Factors Affecting Hospital's Adoption of a Market Orientation

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Abstract: This study investigates factors affecting hospital's adoption of a market orientation and the difference between public and private hospitals in Taiwan in their market orientation after implementation of the National Health Insurance program. Hospitals, both private and public, with more than 100 sickbeds are selected from three municipalities in Taiwan, namely Taipei, Taichung, and Kaohsiung. The subjects are high-ranking executives in these hospitals. A total of 152 copies of the questionnaire are distributed. Empirical results are as follows: (1) Private hospitals are faced with a higher degree of environmental uncertainty than public hospitals and are thus characterized by higher levels of market orientation; (2) Private hospitals are more influenced than public hospitals by their organizational entrepreneurship in market orientation; (3) Private hospitals pay more attention to professional ethics and are more market-oriented than public hospitals; (4) Market orientation has significant and positive influence on hospital's organizational performance. Compared with previous studies, this study has the following features: (1) Difference in market orientation between public and private hospitals in Taiwan is seldom addressed in previous studies. Unlike these studies, which are mainly focused on hospitals in the US and European nations, this paper discusses market orientation among hospitals in Taiwan. (2) Previous research on issues concerning hospital management is mostly concentrated on discussion of medical quality, and the research on factors affecting hospital's market orientation is really rare. However, investigation of these factors is really necessary. (3) Integration of multivariate analysis and nonlinear fuzzy neural network model for an empirical test is rare among previous studies of related issues. This methodology is expected to be more contributive to the academic area.

Key-Words: market orientation, environmental uncertainty, entrepreneurship, professional ethics

1 Introduction

Since implementation of National Health Insurance (NHI) in 1995, controversies surrounding the system have never ceased. These controversies were mainly sparked by: (1) Retrospective review of claims for reimbursement: Although a set of standards and procedures of insurance imbursement have been set up, approval of certain claims still relies on discretion of the authorities. As a result, complaints of hospitals about insurance reimbursement usually arise. (2) A widening financial black hole: The NHI system has been operating at a deficit since implemented. For instance, the overdue premiums (subsidies) of all local governments have exceeded NT$40 billion as of 2005. (3) Waste of medical resources: The NHI program is mandatory, and more than 90% of hospitals and clinics nationwide have participated in this program. As seeking medical services is very convenient, waste of medical resources may easily occur. For instance, the average number of outpatient visits per citizen is 14.85 as of Jun 2004. This figure is several times more than the averages in US and European nations, which range only between 4~5. (4) Misconception among citizens and improper allocation of medical resources: Most Taiwanese people do not have the concept of "visiting hospitals for serious diseases and clinics for small ailments". They firmly believe that large-scale hospitals can always provide better medical services and professional techniques of famous doctors. Besides, a family physician's referral system has not been set up so far. Improper allocation and waste of medical resources have become ubiquitous problems. The main purposes of the NHI program are to provide health care to all citizens at lower costs and to improve medical quality through use of the global budget payment

system. However, every policy has its merits and demerits. Due to the fact that the current medical environment is adverse to hospital management, many hospitals have attempted to introduce business administration methods to hospital management. Previous studies on administration and management have been more focused on elements of medical service quality and evaluation criteria ([2], [1], [11]). As the intensity of competitions among hospitals keeps rising, how to enhance patient return rate has become more and more important in hospital management and administration.

The NHI system has fallen into a widening financial black hole since implemented. Bureau of National Health Insurance (BNHI), on one hand, needs to constantly alter the basis for calculating the premium. On the other, in addition to the global budget payment system, it has adopted the policy of maximum number of patients to be served daily to improve overall medical quality and doctor-patient relationships. However, a stereotypical concept that "large hospitals have more medical resources and better doctors" still remains in most of Taiwanese people, causing increasing pressure on hospital management. Many private hospitals have thus adopted market-oriented strategies. For instance, they introduce a shopping street to increase their non-operating income and establish special clinics that charge high medical expenses for a specific customer group (differentiated marketing) to increase their operating income. Therefore, one of the objectives of this paper is to explore the factors affecting hospitals' market orientation and verify if these factors apply to both private and public hospitals. This paper attempts to not only find the dominant factors of hospital management but also provide a reference for hospitals on setting up administrative and managerial policies.

Previous studies of hospital administration and management have been more focused on the following issues: (1) Legal analyses: Attribution of responsibilities for medical malpractices and meaning of ruling in historic cases. (2) Analysis and review of medical disputes: Discussion of causes of a medical dispute and static analysis of the coping measures; The Joint Commission on Accreditation of Healthcare Organization (JCAHO) requires all hospitals in the United States to actively inform patients of medical malpractice. If malpractice of a hospital is confirmed through investigation of the commission and discussion with the patient, the hospital's certification may be revoked. (3) Issues related to medical service quality ([14], [38], [8], [16]): These studies are more focused on investigation of micro factors, such as service quality and medical disputes, and seldom discuss macro factors of hospital management and factors affecting future development of hospitals in Asian nations, such as Taiwan. (4) Case research method and qualitative analysis are the main research methods in these studies. Instances of applying both qualitative in-depth interview and quantitative data analysis are really few. Thus, this paper attempts to use quantitative analysis and a fuzzy neural network model to verify research hypotheses. This is also the third objective of this research.

2 Literature Review

2.1 Market Orientation

Market orientation is to obtain a competitive advantage through satisfying customer needs and creating superior customer values ([17], [24], [7], [28]). Market orientation has been defined from various perspectives: (1) Behavioral perspective: [17], for instance, propose the steps of market orientation based on the consideration of tactics; (2) Cultural perspective: [24] describe how the role of market orientation as a value norm in organizational culture has been elevated as a strategy; (3) Market orientation is supplementary to the marketing concept: [10] propose that market orientation is to utilize competitive strategies and tactics with considerations of customer needs and responses of competitors.

"Market orientation" and "performance" has been widely recognized as closely related. Especially in previous studies of business administration and healthcare industries, such relationship is particularly stressed ([24], [18]). Some studies also empirically tested the moderating effect of environmental uncertainties on the relationship between market orientation and performance. For instance, [20] used a sample consisting of hospitals in a five-state region of the United States and found that the effect of marketing orientation on business performance is moderated by environmental uncertainties. However, antecedents that affect market orientation, especially in Asian nations, have seldom been addressed. For instance, hospitals around the island have been gradually managed with a market orientation since implementation of the NHI policy in Taiwan. What are the dominant factors that affect regional hospitals' adoption of a market orientation should be further investigated.

In recent years, the hospital management environment in Taiwan has seemingly become less stable after implementation of the NHI program. In the past, such environment was advantageous to hospitals and doctors, because there was no

limitation on total amount of reimbursement or total amount of patients to be served. Besides, as citizens become more conscious of their rights, patient-doctor relationships are no longer dominated by doctor's absolute power and professionalism. The increase of medical dispute cases in recent years ([32]) is an evidence of this phenomenon. From a performance comparison between public and private hospitals in Taiwan, we can find that private hospitals, such as Chang Gung Memorial Hospital and Kaohsiung Medical University Hospital, have taken a stride toward market-oriented management. In other words, private hospitals react to changes or uncertainties of the external environment faster than public ones. Public hospitals react to systematic or environmental uncertainties at a slower pace, mainly because most public servants would rather abide by regulations and take more convenient methods to avoid troubles. Practitioners in public hospitals are also more assured of career stability. Because the public system is rigid and the average income among practitioners in public hospitals is lower, public servants generally have less intention to proactively make changes to the status quo. Many public hospitals have inferior performance to private hospitals, mainly because their introduction of marketing approaches is not active and deep enough. Therefore, we agree with the empirical finding of [20] that hospitals in high uncertainty environments will be characterized by higher levels of market orientation than hospitals in low uncertainty environments.

H1: Private hospitals are faced with a higher level of environmental uncertainty than public hospitals and are thus characterized by higher levels of market orientation.

2.2 Organizational Entrepreneurship

[9] stresses that, in health care organizations, entrepreneurship refers to whether the administrator of the organization can undertake specific entrepreneurial activities, i.e. activities with an innovative and updated content. [33] points out that organizational entrepreneurship has been defined as a management method or a specific behavior of the administrator. Such behavior is intended to seek market opportunities through active pursuit of gains and management of resources. [15] also mention that corporate entrepreneurship is the process by which firms notice opportunities and act by organizing transactions between factors of production to create surplus value. [5] propose three dimensions of corporate entrepreneurship, including innovation, risk-taking, and proactiveness. [19] point out in an empirical study of state-run enterprises in China that an organization will experience a larger change if it exhibits stronger customer orientation, corporate entrepreneurship, and learning orientation. Simply put, an organizational will obtain a large change if it exhibits a higher level of creative culture or its administrator is willing to take higher risks for organizational resources. Besides, proactiveness of the administrator is also one of the important elements in development of market opportunities and customer orientation.

In Taiwan, private hospitals are operating under increasingly competitive pressure, and implementation of the NHI program has caused adverse impact on their income and amount of outpatient service. Therefore, private hospitals have a higher intention to make organizational changes to enhance competiveness and satisfy patient needs. [4] mention that local patients have become more conscious of consumer sovereignty after implementation of the NHI program. Hospitals need to not only emphasize medical quality but also collect feedbacks from patients to improve their services. In Taiwan, public institutions, including state-run enterprises and medical institutions, have long been protected by the government. Their administrative efficiency is low, and servants in public institutions are far less sensitive to the urgent need for reforms and innovations than servants in private ones. Private hospitals, on one hand, have less affluent medical resources than before, and on the other, are operating under more intense competitions. Many of them have gradually and proactively introduced a market orientation. Compared with public hospitals, they are more alert to management crises and more concerned about medical quality. For instance, most of them will set up feedback boxes and offer options of sickrooms to patients to satisfy their demands.

H2: Private hospitals are more influenced than public ones by their organizational entrepreneurship in market orientation.

Although the importance and necessity of medical quality is stressed in previous research ([27]), the relationship between quality context and market orientation is seldom addressed. Only [20] have revealed through a survey on 293 high-ranking executives in 175 US hospitals that quality context has no significant influence on market orientation, and quality context significantly moderates the relationship between quality context and market/product development (MPD). The difference in variables between public and private hospitals, especially in Asian nations, is seldom explored.

2.3 Issues concerning professional ethics of hospitals

The ethics of practitioners in hospitals has been a concern among administrations of hospitals, medical schools, and the mass media in Taiwan. In the wake of the occurrence of several significant events, including protest and leave of position of some medical staff during the outbreak of SARS, a series of cases involving physicians castrating medical records, and rejection of patients with severe diseases, Department of Health (DOH) and executives of medical universities in Taiwan have set up high ethical and moral standards for physicians. Some drastic reforms can thus be expected. For instance, long-term strategies are adopted. Performance in aspects other than the academic achievement is also considered in the selection of medical school students. Interview, test of personality, and test of their perception of life are also conducted, in an attempt to admit students who are more compliant with the ethical standards into medical schools. Besides, practitioners are also required to attend courses of ethics education. Practitioners who violate regulations governing medical ethics will be forced to take the courses again. Researchers of professional ethics have proposed that it is a sense of responsibility and a conduct of avoiding self-interest orientation during provision of service [35]. [36] argue that organizations with an intention to provide better and higher quality services are more likely to adopt a market-oriented management model.

H3: Private hospitals pay more attention to professional ethics and are more market-oriented than public hospitals.

2.4 Medical Service Quality Models

Previous studies on medical service quality are mostly focused on the following issues: (1) Most of them directly apply PZB's five dimensions of service quality ([26], [21], [22], [4]) or derive dimensions from PZB's model to measure hospital service quality ([3], [37]); (2) Some of them apply the context of total quality management (TQM) to explore factors affecting patient satisfaction with hospitals ([39], [23]); (3) or utilize continuous quality improvement methods to improve medical service quality [30]. As to the relationship between market orientation and service quality, most research agrees that hospital's market orientation has a positive effect on service quality. For instance, the empirical evidence of 175 US hospitals in [27] suggests that market orientation is beneficial to improvement of service quality. [13] point out that marketing is targeted at external presentation of quality, and the commonly called service quality is a construct of product or service. Market orientation and service quality are two sides of one coin and highly correlated. We can therefore infer that hospital with a market orientation take customer satisfaction and service quality improvement as their goals, so market orientation has positive effect on their performance. The empirical evidence in [35] also suggests that market-oriented hospitals will exhibit better organizational performance.

H4: Market orientation has significant and positive influence on hospital's organizational performance.

3 Methodology

3.1 Research Procedure

We attempted to have a better understanding of the antecedent variables of hospital's market orientation through qualitative expert interviews. Therefore, senior management professionals with a medical background and an executive position in regional hospitals were selected for in-depth interview. The results would serve as a basis for the subsequent questionnaire development. Through a pretest, the questionnaire items were modified to produce a final questionnaire. In this paper, public hospitals refer to municipal or county hospitals, and private hospitals refer to hospitals established in the name of a foundation but whose management personnel do not have the qualification as a public servant or a public hospital physician.

3.2 Research Structure

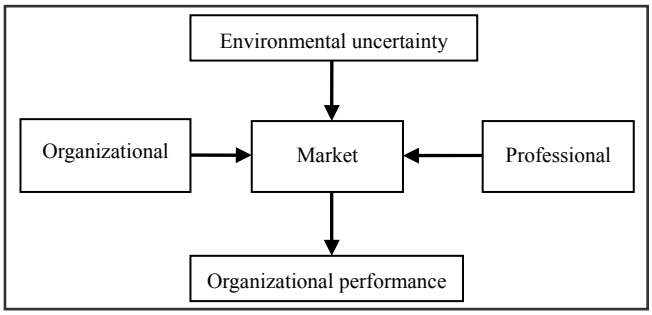


Fig.1 Research structure

3.3 Population and Sampling Method

The subjects were mid and high-ranking executives in hospitals, public and private, with more than 100 sickbeds in Taipei, Taichung, and Kaohsiung. A total

of 152 questionnaires were distributed (48 copies to public hospitals and 104 to private hospitals). Through reminding and urging on the telephone, 72 valid responses were returned. The valid response rate was about 46%.

3.4 Reliability and Validity Analyses

According to [25], reliability exceeding 0.7 denotes high reliability. [6] also proposes that Cronbach's alpha greater than 0.7 denotes high reliability, Cronbach's alpha between 0.7~0.35 is an acceptable level, and Cronbach's alpha below 0.35 should be rejected. In this paper, all the dimensions have a reliability value above 0.75 (as shown in Table 2), meaning that the overall reliability is better than the acceptable level. Besides, the questionnaire was designed with reference to opinions of previous scholars (see Table 1). The items of the questionnaire covered most of the constructs to be measured, so content validity of this questionnaire was assured.

Table 1 Conceptual definition of each dimension

Dimension	Conceptual definition and items	References and modifications
Environmental uncertainty	Environmental uncertainty is defined as the level to which the macroeconomic and competitive environment is advantageous to hospital management. Items in this dimension include: The degree of competition in hospital management; The barrier to entry into the medical industry; Generally, patients' demand for service quality; Legal control and assurance of quality of hospital products and services.	[27]
Organizational entrepreneurship	Organizational entrepreneurship refers to the degree of innovativeness, risk-taking, and proactiveness of the manager of an organization. Items in this dimension include: Compared with competitors, our hospital tends to take higher risks; Compared with competitors, our hospital tends to be more engaged in strategic planning; Compared with competitors, our hospital has a better ability to confirm patient needs; Compared with competitors, our hospital has a better ability to confirm new development opportunities; Compared with competitors, our hospital is more innovative; Compared with competitors, our hospital has set up a reward mechanism to encourage development of new businesses.	[19] and [29]
Professional ethics	Professional ethics is defined as conducting medical practices in accordance with all the regulations and not in violation with moral or ethical norms in the medical field during treatment of and contact with patients. Items in this dimension include: I always put patient's interests before my interests; High-ranking executives always put hospital interest before their interests; I usually put myself in patient's shoes; I always adhere to the highest standards of medical ethics to treat my patients; I am always honestly explain to my patients about their health conditions; I always do my best to deal with patient's business.	[35]
Market orientation	Market orientation refers to obtaining a competitive advantage through satisfying customer needs and creating superior customer values. Items in this dimensions include: We deeply understand what patients need; Our primary goal is to satisfy our patients; We provide facilities of varying medical standards for patients to choose from; We can quickly react to patient's feedback or complaint; We can satisfy patients' demands for medical facilities of various standards; We can quickly react to competitors' activities; The executives discuss about strategies of the competitors on a regular basis; We always follow regular norms of hospital management.	[24], [12] and [35]
Organizational performance	Organizational performance refers to the hospital's healthcare quality, profitability, revenue, and financial performance in the last three years. Items in this dimension include: Compared with the health quality performances of the last three years, the hospital has made some progress this year; Compared with the profitability of the last three years, the hospital has made a significant improvement this year; Compared with the financial performance of the last three years, the hospital has a significant improvement in financial performance this year; Compared with patients' ratings of the hospital's medical services in the last three years, there is a significant improvement in their satisfaction this year.	[35] and [36]

3.5 Hypotheses Testing

We adopted testing methods for nonlinear fuzzy neural network model, including analysis of variance and regression analysis. Besides, we also used a nonlinear fuzzy neural network model to test the proposed hypotheses. We adopted the fuzzy neural network model for the following reasons: First of all, interactions between variables can be more precisely captured. According to [34], neural network has the ability identify data types and relations within the data, so it can be applied to multivariate statistical analysis. Secondly, this model can be applied for varying purposes and has been developed to a mature state. It can be used for forecasting and classification, and such capabilities also apply to uncertain behavior systems. This model has the following advantages: (1) It can approximate any nonlinear function (the research sample is a highly nonlinear function); (2) All quantitative or qualitative messages are evenly distributed among the neurons of the network, so the model has good fault tolerance and robustness; (3) Under parallel distributed processing, fast computing of a large amount of data is possible. This model is thus suitable for analysis of a nonlinear system involving complicated behaviors in the domain of business administration; (4) Few preprocessing operations are required. Users of the model only need data for the input layer and the output layer, input them into the system, and they can obtain relationships among variables; and (5) Through iterative learning, it can be applied to empirical studies without prior knowledge of the relationships among variables and sampling method. Therefore, it can be applied to a larger scope of areas than conventional statistical methods.

3.6 Structure of the Fuzzy Neural Network

We attempted to apply the fuzzy neural network technique and Sugeno's [31] fuzzy inference system to fuzzify collected data into fuzzy values using membership functions and fuzzy subsets. Through this process, the internal mapping between original input/output data and input/output data of the system (a precise mathematical model) can be transformed into a fuzzy relationship expressed by if (fuzzy subset of input linguistic variables) and then (fuzzy subset of output linguistic variables), and a fuzzy model can be created. Besides, each linguistic variable can be further divided into various degrees from low, mid to high or more detailed variables to obtain more accurate results. "Fuzzification" → "fuzzy inference" → "fuzzy judgment" makes up the most fundamental framework of a fuzzy system. After a fuzzy system is expressed as a network structure, a fuzzy neural network can be obtained. The effect of this neural network is equivalent to that of a fuzzy system at the input and output, and the internal weighted values or node parameters can be modified through learning. Besides, through certain learning algorithms, the optimal membership functions and fuzzy rules can be automatically generated. These membership members and fuzzy rules can be later used to derive a nonlinear model of the system.

In this paper, we explain this model using a three-input and one-output neural network structure. This structure can be extended for models involving more inputs or outputs. The structure is shown in Figure 2.

3.7 Research Procedure

1. All the collected responses were organized to obtain 152 records.

2. Four hypothesized input and output variables were defined, and the number of membership functions that each variable corresponds to was determined.

3. Training of the fuzzy neural model was conducted. Each learning epoch consisted of training with 152 records. Parameters were updated during the training to obtain the optimal shape of membership functions and rule base.

4. After the training, a fuzzy neural model was obtained, and the effect of each input variable on output variables could be tested. Because the effect of a certain input variable on output variables was to be tested, except the tested input variable, all the variables were held constant (the means among the 152 records were obtained to minimize the effect of these variables). The values of the tested input variable were confined to a range between 1.5~4.5 to comply with the actual data range.

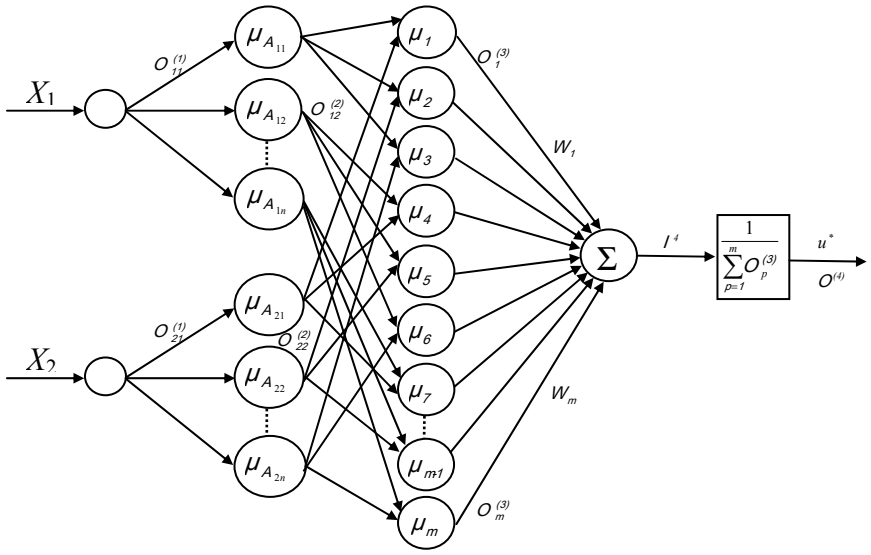


Fig. 2 Structure of the fuzzy neural network

1. Layer 1: Input layer

Input units: $I_I^{(1)} = X_1, i = 1,2$

Output units: $O_{ij}^{(1)} = I_i^{(1)}, i = 1,2; j = 1,2,\Lambda,n$

2. Layer 2: Linguistic term layer

Gaussian function is used to infer the membership degree of each output unit of Layer 1.

Input units:

$$I_{ij}^{(2)} = -\frac{(O_{ij}^{(1)} - a_{ij})^2}{b_{ij}^2}, i = 1,2; j = 1,2,\Lambda,n$$

Output units:

$$O_{ij}^{(2)} = \mu_{A_{ij}} = \exp(I_{ij}^{(2)}), i = 1,2; j = 1,2,\Lambda,n$$

where a_{ij} and b_{ij} respectively denote the center and the width parameters of the Gaussian function.

3. Layer 3: Rule layer

The fitness value of each rule in the rule base is estimated.

Input units:

$$I_{(j-l)n+l}^{(3)} = O_{ij}^{(2)} O_{2l}^{(2)}, j = 1,2,\Lambda,n; l = 1,2,\Lambda,n$$

Output units: $O_i^{(3)} = \mu_i = I_i^{(3)}, i = 1,2,\Lambda,m(=n^2)$

4. Layer 4: Output layer

Input units: $I^{(4)} = \sum_{p=1}^{m} O_p^{(3)} W_p$

Output units: $O^{(4)} = \mu^* = \frac{I^{(4)}}{\sum_{p=1}^{m} O_p^{(3)}}$

Based on the above structure, a typical rule can be written as follows:

if X_1 is $\mu_{A_{11}}$ then $W_1 = K_1$

K_1 = constant (zero-order Sugeno fuzzy model)

or

$K_1 = p \times X_1 + q \times X_2 + r$ (first-order Sugeno fuzzy model, p, q, r are all constants)

In this paper, the membership functions (a_{ij} and b_{ij}) were optimized using the steepest descent method of the back-propagation model. The rule base (K) was fine tuned using the least square estimation method.

4 Empirical Results

In order to test H1, H2, and H3, analysis of variance was adopted. The results are presented in Table 2~4. As shown in these tables, private hospitals showed more significant differences than public ones in the test of the effect of environmental uncertainty, entrepreneurship, and professional ethics on market orientation. To further test the effect of each variable on market orientation, we adopted multiple regression analysis. As shown in Table 5, private hospitals are significantly influenced by environmental uncertainty (β=0.376), entrepreneurship (β=0.458), and professional ethics (β=0.317) in their market orientation. However, public hospitals are

not significantly influenced by any of these antecedent variables in their market orientation. Therefore, H1, H2, and H3 are all supported.

In addition, we also applied regression analysis to test H4. As shown in Table 6, market orientation has significant and positive influence on organizational performance (F=25.79, p<0.01). Thus, H4 is supported.

Table 2 Analysis of variance of the effect of environmental uncertainty on market orientation among public and private hospitals

Hospital type	Mean	S.D.	F-value	P-value
Private	152.3	24.6	29.621	0.000***
Public	116.8	33.1	0.519	0.482

*p<0.05, **p<0.01, ***p<0.001

Table 3 Analysis of variance of the effect of entrepreneurship on market orientation among public and private hospitals

Hospital type	Mean	S.D.	F-value	P-value
Private	169.6	29.6	35.684	0.000***
Public	132.8	35.7	0.052	0.641

*p<0.05, **p<0.01, ***p<0.001

Table 4 Analysis of variance of the effect of professional ethics on market orientation among public and private hospitals

Hospital type	Mean	S.D.	F-value	P-value
Private	147.5	39.5	49.874	0.000***
Public	118.7	46.8	0.013	0.856

*p<0.05, **p<0.01, ***p<0.001

Table 5 Regression analysis of the effect of antecedent variables on market orientation

Antecedent	Standardized estimate (β)	t-value	p-value
Private hospitals	0.196	2.142	0.006**
Environmental uncertainty	0.376	2.725	0.003**
Entrepreneurship	0.458	2.652	0.005**
Professional ethics	0.317	2.846	0.002**
Public hospitals	0.085	0.591	0.681
Environmental uncertainty	0.006	0.065	0.921
Entrepreneurship	0.001	0.007	0.984
Professional ethics	0.019	1.425	0.132

F-value=3.249 p-value=0.000*** R=0.624 R-square=0.416 Adjusted R-square=0.312

*p<0.5, **p<0.01, ***p<0.001

Table 6 The effect of market orientation on organizational performance

β coefficient / Independent variable	Organizational performance	F-value	p-value	R^2	Adj R^2
Market orientation	0.153**	25.79**	0.000	0.086	0.083

*p<0.05, **p<0.01

The relationship between environmental uncertainty and market orientation, as hypothesized in H1, is discussed as follows. Each input variable had two membership functions, namely Low and High, and the rule base was based on a zero-order Sugeno fuzzy model. Through 137 learning epochs, the average testing error was 0.1026, as shown in Figure 3. In Figure 3, ˙denotes the testing data, and ♦ denotes the output data obtained from the fuzzy neural network model. The values of "environmental uncertainty" and "market orientation" are closely distributed, indicating that there is a significant and positive relationship between the two variables.

The difference between public and private hospitals in this relationship was further tested. Each input variable had two membership functions, namely Low and High, and the rule base was based on a zero-order Sugeno fuzzy model. Through 158 and 167 learning epochs, the average testing errors were 0.1154 and 0.1349, respectively. The testing

result is shown in Figure 4(a) and 4(b). In these figures, ˙denotes the testing data, and ♦ denotes the output data obtained from the fuzzy neural network

model. From the distribution of ˙ and ♦ in the two figures, we can find that the values of "environmental uncertainty" and "market orientation" obtained from private hospitals are very close (as shown in Figure 4(a)), and the values of "environmental uncertainty" and "market orientation" obtained from public hospitals are unevenly distributed. Therefore, H1 is supported.

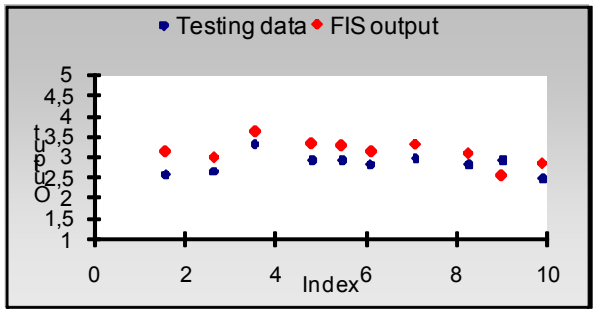
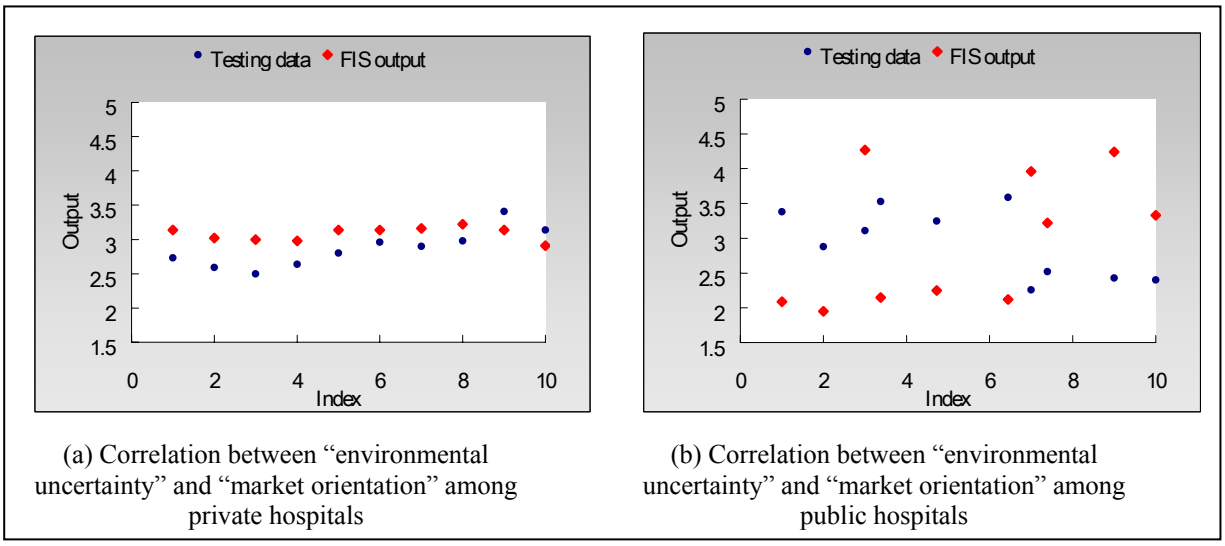


Fig. 3 Input variables and membership functions of "environmental uncertainty" and "market orientation"



(a) Correlation between "environmental uncertainty" and "market orientation" among private hospitals

(b) Correlation between "environmental uncertainty" and "market orientation" among public hospitals

Fig. 4 Input variables and membership functions

The relationship between entrepreneurship and market orientation, as hypothesized in H2, is discussed below. Each input variable had two membership functions, namely Low and High, and the rule base was based on a zero-order Sugeno fuzzy model. Through 189 learning epochs, the average testing error was 0.1847. The testing result is presented in Figure 5. In Figure 5, ˙denotes the testing data, and ♦ denotes the output data obtained from the fuzzy neural network model. The values of "entrepreneurship" and "market orientation" are closely distributed, indicating that there is a significant and positive relationship between the two variables. The effects of "entrepreneurship" on "market orientation" for public and private hospitals were compared. Each input variable had two membership functions, namely Low and High, and the rule base was based on a zero-order Sugeno fuzzy model. Through 206 and 189 learning epochs, the average testing errors were 0.1249 and 0.1487, respectively. The testing result is shown in Figure 6(a) and 6(b). From the distribution of ˙ and ♦ in the two figures, we can find that the values of "entrepreneurship" and "market orientation" obtained from private hospitals are very close (as shown in Figure 6(a)), and the values of "entrepreneurship" and "market orientation" obtained from public hospitals are unevenly distributed. Therefore, H2 is supported

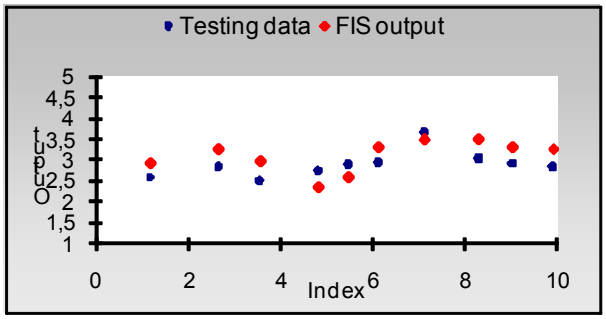
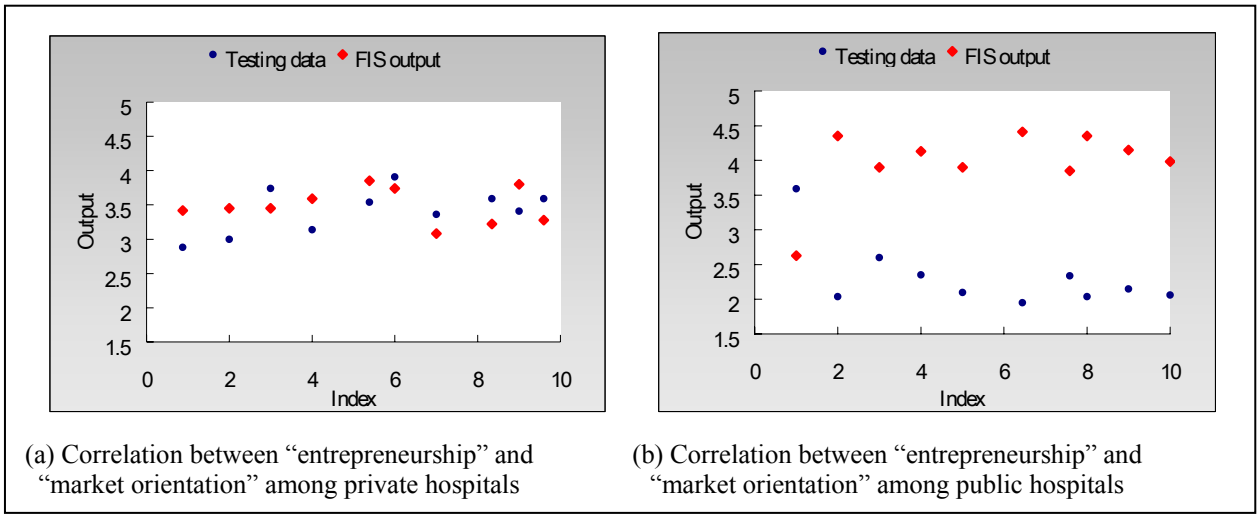


Fig.5 Input variables and membership functions of "entrepreneurship" and "market orientation" of "environmental uncertainty" and "market orientation" among public and private hospitals



(a) Correlation between "entrepreneurship" and "market orientation" among private hospitals

(b) Correlation between "entrepreneurship" and "market orientation" among public hospitals

Fig. 6 Input variables and membership functions of "entrepreneurship" and "market orientation" among public and private hospitals

H3 was verified following the above procedure. Through 218 learning epochs, the average testing error was 0.1875. The testing result is presented in Figure 7. In this figure, ˙denotes the testing data, while ♦ denotes the output data obtained from the fuzzy neural network model. The values of "professional ethics" and "market orientation" are closely distributed, indicating that there is a significant and positive relationship between the two variables. The effects of "professional ethics" on "market orientation" for public and private hospitals were compared. Each input variable had two membership functions, namely Low and High, and the rule base was based on a zero-order Sugeno fuzzy model. Through 219 and 163 learning epochs, the average testing errors were 0.1129 and 0.1856, respectively. The testing result is shown in Figure 8(a) and 8(b). From the distribution of ˙ and ♦ in the two figures, we can find that the values of "professional ethics" and "market orientation" obtained from private hospitals are very close (as shown in Figure 8(a)), and the values of "professional ethics" and "market orientation" obtained from public hospitals are unevenly distributed. Therefore, H3 is supported.

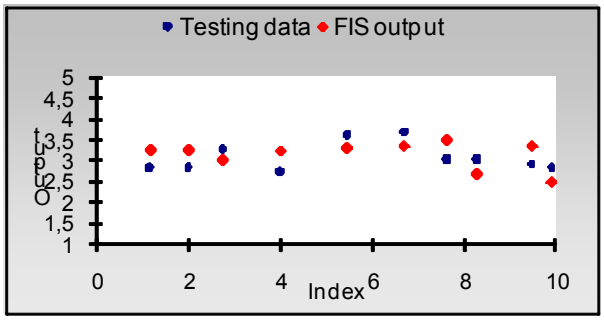
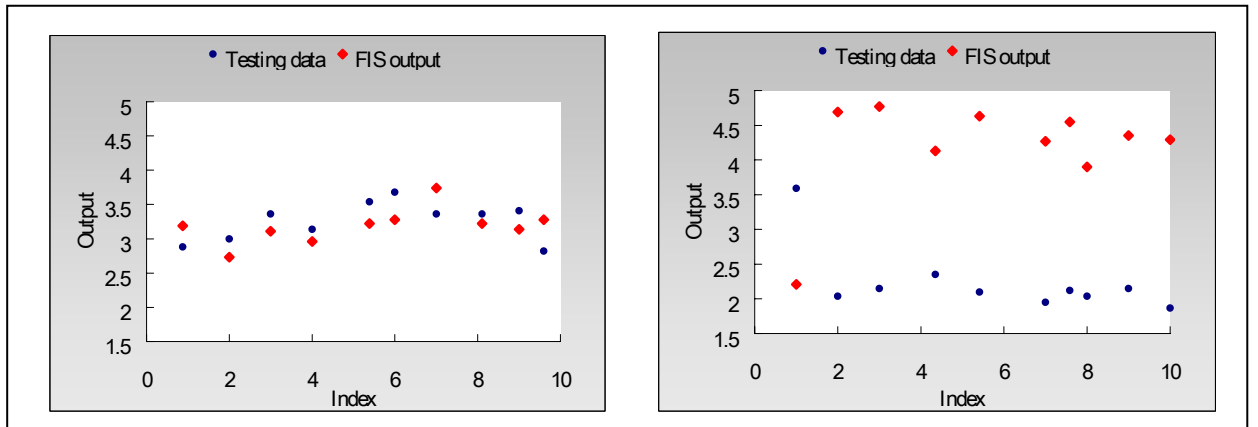


Fig.7 Input variables and membership functions of "professional ethics" and "market orientation"



(a) Correlation between "professional ethics" and "market orientation" among private hospitals

(b) Correlation between "professional ethics" and "market orientation" among public hospitals

Fig. 8 Input variables and membership functions of "professional ethics" and "market orientation" among public and private hospitals

H4 was verified following the same procedure. Through 148 learning epochs, the average testing error was 0.1105. The testing result is presented in Figure 9. In this figure, ˙denotes the testing data, while ♦ denotes the output data obtained from the fuzzy neural network model. As shown in this figure, the values of "market orientation" and "organizational performance" are closely distributed, indicating that there is a significant and positive relationship between the two variables.

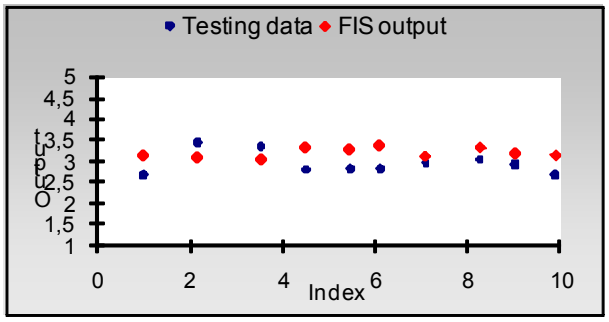


Fig. 9 The input variables and membership functions of "market orientation" and "organizational performance"

5 Conclusions and Suggestions

In this paper, hypotheses were tested using a statistical analysis method and fuzzy neural network model, respectively. All the hypotheses were supported in both tests. From the testing results, the following conclusions were obtained. (1) The empirical results are consistent with the findings in [35]: organizational entrepreneurship positively influences market orientation, and market orientation also positively influences organizational performance. However, this paper distinguishes itself from [35]'s study by including a further comparison between public and private hospitals. The empirical results are inconsistent with the findings in [27]. [27] emphasize that market orientation is a mediator variable in the relationship between quality context and quality outcome. (2) The empirical results show that private hospitals in Taiwan are facing increasingly competitive pressure and have thus directed their management strategies toward commercialization. For patients, such tendency will propel hospitals to improve medical quality and establish better patient-doctor relationships, which is a win-win situation. Besides, because private hospitals are operating under flexible systems and public hospitals tend to adopt more conservative management models, the pricing gap between the two types of hospitals will be larger in the future. (3) The empirical result of H3 (Private hospitals pay more attention to professional ethics than public hospitals) does not imply that practitioners in private hospitals follow higher moral standards. The reason for this outcome is that private hospitals adopt stricter management methods. They may use various disciplinary and rewarding measures to ensure that all practitioners are prudent in their practices. (4) The empirical results reflect that private hospitals react to environmental pressures faster than public hospitals. This phenomenon can also be observed among other types of civil organizations whose performance is affected by their organizational culture.

Compared with previous studies, this study has the following features: (1) The difference in market orientation between public and private hospitals in Taiwan is seldom addressed in previous studies. Unlike these studies, which are mainly focused on hospitals in the US and European nations, this paper discusses market orientation among hospitals in Taiwan. (2) Previous research on issues concerning hospital management is mostly concentrated on discussion of medical quality, and the research on factors affecting hospital's market orientation is really rare. However, investigation of these factors is really necessary. (3) Integration of multivariate analysis and nonlinear fuzzy neural network model for an empirical test is rare among previous studies of related issues. This methodology is expected to be more contributive to the academic area.

Suggestions for future researchers: (1) Variables which may moderate market orientation and their moderating effects, such as leadership style which may moderate the relationship between firm policy and market orientation, can be explored. (2) The effect of hospital resources and competency on adoption of a market orientation can be investigated from the view of core competency. (3) Other variables, such as authoritarian leadership, or a long-term cross-sectional study can be included to increase the breadth of the research factors. (4) Other research methods, such as linear structured equation modeling (SEM), can be applied to verify the result of hypothesis testing. Such application will be more contributive to the academic area.

The research constraints are as follows: (1) Using a sample of hospitals with more than 100 sickbeds may derive inaccurate results. In Taiwan, hospitals are classified into teaching hospital, medical center, and regional hospital. The service area, medical facilities, available clinics, and hospital scale may vary greatly across different scales of hospitals. Therefore, the service area,

medical facilities, available clinics, and scale of a hospital may affect the urgency for adopting a market orientation. (2) Some of the questionnaire items require evaluation of personal ethics and professional ethics. For self-defense, respondents would not have honestly reflected their true evaluations. (3) This paper uses cross-sectional data to investigate factors affecting hospital's adoption of a market orientation. Future researchers are suggested to use longitudinal data or qualitative in-depth interviews to investigate the same issue and obtain more in-depth implications.

References:

[1] Bowers, M. R., Swan, J. E. & Koehler, W. F., What attributes determine quality and satisfaction with a health care delivery? *Health Care Management Review*, Vol.19, 1994, pp.49-55.

[2] Carey, R.G.. & Seibert, J. H., A patient survey system to measure quality improvement questionnaire reliability and validity. *Medical Care*, Vol.31, No.9, 1993, pp.34-845.

[3] Charska, N. I., Use of medical service and satisfaction with ambulatory care among a rural Minnesota population. *Publish Health Report*. Vol.95, No.1, 1980, pp.44-52.

[4] Chou, Shieu-Ming, Chen, Thai-Form, Woodard, Beth & Yen, Miao-Fen , Using SERVQUAL to evaluate quality disconfirmation of nursing service in Taiwan. *Journal of Nursing Research*, Vol.13, No.2, 2005, pp.75-83.

[5] Covin, J. G. & Slevin, D.P., A conceptual model of entrepreneurship as firm behavior. *Entrepreneurship Theory and Practice*, 1991,pp.7-25.

[6] Cuieford, J. P., *Fundamental statistics in psychology and education*, New York :McCraw Hill, 1965.

[7] Deshpande, R., Farley, J.U. & Webster, F. E., Corporate culture, customer orientation and innovativeness in Japanese firms: A Quadrad analysis. *Journal of Marketing*. Vol.57, 1993, pp.23-27.

[8] Friedman, M.A., Issue in measuring and improving health care quality. *Health Care Financing Review*, Vol.16, No.4, 1995, pp.155-173.

[9] Guo, K. L., Entrepreneurship management in health services: An integrated model. *Journal of Health & Human Service Administration*, Vol.28, No.4,2006, pp.504-530.

[10] Hunt, S. D. & Morgan, R.M., The comparative advantage theory of competition. *Journal of Marketing,* Vol.59, April, 1995, pp.1-15.

[11] James, B. C., Physicians and quality improvement in hospitals: How do you involve physicians in TQM? *Journal for Quality & Participation*, Vol.*25*, No.2, 2002, pp.56-63.

[12] Jaworski, B.J. & Kohli, A.K., Market orientation: Antecedents and consequences. *Journal of Marketing*, Vol.57, July, 1993, pp.53-70.

[13] Johnson, M. D. & Gustafsson, A., *Improving customer satisfaction loyalty and profit: An integrated Measurement and Management System*. Jossey-Bass. San Francisco, 2000.

[14] Jone, J., Improving quality through patient provider communication. *Journal of Health Care Marketing*, 1992, pp.51-60.

[15] Jones, G.R.& Butler, J.E., Managing internal corporate entrepreneurship: An agency theory perspective. *Journal of Management*, Vol.18, No.(4), 1992, pp.733-749.

[16] June, H.L. & Lois, V. B., Defining patient perceived quality of nursing care. *Journal of Nursing Care Quality*, Vol.16, No.1, 2001, pp.34-60.

[17] Kohli, A.K. & Jaworski, B.J., Market orientation: The construct, research propositions and managerial implications. *Journal of Marketing*, Vol.54, No.2, 1990, pp.1-18.

[18] Kumar, K., Subramanian, R. & Yauger, C., Examining the market orientation-performance relationship: A context-specific study. *Journal of Management*, Vol.24, No.2, 1998, pp.201-233.

[19] Liu, S.S., Luo X. & Shi, Yi-Zheng., Integrating customer orientation, corporate entrepreneurship and learning orientation in organizations-in-transaction: An empirical study. *International Journal of Research in Marketing*, Vol.19, 2002, pp.367-382.

[20] Lonial, S.C. & Raju, P.S., The impact of environment uncertainty on the market orientation—performance relationship: A study of the hospital industry. *Journal of Economic and Social Research*, Vol.3, No.1, 2001, pp.5-27.

[21] McAlexander, J. H., Kaldenberg, D. O. & Koening, H. F., Service Quality Measurement. *Journal of Health Care Marketing*, Vol.14, No.3, 1994, pp.34-40.

[22] Minjoon, J. R., Peterson, R. T. & Zsidisin, G.A., The identification and measurement of quality dimensions in health care: Focus group interview results. *Health Care Management Review*, Vol.23, No.4, 1998, pp.81-96.

[23] Motwani, J. S. & Brashier, L.W., Implementing TQM in the health care sector. *Health Care Management Review*, Vol.21, No.1, 1996, pp.73-82.

[24] Narver, J. C. & Slater, S. F., The effect of a market organization on business profitability. *Journal of Marketing*, Vol.54,October, 1990, pp.20-35.
[25] Nunnally, J. *Psychometric theory*, New York: McGraw Hill, 1978.
[26] Parasuraman, A., Zeithaml, V.A. & Berry, L.L., A conceptual model of service quality and its implication for future research, *Journal of Marketing*, Vol.49,(Fall), 1985, pp.41-50.
[27] Raju, P S. & Lonial, S.C., The impact of service quality and marketing on financial performance in the hospital: An empirical examination. *Journal of Retailing and Consumer Service*. Vol.9, 2002, pp.335-348.
[28] Slater, S. F. & Narver, J.C., Market orientation, customer value and superior performance. *Business Horizons*. Vol.37, No.2, 1994, pp.22-28.
[29] Smart, D.T.& Conant, J.S., Entrepreneurial orientation, distinctive marketing competencies and organizational performance. *Journal of Applied Business Research*, Vol.10, No.(3), 1994, pp.18-28.
[30] Solberg, L.I., Kottke, T.E., Brekke, M.L., Calomeni, C. A., Conn, S. A. & Davidson, G., Using continuous quality improvement to increase preventive services in clinical practice—going beyond guidelines. *Preventive Medicine* , Vol.25, 1996, pp.259-267.
[31] Sugeno, M. *Industrial Applications of Fuzzy Control*, Elsevier Science Pub. Co.,1985.
[32] Taiwan Health Care Reform Foundation Reference on Medical Disputes, Taipei, 2003.
[33] Thompson, J.L., A strategic perspective of entrepreneurship. *International Journal of Entrepreneurship Behavior & Research*, Vol.5, No.6, 1999, pp.279-296.
[34] White, H., Some asymptotic results for learning in single hidden layer feed-forward network models. *Journal of the American Statistical Association* , Vol.84, 1989, pp.1003-1013.
[35] Wood, V. R., Bhuian, S.& Kiecker, P., Market orientation and organizational performance in not-for-profit hospitals. *Journal of Business Research*, Vol.48, 2000, pp.213-226.
[36] Wood, V. R.& Bhuian, S. N., Market orientation and nonprofit organizations: Performance associations and research propositions. *Journal of Nonprofit & Public Sector Marketing*, Vol.1, No.1, 1993, pp.7-32.
[37] Woodside, A.G., Fred, L. & Daly, R.T., Linking service quality, customer satisfaction and behavior. *Journal of Health Care Marketing*, Vol.9, 1989, pp.5-17.
[38] Vandamme, R.& Leunis,J., Development of a multiple-item scale for measuring hospital. *Journal of Service Industry Management*, Vol.4, No.3, 1993, pp.30-49.
[39] Ziegenfuss, A. & O'Rourke, O., Patient complaints and total quality management: An examination of fit, *The Joint Commission*, 1995, pp.133-142.