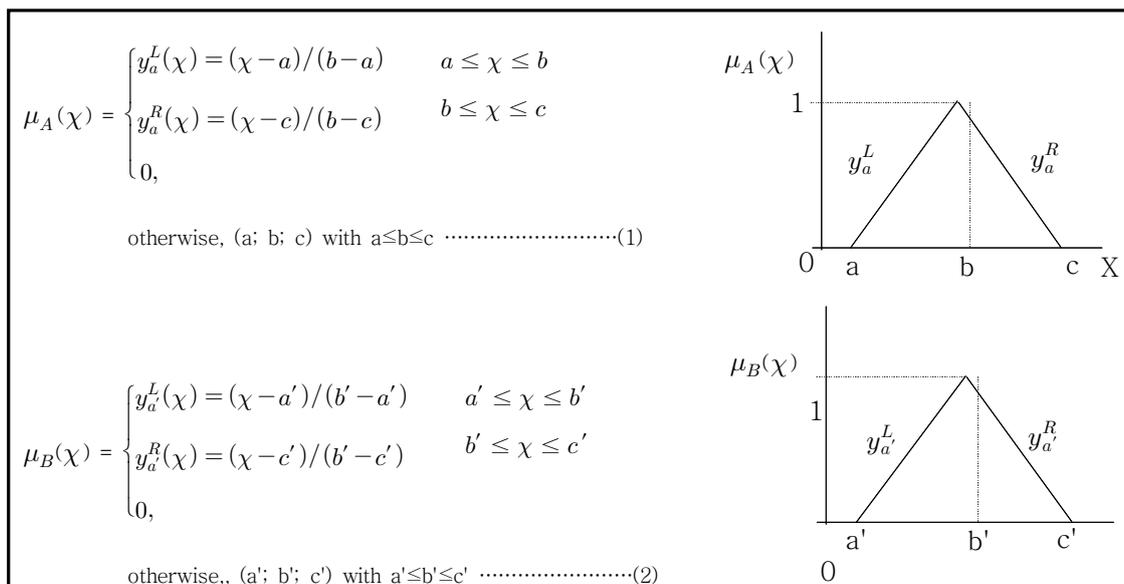
A fuzzy set is a class of objects with a continuum of grades of membership. Such a set is characterized by a membership(characteristic) function which assigns to each object a grade of membership ranging between zero and one. The notions of inclusion, union, intersection, complement, relation, convexity, etc., are extended to such sets, and various properties of these notions in the context of fuzzy sets are established. In particular, a separation theorem for convex fuzzy sets is proved without requiring that the fuzzy sets be disjoint(Zadeh, 1965, 3338).

Fuzzy theory is trying to permit human′s subjective recognition and after objectifying it, to reveal it. In spite of Fuzzy as a mathematical concept, it uses a doubtful concept like the ambiguity. This is different from the common mathematical concept. In shortly, Fuzzy uses vagueness that doesn′t have exactly boundary and ambiguity that has a variety of possibilities to be included in no matter where(Jang, 1997: 5).

Explained it in detail, a Fuzzy set can have one element partially. In other words, if A is space of χ, A of a Fuzzy set would have each χ in X. At this moment, $\mu_A(\chi)$ Triangular

Membership Function is space number in [0:1] and if using TMF, it would be useful efficiency in calculating and availability in searching for data(Shin, Hyun-Gag, 2004: 39-40).

Triangular Fuzzy Number $\bar{A}$ of importance level and Triangular Fuzzy Number $\overline{B}$ of recognition level, each is comprised of 3 elements, (a, b, c), (a′, b′, c′), so TMF $\mu_A(\chi)$ and $\mu_B(\chi)$ is like following.

$$\mu_A(\chi) = \begin{cases} y_a^L(\chi) = (\chi - a)/(b-a) & a \le \chi \le b \\ y_a^R(\chi) = (\chi - c)/(b-c) & b \le \chi \le c \\ 0, \end{cases}$$

otherwise, (a; b; c) with a≤b≤c ·························(1)

$$\mu_B(\chi) = \begin{cases} y_a^L(\chi) = (\chi - a')/(b'-a') & a' \le \chi \le b' \\ y_a^R(\chi) = (\chi - c')/(b'-c') & b' \le \chi \le c' \\ 0, \end{cases}$$

otherwise,, (a'; b'; c') with a'≤b'≤c' ······················(2)

<Figure 2>Triangular Membership Function of Fuzzy Number

a and c is evaluation of the maximum value and the minimum value within a area. b is the average value of fuzzy number B. As b is the vertex of membership function, $\mu_A(\chi)=1$. Therefore, there is Triangular Fuzzy Number B = (a; b; c) between a and c, which is translated by b which fuzzy quantity became. Average fuzzy number A_{ave} of Triangular Fuzzy Number $\bar{A}i =(a_1^{(i)}, a_2^{(i)}, a_3^{(i)})$is like following.

$$\widetilde{A} = A_{ave} = \frac{\widetilde{A}_1 + \widetilde{A}_2 + \widetilde{A}_3 + \cdots + \widetilde{A}_n}{n}$$
$$= \frac{\sum_{i=1}^{n} a_1^{(i)}, \sum_{i=1}^{n} a_2^{(i)}, \sum_{i=1}^{n} a_3^{(i)},}{n}$$
$$= (a_1, a_2, a_3,)$$

Fuzzy model of competitiveness evaluation procedural as follows. Firstly, to understand the competitiveness and hierarchical structure to be prioritized in senior industry. Secondly, to analyze

relative importance in senior industry, which contributes to competitiveness and   relative importance in the senior industry and the key field by using AHP. Thirdly, to survey and estimate respectively related areas with the senior industry to promote. In the process, the number indicated in the survey converts to fuzzy number, which is analyzed by fuzzy model. Fourth, by weighting the relative importance to the promotion of industries for the elderly in the field of competitiveness in each field measurements by calculating the weighted average and fuzzy numbers to obtain the value of the center of gravity will determine the position(Shin, 2004: 41-2).

3) Apply for a Discussion of Fuzzy AHP

Fuzzy AHP method is similar with basically the traditional AHP method. However, the data used in the operation process is usually called fuzzy numbers rather than a number of points differs from traditional AHP method. In other words, Fuzzy AHP in data collection through a questionnaire survey data reflects the thinking of the fuzzy a fuzzy one believes the data itself, which is defined as fuzzy numbers. And the number of fuzzy calculates respectively relative reasons and alternatives, relative importance by creating a matrix scores are calculated for each study offers alternative. These studies expand the existing use of the AHP in the business environment for strategic management′s forecasts used to be also used by the Fuzzy AHP(Seo, 2007: 159). Most of the studies are qualitative factors that mean expression of the language for expressing fuzziness is most things, Therefore this study considered along with qualitative and quantitative parts of Fuzzy AHP based industries for the elderly for the selection of priority sectors in decision-making model to evaluate.

3. Empirical studies reviewed

An Empirical Study of the domestic industry on senior industry to look at, Housing for the elderly as a problem for the industry and related sectors and the lack of welfare facilities for the poor quality of service was mentioned by Jeong(2005). She added that facilities for the elderly of the operational difficulties and lack of government support and approval procedures for demanding noted. In aging society, a new social welfare system for the elderly in need of the industry, and then analyzed the status and problems of the role of social welfare systems in the private sector and public sector share was proposed by Jeong(2007). Fuzzy AHP for the selection of priorities and related research as applied, Lee(2003) analyzed and estimated Quantitatively on that the port

of Busan in any form would be desirable to operate by using AHP. Following the <table 5> is an arrangement that shows research papers and related industries for the elderly on the Application of Fuzzy AHP based on empirical research.

<Table 5> senior industry and Fuzzy AHP of Empirical Studies Review

field	researcher (year)	the analyzed	contents
senior industry	Lee, Sung-Hwan (2005)	Elderly Care Services	Focusing on the elderly care services for the old in developed countries, and Korea to compare and analyze the problem and Industrial Revitalization presented.
	Jeong ,Yun-Mo (2007)	Social welfare system	Aging society, a new social welfare system for the old in need of the industry, and then analyzed the status and problems of the role of social welfare systems in the private sectors and public sectors share was proposed.
	Choi, Dong-Sun (2007)	Study of occupation	Through professional research on the world of work in industries for the old in-depth information to create jobs for the old, as well as the industry was looking for ways to activate.
Fuzzy AHP	Lee, Chang-Hyo (2003)	Busan' port management	Using Fuzzy AHP, Port Authority, port efficiency, port development, factors such as urban development is the most preferred of Busan port management system was evaluated
	Lee, Hoe-Sik (2006)	Service Quality Management	Based on AHP and fuzzy numbers, trying to attemp methodological study using quality of service for a representative model, SERVQUAL model and SERVPERF model
	Seo, Kwang-Kyu (2007)	SCM System Selection	For SCM system selection to decide an item reliability, development and management, integration aspects, cost, and characteristics of the selected factors were analyzed.
	Kim, Tae-Hoon et al. (2008)	Consumers selected courier services	Courier courier services in transactions between consumers in selecting a major pyeonggagijunin tangibles, reliability, responsiveness, ease of selection factors are analyzed.

III. Senior Industry Initiative for Priority Selection

1. Sample selection and data collection methods

In senior Industry, through AHP method to prioritize in survey of Daegu in social welfare facilities and workers organizations, government officials, professors, researchers, graduate students in 2008 180 patients June 23 to July 7 surveys were conducted. The questionnaires were collected every 115. Each of the first 115 responses collected falsely decide to have 7 sets and wealth, and Microsoft Excel 2007 by using the consistency ratio (Consistency Ratio) of 0.2 or more 42 departments and remove[3] the rest 66 were used for actual analysis hawk.

A questionnaire was presented such as <Table 7> as the 2 layer of 4 factors and the 3 layer

of 14 factors. The composition of the survey questions by each one at a time comparison between two elements that were used to compare the two won, the range of scales that are commonly used in the AHP 9-point scale was used, the number 1 through 9 evaluate each item by its reciprocal as a measure of the relative importance liver relative weights were obtained after 0.7)

This study surveyed social workers at facilities and institutions, public officials, professors, researchers, graduate students in the gender characteristics of full analyst Male 66 people in 39 patients (59.1%), female, 27 patients (40.9%) and men than women were more responsive to the distribution, age, the 20s 6 (9.09%) and was significantly lower, 30 ′, 7 (10.61%), the early 40s the 14 patients (21.21%), late 40s The 13 patients (19.70%), and 50 pay 12 (18.18%), respectively. In response distribution of respondents by educational attainment, level 66 patients, 36 (54%), college graduates in 20 patients (30%), and the Graduate School at least 4 people (6%) were.

<Table 6> demographic characteristics of the sample

topics	variable	number of samples(%)
Gender	Male	39(59.1%)
	Female	27(40.9%)
Ages	21years old-30years old	6(9.09%)
	31years old-35years old	7(10.61%)
	36years old-40years old	14(21.21%)
	41years old-45years old	14(21.21%
	46years old-50years old	13(19.70%)
	over 50 years old	12(18.18%)
Education	High school graduation	36(55%)
	University graduate	20(30%)
	over Graduate school	10(15%)
Monthly Income	less than 100 million won	3(5%)
	100-199million won	21(32%)
	200-299million won	17(26%)
	300-399million won	14(21%)
	400-499million won	7(11%)
	500million won	4(6%)
Total		66(100%)

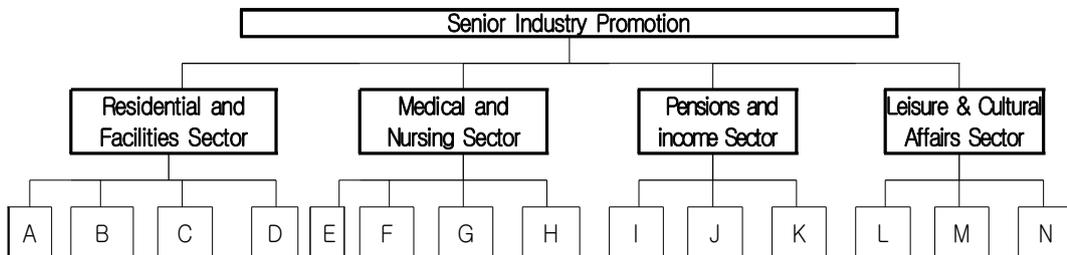## 2. Set of measurements and analytical model

---

3) AHP consistency ratio of subjects responding to the identified data indicate that only less than 0.2 were used for data AHP. The results of the consistency ratio of 0.2 or less, the individual respondents, 66 patients were identified. Typically, the ratio of 10% is within the consistency with comparison of the relative considered consistent, and if you can not afford less than 20% are reported to(Lee, 2000: 256-7)

In order to select priority sectors in senior industry, the elements measured in the priority sectors should be made. Priority sectors selected industries for the old sector of the measuring element provided by the following <Table 7> and the same.

<Table 7> Senior Industry measurements of priority sectors

classified		the priority of industrial promotion measures for the old
Measurement goals		·Senior Industry related to areas measure of priority sectors
Measurement area		·Housing, facilities, health, care, pensions, income, leisure and cultural sectors
Measuring element	Housing. Facilities sector	·Supply expanded by only elderly housing, apartments ·Parents keep expanding the supply of homes for three generations living together ·Providing actual expand rental housing ·Providing actual expanded nursing home supplies
	Health. Care sector	·Only elderly hospital expansion ·Long Term Care specialist facility expansion(Dementia, such as hospitals or nursing homes) ·Elderly health care delivery system expansion ·Expansion of health supplies, equipment supply for the old
	Pension. Income areas	·Establishment of Private Pension System (Including old-age pension) ·Inverse establish bases system ·Insurance Coverage for a variety of institutions to establish income
	Leisure. The cultural sector	·Recreational facilities for the elderly (entertainment, sports, cultural centers, etc.), expanding ·Acquired knowledge, information and recreational activities for active seniors Continuing Education ·Employment and social participation of senior opportunities

Thus, <Figure 3> is showing the fields and the elements selected for the old in senior industry.

1Step	Senior Industry
2Step	Residential areas, facilities, medical and nursing fields, the field of pensions, income, leisure and cultural sectors
3Step	A,Houses and apartments by the elderly, B. Generation shared house, C. Rental House , D. Cost-nursing home, E.Seniors-only hospital, F.Long-Term Care Hospital, G.Elderly Health Service, H.Geriatric health supplies and equipment, I.Private pension system, J.Inverse base system, K.Income Insurance Coverage, L.Recreational facilities for the elderly, M.Elderly Continuing Education, N.Senior employment opportunities and social activitiesFrom analysis of related facilities and organizations in social welfare workers, government officials, professors, researchers, graduate students health. Care is reported to be most important in the field.

<Figure 3> AHP model to prioritize in senior industry

IV. An Analysis of the Priorities in Senior Industry

1. Fields measured weights and the relative importance analysis

What the surveyed selected in senior industries for the old at 1 step in the analysis of the relative importance is like <table 7>. Viewed by sector, Health care·Nursing field (.432), Residential Facility field (.262), Pension Income field (0.216), and Leisure·Cultural field (0.090) was calculated in order of importance. Related facilities and organizations in social welfare workers, government officials, professors, researchers, graduate students health regard Health Care the thing that is the most important in the field from analysis

Health and Medical care, especially in the field of Leisure and Cultural field of relative priority almost four times higher than the strikes, but also residential field, Medical facilities, medical care and pensions field, income field compared to the nearly 2-fold higher priority.

In Korea, There are many structural defects related to Medical facilities for the old. There are the old suffer from Senile dementia such as Alzheimer so they need the same long-term care facilities and home care services but they are not enough to by lacking of infrastructure, hospitals and nursing homes for the elderly and the nursing staff in labor-intensive industries due to high labor expenses to avoid participation in the private sector's institutional improvement This can be understood as the most important(Ministry of Health & Welefare. 2006: 6).

the consistency of survey responses to determine the degree of consistency for the verification of the criteria outlined in the survey Consistency Ratio(CR) are shown as 0.0781 is consistent.

2. Priority importance analysis in senior industry

1) Residential·Facilities field

<Table 8> Relative Importance in senior industry

Surveyed 1step	Importance	Ranking
Housing·Facilities field	0.262	2
Health·Care field	0.432	1
Pension·Income field	0.216	3
Leisure·cultural field	0.090	4
Total	1.0	

Analysis of the relative importance at the second step in senior industry analysis for the old by the surveyed is like <table 8>.

Viewed by fields, a house·apartment supply expanded by only (0.318) for targeted to aged Person, Cost nursing home supply expansion (0.296), actual cost rental housing expansion (0.294), elderly parents to support expanding the supply of homes for three generations living together (.092) in the order of importance was calculated. Through analysis of these subjects, 'houses and apartments supply expanded by only for the old' are reported as the most important.

Specifically, the field that is Self-old private houses and apartments just for the old supply expanded by only 'relative priorities is almost three times higher than the field that is houses to care for elderly parents living with three generations supply expanded. This is the consumer who does not seem to facilitate the supply of homes watching, lack of financial institutions for elderly housing, the difficulty of caring for a companion move and need to be improved and the tax penalty has been emphasized.

<Table 9> Relative importance and ranking in Housing. Facilities field

Surveyed 2Step Housing. Facilities field	Importance	Ranking
Supply expansion just for only elderly housing, apartments	0.318	1
Supply expansion of homes for three generations living together	0.092	4
Supply expansion of rental housing	0.294	3
Supply expansion of nursing home	0.296	2
Total	1.0	

In Housing·Facilities for the elderly in the fields of industry, to prioritize the consistency of survey responses for the percentage of respondents (Consistency Ratio: CR) in the survey

responses appear to 0.0613 is consistent.

2) Health Care field

To prioritize relative importance of Health. Care field in senior industry, <table 9> was derived.

<Table 10> Relative importance and ranking in Health. Care field

Surveyed 2Step Health. Care field	Importance	Ranking
Expansion of Only elderly hospital	0.213	3
Expansion of long-term care specialist facilities (such as de mentia, hospital or nursing home)	0.321	1
Expansion of Elderly health care delivery system	0.185	4
Expansion of health supplies, equipment supply for the elderly	0.281	2
Total	1.0	

In Health. Care field, the 'long-term care specialist facility expansion (0.321) in the retirement plan were surveyed for the first, geriatric health supplies, equipment supply expansion (0.281)' and 'old private hospital expansion (0.213) 2, and 3 were ranked, elderly health care delivery system expansion (0.185) showed the lowest priority.

Therefore, the older and health-related needs would regard as the most necessary requirements. However, professional health services may be provided by the hospital for the elderly, senile dementia, but absolutely necessary, hospitals, long-term facilities that provide care and home care services and lack of infrastructure, hospitals and nursing homes for the elderly and the nursing staff working Due to the high labor-intensive industries and the private sector to participate in spending to avoid a situation it is necessary to improve institutional(Ministry of Health & Welfare, 2006: 6). Health·Care field in Senior Industry to prioritize, social welfare workers, government officials, professors, researchers, graduate in the facilities and institutions survey response rate of consistent (Consistency Ratio: CR) in the survey responses appear to 0.0923 is consistent.

3) Pension-Income field

In Pension ·Income field, Private pension plans established (0.415) was the highest relative need. And then Various Income Coverage Insurance System established(0.321), Reverse Mortgage scheme established (.264) in the order of. This is actually a means to prepare for life after

retirement pensions, savings, real estate is as regards the order. The pension system in an industrial society inevitably have to be provided by social insurance, but the national pension, company pensions, private pensions such as the immaturity of the social system in which virtually guaranteed retirement income that is considered not help. Security products are not diversified, with no income and no income, low income for the old who did not have the charm of income protection products are shown. To be improved as a result of these problems are shown.

<Table 11> Relative importance and ranking in Pension·Income field

2Step Pension ·Income field / Surveyed	Importance	Ranking
Establishment of private pension (old age pension, etc.)	0.415	1
Inverse establish bases system	0.264	3
Insurance Coverage for a variety of institutions to establish income	0.321	2
Total	1.0	

4) Leisure-Cultural field

In Leisure·Cultural field, expansion of old people's employment opportunities and social participation (0.438) is the highest relative need. The second is recreational facilities for the elderly (entertainment, sports, cultural centers, etc.), expansion (0.291). Then the following is acquire knowledge, information, recreational and sports activities for Lifelong Education for the Elderly (0.271) than that of other factors, the need is lower. Korea insufficient to meet the needs of the elderly, and institutions have a social atmosphere. This is true for senior employment section. Therefore, the need for it seems to be highly.

<Table 12> Relative importance and ranking in Leisure·cultural field

2Step Leisure·Cultural field / Surveyed	Importance	Ranking
Recreational facilities for the elderly (entertainment, sports, cultural centers, etc.), expanding	0.291	2
Acquired knowledge, information and recreational activities for active seniors Continuing Education	0.271	3
Employment and social participation of senior opportunities	0.438	1
Total	1.0	

3. Analysis of integrative importance

<Table 12> shows the Priorities in Senior Industry for the entire complex, each step represents the weights and priorities.   In this study, step by step details for the Senior Industry Determinants of the relative importance is based on obtaining.   The respondents of the surveyed. Health·Care field of 'professional long-term care facility expansion (specialized hospital or nursing home, dementia, etc.) combined with two .138672 weights and was the highest priority. In addition in Health. Care field, Geriatric health supplies, equipment supply expansion (0.121392)', 'elderly-only expansion of specialty hospitals (0.092016) ', etc., and the priority order of the total combined weight 1,2,3 health. Care sectors were shown higher. The fourth is 'Establishment of a private pension system (such as old age pension) appeared as importance 0.08964 in Pension·Income field. The following, fifth, is supply expansion of Seniors-only houses and apartments appeared as importance 0.083316 in Residential·Facilities field, which is higher among the things surveyed to prioritize in senior industry though supply expansion of a sharing house to care for elderly parents living with three generations was the lowest priority in the overall sensitivity.

As described earlier, the Priorities in Senior Industry is Health·Care field through all of the combined weights and priorities. This field is a sector related to the old's important need, which is health-related needs. There This survey showed that quality of professional health care services than the hospital can be provided for the old and a special hospital such as senile dementia need to be expanded absolutely.

<Table 13> Complex weighting and general ranking in senior industry analysis

1Step*2Step	Surveyed	Importance	Ranking
Housing·Facilities field	Supply expansion just for only elderly housing, apartmentss	0.083316	5
	Supply expansion of homes for three generations living together	0.024104	14
	Supply expansion of rental housing	0.077028	8
	Supply expansion of nursing home	0.077552	7
Health·Care field	Expansion of Only elderly hospital	0.092016	3
	Expansion of long-term care specialist facilities (such as dementia, hospital or nursing home)	0.138672	1
	Expansion of Elderly health care delivery system	0.07992	6
	Expansion of health supplies, equipment supply for the elderly	0.121392	2
Pension·Income field	Establishment of private pension (old age pension, etc.)	0.08964	4
	Inverse establish bases system	0.057024	10
	Insurance Coverage for a variety of institutions to establish income	0.069336	9
Leisure·cultural field	Recreational facilities for the elderly (entertainment, sports, cultural centers, etc.), expanding	0.02619	12
	Acquired knowledge, information and recreational activities for active seniors Continuing Education	0.02439	13
	Employment and social participation of senior opportunities	0.03942	11

4. Competitiveness ranking through Fuzzy Sets Theory

Completely independently of the evaluation factors based on the Fuzzy AHP was used because existing evaluation factors isn't independent. In this study, the Priorities in Senior Industry through the fuzzy concept can be evaluated(See Table).

The process of normalization of fuzzy numbers answered by dividing the largest number should be. To do why that is going through this process triangular fuzzy weight function can be closer to 1 which is the ideal midpoint survey results. In this way, the performance evaluation of Senior Industry answered in the fuzzy numbers like <table 13> were derived(Shin, Hyun-Gag, 2004: 60-1). By weighting the relative importance of PIj performance measures and fuzzy concept PMji by the weighted average, each elderly-friendly industries to the overall competitiveness of the Industry for can be calculated as follows.

<Table 14> Fuzzy value in senior industry

Classified		Response Status			Normalized Fuzzy Measure			Fuzzy value	Ran-king
		a	b	c	a	b	c		
Housing· Facilities field (0.262)	only elderly housing, apartmentss	1	3	5	1/5	3/5	5/5	0.1572	8
	for three generations living together	2	3.5	5	2/5	3.5/5	5/5	0.1834	6
	rental housing	1	2.5	4	1/5	2.5/5	4/5	0.131	9
	cost nursing home	3	4	5	3/5	4/5	5/5	0.2096	5
Health· Care field (0.432)	Only elderly hospital	1	2.5	4	1/5	2.5/5	4/5	0.216	4
	long-term care specialist facilities	3	3.5	4	3/5	3.5/5	4/5	0.3024	2
	Elderly health care delivery system	2	3	4	2/5	3/5	4/5	0.2592	3
	health supplies, equipment supply for the elderly	3	4	5	3/5	4/5	5/5	0.3456	1
Pension·I ncome field (0.216)	private pension	2	3	4	2/5	3/5	4/5	0.1296	10
	Inverse base system	1	2.5	4	1/5	2.5/5	4/5	0.108	11
	Insurance Coverage for a variety of institutions to establish income	3	4	5	3/5	4/5	5/5	0.1728	7

<Table 14> Fuzzy value in senior industry(continue)

Classified		a	b	c	a	b	c	Fuzzy value	Ran-king
		Response Status			Normalized Fuzzy Measure			Fuzzy value	Ran-king
Leisure·cultural field (0.090)	Recreational facilities for the elderly	1	2.5	4	1/5	2.5/5	4/5	0.045	14
	Continuing Education	2	3.5	5	2/5	3.5/5	5/5	0.063	12
	Employment and social participation of senior opportunities	1	3	5	1/5	3/5	5/5	0.054	13

※ Response status: a = lower limit, b = average, c = cap.

※ Fuzzy Measure: OC = [(PMji × PIj) + (PMji × PI2) + · · · + (PMji × PIN)]

Korea is currently implementing the Senior Industry to prepare for life of the old after retirement as an indicator of competitiveness found by fuzzy measures.

With fuzzy model, in senior industry each detailed fuzzy numbers in each sector as a whole may appear competitive. In addition Fuzzy model expressed as a competitive advantage gives the exact number of the Priorities in Senior Industry. <table 13> using the fuzzy set theory Checklist Senior Industry has assembled an integrated competitive, which helps to select the field to pursue in Senior Industry.

Analysis based on social workers in facilities and agencies, government officials, professors, researchers and graduate students of the survey respondents weighted fuzzy evaluation model, competitive, Health·Care field ranked No. 1 on the best No. 2, and 3 were ranked. Then the following in Leisure·Cultural field recreational facilities for the old with a fuzzy evaluation model was ranked the lowest as No.14. The detail analysis is shown on the <table 13>.

With the fuzzy model by developing indicators of competitive advantage in Senior Industry, competitiveness in the priority sectors for the overall assessment was performed. In addition, synthesis of several properties with in Senior Industry, and between those areas and to compare the current and future priority was to figure out what field to pursue.

Ⅴ. Policy Implications and Conclusions

In this study, on the basis of entry to an aging society, we looked at the Senior Industry. We attempted with a hierarchical approach for the priority in each field of Senior Industry. The former studies on senior industry were focused on activation of the trends and outlook, and

international initiatives in senior industry but this study is focused on an analysis of the priorities in senior industry to have competitive advantage.

With AHP which is a method defined complex decision-making process as a hierarchical approaches, for each sector of the Senior Industry together with the relative importance was assessed when considering. In addition, decision-makers to rely exclusively on subjective judgments on the situation of human judgments to deal with ambiguous language that combines fuzzy set theory, using Fuzzy AHP substantially main industries selection in Senior Industry was applied. Within the existing environment of the AHP compares the relative value to a random selection, but, in case applied to Fuzzy AHP method, it is derived a fuzzy number so it is so useful to estimate competitive ranking the industries of Senior Industry.

Using AHP method for relative importance of each sector of senior industry analysis of the health of the respondents surveyed. Health·Care in the field of the 'long-term care specialist facilities expansion (specialized hospital or nursing home, dementia, etc.) combined with two weights and 0.138672 was the highest priority. And in Health·Care field geriatric health supplies, equipment supply expansion (0.121392), elderly-only expansion of specialty hospitals (0.092016), and so full of complex weights and priorities 1,2,3 stomach health . care sectors were higher. Facilities in the areas of support for elderly parents living with 3 generation house supply expansion 'has the lowest priority in the overall significance was found.

A triangular fuzzy number and then applying the Fuzzy AHP method utilizing a more subjective perspective, the objective of senior industry were analyzed by industry sector competitive properties. Respondents of the survey results weighted fuzzy analysis likewise analysis from AHP method, competitive assessment and medical treatment as the highest ranking of all the areas were occupied. In leisure·Cultural field, recreational facilities for the old with a fuzzy model of the competitive assessment of the lowest ranked 14 on the ranking results showed.

According to a study the Priorities in Senior Industry is Health·Care field through all of the combined weights and priorities. This field is a sector related to the old's important need, which is health-related needs. There This survey showed that quality of professional health care services than the hospital can be provided for the old and a special hospital such as senile dementia need to be expanded absolutely.

To promote senior industry the role of government as follows.

Firstly, Long-term care facility for Alzheimer patients and nursing home services and nursing agencies on manpower priority should be to devise an alternative. Secondly, welfare services for the old people diverse from private companies to supply tax breaks and deregulation of

government should be considered. Thirdly, the efficient operation of long-term care system and the expansion of old age income security policy, the reform should be considered.

The social environment due to the rapid aging to respond to changes in government efforts are needed. In other words, senior industry development and activation for the for population at the level of governments will be able to improve the quality of life. Therefore, the government's active policy for the entry to an aging society and the changes of social awareness about the old will enable Korea to enhance competitiveness through developing senior industry and related to sectors to promote the old's welfare.

References

Aging and Future Society Commission. 2005. *A Study on Analyzing Industries for the Elderly and Developing Their Cultivation Plans.* 2005. 2.

Chang, Da-Yong. 1996. Applications of the Extent Analysis Method on Fuzzy AHP. *European Journal of Operational Research.* 95: 649-655.

Choi, Dong-Sun. 2007. Research on Occupations in Senior Industry: Exploration in IndustrialSectors of Long-term Care, Supportive Aids or Devices, Leisure for Elderly, and Recreation. *The Korea Research Institute for Vocational Education and Training.* 8: 379-384.

Choi, Sung-Jae. 2002. A Study of Silver Industry Promotion in Korea. P*lanning and Policy.* 254: 40-51.

Choi, Woo-Ram. 2004. *A Study on the Decision Method of priority in Housing Environment Improvement.* a doctoral dissertation. The Graduate School of Chonnam National University.

Chon, Kyoung-Hye. 2008. *A Study on Actual Condition and Activating Measures of Silver Industry in Korea, a master's thesis.* The Graduate School of Education Yonsei University.

Hyun, Oye-Sung. 2005. *Silver Industry.* Seoul: Hakhyensa.

Jang, Lee-Chae. 1997. *Fuzzy Mathematics.* Seoul: Kyousa.

Jeon, Chai-Geun. 2003. A Study on the Silver Business for the Aged Welfare in Korea. *Social of Welfare for the Aged.* 20: 157-178.

Jeong, Hae-Seon. 2005. *An Activating Methods of Silver Industry in an Aging Society.* a master's

thesis. The Graduate School of Public SeJong University.

Jeong, Yun-Mo. 2007. A Study for Activating the Pro-Aged Industry. *Social Welfare Policy.* 29: 45-66.

Ju, Jeong-Moon. 1997. *An Evaluation Model on Enterprise Using Fuzzy Integral.* a master's thesis. The Graduate School of KyungNam University.

Kim, Tae-Hoon & Kim, Pan-Soo. 2008. A Fuzzy AHP based Customer's Selection of Home Delivery service. *Korea Industrial Economics Association.* 21(4): 1725-1743.

Lee, Chang-Hyo. 2000. *Group Decision Making.* Pusan: Sejong.

Lee, Gang-Woong & Kim, Sung-Kuk. 2003. A Study on the Selection of the Administration System for Busan New Port Using the Fuzzy AHP. *The Korean Journal of Local Government Studies.* 7(2): 69-87.

Lee, Hoe-Sik. 2006. Methodology of Service Quality Evaluation Using Analytic Hierarchy Process and Fuzzy Numbers. *Institute of Industrial Technology Journal.* 1(31): 1-15.

Lee, In-Hee. 2004. A Model of the Division of Roles in Social Welfare Service Provision. K*orean society and public administration.* 14(4): 123-145.

Lee, Suk-Tae. 1994. *A Study on the Development of Hierarchical Fuzzy Evaluation Algorithm and Its Application.* a doctoral dissertation. The Graduate School of Korea Maritime University.

Lee, Sung-Hwan. 2005. A Study on the Activation Policy Direction of Silver(universal design) Industry. *Journal of Social Science.* 26(1): 1-26.

Moon, Hyun-Sang. 1997. A Study on Developmental Plans of Silver Industry. *Health and Welfare Policy Forum.* 5: 67-71.

Park, Sung-Bok. 2004. An Integrated Model for Studying the Quality of the Elderly. *Korean Society and Public administration.* 15(3): 159-179.

Seo, Kwang-Kyu. 2007. A Fuzzy AHP based Decision-making Model for SCM System Selection, *Journal of the Society of Korea Industrial and Systems Engineering.* 30(3): 158-164.

Shin, Hyun-Gag. 2001. *An Evaluation Model for the Competitiveness and performance Measurement of Business.* a doctoral dissertation. The Graduate School of ChongJu University.

Sung, Do-Kyung. 2008. A Study on the Priority-setting of Silver Industry for the Welfare of Elder. *Korean Public Administration Quarterly.* 20(1): 1281-1301.

Won, Jai-Mu & Kee-Bok Son. 1996. A Development of the Evaluation Methodology of Alternative Subway Lines Using Fuzzy Theories. *Korea Planners Association.* 31(5): 231-241.

Won, Yoong-Hee. 2000. A Study on the Silver Industry in Korea. *Tourism Research.* 14(1): 161-181.

Yoo, Mun-Mu. 2006. A Comparative Study on "Silver Industry" in Japan and Korea. *Asia Studies.* 8(2): 85-111.

Mario Enea and Tommaso Piazza. 2004. Project Selection by Constrained Fuzzy AHP. *Fuzzy Optimization and Decision Making.* 3(1): 39-62.

Saaty, T. L. 1982. *Decision Making for Leaders.* Belmont, CA: Lifetime Learning Publications.

http://www.nso.go.kr. the Korea National Statistical Office

http://www.donga.com/fbin/output?n=200704240144. Dong-A Newspaper

---

崔仁圭: 영남대학교 행정학 박사학위를 취득하고, 현재 대구과학대학 경찰행정과에 근무 중이다. 관심 분야는 국가위기관리, 고령친화산업, 출산지원정책, 재난관리 공기업 분야이며, 논문으로는 '지방의료원의 경쟁력 평가를 위한 종합적 모형개발(2009), 주취자에 대한 경찰의 효율적인 대응방안: broken window theory 관점에서(2009), '치안서비스 효율성에 대한 시계열분석'(2008), 저서로는 쉬운행정학(2010), 조사방법론의 이해(2011)등이 있다. 등이 있다(vov6651@yahoo.co.kr).

金線影: 경북대학교 행정학 박사과정을 수료하였고, 현재 경북대학교에 시간강사로 근무 중이다. 관심 분야는 국가위기관리, 사회적자본, 자연자원 관리 등이고 논문으로는 대학 내 창업보육센터 운영상의 문제점과 개선방안 : 대구지역을 중심, 한국과 독일의 다문화 비교 : 다문화정책 환경과 정책 특징을 중심으로 등이 있다 (Sylikelily@hanmail.net).

An Analysis of the Priorities in Senior Industry
by Using Fuzzy AHP

In Kyu Choi, Sun Young Kim

This research purpose is to show following. The Meaning and Concept of senior industry Most of all, Based on theoretical Approaches, I find the Meaning and Concept of senior industry and define what senior industry is, what has meaning in korea and we use AHP for deriving prioritizing in senior industry. Especially we focus on Relative Importance of this field. Secondly, we estimate senior industry using Fuzzy sets. Thirdly, we find it that each of senior industry has strengths and weaknesses and how to reinforce Competitiveness in this field. Consequently, based on these studies, we suggest policy Implications to apply to develop and promote senior industry. Using AHP method for relative importance of each sector of senior industry analysis of the health of the respondents surveyed. Health·Care in the field of the 'long-term care specialist facilities expansion (specialized hospital or nursing home, dementia, etc.) combined with two weights and 0.138672 was the highest priority. And in Health·Care field geriatric health supplies, equipment supply expansion (0.121392), elderly-only expansion of specialty hospitals (0.092016), and so full of complex weights and priorities 1,2,3 stomach health, care sectors were higher. Facilities in the areas of support for elderly parents living with 3 generation house supply expansion 'has the lowest priority in the overall significance was found.

Key Words: senior industry, Fuzzy sets, AHP(Analytic Hierarchy Process)