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Information Regarding:

**The International Journal of Organizational Innovation (IJOI),
The 2014 International Conference on Organizational Innovation, and
The International Association of Organizational Innovation (IAOI).**

The International Journal of Organizational Innovation (IJOI) (ISSN 1943-1813) is an international, blind peer-reviewed journal, published quarterly. It may be viewed online for free. (There are no print versions of this journal; however, the journal .pdf file may be downloaded and printed.) It contains a wide variety of research, scholarship, educational and practitioner perspectives on organizational innovation-related themes and topics. It aims to provide a global perspective on organizational innovation of benefit to scholars, educators, students, practitioners, policy-makers and consultants. All past issues of the journal are available on the journal website. Submissions are welcome from the members of IAOI and other associations & all other scholars and practitioners. Student papers are also welcome.

For information regarding submissions to the journal, go to the journal homepage:
<http://www.ijoi-online.org/> To Contact the IJOI Editor, email: ijoinnovation@aol.com

Note: the format for this Journal has changed with the January, 2013 issue. The journal is now published in a two-column format (instead of the single column format used in prior issues). Please see the new Author Writing Guidelines on the Journal's website, as well as a sample article showing how they will appear in the new format.

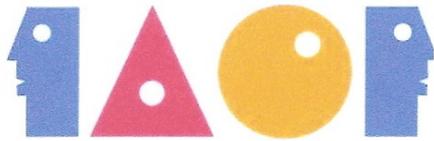
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<http://www.iaoiusa.org>

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The **2014 ICOI Conference** will be held in Manila, Philippines at De La Salle University, **August 13-15, 2014**. Complete details will be available soon.

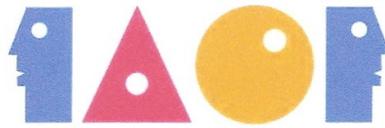
The 2015 ICOI conference location is Jogja/Jogjakarta, Indonesia. Jogja is a famous tourist destination after Bali. For more information, please visit <http://www.yogyes.com/> the Air-angga University will be the Host



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HUMAN RESOURCE MANAGEMENT: A STRATEGIC THEORETICAL PERSPECTIVE

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Abstract

The development of strategic roles requires a paradigm shift to the program of training and development, so that it could be obtained the much deeper consideration to the purposes and goals of the development directions. The initial focus of the department of training and development was on the products. The staffs would develop the products as many as possible and offer those products to the organizations. It came to our mind, a little bit, if a program was needed or in reality, could be used. The objectives were to produce products as many as possible for being used by a group or an individual as many as possible. The shift of the training program was focused much more on the service aspect and it made the department of training and development experiencing much more progress. Here, the department of training and development emphasized that both products and services should comply with the form of actual needs of the users. The concept of the training program was the clients' involvement, and the service aspect to the customers became the most important thing. With various types of well-identified customers, the staffs would focus much more on the efforts of assuring that all customers would be very much pleased with the products and services provided for the customers.

Keywords: Human Resource, Strategic Theory, Training and Developing Trends.

Introduction

In recent decades, it has developed an interest in the field of "Strategic Management" that resulted in the neglect of the resources owned by an organization. (Hutabarat and Huseini, 2006) Training and development programs are closely linked

to the strategic directions of the organization. The types of programs and services provided by the training and development function is more focused on customers and be proactive because the types of programs and services are supporting the strategic goals. The success rate of the program is measured in the amount of outcomes or

output that connect with other forms of strategic initiatives. The objectives of the new program types suggest the measures that support the strategic objectives that are directly or indirectly.

Strategic Role

Strategic management is a way leading company in the main goals; that is, the development of corporate values, managerial capabilities, organizational responsibilities, and administrative systems that are connecting the strategic and operational decision making at all levels of the hierarchy, and through all business lines of business and authority functions of the company.) Training and development functions are balanced in the assumed some role in developing and supporting the strategy type of organization. In some organizations, these functions only assume one or more of the role forms, while at the world-scale training and development organizations, the function develop the five forms of role to build a strong relationship with the strategy aspect. (Jack J. Phillips, 1999)

1. Strategic Planning. The first important role for training and development function is to develop its own strategic planning. This effort will bring the strategy aspect to the department level with the type of planning that must be closely linked to the strategic planning of the organization, which began with the mission statement and contain specific types of strategies that can be understood by members of staff for training and development, and can implement temporary while they try to keep in touch with the strategic direction of the organization.

2. Strategy formulation. Training and development department, as an important function within the organization, often help in developing the strategic planning for the organization. In this role, the leader of the training and development section

has a "deep engagement" in which the strategy was developed and produced an important input, which heightens the critical issues, put forward the necessary considerations that needed, and offer the recommendations and solutions to establish the direction. This is perhaps the most important role of the program in relation to the strategy.

3. Strategy Implementation. As different parts of the organization's strategic planning implementation, training and development functions often take part in the implementation process with the specific types of programs, services, and process. Almost every implementation process of strategy will require training programs and care services, because the elements of learning and application is essential to the achievement of strategic objectives.

4. Strategic Outcomes. Training and development programs operate strategically when such programs are directing the important measures of business and operations performances. When the current training and development programs and services are achieving the success, its provide business results that usually linked to the strategic objectives.

5. Strategy Training. The last role assumed by a number of training and development function is used to train the planning and implementation processes strategically to the other parties in the organization. Dynamic and complex organization requires an appropriate level of knowledge and skills toward the strategic planning and implementation processes. Managers, team leaders, supervisors, and - in some cases - all employees must understand the processes, requirements, tasks, and outputs of the strategic planning. Through consulting services and training programs, the training and development department can build the right type of expertise.

The operational framework can be used to develop a strategic role for the organization of training and development. See Framework in Figure 1. describes the specific questions about the type of strategic human resources. The development of strategic role requires a paradigm shift on the training and development programs so that there is a more in-depth consideration to the objectives of the development direction. As illustrated in Figure 2., the initial focus of the training and development department is on the product. Party staff de-

velop products as much as possible and offer it to the organization. In a catalog format, packs in a lot of patterns, training and development programs are selling these products in a similar process to the sales program of items which are *off-the-shelf* in the supermarket. (Jack J. Phillips, 1999) There is little thought, when the programs were needed or virtually working. The goal is to produce as much product as possible, and be used by groups and individuals as possible.

	Organizational	Process	Employees
Strategy / End Targets / Mission	<i>Organization:</i> Are organizational strategy and budget support strategic HR types? <i>Department of Training and Development:</i> Is the P&P strategy supports the type of strategic HR?	<i>Organization:</i> Are the organizational processes have end goals regarding the strategic human resources? <i>Department of Training and Development:</i> Are the processes of training and development programs have goals that can be measured to achieve strategic HR?	<i>Organization:</i> Are the goals of employees are related to the need of strategic HR? <i>Department of Training and Development:</i> Are the output and standard forms of training and development programs related to strategic human resource requirements?

Note: (Adapted from: Mc Clernon, Timothy R. dan Swanson, Richard A.. "Redefining HRD's Role in the Corporation: A Case Study on Becoming a World-Class Business Partner," In *Action Leading Organizational Change*. Elwood F. Holton dan Jack J. Phillips (eds.), Alexandria, Va.: American Society to Training and Development, 1997, p. 1-21).

Figure 1. Strategic Human Resource Development Performance Level of Training and Development Program



Source: Jack J Phillips, Ph.D., HRD Trends Worldwide, 1999.

Figure 2. Thinking Strategically

Shifting the training programs that focuses on the aspects of service makes training and development department has developed. In this case, the training and development department stressed that the products and services must meet the actual needs of the users. The concept of training program is the client parties' involvement, and the customer service aspect becomes very important. With various types of cus-

tomers are identified, the staff is focused on ensuring that the customer was happy with the product and service that delivered to them.

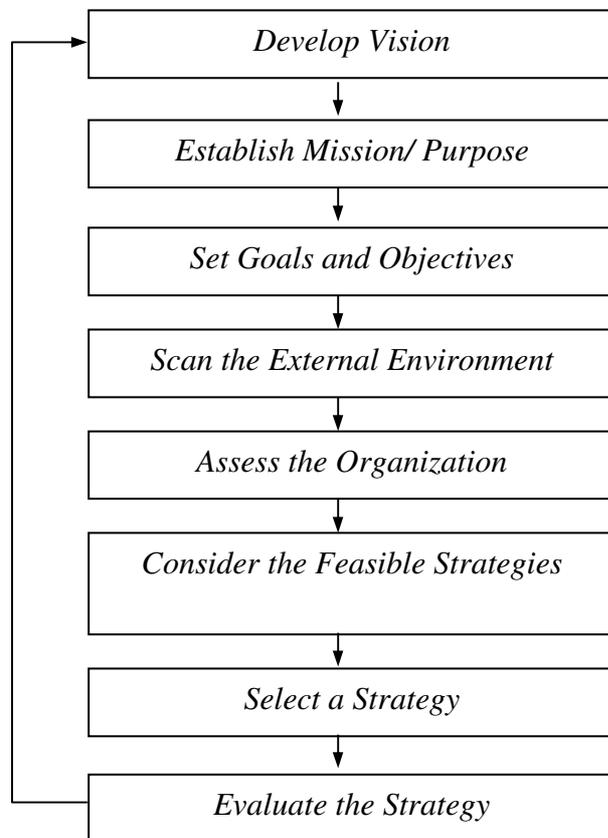
As evidence, the function of training and development is currently focused strategically, which means that the presence of considerations regarding the products and

services that meet the needs of organizational related to the strategic goals.

Thoughts lead to aspects of customer satisfaction levels which ensure that products and services are closely related to the types of strategies that are important in the organization and that the results expectedly achieved. This form of strategic thinking helps ensure the training and development function provides a decent value for the organization as well as being an important business partner to the management team.

The Traditional Strategic Planning Model

Various models of strategic planning reflecting various stages, process, and steps required to develop a strategic plan and process for the organization. The model shown in Figure 3., from the standpoint of training and development function, is considered as one of the most fruitful and practical model. (Jack J. Phillips, 1999)



Source: Jack J Phillips, Ph.D., HRD Trends Worldwide, 1999.

Figure 3. The Strategic Planning Process

Develop a vision. Important part in the efforts to develop a strategic direction of the department of training and development is to develop the right vision that reflecting the type of strategy and the other shifting

forms in the training and development function. Establish the mission / purpose. The next step of the model is to develop a specific mission or purpose for the training and development organization, regardless

of whether the department is positioned within the main department, division, unit, subsidiary, or the company as a whole. The mission statement describes why the organization is real there. The mission statement is usually simple, sometimes a single sentence, and serves as a reason for organizations to maintain its continuity. Set the final goals and objectives. The next logical step in the strategic planning model is to develop goals and objectives. Final goals are usually more common than objective and reflect the ideal description about where the organizational direction. Goals are usually more focused on specific things, with the measures, time frame, and sometimes even some form of responsibility. Goals and objectives of training and development programs should reflect, to some extent, the strategic goals and objectives for the units of organization serviced. Also, the goals and objectives of the program should support the strategic objectives of organization as a whole.

Observe the external environment. The next step is to observe the external environment for the important issues that will affect the strategic direction of organization. For training purposes, this step could involve efforts to examine the quality of new recruitments, resources for new employees training programs, resources for designing, developing, and distributing training programs, market conditions that affect the type- types of expertise and competence in the workplace, technology department, and the department of law and authority. For certain types of organizations, the external environment will contain a variety of influencing factors that can provide major input into the strategic planning process.

Assess the organization. In this step, the strength and weaknesses of the organization will be specified. Weakness indicates specific areas where process improvement should be done to enhance the effective-

ness and efficiency levels of education and training functions. Strength was also identified, which is an important asset of the function. This step requires an objective point of view to determine which issues are actual strengths and weaknesses.

Take into account the types of strategies are feasible. The next step is to consider the full range of types of potential strategies to develop the types of strategic planning. Feasibility is an important element, as well as the relationships forms on strategic needs of the whole business unit and organization. (Jack J. Phillips, 1999) In this step, all types of previously process, from vision to mission to the goals and objectives, were integrated to determine the specific strategic types where appropriate or suitable.

Choose the type of strategy. Strategies selected and implemented through schedules, assignments, and following specific responsibilities. Strategic planning are translated into the forms of operational planning for the training and development function, while specific programs and services were developed and distributed. The implementation process involves an effort to providing coordination, allocating the resources, developing the policies, and implementing the practice, as the strategy is implemented throughout the organization.

Evaluating strategies. The final step of the model is to evaluate the degree of success of the chosen strategy. This is a form of periodic view, which is sometimes carried out annually. The objective of this step is to measure or estimate the level of success of the strategy and planning back when needed. Thus, the cycle continues, as the adjustments efforts were made and a new type of strategy was developed.

The definition of HRM is the policies and practices that someone needed to run the "people" or human resource aspect

from a position of management, including recruitment, screening, training, reward, and assessment. While HRM Strategic can be defined as the combination of HRM with Organizational Strategic Management, or in other words, as the pattern of human resource activities that planned to achieve organizational goals. From the above definition, there are two important things that distinguish Strategic HRM and HRM, namely: (a) Vertically, Strategic HRM practices associated with strategic management processes in an organization; and, (b) Horizontally, Strategic HRM emphasis on the coordination and linkages between various practices of HRM. In addition, there are six essential elements in strategic HRM approach (Mangkuprawira, 2004) that is: (1) understanding the effect of external environmental; (2) understanding the dynamics influence and labour market competition; (3) long term focus; (4) focus on choice and decision making; (5) growth of all personnel; and, (6) integrity with corporate strategy.

The primary key idea of all strategic management keys is to coordinate all corporate resources, including human resources and any components that contribute to implement the strategy. If all functions are integrated, there will be no counter-productive and each individual work together in accordance with a clear direction synergistically. In other words, there is a perfect coordination and the combination use of managerial and operational functions, where it will make the entire company more valuable than any other company.

Differences Between Strategic and Traditional HRM

Basically, Strategic HRM approach involved in strategic planning, decision-

making and coordinating all HR for the entire employee. It is an approach to give full authority for the head of human resources unit in the organization. Strategic HRM also see the HR function as an integral part of all corporate functions such as marketing, production, finance, law and so on. Strategic HRM approach puts the deputy director of human resources as an integral part of a team. Nowadays, several theories developed can be divided into two groups, namely: (a) the theory of strategic HRM which encompass the Resource-based Theory, Behavior Perspective, Cybernetic Systems, and Transaction Cost Theory/Agency; and, (b) theory of Non-Strategic HRM which encompass the Model Dependence, and Institutionalism, can be shown in Table 1. (Mangkuprawira, 2004)

Strategic Operations

How the training department to be more strategic? Some form of action can be done through training and development functions for more related to aspects of strategy. Some type of action shows a paradigm shift for training staff, while others carry out the necessary actions that needed to develop the special kind of relationship. Ten special form of action are recommended. (See Table 2.)

Develop strategic planning. The training and development function should develop its own strategic planning. The function will have difficulty in obtaining the relation to overall strategy of organization if the function does not have its own strategic planning. This condition is often the first step in the process. Develop a strategic plan that will not only ensure the kind of relationship, but also indicates the type of competence in the strategic planning process.

Table 1. Differences between Strategic and Traditional HRM

Dimensions	Strategic HRM	Traditional HRM
Planning and Strategy Formulation	Involved in overall planning and linking the HR functions with corporate strategy	Involved only in operational planning
Authority	Has the function and authority status for top personnel employees (e.g, deputy director of HR)	The status and authority for medium employees (e.g, personnel director)
Scope	Concoers with all management and employees	Concoers primarily with employees daily, operations, and clerical
Decision Making	Fully integrated with the organizational, marketing, budget, legal and production functions	Moserat toward the limited inetgration with organizational functions
Coordination	Coordinate all HR activities, such as recruitment, staffing, and fair employment opportunities	Not all coordinate the HR functions

Source: Mangkuprawira, 2004.

Shift to the role of performance improvement. The shifting trend from training function to performance improvement function is an important step in the development of strategic relationships. Many types of strategic objectives that focus on the measurement of critical business performance, which can be improved through training and development function.

Establishing cooperative relationships with key managers/principal. Trend to develop forms of cooperation with the other members of managerial group is essential in relation with the aspects of strategy. The key managers are developing and implementing the major strategic objectives of organization. Work closely with the managers to meet their needs as well as to have support, assistance, and direction from them which will help ensure that the training function has been associated with the aspects of strategy.

Be focused on the customer. Because the aspects of relationship and satisfaction level to the customer are usually the stra

tegic issues, shifting the trend for training programs to be closer with the customer will help to guarantee the availability of close relationships with the aspects of strategy. When organizations operate in an environment that is mainly oriented to the customer, training and development function does not only have to work with internal customers to meet their specific needs, but also it have to develop the types of programs, product, and services to be connected with the issues of relationship forms with the customer.

Communicate regularly with key executives. Because of the chief executives set the strategies, a flow of communication with them on a regular basis can ensure that the types of services and training and development programs are targeted to assist in the achievement of strategic goals. Termination and alliances issues can be quickly adjusted when the top executives become aware of them and when mechanisms are placed in adjustments efforts.

Measure the pulse of the organization. Work climate should be monitored, and

Table 2. The Concept of the Types of Trend Which Rank Based On Its Interests Properties

Interest-Based Ranks	Type of Trend
1	The elements of the cost of training and development programs monitored accurately to manage resources and demonstrate accountability
2	Efforts to measure the value of return on investment in training and development program began to develop in use
3	Evaluation processes measure the success of training and development programs systematically
4	The process of needs assessment and analysis have obtained more suppression of thought
5	The staff of training and development as well as the line management establish cooperation to achieve the end goals of a general nature
6	The training and development programs are linked to the strategic direction of organization
7	The concept of “learning organization” has been used
8	Implementation of training and development programs change rapidly
9	The training process is shifted to the performance improvement process
10	Development and training technology is experiencing a rapid development process
11	The responsibility for training and developments programs shared on a number of groups
12	More training and development programs are carried out to contractors outside the company
13	More training and development programs are designed for the global use
14	Training and development functions are added to the ‘profit center’ concept
15	The budget amount for training and development programs have increased
16	The concept of “corporate universities” gains more recognition

Source: Jack J Phillips, Ph.D., *HRD Trends Worldwide*, 1999.

the programs should be developed to improve the organization. Some strategic objectives rotate around the satisfaction level of employees, employee involvement level, and employee commitment tiers. The pleasant and productive work climate is essential and usually be the part of strategy. Training and development function should monitor important measures such as job satisfaction, attitude, organizational commitment, and work climate, through various feedback mechanisms to ensure the climate is consistent with the management’s expectation level.

Establish programs with core competencies types. Most organizations have developed the types of core competencies needed to position the organization for future success rates. Some forms of strategic initiatives revolve around efforts to develop the core competencies. A lot of training and development programs should be directly linked to the types of the core competencies whenever possible.

Consider the results-based approach at all levels. Elements of return on investment, business influence, behavior change, and transformation in the workplace, are the

important strategy categories. When organizations focus on the achievement of the primary measures of outcome, it is likely to relate it with the strategic goals are very high. Also, if the results of which can be measured were reported to the appropriate target audience, it can help ensure that the training and development functions are always involved whenever strategic issues are discussed.

Link the training and development functions for all steps of the process. Figure 4. shows how the training and development function may relate to the types of strategies within each of the main steps of training and development cycle, from needs assessment level to evaluation level. At the level of assessment and needs analysis, strategic issues must be identified, including specific measures that should be raised in such programs. The specific types of programs and services which can enhance or develop these measures, are identified in the analysis process so that there is a direct relationship between the needs and proposed program.

Objectives that are developed to drive the impact of business, application, and transformation, are the general form of strategic and operational. Specific goals provide direction needed to ensure that these programs are on target and help achieve the strategic objectives of organization. During the design process, each of these elements, modules, or activities, must reflect the vision, values, philosophies, and beliefs that involved in the overall strategic planning of organization. Also, issues such as the purchase vs. develop the programs may reflect the strategic goals of the organization with respect to the level of use of outsourcing efforts vs. developing the programs internally developed. The distribution process reflects important strategic issues such as the use of technology and performing the timely

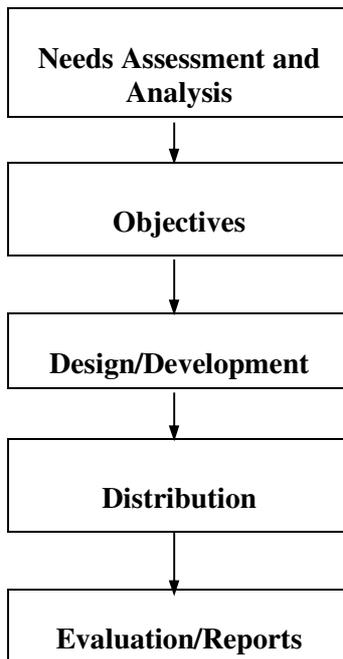
distribution of training and development function. Managers are involved in the distribution of issues when the programs implemented in the form of decentralization in all areas and locations. Evaluation process provides an opportunity to measure the business influence on strategic measures and reports on the results obtained to the right target audience along with other forms of strategic success. Thus, each step in the training and development cycle is showing opportunities for relationships on the aspects of strategy in organization.

Future Outlook

This type of trend is likely to continue in the future, and it is seen as a need by many stakeholders. This condition has been developed over the years. Driving factors for this trend must be sustainable and may be strengthened in the future. Some authorities consider that this type of trend is needed to maintain the viability of training and development function that operates correctly. Without any form of strategic relations, training and development function can eliminate the nonessential role in the organization, perhaps through the outsourcing process by simply searching the processes of training and development which is essentially needed.

Achievement level of success with this type of trend gives some important advantages. Linking aspects of the strategy will be to build closer ties between the training and development function with senior management team. This is one of the most important elements in the development of cooperation needed to convince senior managers that the training program can add value to the 'bottom line', while the strategic objectives were improved through training and development programs.

PROCESS STEPS



RELATION ON ASPECTS OF STRATEGY

- Strategic business needs that identified
- The programs / services that relate to needs
- Developing the objectives of business-influence (strategic)
- Developing the objectives of application / transformational (strategic)
- Design reflects vision / values / philosophy
- Development vs purchase reflects the strategic direction
- Distribution reflects the strategic issues such as technology, just-in-time delivery, and decentralization
- Strategic partnership with management
- Measuring the impact of strategic business
- Reporting the results along with other strategic issues

Source: Jack J Phillips, Ph.D., *HRD Trends Worldwide*, 1999.

Figure 4. Linking Training and Development Function to Aspects of Strategy

Aspects of budget and funding are often influenced by the degree to which training and development programs related to the aspects of strategy or perceived to be associated with the aspects of strategy. A clear form of relationships makes much easier to obtain the necessary amount of budget. No relationship will cause problems in time of budgeting process. Also, strategic training and development programs will ensure that funding for the training and development function has utilized appropriately. The conditions assure that the training and development process will add value in the most problematic areas - the areas that are closely related to the future of organization.

Success with this process moves the training and development functions on the important and vital position in the organization. While the training and development program has been upgraded to an important strategic role, the company will see it as a necessity to position the organi-

zation in the future. In summary, it would appear that this type of trend will be sustained in the future as well as the staff of training and development section must continue achieving forms of progress with this important type of relationship.

Based on the theoretical perspective of the study were taken from the *HRD Trends Worldwide* by Phillips, (1999), that the research conducted is comprehensive, to strengthen the strategic theoretical perspectives if training and development programs that also based on the form of real practice of the individuals who lead the functions of training and development within major organizations. As drawn in Figure 5. (see end of article), these studies involve several key elements.

1. The initial list of these types of trends are developed based on the results of direct observation in organizations through the work of *Performance Resources Organization* (PRO) company, an

international consulting firm, which mainly focused on the development of results-based training and development process. In the forms of contact with all clients all over the world, some type of trend was common for organizations faced in which identified and published initially as a form of internal documents in PRO.

2. The initial list that support the review of literature to determine the extent to which these trends emerged as something common to face from one region or country to another region or country. This study attempts to produce an additional number of new trends and to support the adjustments efforts to the initial list.

3. The survey was conducted in thirty-five organizations that implement training and development programs and are members of the International Federation of Training and Development Organizations (IFTDO). All industrialized and emerging countries displayed in the survey process. This initial survey provides additional insight on the major issues facing by the functions within these countries.

4. A literature search efforts were intensively conducted to all major publications, both domestic and international. This study attempts to show the issues, challenges and additional trends facing by the organizations that implementing training and development programs.

5. A survey carried out on the managers of training and development departments to determine the existence and nature of the interests of each type of trend. The survey was conducted in twenty states on groups of people who have a particular job position as the manager of training and development department, manager of education and training department, manager of the learning department, and manager of performance improvement department.

6. Although the elements of this major study provides the basis of the overall trend of development process, the types of trend has also been discussed in several programs that include the workshop process for officials of training directors, which conducted outside the United States by the author.

7. Lists of these types of trends are also obtaining the validation through the PRO partner when the firm continue to work with clients in all industrialized countries as well as with several clients who come from developing countries. This is an effort to identify trends types of literature, but also attempt to observe trends types within an organization or trends are illustrated by the internal staff training and development.

These types of trends emerging from organization to organization, from country to country, from one culture to another culture. Author aims not to make any effort to discuss the various differences of culture and cultural issues that are unique to a particular organization or country. However, this paper focuses on the types of trends that should be common to encounter, important, and vital in every major organization.

The Process of Training, Learning,
Education, Performance
Improvement, Development, Etc.

When shown the types of trends in this paper, importantly, many shape changes and progress rapidly in the scope of training and development. These changes include that focuses on traditional training function and use different terminology for the label over the function. Although many global organizations who still like to use the words of “education and training” to demonstrate the process for increasing the types of skills that relate to work assign-

ments as well as for the preparation of the individual for the types of jobs in the future, some other organizations like the terms “learning” and “learning solution” as the organizations have been an important part in the development of learning-oriented organizational. Still a number of other organizations find barriers on ‘learning process’ and prefer to focus on the ‘performance’ element or ‘performance improvement’, where the overall scope of the training program has been expanded to be a function to improve performance. Even a number of other organizations that emphasize the development aspects of its employees and would prefer to use the term “development” in this regard.

Although these differences are important, but this condition is consistent, the terms of “training and development”, “education and training”, “learning, and performance improvement”, will be used for interchangeable to reflect the functionality thoroughly. For a particular sentence or paragraph, this terminology is not meant to be limiting or reflect a different emphasis. Combination will be used for, in reality, a combination contained in the organizations as well as sometimes occurred in the same organization. The concept of the types of trend which rank based on its interests properties can be shown in the following Table 2.

Application of Theory

As a case for the strategy implementation and training programs, we can examine from Singapore Airlines and Rhone-Poulenc Rorer.

Singapore Airlines. As a company that has greatest benefit with a flawless record for customer service process, Singapore Airlines Company has been in operation for over fifty years and is currently serving network airlines in the seventy-four cities in forty-one countries. In its review, Travel

magazine stated Singapore Airlines has been consistently rated as the best airlines in the world. Also, the company has the most modern fleet anywhere in the world. Records of its reliability and level of security is highly guarded, and its records of the exact time of departure is at the top.

Singapore Airlines spends approximately \$ 5.600 per employee per year for the training program, which is 12 percent of payroll - the largest budgetary commitment for training program of any company in the world. By having as many as 28,000 employees, the value of these investments demonstrate outstanding commitment to training and development programs. Based on Singapore Airlines' managing director, training and development functions has become an important link in the form in meeting key strategic objectives of the company. These targets include services for customers, profit-ability, reliability, and security. Training programs for cabin crew, flight operations training for executive, management development, commercial training, and computer training are the main forms of influence on these strategic goals. Not only to direct key strategic initiatives, the training programs has helped build the reputation of the company's successful flight. Singapore Airlines has gained a first-and second rank in the list of the companies most respected in Asia since the list was published. Managing director attach this impressive notes to the employees and management of the airline, and the training and development programs have played an important role in the efforts to develop and establish the levels of competence in achievin this success.

Rhone-Poulenc Rorer. In the past twenty years ago, Rhone-Poulenc Rorer (RPR) has transformed itself from a French company or companies crawl into a highly successful global corporation with more than 90,000 employees in more than 140

countries. The key element in this amazing transition process is the strategy of global human resource development (HRD). The company strongly emphasizes the need to recruit managers on a global scale and move these managers around the world. These international assignments strategies provide some benefits for the managers, as well as the economic payoff values for RPR. For example:

1. The managers become more aware of geographic, industrial, and cultural aspects of the company.
2. There is a great integration over the types of businesses, as well as efforts to build the appropriate or proper kind of relationship.
3. Increased flow of technical information and marketing.

An important part of the HR strategy is to provide guidance to prospective new managers. Mentor on the RPR in general is a senior manager at the central office has a brilliant reputation for technical expertise, is a good communicator, and willing to carry out the counseling tasks. These new managers maintain the relationship with the mentor or mentor on regular basis and undertake consultation with them on a career path as well as issues regarding career. In actual, the mentor negotiates assignment forms with other executives on behalf of the manager. Essentially, the mentor guides the career path of manager in the company.

The core for RPR is the truly global scale of managers development process, as the effort of RPR by recruiting more employees and non-French managers to achieve the ultimate goal of "world community"'s development efforts - the people who think that the world is the center of corporate.

Conclusion

A paradigm shift for a closer link between training and development functions and aspects of strategy has been developed over the years. For a number of leaders of training and development function, it is a logical application of a development process which is very familiar to the human resources. If the top executives in the field of training and development has undergone significant experiences within the operational lines, the strategic planning is often seen as a necessary and essential process. As a result, the shift process runs with ease, and levels of advancement are often more substantial and identifiable.

For other leaders, reluctance to change significantly can emerge in a number of different scope as follows.

First, a significant paradigm shift must occur for the training and development staff. The member of staff had to shift roles and change their thinking and approach as they assess the needs, designs, and develops programs, distributes products and services, as well as evaluate the results.

Second, the staff member should develop a proper understanding of strategic planning and how this understanding can help the organization. This comprehension often reduces reluctances and provide the type of expertise needed to help organizations with strategic planning issues.

Third, the parts of training and development process may have to be changed so that these programs are more closely combined with the results of the strategic output. Starting with level needs assessment, some steps may require the adjustments so that the strategic relationships and initiatives can be integrated.

Fourth, the HR staff members will need to form the relationships with major clients across the entire organization. Form of this relationship is essential for programs and services remain focused on major goals and objectives in the organization and to build the kind of support needed to make these programs are more effective and efficient.

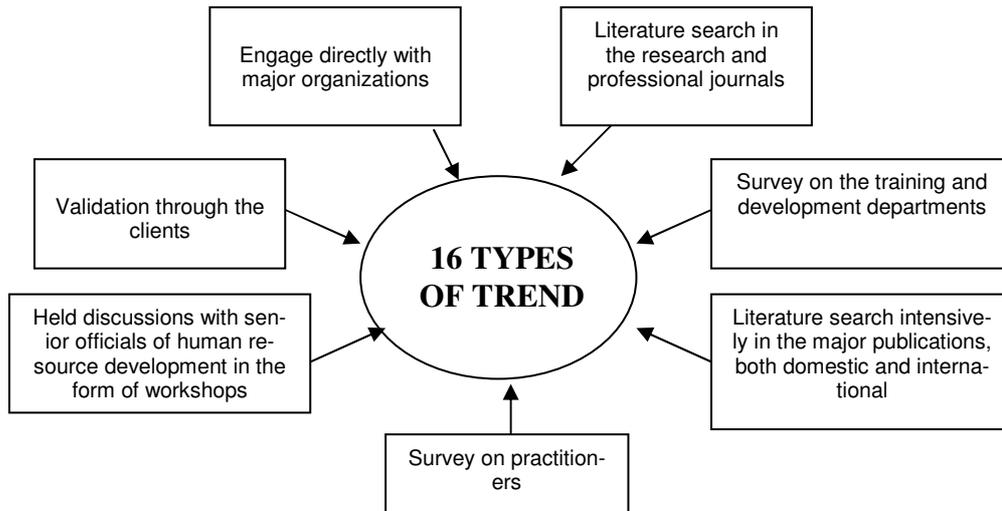
And finally, the staff members of training and development department should be more business-minded. They

must develop a better understanding about the business issues, operational considerations, and external issues facing by organizations, particularly the strategic issues. This condition often requires more financial and operations knowledge for the entire staff of training and development section.

Prior to strengthen the relationship between training and development functions and aspects of strategy, several key questions must be raised.

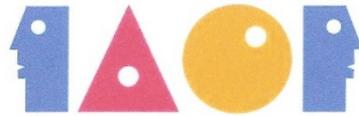
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Source: Jack J Phillips, Ph.D., *HRD trends Worldwide*, 1999.

Figure 5. Research Basics on the Types of Trend



LICENSE INCOME OF TECHNOLOGY COMMERCIALIZATION: THE CASE OF U.S. UNIVERSITIES

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Abstract

After the Bayh-Dole Act launched in 1980, the activities of technology transfer between academic and industries were dramatically boosted thereafter. What factors influence the performance of technology transfer were proposed by some previous researches, most of them thought researches expenditure, patents, and published articles had significant weight. According to some case studies of famous journals pointed out patent had no contribution, this study uses AUTM licensing survey to figure out the relationship between issued patents, published articles, and technology commercialization. The result of the study shows that published articles do have effect, but patents issued do not make significant effect on technology commercialization.

Keywords: technology transfer, license income, patent issued, invention disclosure, published articles

Introduction

The status of technology transfer in American universities can be realized by

The Association of University Technology Managers (AUTM). The annual investigation data of AUTM show that all American universities highly emphasize academic researches. The research funds of all universities in America were 13 billion US dollars in 1991, but it increased almost three times within 10 years. The level of funds reached to 35 billion US dollars in 2002, and there were more outstanding increase in the following four years. The

research expenditure in 2006 even broke 45 billion US dollars. Regarding the doubts of different inputs of research funds generating different performance of outcome, AUTM also investigated several indicative numbers of research results. Based on the issued patent numbers and patent application numbers, the investigation results suggested that the number of application cases increased year by year, while the patent numbers of each university don't grow at the same trend, and the research expenditure and license revenue of each universities don't reduce.

Crepon et al. (1998) put forward that there was a positive correlation between

the output of business patent and the input of research expenditure. However, American universities are non-profit organizations, and they don't need to be responsible for shareholders. AUTM's data in 2006 showed that license revenue for College of William & Mary and University of Montana was zero, but their input of research expenditure was even higher than the ones of other universities, whose license revenue was not zero, but the two universities' input of research expenditure continuously increased year by year, and there was no actual license revenue. It disclosed that whether there is an apparent correlation among the input of universities' research expenditure, the research output, and the license revenue or not, it still needs a deep exploration.

On the basis of the motive and background above, the purpose of the study is to treat the mode of license revenue of technology transfer in American universities and to try to find out the mediating factors, which can raise the license revenue, as the preparation direction before the technology transfer. And then, there is a review of the affection of research input and output on license revenue. In light of these concerns, this study has three purposes: (a) to treat the affection of resource input and output on license revenue of technology transfer; (b) to find the roles of published articles and issued patent numbers and invention disclosure numbers in the process of technology transfer; and (c) to find out the important factors, which have great affection on license revenue.

Literature Review

Technology Transfer

Mansfield (1975) deemed that technology transfer is the technology used by a certain organization or country, and the technology is introduced to other countries, regions or organizations for further application. Zaleski and Wienert (1980)

thought that technology transfer is a process, in which, an organization or country transfers its new innovative products or technology tips to other organizations or countries for use. Hameri (1996) considered that technology transfer is an active and ambitious process to spread or obtain technology knowledge, data or experience by the procedure of authorization, external investment, and purchase.

Research Input and Research Outputs

Adams and Griliches (1996) took American universities as research subjects, and studied the relationship among paper numbers, cited paper numbers, research expenditure, and the numbers of scientists and engineers. The research suggested that there are two main outputs, new scientists and new concepts generated by academic researches. The number of scientists is more easily measured. However, new concepts are more abstract and difficult to be measured so that paper numbers and cited paper numbers are the measurement indicators of new concepts. The research result proves that the raise of research expenditure is helpful to generate more paper numbers, and the β value of cited paper numbers is higher than the one of paper numbers. This means the raise of research expenditure is with a positive affection on paper quality.

Adams and Griliches (2000) further explored related issues of research outputs and paper numbers. The research expenditure was similarly treated as research input, and paper numbers and cited paper numbers were treated as research outputs. The phenomenon of decreasing returns to scale was found in the research output of American universities, and there was a higher level of output in private universities than in public universities. Nevertheless, if all schools were analyzed, there were still fixed returns to scale. Furthermore, data envelopment analysis was employed by Geraint and Johnes (1993) to

analyze the research efficiency of economic departments of 36 universities in UK from 1984 to 1988. The results presented that if research expenditure is regarded as input, it will improve the efficiency of decision-making units, and this explains the affection of research expenditure on research input.

In the research of R & D expenditures, invention outputs and patent numbers, Pakes and Griliches (1980) ever analyzed the data of 121 large-scale enterprises from 1968 to 1975. The outcome showed that there is an apparent relationship between research expenditure and patent numbers, so patent numbers can be used to measure the economic benefit of research input. Acs and David (1987) verified that patent numbers can be as indicators to measure the performance of research development. When Griliches (1991) collated American enterprises' data from 1954 to 1987, he found that there was a link between research expenditure and patent numbers. Griliches (1994) further pointed out that when it's not easy to get related data of R & D, abundant patent numbers can be an indicator to measure the invention input and output.

Patent Licensing and License Fees

The so-called patent license means patentees still possess the complete right of patent, and only one or whole part of the execution of the patent is licensed to others under specific conditions. The content of license includes manufacture, sale, importation, usage or some of them, and depends on different cases. Patentees still own original rights, so patent license is to make licensed persons stay in a legal position of using patent rights and avoid to be charged with patent infringement. Cho (1988) definition of technology license is a behavior that an enterprise sells its technology or management skills to get rewards from the other party. Nevertheless, Millman (1983) defined technology li-

cence as a certain period, in which, one party transfers proprietary technology, such as patent, trademark, and various methods to the other party to obtain rewards.

The right of license can be divided into exclusive license and non-exclusive license. Exclusive license is usually limited to the application of product or to the sales in certain areas or region. While enterprises get the technology license from schools, they still need to have a long-term input in R & D to commercialize the technology. Small or new enterprises have much higher proportion of exclusive license than larger ones. Theoretically, more businesses prefer non-exclusive license because it is much more competitive and allows invention to have an extensive application. Owing to this, many scholars and experts question the appropriateness of exclusive license. Mowery et al. (2001) pointed out that exclusive license of American universities doesn't comply with the fair spirit of public investment, and if it can be put into public domains, it may generate more benefits.

The Establishment of Assumption and the Definition of Variables

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Research Expenditure and Output Of the Research

According to the above-mentioned document, we know that research expenditure usually been taken for one of the variable of research output. The total number of dissertation announcement and number of the published dissertation estimated for objective evidence of the college research output is an important standard to acquaint with the performance of college academic research. The patent issued number is also one of the research output indexes. Besides, not every research result will pre-

sent by patent, so the times of invention disclosure could be supplanted the part which can't expound of patent issued number. Therefore, this study makes some hypothesis below.

H1 : The research expenditure has the remarkable positive effect on the research output.

H1a: The research expenditure has the remarkable positive effect on published articles.

H1b: The research expenditure has the remarkable positive effect on the number of patent issued.

H1c: The research expenditure has the remarkable positive effect on the number of invention disclosures.

The Research Output and the License Incomes

To translate the measured method of enterprise management performance into the measured method of technology transfer performance, university acts just like the general enterprise. The university research output is similar to the product of industries. It takes research output as the input of technology transfer and the license incomes is the output of the technology transfer. Therefore, we can measure the technology transfer performance which comes from the technology provider by measuring the financial index. Base on the above-mentioned document, this study makes some hypotheses below.

H2: The research output has the remarkable positive effect for the license incomes.

H2a : The result of dissertation announcement has the remarkable positive effect on the license incomes.

H2b : The number of patent issued has the remarkable positive effect on the license incomes.

H2c : The number of invention disclosures has the remarkable positive effect on the license incomes.

This study is about to discuss how the research expenditure affect the license incomes, but the research expenditure belong to research input. Published articles, the number of patent issued and the number of patent issued invention disclosure is the research output. The research output can be license incomes by passing many processes of technology transfer. So the research use the this three research output which are published articles, the number of patent issued and the number of patent issued invention disclosure for the mediating variable between research input and license incomes. Therefore, this makes some hypothesis for the relation between mediating variable and license incomes below.

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H3: The research expenditure through mediating effect of research output has the remarkable effect on license incomes.

Combining the above mentioned hypothetical ratiocination, the structure of this study is shown on Figure 1.

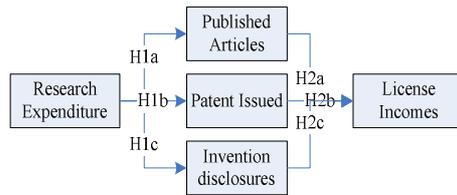


Figure 1. The Structure of Research

Research Method

The data come from three sources: the date of research expenditure, patents issued, invention disclosure and License incomes come from AUTM licensing survey, the data of research expenditure comes from AUTM licensing survey of 2005, the data of published articles, invention disclosure and license incomes come from AUTM licensing survey of 2006 and the data of published articles come from ARWU's investigation of 2006.

This study is about to discuss how the research expenditure affects the license incomes which use the data of 2006; The samples based on the AUTM licensing survey summary compare with top 500 universities which must be investigated by ARWU. Because of the huge variation of license incomes among those universities, this study uses the regression analysis after logging the license incomes.

This study finally put the simple data in order that is the top 102 universities' outcome of technology transfer. This study uses simple regression and multiple regression analysis. H1 used simple regression and H2 which has two more independent variables uses multiple regression analysis.

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Examining the mediating effect of published articles, patents issued and invention disclosure, Baron and Kenny (1986) brought up the mediating effect method which con-

firms the existence of the mediating effect from research output.

Regression Analysis

In terms of hypotheses testing, this study takes the models of hypotheses to do the regression analysis. The models of each hypothesis are following.

Model 1: Doing the simple regression analysis of single independent variable toward three intervening variables (published articles, patents issued, and invention disclosures). Model 2: Doing simple regression analysis of three intervening variables toward single independent variable.

Model 1: The result of research input and research output with regression analysis.

β -value of research expenditure toward published articles is 0.788, and after adjusting R² is 0.616. β -value of research expenditure toward patents issued is 0.690, and after adjusting R² is 0.471. β -value of research expenditure toward invention disclosures is 0.771, and after adjusting R² is 0.591. The three patterns have positive correlation significantly.

According to the results above, the results show the research expenditure toward the three research outputs have quite big positive effects, and the explanatory power of the three patterns is quietly high. It also represents that the research expenditure is the important variable of published articles, patents issued, and invention disclosures. Hypothesis 3 was supported.

Model 2: The result of research output and license income with regression analysis.

β -value of published articles toward license income is 0.627, and after adjusting R2 is 0.386. β -value of patents issued toward license income is 0.453, and after adjusting R2 is 0.198. β -value of invention disclosures toward license incomes is 0.557, and after adjusting R2 is 0.304.

There are all positive effects toward license income, and achieve the significant level. Also, the explanatory power is quite high. It represents the published articles, patents issued and invention disclosures are the important variables of license income. Hypothesis 2 was supported.

Hypothesis 3 predicted a mediating effect of research output between research expenditure and license incomes.

Step 1: Prove that significant relationship between research expenditure and published articles, patents issued invention disclosures. This step of this procedure was substantiated by the regression results shown in Figure 2.

Step 2: The direct effect of research expenditure and license incomes was examined. The result shown in Figure 3.

Step 3: All the three research outputs were entered solely to its direct effect on license incomes. Published articles, patents issued and invention disclosures are significantly, positively related to license incomes.

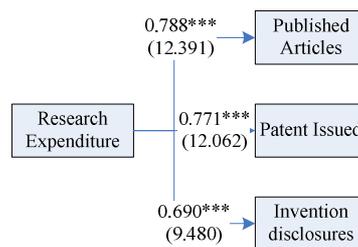


Figure 2. Results of research expenditure and research outputs

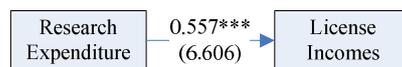


Figure 3. Results of research expenditure and license incomes

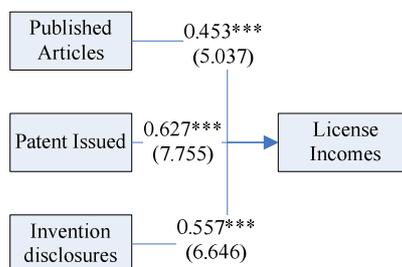


Figure 4. Results of research outputs and license incomes

Step 4: Both the research expenditure and all the three research outputs were entered to evaluate the mediating effect. When re-

search expenditure and all of the interaction terms of research outputs were entered, the results showed just one of the

interaction item (patents issued) of research output variables was not significant. The influence that Research expenditure to License incomes is drew by Published articles and Invention disclosures. It proves Published article and Mediating effect exist. However, Patents issued turns to be not evident. That shows patents issued ($\beta = -0.121, p > 0.05$) is not simultaneously mediating variable among published articles and invention disclosures. Therefore, Hypothesis 3 was partly supported.

Conclusion

The purpose of the study is to treat the affection of research input and output on loyalty fees of technology transfer and to further realize important factors, which affect license incomes, through the research output of published articles, issued patent number and invention disclosure number.

Relationship Between Research Input and Output

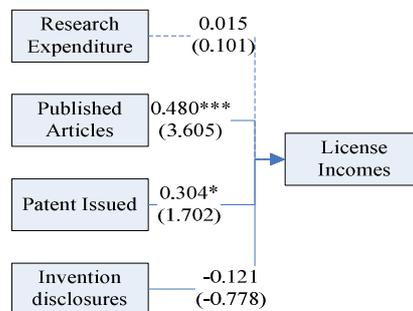


Figure 5. The mediating effect result

Relationship Between Research Output and License Incomes

After the demonstration of regression analysis, the above three research outputs have a positive relationship to license incomes. It signified that the three research outputs also affect the license incomes. This conclusion is similar to the one of Crepon et al. (1998).

Research expenditure is taken as the measurement of research input. Research expenditure means the amount invested into research by schools, and research outputs are measured by the results of published articles, issued patent number and invention disclosure number. The outcome demonstrates that research expenditure and the scale of schools have positive relationship to the results of published articles, issued patent number and invention disclosure number. It suggests that the increase of research expenditure can make the results of published articles, issued patent number and invention disclosure number go up. Expenditures are important inputs of production. If without considering efficiency, more inputs bring more outputs. Although the result in the study is same as the one of previous scholars, the study confirms that the results of published articles, issued patent number and invention disclosure number are significant research outputs.

Published articles represent the research outcomes of schools, and research outcomes can be as a bargaining chip to negotiate royalty fees in the process of technology transfer to raise the amount of royalty. Patents are more specific subjects to be licensed. The more patent rights schools have, the more subjects they can license, and the probability of license incomes will be higher. Invention disclosure is a way to deal with potential licensed patents, but there won't be a necessary patent in the end.

The source of royalty fees is not just from patents, but also from commercial secrets or copyright transfer, and invention disclosure enhances the opportunities of technology or right to be licensed.

Besides, the analysis outcome of the published articles accounts for 40% explanatory power, invention disclosure number 30%, and issued patent number 20%. The outcome has a gap with general perception. Published articles were an indicator to evaluate academic achievement in other literatures, and invention disclosure number and license incomes were seldom discussed. Patent seems to be the most outstanding influencing factor to license incomes. However, according to the research result in the study, patent number is still apparently related to license incomes though their explanatory power is weaker than other two variables.

Mediating Variables With Effect on License Incomes.

After the examination, published articles and invention disclosure are really mediating variables, but issued patent number is not. That means only parts of the assumptions are correct. Research expenditure and the input of human resource of schools will produce positive affection on license incomes via published articles and invention disclosure number instead of via patent number. The outcome is surprising because it's different from the concept of patents generating revenues. In order to realize the reason, an extra examination of mediating variables is made in the study, and a regression analysis is done based on the three variables and license incomes.

The outcome shows that the model has 42% explanatory power. When the published articles and invention disclosure number are simultaneously considered, issued patent number won't be that outstanding. Even, there is a trend of negative relation to issued patent number, and this implies that the affection of issued patent number on license incomes is very weak on the basis of the three variables. The result reverses the thought of patents creating income.

Nevertheless, the study is analyzed by the sole model of taking patent number as mediating factor. Figure 6 is its extension of hypothetical model. After the two models are testified by mediating effect, the result equally proves issued patent number not to be a mediating variable, and this makes the role of issued patent number have different explanation in the procedure of technology transfer. In term of the result, it implies that there is still a long way to go by taking advantage of issued patents to proceed with technology transfer or even to produce revenue. Proprietary of patent is not the guarantee of the increase of license incomes.

While other research studies explored this topic deeper, similar concepts like this study are found, and the general perception of patent being a key in technology transfer needs to be reviewed. Patent may play a significant role in the procedure of technology transfer. However, it could be a sufficient condition absolutely not a necessary condition. Some similar researches were found by Colyvas et al. (2002) after they undertook a study to American universities.



Figure 6. Extension of hypothetical model

Consequently, the concept of the study is that patent number is not the guarantee of license incomes in the process of technology transfer. Revenues from licensed patent are affected by the process of technology transfer instead of the simple concepts that more patents create more revenues. For the reason, there should be other complementary measures for patent-based technology transfers to bring benefits, for instance, excellent technology transfer personnel or the stimulation of government policy. Even though it's generally believed that academic researches are still far away from the formation of business opportunity, the results in the study reveal that more technology transfer opportunities could be created by the application of research expenditure to academic or technology research, and the increased effect of license incomes might be higher than general awareness. So, schools could then rethink about intellectual strategies for technology transfer in accordance with the results.

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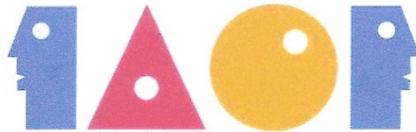
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Exploring the Relations between Service Quality and Consumer Behaviors-A
case study of 85°C Bakery Café from Taiwan

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Abstract

It is a key competitive advantage in the coffee franchised industry on service quality. This paper investigated the relation between the service quality and consumer behaviors. A case study of 85°C Bakery Café was taken through conducting a survey of 1,124 questionnaires to 21 stores in Taichung, Changhua and Yunlin County of Taiwan. There were significant difference in the consuming behavioral intentions and perceptions of service quality among customers' characteristics. Findings were as follows: (1) perception of service quality and consumer behaviors had remarkable correlation: need recognition in physical demands for coffee had a slightly positive relationship with the reliability of service quality; (2) need recognition in special soft drinks had slightly negative relations with the reliability and responsiveness of service quality. (3) Age, demographics variables made remarkable impact on consumers' perception of "reliability" while education made significant differentiation in the perception of "reliability" and "responsiveness." (4) Age, education and monthly income appeared to have significant differentiation in consumer behaviors. Practical suggestions were made regarding simplified procedures for on-site production and the training of service personnel to reach high service quality.

Keywords: service quality, consumer behavior, the bakery café industry

Introduction

Most research defines food service in the category of "hospitality" or with 'tourism,' which mostly contributes to both hotels and tourism. This study explores service quality in the context of the bakery café in-

dustry and argues that the bakery café industry has unique characteristics in consumer behaviors and service quality. Lately, Taiwan's economic standard of living has reached a level in which the people of Taiwan are able to enjoy the leisure life and food. Established in 2003, 85°C Bakery Café

currently has over 700 branches located within Taiwan, Australia, China and America in 2012 (source: website of 85°C Bakery Café). 85°C Bakery Café holds the idea that it could serve the five-star coffee and breads for the customers with low price. Therefore, this rapidly growing store invokes a research interest in examining if customers' perceptions on service quality play an influential role in customers' purchase behaviors.

It is assumed that the better perceptions on service quality are, the higher customer satisfaction is and the higher customer loyalty will be. This study was conducted to assess the relations between service quality and customer behaviors. The ultimate purpose of this study is to understand the customers' buying decision-making process of café customers, and the dimensions of SERVQUAL in the café industry. Then, a model integrating customer demographics, service quality, and customer behaviors is suggested and empirically tested in the coffee industry.

Literature Review

Consumer behaviors

Consumer behaviors refer to the decision-making process before and after involving, receiving, consuming and dealing with products services (Reynolds & Wells, 1997). The profiles of consumer behaviors are diverse. It can be as simple as routines in personal purchases, such as the purchase of affixed supplement or the daily necessities, or can be as complex as the purchase of houses and cars, involving complex decision-making assessment and requiring information and product knowledge. The physical buying behavior in cafe industry can be analyzed from the following aspects. The decision-making process related to consumer purchase and the factors are considered. The comfortable atmosphere constructed by a coffee shop, the flavor of coffee or to meet requirements of social activi-

ties may account for the reasons why consumers come to a coffee shop. In this regard, consumer behaviors to choose a coffee shop and it can be interpreted as the consumer decision-making process.

Consumer decision-making process

Consumer decision-making process means that in the evaluation process, there are two or more decisions making before and after purchasing products or services. Such behaviors are intrinsic to consumer experiencing knowledge and integrated into the final decision (Mowen, 1987). To focus on the decision-making process, the "EKB" model (Engel et al., 1968) consists of four principals, the input, information processing, decision process, and variables influence decision process, is applied to understanding the factors of internal/external interactions. Rice (1993) suggested a feedback loop for developing the EKB model. Foxall (2005) also emphasized the importance of evaluation after purchase for future purchase patterns. Yoon and Uysal(2005) purposed to improve and sustain the competitiveness by creating positive post-purchase behaviors with higher consumer satisfaction. There are five processes of the EKB's: problem recognition, information search, alternative evaluation, purchase, and post-purchase evaluation, and these are taken as the consumer decision-making processes in this study, and the questionnaire is also designed based on such a structure. In this study, the market segment is determined by the demographic factors, including age, education, occupation, lifecycle stages and economic situation. Hypothesis one is stated as follows:

H₁: Demographic variables appear significant effects on consumer behaviors in the decision-making process.

Service Quality

Service quality, expectations prior to purchase and perceptions of company performance after purchase, is considered as subjective judgment and feelings of customers in the services process and results. In other words, a process evaluation depends on perceptions and psychological satisfaction and feelings. Hernon and Nitecki (1999) emphasized the gap between service provided and customer expectations and focused on reducing the gap. From the above arguments, the interaction between consumers and service providers is critical for measuring service quality as service providers could easily understand consumers and identify the actual needs through interactions (Sureshchander et al, (2002).

Parasuraman, Zeithaml and Berry (1985, 1988) probed four kinds of service industries(banks, credit card industry, securities firms, and product maintenance industry) and conduct depth interviews and focus group interviews to develop a conceptual model of service quality and proposed SERVQUAL (service quality) scale, this scale has been widely used in a variety of industries. And the five dimensions in SERVQUAL focus on the human aspects of service delivery (responsiveness, reliability, assurance, and empathy) and tangibles services. Ladhari (2009) recommended that the SERVQUAL model, as a good scale for assessing the service quality in different industries, allowed choosing the most important dimensions for ensuring reliability and validity in specific services. Service quality is regarded as the core variable in the SERVQUAL scale (Oh and Parks, 1997), and the scale could best meet the research objective. As a result, Hypothesis two is stated as follows.

H₂: Service quality appears significant differences among demographic variables.

Importance of service quality for the context of a bakery café

Service quality in a coffee shop is involved with a combination of services items such as music, drive-through services and newspaper to stay competitive. For example, Starbucks offers free wireless Internet access to its customers, and this service capability may heighten the importance of service innovation to meet the satisfaction of the service quality. Parasuraman et al. (1988) included five dimensions in service quality as (1) Tangibles- physical facilities, equipment, and staff grooming; Reliability - the ability to perform the promised service dependably and accurately; Responsiveness, the willingness to help customers and provide prompt service; Assurance- covered by knowledgeable and courteous staff and their trust and confidence of inspiration; Empathy - about the care provided by a company and personal attention. Such dimensions could be used as the characteristics of service quality in a coffee shop. For example, responsiveness refers to customer interactions. And in recognizing the importance of customer interaction with service provider in delivering service and creating value, practitioners consider service quality as a driver of corporate marketing and financial performance (e.g. Gummesson, 1994). In many studies, customer's service quality rating has significant influence upon customer satisfaction, attitudes and repurchases (e.g. Park Jung-hwan, 1999). Therefore, a complete management strategy for service quality is a necessary and basic demand for a bakery café to stay competitive in Taiwan. A complete service quality innovation strategy should consider understanding customer behaviors. This study therefore presumes a correlation between consumer behaviors and the service quality perception. Hypothesis three and four are stated as follows and Figure 1 presents the theoretical framework.

H₃: Consumer behaviors show positive correlations with service quality perception in a bakery café.

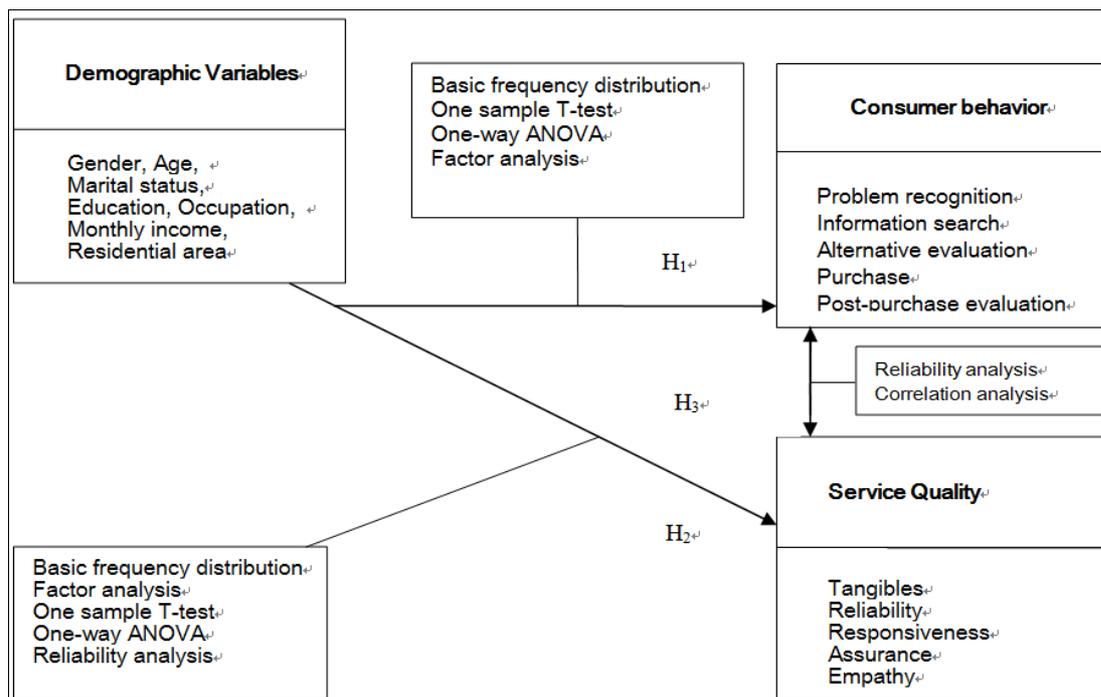


Figure 1. Conceptual diagram for tests of all variables.

Methods

Sample and Research Procedures

During a three-month period in 2010 and 2011, we gathered data from 21 stores of 85°C Bakery Café in three regions of Taiwan. The three regions have the advantages of geographical convenience. We delivered directly in the franchised firms in business districts that provide us access to have convenient samples. The 21 stores were chosen based on two criteria. The first criterion was the relative level of service quality sustained by a store (Hall and Porteus 2000). We detect the quality level through the quality certificate provided by County Public Health Bureau. The second criterion was the store history: this research observed that sustaining a certain service quality position in a market store attracts consumers.

Each survey sent to customers through contacts of internal employees so that the sample respondents understood the purpose of surveys and had motivation to reflect their consumption experience in the stores. On average, researchers distributed 50 questionnaires to each store, and 100 sample respondents for three stores in Taichung City with greater consumption potential. In total, 1250 questionnaires were distributed to the customers of 21 stores of 85°C Bakery Café in Taichung, Changhua and Yunlin County of Taiwan. A total of 1124 copies of questionnaire were valid, and the return rate was 90%. Respondents held the following jobs: 48 percent were university students, 34 percent were in business and service industries, 9 percent were government or military officials, and 9 percent were in the industries of agriculture, forestry, animal husbandry and fisheries. With the first two peak frequencies of a sample of descriptive statistics was shown in Table 1.

Table 1. With the first two peaks frequency analysis of a sample of descriptive statistics

Items		Frequency	%
Gender	Male	516	46
	Female	608	57
Age	19~30 years old	635	56
	31~40 years old	185	16
Marital status	Unmarried	707	65
	Married	387	35
Education	Senior high school	252	22
	College/University	599	53
Occupation	Student	540	48
	Business and Services	383	34
Monthly income	Below NT\$10,000(US\$333.4)	329	29
	NT\$10,001~30,000(US\$333.4-1,000)	468	42

Variables

Consumer's perception of their consumption behavior.

Procedures used by the EKB model (Engel et al., 1995) were used in the theoretical development of our measures of consumer's perception of their consumption behaviors. We adapted items from previous research and developed them through interviews with one store manager in order to capture consumption behaviors specific to coffee franchised stores. We asked three consumers to assess the wording and appropriateness of the items that we developed. The final assessing scales were specified as information search, alternative evaluation, purchase, post-purchase and evaluation problem recognition, which were literally meaningful for the application to the bakery café industry.

Overall, we used 45 items representing five sub-dimensions to measure consumer' behaviors. We conducted a principal component factor analysis with varimax rotation and found that all 45 items loaded on ten factors with an eigenvalue over 1. Ten factors explained the decision making process where a consumer comes to a coffee shop (see Table 2). First of all,

need recognition had four factors, and we named them as (1) physical demands for coffee-thirsty, refresh, and regular coffee (2) desires for social activities-to get together, to discuss matters, and to give treats, to celebrate festivals and to kill time, (3) need for special soft drinks- Sea Salt Coffee, tea, smoothies, and milk tea, (4) need for bakery-birthday cake, bread, refinements and gifts. Information research had two factors: (1) information search from physical channels-word of mouth, physical stores, or physical advertisement, (2) information search from websites. The dimension of evaluations had four factors: (1) promotion-coupons, pre-paid cards, or value cards, (2) evaluation for coffee and cake: Price, taste, and appearance, (3) evaluation for bread, (4) delivery. We further tested reliability and found good reliability ($\alpha \geq 0.72$) for ten factors (Table 2).

Consumers' perception of service quality

In this study, 22 items were derived from SERVQUAL by Parasuraman, Zeithaml, and Berry (1985, 1988, and 1991) with four items for Tangibles, five for Reliability, four for Responsiveness, four for Assurance, and five for Empathy. A principal component factor analysis with varimax rotation produced three new factors (Table 2): the first and most consid-

eration in service quality was the reliability regarding food safety, courtesy to cus-

tomers, and food ordering process.

Table 2. Factor Analysis and Reliability

Factors	Eigen value	Variance Explained	Cumulative of variance explained %	Cronbach' α
Consumer Behaviors				
1. Physical demands for coffee	9.26	20.58	20.58	0.75
2. Desires for social activities	4.52	10.03	30.61	0.74
3. Need for special soft drinks	3.50	7.77	38.38	0.76
4. Demands for bakery	2.49	5.53	43.91	0.73
5. Information search from physical channels	2.09	4.65	48.55	0.75
6. Information search from websites	1.92	4.27	52.82	0.76
7. Promotion				
8. Evaluation for coffee and cake	1.58	3.51	56.33	0.74
9. Evaluation for bread	1.46	3.24	59.57	0.76
10. Delivery	1.29	2.88	62.45	0.75
	1.224	2.72	65.17	0.76
Service Quality				
1. Reliability	11.52	47.48	47.48	0.82
2. Responsiveness	1.60	6.30	52.28	0.89
3. Tangibles	1.08	4.89	59.67	0.88

The second factor was from items that talked about being active to offer appropriate service, fulfilling specific needs demanded by customers, and offering knowledge of products to build up customers' trust. Then, the second factor was named as responsiveness. The third factor was the tangible physical facilities, tools and equipment for the provision of services, personnel appearance. The three scales demonstrated high reliability ($\alpha \geq 0.82$) (Table 2).

Results

Table 3. reports ANOVA for the effects of demographic variables on consumption behavior. Age made significant differences in the Physical demands for coffee, desires for social activities, information search from physical channels and from websites, evaluation for bread, and delivery. Besides, educational level made significant differences in the need for special soft drinks, physical demands for coffee,

and desires for social activities. Monthly income made significant difference in coffee demands and information search channels from website wherein consumers with monthly income between NT\$ 10001 and 30000 emphasized more the availability of information from websites than those with monthly income over NT\$ 70001. Thus, we found support for Hypothesis 1: Demographic variables appeared significant effects on consumer behaviors in the decision-making process.

Age made significant difference for the perceptions of service quality wherein 41~50 consumers emphasize more reliability in service quality than those more than 51 years ($p = 0.017$). Besides, consumers with master's degree emphasized more responsiveness in service quality than those with educational level in junior high schools (Table 3). We found the results would partially support Hypothesis 2: The significant differences exist in the relationship between demographic variables and

Table 3. ANOVA for demographic variables impact on consumption behavior and service quality

Independent variable	Dependent variable	F value	Significance	Scheffe's multiple comparisons
Age	Physical demands for coffee	7.012	0.000***	41~50 years old>less 18 years old
	Desires for social activities	4.425	0.002**	41~50years old>more than 51 years old
	Information search from physical channels	2.769	0.028*	41~50 years old>more than 51 years old
	Information search from websites	7.147	0.000***	41~50 years old>more than 51 years old
	Evaluation for bread	3.048	0.018*	41~50 years old > more than 51 years old
	Delivery	3.661	0.006**	41~50 years old>more than 51 years old
Marital status	Information search from physical channels	6.724	0.028*	married>unmarried
	Promotion	4.087	0.044*	married < unmarried
Education	Physical demands for coffee	5.882	0.001**	Junior high school < Above or equal to Master's degree
	Desires for social activities			
	Need for special soft drinks	4.350	0.005**	Bachelor's degree> Senior high school
Occupation		5.290	0.001**	Junior high school>Above Master's degree
	Desires for social activities	4.548	0.001**	Agriculture, forestry, fishery, animal husbandry < military and government workers
Monthly income	Physical demands for coffee	5.595	0.000***	Income under NT\$10000<Income of NT\$ 50,001~70,000
	Information search from websites	2.780	0.028*	Over NT\$ 70,001< Income of NT\$ 10,001~30,000
Age	Reliability	3.078	0.017*	41~50 years old>less 18 years old
Education	Reliability	2.973	0.032*	Above or equal to Master's degree>senior high school
	Responsiveness	5.480	0.001**	Above or equal to Master's degree>junior high school

Note: *p<0.05, **p<0.01, ***p<0.001

service quality, only limited to age and education.

Table 4 reported the correlation of consumer behaviors and service quality. In general, our factors of consumer behaviors had the slightly significant positive relationship with service quality, except the need for special soft drinks ($r = -0.21, -0.12, -0.19$). The highest correlation was detected between “physical need for coffee” and “tangibles” ($r = 0.24$). The highest correlation showed that when consumers come to the café for coffee consumption, they emphasize tangible quality of service. Thus, we found support for Hypothesis 3: The positive correlation exists between the consumer behaviors in a bak-

ery café and the perceptions for service quality.

Next, we used ordinary least square regression analysis to predict the perception of service quality through the consumption behavior. According to the findings in Table 5, consumption in special drinks would predict overall the negative perception of service quality in dimensions of reliability, tangible and responsiveness ($\beta = -0.34, p < 0.05, \beta = -0.21, p < 0.05, \beta = -0.27, p < 0.001$, respectively). As far as tangible was concerned, physical demands for coffee, need for bakery, search in physical channels ($\beta = 0.19, p < 0.05, \beta = 0.20, p < 0.05, \beta = 0.17, p < 0.05$, respectively).

Table 4. Analyses for the correlations between service quality and consumer behaviors

	Physical demand	Desire-social activities	Need-special drinks	Need-bakery	Search-physical	Search-websites	Promotion	Evaluation-coffee & cake	Evaluation-bread	Delivery	Reliability	Responsiveness	Tangibles
Physical demand	1												
Desire- social activities	0.44**	1											
Need-special drinks	0.33	0.54**	1										
Need-bakery	0.11	0.21	0.23	1									
Search- physical	0.32	0.51	0.32	0.54**	1								
search - websites	0.23**	0.33**	0.35**	0.35	0.37	1							
Promotion	0.21	0.31	0.25	0.23	0.22	0.32	1						
Evaluation – coffee & cake	0.40**	0.28	0.14	0.11	0.21	0.27	0.29**	1					
Evaluation-bread	0.35	0.23	0.27	0.45**	0.32	0.21	0.33	0.51	1				
Delivery	0.39**	0.26	0.19	0.31	0.25	0.28	0.35**	0.33	0.21	1			
Reliability	0.20**	0.08	-0.22**	0.19**	0.12*	0.04	0.14*	0.07	0.05	-0.08	1		
Responsiveness	0.15*	0.05	-0.12	0.19**	0.23**	-0.04	0.18**	0.02	-0.05	-0.07	0.32	1	
Tangibles	0.24*	0.06	-0.19*	0.12	0.10	-0.03	0.13*	-0.04	-0.04	-0.08	0.25	0.21	1

Note: **p<0.05, (two-tailed test)

Table 5. Results of Regression predicting service quality

Variables	Reliability	Tangible	Responsiveness
Intercept	3.01	2.809	3.422
Physical demands	.16*	.19*	
Need-special drinks	-.34**	-.21**	-.27***
Need- bakery	.21*	.20**	
Search-physical channels		.17**	
R ²	0.15	0.16	0.99
ΔR ²	0.12	0.12	0.06
ΔF	4.26***	4.38***	2.616**

Readiness and willingness to help customers and employees should provide prompt timely services were emphasized and demanded by consumers with higher education. This result showed that education might teach people to be alert to responsiveness in manners performed by service attendants. The findings of this study were consistent with Yuan et al.'s (2012) notion of the importance of recognizing customers' varying preferences. The results, different from other studies and

empirical findings (Barber and Goodman 2011; Chen and Hu, 2009), would suggest a more detailed symbolic value perception from service quality attributes involving with coffee quality, food and beverage, and extra benefits.

Regarding the relationship between service quality and customer behaviors, the slightly negative correlation existed between the need for special soft drink and the perceptions of three dimensions of ser-

vice quality ($r = -0.215$ in reliability; $r = -0.123$ in tangibles; $r = -0.193$ in responsiveness). In other words, the more frequency in beverage consumptions, the less satisfaction they have for the perception of the service quality. The hypothesized positive relationship of perceptions with consumer behavior was not supported in this study. This result could be attributed to the complexity in the beverage production process. All soft drinks were prepared on the spot for customers in an open counter. The making process is involved with the variant amount of sweetness, additives, and water according to individual's preference. Therefore, long-waiting time might cause the dissatisfaction with service quality for youngsters (less than 18 years old) while they had the most frequent consumptions. Besides, the slightly negative correlation existed between the younger and the responsiveness. This result showed that though a customer can get fresh, made-to-order soft drinks, the service attendants may show the lack of initiative to care for customers' emotional uneasiness. This finding would support previous studies (e.g. Cronin et al., 2000; Tam, 2004) by confirming products as the determinant attributes of service quality in the coffee industry. Coffee quality, and food and beverage dimensions reflected the determinant attributes of service quality for explaining both functional value and symbolic value perceptions.

From the analysis carried out, the SERVQUAL model appears to be appropriate in three dimensions in the coffee industry: tangible, responsiveness, and reliability. Items for assurance and empathy were overlapped with reliability and responsiveness, respectively. This meant the SERVQUAL's discriminant validity for this study differs from the original study carried out by Parasuraman et al., (1988). This study showed lack of support for the discriminant validity of SERVQUAL which was reflected in the factor analysis.

This finding indicated that instruments to measure service quality should incorporate industry features in order to reflect correctly the perception of service quality.

Practical Implications

According to empirical results, among three dimensions of service quality, some consumers concern more "reliability" and "responsiveness," especially for those who have long-term experience of purchases of special soft drinks. For practical implications, first, it was recommended to simplify the production process for special soft drinks so that customers didn't take a long time to wait for on-site production. Second, service personnel should respond to the needs of customers in longer cashier lines or in waiting for on-site production so that complaint can be reduced. Third, for the veteran coffee drinkers, coffee series products were mainly sold goods. The training of operators and employees might not be ignored. A set of procedures and quality control standards could maintain consistency and stability of the food and beverage quality. To strengthen, the expertise was able to respond to customer problems, as well as handle crises immediately. These measures enabled employees to enhance service quality.

This study had shown that segment markets in beverage were prevalent. This study suggested that the future studies should focus on segmented markets and investigate differences in need recognition in relation to psychological and physical factors. Besides, veteran consumers might have different perception of service quality, compared to ordinary consumers. Future studies could examine the effects of relational quality on influencing service provision and customer loyalty. According to King and Garey (1997), relational quality refers to "customer perceptions and evaluations of individual service employees' communications and behavior, such

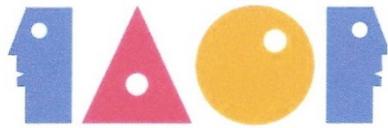
as respect, courtesy, warmth, empathy, and helpfulness. Researchers could further see if the relational quality mediated the consumer's perception of service quality, es-

pecially in services with a high level of interaction between customers and employees.

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DEVELOPING RESEARCH ON VEHICLE TIRE PRESSURE DETECTION AND ADJUSTMENT SYSTEM

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Abstract

In order to meet the expectation for energy saving and pollution reduction, the automotive industry has focused on the development of the vehicle exterior design, with particular emphasis on ECU microcomputer control. However, most of the researches focus on the depot of the tire pressure monitoring system. In this research, the study concentrates on the investigation of the tire pressure adjustment, as well as the design and development of a tire pressure detection and adjustment system. The result of the study shows that the tire pressure would change dramatically when the vehicle travels for a long distance leading to a possible deflated tire. By detecting the tire pressure with control to adjust tire pressure, the vehicle is able to maintain a regular and ordinary tire pressure. The Taguchi method is used to optimize the design parameter for tire pressure detection and adjustment system.

Key words: ECU microcomputer control, tire pressure detection system, tire pressure control, Taguchi method

Introduction

Vehicles available on the market are only equipped with the tire pressure detection system, but the tire pressure cannot be controlled and adjusted. Drastic changes in

tire pressure, deflation or inadequate tire pressure during long distance travel can often threaten driving safety. To make up for the inadequacy of the tire pressure detection system, this study proposed an innovative concept to control tire pressure by using aerator with pressure sensitive switch. When the pressure sensitive switch

senses the tire pressure being below the set value, it actuates the aerator. When the tire pressure reaches the specified pressure, the action of the aerator is stopped by the pressure sensitive switch.

Currently, tire pressure monitoring systems can be divided into Direct Tire Pressure Monitoring System and Indirect Tire Pressure Monitoring System. The former is to directly measure the tire pressure by installing pressure sensors and transmitters in the tire. The receiver installed in the vehicle receives the signals to display and monitor the tire pressure. When the tire pressure is too low or when there is deflation, the system automatically alerts. The latter is not to measure the tire pressure directly but use the wheel speed sensors of the vehicle ABS (Anti-lock Braking System) system to compare the times of rotation of the four tires. When the pressure of a tire is too high or too low, the tire diameter becomes larger or smaller, resulting in changes in the rotation speed of the wheel accordingly. Therefore, the times of rotation per kilometer differs from the other three tires. In this case, warning signals are displayed in the vehicle computer. Due to a high error rate, it cannot judge the condition of more than two tires with deflation and the situation of speed above 100 km/h. Direct Tire Pressure Monitoring System, with the pressure sensor and radio transmitter installed in each tire, has more accurate warning signals. Moreover, when the tire is punctured, tire pressure quickly decreases, and pressure sensors directly transmit the relevant data to ECU (Electronic Control Unit). The warning message is immediately sent out by the tire pressure monitoring system. Therefore, for both new and used vehicles, the Direct Tire Pressure Monitoring System is the most commonly used tire pressure monitoring system. When the tire pressure is low, the contact area of the tread with the ground increases, so that the friction force is larger. The vehicle engine

load becomes heavier to increase fuel consumption while the steering wheel becomes heavier as well. Slight depression may occur in the middle of the tread to reduce the tire drainage. As a result, the vehicle can easily skid in high-speeding travel in rainy days. After long time use, uneven wear state with shallower tread on both sides may set in. When the tire rotates, the internal temperature can easily rise due to the substantial deflection of the tire wall, resulting in the risk of flat tire in high-speed travel. When the tire pressure is too high, the central part of the tread may protrude, so that the tire cannot fully contact the ground. The drainage performance of the tire is also poor. Although the vehicle engine load is lighter, it is in the danger of flat tire due to too high pressure. For a long time, the uneven wear state with shallower central part of the tread occurs, and the narrower tread reduces vehicle stability while riding comfort deteriorates due to poorer shock effect of hardened tire.

Therefore, too high or too low tire pressure causes uneven tire wear to reduce the tire service life. The correct tire pressure can make the tread in contact with the ground at the maximum area. In this case, the tire grip and drainage performance are the best, so that the engine power can be fully played to achieve the most fuel-efficient status. Hence, if the vehicle tire pressure can be kept normal, the driving will be safe and comfortable. Moreover, the appropriate contact of tire and ground can save fuel consumption.

Multi-Factorial Experimental Design Steps

Taguchi Orthogonal Array Factor Level Setting

This paper discusses the impact on air flow velocity and time in the automatic inflation of vehicle tire. The airflow out-

going time is smaller the better, which is used as the quality measurement method. Next, according to the experimental results of other literature, this study summarized four influential factors as the control factors for the experimental analysis. The four

factors are pneumatic electromagnetic valve (A), pneumatic pressure regulating valve(B), air compressor pipe size(C), bend pipe angle(D). Each control factor has three levels as shown in Table 1.

Table 1. Experimental control factors and levels

Control	factor	Level 1	Level 2	Level 3
A	Pneumatic electromagnetic valve	0.5 kgf/cm ²	1 kgf/cm ²	1.5 kgf/cm ²
B	Pneumatic pressure regulating valve	35psi	45psi	55psi
C	Air compressor pipe size	5X8mm	6.5X10mm	8X12mm
D	Bend pipe angle	30°	45°	60°

Orthogonal Array Selection

The orthogonal array is represented by La (bc), where L is the orthogonal array; a is the total number of experiments, representing the number of columns represents the times of experiments in the orthogonal array; b is the number of levels, representing that design parameter has b different values, which is determined by the number of design parameters before the design of levels to analyze the impact of various design parameters on target function with least number of experiments; c is the design parameter or factor, when making the table, the design parameters are represented by rows. The purpose of orthogonal array is to reduce the number of experiments to get unbiased data.

In this experiment, the Taguchi L9 (34) was used, as Table 2, to conduct the numerical experiment of the relationship between airflow speed and time in the automatic inflation of tire. Without considering the interaction of the factors, the Taguchi L9 (34) orthogonal array is a very efficient three-level orthogonal array. The experiments were numbered 1~9, and thus

there were nine experiments. The experiments were completed in the sequence of the orthogonal array. ABCD in Table 2 represents the control factors including pneumatic electromagnetic valve, pneumatic pressure regulating valve, air compressor pipe size, and bend pipe angle. Each factor has three levels. Taguchi L9 orthogonal array with nine columns is mainly for the configuration of factors or interactions. The orthogonal array has four major factors as the principal effects. Although there are slightly interactions, the experiment considered the experimental scale and neglected the existence of the interaction of ABCD. Nine 9 experiments were conducted; the orthogonal array was the saturated orthogonal array filled up with control factor.

Since the tire pressure can only be monitored but not controlled in current vehicles, this study proposed a design of tire pressure control method by installing the aerator with pressure switch to control the tire pressure. When drastic changes in tire pressure, deflation or low tire pressure occur in high-speed travel of the vehicle, the pressure sensed by the pressure switch

is lower than the setting value. In general, the idealist tire pressure is 80% of the maximum tire pressure (MAX PSI) (it varies from brands, models, and sizes, but not a fixed value). This paper sets the ideal tire pressure as 32 psi. When the tire pressure is lower than 26 psi, the aerator is actuated by the tire pressure adjusting system.

When the tire pressure reaches the normal value, the action of the aerator will be canceled. The process should be very short for time considerations. Moreover, to lengthen the service life of various parts, the parts should be adjusted to the optimal state by using Taguchi experimental method to achieve the overall optimal efficiency.

Table 2. L9 (34) orthogonal array

EXP.	A	B	C	D
1	1	1	1	1
2	1	2	2	2
3	1	3	3	3
4	2	1	2	3
5	2	2	3	1
6	2	3	1	2
7	3	1	3	2
8	3	2	1	3
9	3	3	2	1

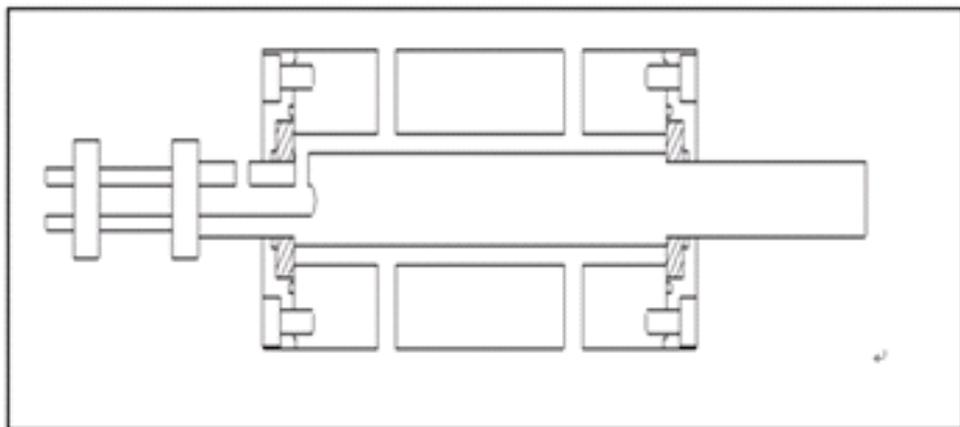


Figure 1. Central air chamber mechanism's main axis and sleeve body

Principles For The Design Of The Tire Pressure Regulation And Control System

Innovative Design of Tire Pressure System Mechanism.

In the design process, we encountered some difficulties. When the vehicle

is travelling, the tires will continuously rotate. Hence, when the pneumatic tube is connected with the valve, the pneumatic tube will be wrapped by the drive shaft due to the rotation of the wheels. To overcome the technical problem, we made innovative attempts in the design of the drive mechanism. A hole was drilled at the central axis of the drive shaft and a hole in the

drive shaft close to the tires to connect the valve by using the connector. In this way, pneumatic tube and tire can rotate synchronously to solve the technical bottle-

neck that the pneumatic tube is wrapped by the drive shaft. Figure 1 illustrates the central air chamber mechanism's main axis and sleeve body.

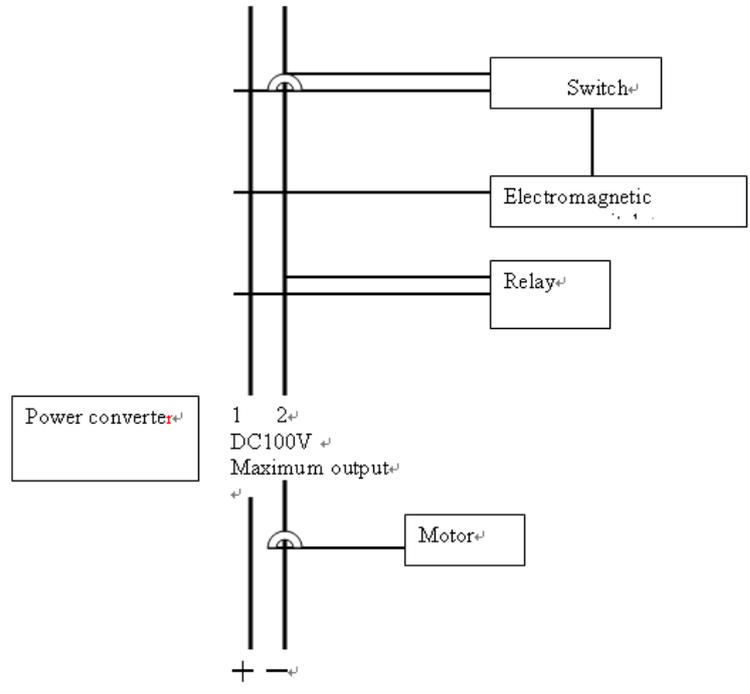


Figure 2. Tire pressure regulation and control system circuit diagram

Table 3. L9 (34) orthogonal array experimental data

	Pneumatic electromagnetic valve (A)	Pneumatic pressure adjustment valve (B)	Pneumatic pipe size	Bend angle
Level 1	1.917	2.355	1.232	1.529
Level 2	-0.75	-0.349	2.778	-0.887
Level 3	0.674	-0.166	-2.17	1.198
Effect	2.667	2.704	4.948	2.416
Rank	3	2	1	4

Experimental Results and Discussion

Effects of major parameters

This study discussed the impact on air flow speed and time in the automation tire inflation process. Short airflow outgoing speed is better. To more easily observe the effects of various control factors, a response table as shown in Table 3 was designed based on the S/N ratio data com-

puted according to Table 3. The response diagrams and tables can directly compare the sequence of factors in priority. S/N ratio response diagram can easily display the optimal combination of parameters in this study.

The factor effect is calculated by taking the average S/N ratio of the factor at II levels. For example, regarding factors A, B:

$$\eta = (\eta + \eta + \eta) = 1.917(\text{dB})$$

$$\eta = (\eta + \eta + \eta) = -0.75(\text{dB})$$

$$\eta = (\eta + \eta + \eta) = 0.674(\text{dB})$$

$$\eta = (\eta + \eta + \eta) = 2.355(\text{dB})$$

$$\eta = (\eta + \eta + \eta) = -0.349(\text{dB})$$

$$\eta = (\eta + \eta + \eta) = -0.166(\text{dB})$$

Optimal Parameter Combination

Based on the Taguchi method, regarding the nine groups of the data of the orthogonal array as shown in Table 3, the shortest air flow outgoing time occurs in L1 and the value is 0.55sec. The optimal parameter combination of the S/N ratio calculated on the basis of the smaller-the-better equation is not among the nine groups of the orthogonal array. Therefore, the optimal parameter combinations were used as shown in Table 6 to conduct an experiment to compare and validate with L1. In the experiment of the parameter combination of pneumatic electromagnetic valve A1(0.5kgf/cm²), pneumatic pressure regulating valve B1(35psi), air compressor pipe size C2(6.5X10mm), bend pipe angle D1(30°) (A1B1C2D1). According to the experimental analysis results, the air flow outgoing time is 0.51 sec, which is better than any parameter combination in L9 orthogonal array. The group of parameters is as shown in (A1B1C2D1). Table 4 combined with Figure 3 show the optimal parameter S/N ratio response diagram, which is the optimal parameter combination of this experiment. The sequence of the major factors of the tire pressure air flow outgoing time is as shown in the S/N ratio re-

sponse table. The descending order of factors by effect is air compressor pipe size(C), pneumatic pressure regulating valve (B), pneumatic electromagnetic valve (A), and bend pipe angle (D).

This study we selected four factors out of the limited number of factors as the control factors. With the various parameter data, it requires a few experiments or simulation by using the Taguchi method and it takes the least time to achieve the satisfactory optimization effect. However, its disadvantage is the fixed level. The optimization result can still be improved.

Maximum Deflation Test With Optimal Parameters

This study used the optimal control parameter combination (A1B1C2D1) as shown in Table 5 to adjust the tire pressure control system to observe the maximum deflation air flow that the system can bear. Based on the study, the maximum deflation airflow is 9.2(L/min). The tire cannot be inflated when it is above 9.2(L/min).

Conclusions

To overcome the technical problem of pneumatic tube being wrapped with the drive shaft due to wheel rotation, this study proposed an innovative design in drive mechanism. A hole was drilled in the central axis of the drive shaft and in the drive axis close to the tire to connect with the air valve, in order to realize the synchronized rotation of the pneumatic tube and tire. The proposed design can overcome the technical bottle that pneumatic tube may be wrapped by the drive shaft. The ranking of the parameter factors by effect in descending order is: air compressor pipe size(C)>pneumatic pressure regulating valve (B) >pneumatic electromagnetic valve (A) >bend pipe angle (D). The analysis using the Taguchi experimental method found that the optimal control pa-

parameter combination of tire pressure regulation and control system is: pneumatic electromagnetic valve A1(0.5 kgf/cm²), pneumatic pressure regulating valve B1 (35psi), air pipe size C2(6.5X10mm), bend pipe angle D1(30°). By using this group of the optimal parameters, this study conducted the deflation experiment to observe the maximum deflation airflow that tire pressure regulation and control system can bear. The experimental results revealed

that the maximum deflation airflow is 9.2(L/min). The tire cannot be fully inflated if it is above 9.2(L/min). At present, tire pressure regulation and control system is still in the stage of prototype development. The findings of this study can be a reference to the future improvement of the tire pressure regulation and control system.

Table 4. Airflow outgoing time

EXP.	A	B	C	D	Airflow outgoing time (sec.)	MSD	SN Ratio (dB)
1	1	1	1	1	0.55	0.303	5.193
2	1	2	2	2	0.83	0.689	1.618
3	1	3	3	3	1.13	1.277	-1.06
4	2	1	2	3	0.65	0.423	3.742
5	2	2	3	1	1.51	2.28	-3.58
6	2	3	1	2	1.32	1.742	-2.41
7	3	1	3	2	1.24	1.538	-1.87
8	3	2	1	3	0.9	0.81	0.915
9	3	3	2	1	0.71	0.504	2.975

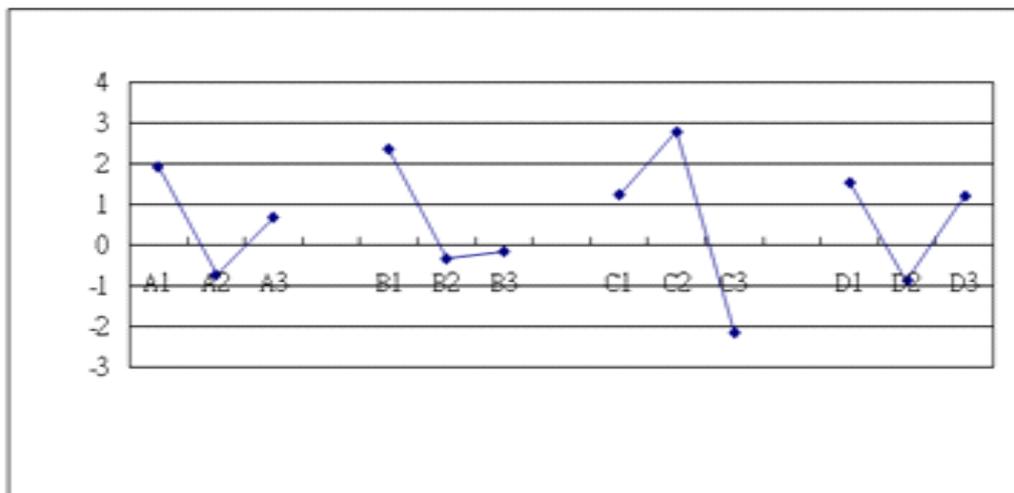


Figure 3. S/N ratio response diagram

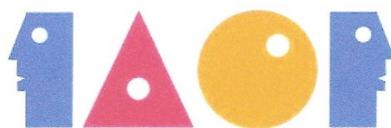
Table 5. Deflation/air flow outgoing time

Deflation air flow	Air flow outgoing time
1.5	0.06
2	0.09
2.5	0.13
3	0.18
3.5	0.24
4	0.3
4.5	0.37
5	0.51
5.5	0.63
6	0.72
6.5	0.86
7	1.01
7.5	1.16
8	1.31
8.5	1.49
9.2	1.65
9.3	3 unable to fully inflate

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THE RELATIONSHIP BETWEEN PACKAGE REDESIGN AND PURCHASE INTENTION

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Abstract

This study aims to explore the effects of consumer perceived values on product purchase intention in case of package redesign. This study employed the hierarchical regression to conduct data analysis to understand the moderating effects of price sensitivity on consumer's perceived value and purchase intention with purchase intention. The consumer perceived value has a significant impact on purchase intention. Among factors of perceived value, quality value of commodity and monetary value of commodity have a significant and positive impact on consumer purchase intention. Regarding commodity goodwill value, it has a significant negative impact on consumer purchase intention. On the other hand, price sensitivity has a significant moderating impact on consumer's quality value of commodity and purchase intention. The research would provide the value for the enterprises to make different pricing policies.

Keywords: Package Redesign, Perceived Value, Price Sensitivity, Purchase Intention

Introduction

With rising international prices of raw materials and products, the trend of rising livelihood necessities is attracting more concerns. Some products, such as milk and coffee, adjust prices directly, some products, such as Coca-Cola and Taiwan Beer,

change packaging design and canister capacity. These are price adjustments that lead to changes of noticeable difference among consumers (Britt, 1975). The improvement of consumer perceived value relies on consumption experience that can be well transmitted (Williams, 2006), while perceived value can help the indus-

try better understand consumption behaviors of consumers (Petrick, 2004). Lemon, Rust and Zeitham (2001) pointed out that consumer perceived value is one of the determining factors of long term business operation of the enterprise. In the market, value has been receiving rising attention of consumers and sellers (Dodds et al., 1991). The value judgment is based on the viewpoints of consumers (Ryu et al., 2008). The consumer viewpoints on perceived value can be measured from the monetary, quality, benefit and social-psychological aspects (Kuo et al., 2009). The consumer perceives the deserved perceived costs and non-pecuniary sacrifice, such as time consumption, energy consumption and brand association (Bolton and Lemon, 1999; Yang and Peterson, 2004; Chen and Tsai, 2008). Therefore, the effect of product perceived value on consumer consumption psychology is an important topic.

The overall assessment of consumer on the perceived value is based on the overall assessment of the product utility after comprehensive measurement of the benefits and costs to drive purchase decision. In other words, it is the perceived assessment results of the customer about product or service (Zeithaml, 1988; Hellier et al., 2003). The gap of perceived value lies in the consumer intention to pay higher price, such as product and service and the actual payment (Bishop, 1984). Perceived value is regarded as a transaction, which is determined by perceived benefits and perceived costs (Lovelock, 2000).

Zeithaml (1988) and Monroe (1990) suggested that overall perceived value has a positive impact on purchase intention, and purchase intention is generated on the basis of consumer's perceived value of price promotion or overall service. Many relevant studies have pointed out that customer's perceived value will positively affect behavioral intention (Fredericks and Salter, 1995; Parasuraman and Grewal, 2000).

Hence, when the consumer perceived value is higher, the repurchase intention and recommendation intention of the customer will be higher.

Wakefield and Inman (2003) indicated that consumer response to price can distinguish the consumer sensitivity to price before purchase. Hsieh and Chang (2005) pointed out that consumer will adjust reaction to specific enterprise or commodity price after purchase. Petrick (2005) suggested that consumers purchasing discounted commodities will be of higher proportion in case of making decisions on purchasing price-sensitive goods. The consumers of higher level price sensitivity will look for lower price and will be more unlikely to purchase when the prices are relatively higher (Foxall and James, 2003). Goldsmith, Kim, Flynn and Kim (2005) argued that price sensitivity is the consumer's reaction to price level and price change. The changes in product prices will affect consumer purchase intention.

This study explores the effects of changes in product packaging on perceived value, price sensitivity and purchase intention, as well as the impact of the perceived value of changes in product packaging on product purchase intention. This study also analyzes the correlation between the perceived value of changes in product packaging and purchase intention in case of using product price sensitivity as the moderating variable. Finally, this study proposes relevant suggestions as a reference to enterprises regarding the impact of changes in product packaging and price on consumer.

Literature Review and Hypotheses

Literature Review

Perceived value

Value is the gap between consumer perceived benefits and perceived costs (Day, 1990; Leszinski and Marn, 1997). Dodds, Monroe and Grewal (1991) argued that perceived value is a trade-off of produce or service quality and monetary cost. Zeithaml (1988) suggested that perceived value is the consumer perception based on gains and losses, that is, the overall assessment of product utility. Mathwick, Malhotra and Rigdon (2001) pointed out that perceived value is a state of perception of product attribute and service performance of the consumer. Through interactive process, it can promote or prevent the achievement of the goals of the consumer. The increase of consumer perceptions of product benefits or quality can strengthen consumer perceived value (Dodd, et.al, 1991; Zeithaml, 1988). The generation of high perceived value can improve value and increase profit as well as enhance the consumer perceived value.

Price sensitivity

Monroe (1973) argued that price sensitivity is the level of perception and reaction of the consumer when product or service price changes. Wakefield and Inman (2003) pointed out that the reaction level of individual consumers to price can be divided into the price sensitivity of the consumer before purchase and the reaction of consumer to price adjustment of specific enterprises or commodities after purchase. Hsieh and Chang (2005) proposed the semantic survey approach to ask consumers about their attitude to purchase after a 10% increase in the price of what they want to buy. Petrick (2005) pointed out that price sensitivity is concerned about consumers of relatively higher level of sensitivity in making purchases decisions as the percentage of such consumers to buy discounted commodities is relatively higher. The consumers of high level of price sensitivity will look for lower prices and are more unlikely to purchase in case

of relatively higher price (Foxall and James, 2003). Goldsmith, Kim, Flynn and Kim (2005) argued that price sensitivity is the reaction of the consumer toward changes in price level and prices. Wakefield and Inman (2003) suggested that, if the consumer strives for low price, it means that he/she is price sensitive.

Purchase intention

Zeithaml (1988) suggested that consumer purchase intention is subject to perceived quality, value, objective price and commodity attribute. If the perceived value is higher, the purchase intention will be higher. Keller (2001) pointed out that purchase intention can be regarded as a key indicator to predict consumption behavior. Blackwell, Miniard and Engel (2006) suggested that purchase intention refers to the product that the consumer wants to buy. Schiffman and Kanuk (2004) indicated that purchase intention is to measure the possibility of buying certain product by the consumer. This study proposes that purchase intention is the possibility of buying certain product by the consumer.

Hypothetical Inferences

Relationship between perceived value and purchase intention

Ravald and Grönroos (1996) argued that customer perceived value has become one of the key factors of differentiation and keeping competitive advantages. Customer perceived value is also the most important indicator of repurchase intention (Cronin et al., 2000; Parasuraman and Grewal, 2000; Choi et al., 2004). When the consumer perceived value is higher, it can better stimulate the repurchase intention. Grunert (2005) suggested that when the perceived quality is very high, the consumer will have the intention to repurchase the product. Kontogeorgos and Anastasios (2008) found that, when the product quali-

ty is recognized by consumers, it will promote the product sales and enhance profits to affect business performance. Tiziana and Gracia (2008) indicated that the consumer attempts to follow healthy and regular life, and will have positive viewpoints about products before generating purchase intention. Batte, Hooker, Haab and Beaverson (2007) found that product purchase is subject to product purchase intention. Oh (1999) and Chen and Chen (2009) respectively pointed out that customer perceived value has a positive impact on customer satisfaction and repurchase intention. This study proposes the following hypothesis:

H1: Perceived value has a significantly positive impact on purchase intention.

Relationships between perceived value, price sensitivity and purchase intention

Sajeev and Colgate (2001) proposed the integrated model of behavioral intentions, and suggested that the customer value concepts constructed by price and quality are the antecedent variable of customer satisfaction to further affect behavioral intention. Lin and Chen (2006) indicated that purchase intention can be an important indicator to predict purchase behavior. Many studies have confirmed that perceived value will positively affect behavioral intentions (Zeithaml, 1998; Fredericks and Salter, 1995; Parasuraman and Grewal, 2000). If the consumer perceived value is higher, the customer's repurchase intention and recommendation intention will be higher accordingly. When the consumer has more knowledge about product and price, the level of price sensitivity will be higher (Huber, Holbrook, & Kahn, 1986). In other words, the consumer's knowledge about the product and consumer price sensitivity is positively correlated (Goldsmith et al., 2005). Wakefield and

Iaman (2003) pointed out that, if the consumer makes additional purchase efforts for lower price, it means that the consumer is sensitive about the price.

Wakefield and Inman (2003) pointed out that, the price sensitivity of purchasing functional products will be higher than that of entertaining products. Meanwhile, users of trendy products cannot resist the attractiveness of the product and reduce their price sensitivity (Goldsmith et al., 2005). The product knowledge and price knowledge of the consumer will increase the level of price sensitivity (Huber et al., 1986; Rao and Sieben, 1992). If the consumer has a lasting interest or concern about the product, the consumer may accept the product at a relatively higher price (Bloch and Richins, 1983), and it also affects its purchase intention. This study proposes the following hypothesis:

H2: With price sensitivity as a moderating variable, the consumer product perceived value has a significant impact on purchase intention.

Methodology

Research Framework

The framework of this study is to explore the correlation between consumer perceived value of changes in product packaging, price sensitivity and purchase intention. According to the research purposes and literature review, this study uses three variables, namely perceived value, price sensitivity, and purchase intention. The conceptual framework of this study is as shown in Figure 1.

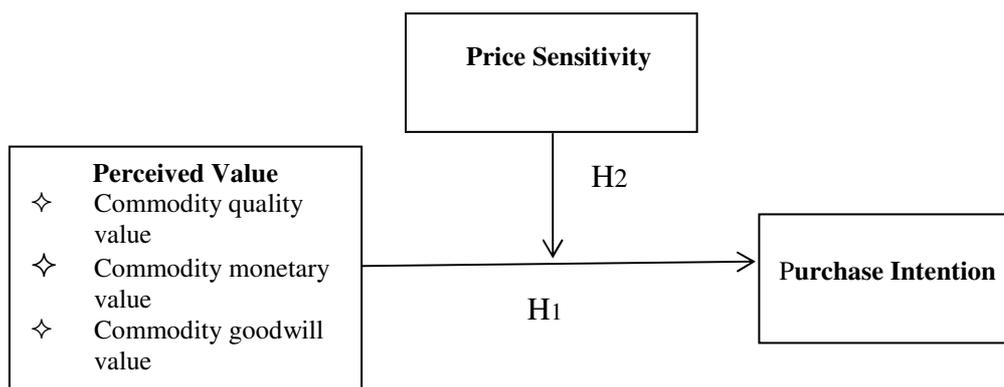


Figure 1. Consumer perceived value, price sensitivity, and purchase intention

Measurement of Variables

Regarding the various research perspectives, this study defined variables and operations by referring to relevant literature to comply with the purpose of this study and wording acceptable to the subjects. This study invited five marketing management teachers to discuss and modify the questionnaire items. Then, the questionnaire was completed according to expert validity requirements. Finally, 30 consumers were tested to confirm the feasibility of the research questionnaire. In addition to personal data, the other parts of the questionnaire were measured by a Likert 7-point scale. The contents are as follows:

Perceived value: based on the perceived value scale developed by Petrick (2002).

Price sensitivity: by referring to the measurement scale for individual consumers developed by Wakefield and Inman (2003), it measures price-sensitive consumers who will be unlikely to purchase at rising price and look for lower price (Foxall and James, 2003).

Purchase intention: by referring to the customer loyalty scale developed by Gronholdt, Martensen and Kristensen (2000).

Questionnaire Pilot Test

Cronbach's α coefficient was used to measure internal consistency as the standard of the research. The Cronbach's α values of the perceived value, price sensitivity and purchase intention are respectively 0.879, 0.773 and 0.720, which are all higher than 0.7. This indicates that the scale has considerable internal consistency.

Data Analysis and Research Results

Basic Characteristics of the Sample

A total of 400 questionnaires were distributed to survey Taiwan's consumer perceived value regarding changes in product packaging, price sensitivity and purchase intention, and 342 valid copies were retrieved, with a valid return rate of 85.5%. Regarding the experience of commodity purchase, 86.5% of the consumers perceived the changes in packaging, and 13.5% failed to perceive the changes in packaging. Regarding commodities of frequent purchase, 44.4% of the consumers purchased livelihood foodstuffs (e.g., rice, oil, salt, sauce and vinegar), 25.1% purchased casual snacks (e.g., biscuits, drinks and snacks), 13.2% of the consumers bought articles for daily use (e.g., station-

ary, paper, toy), and 3.8% of the consumers purchased 3C electronics products (e.g., MP3, 3C peripheral products). Moreover, 67.5% of the consumers were aware of changes in packaging without change in price, and 19.0% of the consumers were aware of changes in price without change in packaging; 62.9% of the consumers often purchase products, 16.4% of the consumers frequently purchase such products, and 7.3% consumers rarely purchase such products; 73.7% of the consumers rated higher than 5 point according to experience of buying the product with changed packaging.

Regarding the demographic information of the respondents, there are 218 male consumers (63.7%) and 124 female consumers (36.3%); most of the consumers are in the age group of 21-40, among which, 43.9% of the respondents are aged 21-30 and 31.3% are aged 31-40; most of them have college level education (58.2%); by occupation, most of them work in the agricultural and fishing industry (25.7%), followed by service industry (20.8%), self-employed (14.6%), and homemakers (14.0%); most of them have a salary level of 35,001~50,000 NTD (50.0%), followed by 50,001~60,000 NTD (25.7%).

Reliability and Validity Analysis

This study employed the maximum variation shaft method of factorial analysis to extract factors of eigenvalue above 1, and deleted questionnaire items with too low factorial loading. In the scale of perceived value, three factors were extracted and the accumulated explanation variation was 76.37%. Factor 1 relating to quality value of the commodity is known as “quality value of commodity”; Factor 2 relating to the monetary value of the product is named as “monetary value of commodity”; Factor 3 relating to the goodwill value of the product is named as “goodwill value of

commodity”. Cronbach’s α values of the three factors are respectively 0.92, 0.93, 0.91. In the scale of price sensitivity, this study extracted a factor with accumulated explanation variation of 73.91%. This factor relating to the consumer sensitivity to product price is named as “price sensitivity”. The price sensitivity perspective’s Cronbach’s α is 0.82. In the scale of purchase intention, this study extracted a factor of accumulated explanation variation of 76.92%. This factor relating to the purchase ideas and status of the consumer is named as the purchase intention”. The purchase intention perspective’s Cronbach’s α is 0.93.

The Cronbach’s α values of all factors in this study are higher than 0.80, suggesting that the scale has considerably high level of validity (Nunnally, 1978). The factor perspective composition extracted by factorial analysis is consistent with the original design of the research, suggesting that the scale has appropriate construct validity.

Research Variable Correlation

According to the correlation analysis as shown in Table 1, regarding the relationship between product perceived value and purchase intention, quality value of commodity and monetary value of commodity are significantly and positively correlated to consumer’s purchase intention. In other words, when the consumer perceived product quality and price change are consistent with the needs, the consumer’s purchase intention will also be stronger. Regarding the relationship between price sensitivity and purchase intention, the data suggest that price sensitivity and purchase intention are significantly and positively correlated. In other words, when the product price sensitivity of the consumer is higher, the product purchase intention is more unstable.

Impact of Perceived Value on Purchase Intention

First, regarding the effects of product perceived value on purchase intention, this study input the dependent variable (purchase intention), and then the independent variable (quality value of commodity, monetary value of commodity and good-

will value of commodity) to obtain the analysis results, as shown in Table 2.

According to Model 1 as shown in Table 2, when dependent variable is purchase intention, (1) independent variable is the quality value of commodity, the β value is 0.118 (p value<0.05), suggesting that quality value of commodity has a positive impact on consumer purchase

Table 1. Table of Pearson Correlation Analysis

Research variable	1	2	3	4	5
Quality value of commodity	1.00				
monetary value of commodity	.33**	1.00			
Goodwill value of commodity	-.10	-.01	1.00		
Price Sensitivity	.33**	.53**	-.09	1.00	
Purchase Intention	.22**	.29**	-.11	.25**	1.00

Note : * denotes p<0.05 ; ** denotes p<0.01

Table 2. Hierarchical regression analysis of purchase intention

Dependent Variable Independent Variable		Purchase Intention		
		Model 1	Model 2	Model 3
Perceived value	Quality value of commodity	0.118*	0.101 ⁺	-0.383
	monetary value of commodity	0.256**	0.207**	0.151
	Goodwill value of commodity	-0.100 ⁺	-0.093 ⁺	-0.598 ⁺
Price Sensitivity			0.103 ⁺	-1.256*
Interaction	Quality value of commodity * price sensitivity			0.812 ⁺
	Monetary value of commodity * price sensitivity			0.107
	Goodwill value of commodity * price sensitivity			0.905
F Value		14.362**	11.525**	7.475**
R ²		0.105	0.120	0.135
ΔR^2			0.110	0.117

Note: ⁺ denotes p<0.1; *denotes p<0.05; ** denotes p<0.01

intention. (2) When the independent variable is the monetary value of commodity, its β value is 0.256 (p value <0.01), suggesting that monetary value of commodity has a positive impact on consumer purchase intention. In other words, the rise of fall of price will affect consumer purchase intention. (3) When the independent variable is the goodwill value of commodity, its β value-0.100 (p value <0.1), suggesting that goodwill value of commodity has a negative impact on consumer purchase intention. The possible reason is the increasing choices of the consumer. Hence, the consumer changes the perceived goodwill value of commodity, and thus reduces the commodity purchase intention. Hence, it can be concluded that H1 is partially supported.

Correlation Between Perceived Value And Purchase Intention: With Price Sensitivity As The Moderating Variable

This study employed the hierarchical regression to conduct data analysis to understand the moderating effects of price sensitivity on consumer's perceived value and purchase intention with purchase intention as the dependent variable. It first, input independent variable of perceived value (quality value of commodity, monetary value of commodity and goodwill value of commodity), and then input moderating variable of price sensitivity. The data analysis results are as shown in Model 3 of Table 2.

When the dependent variable is purchase intention, (1) when the independent variable is the interaction of quality value of commodity and price sensitivity, the β value is 0.812 (p value <0.1), suggesting that the produce price sensitivity has a significant positive moderating effect on quality value of commodity and purchase intention. (2) When the independent variable is the interaction between monetary value of commodity and price sensitivity,

its β value is 0.107 (p value >0.1), suggesting that the moderating effect of price sensitivity on monetary value of commodity and purchase intention is not significant. (3) When independent variable is the interaction between goodwill value of commodity and price sensitivity, its β value is 0.905 (p value >0.1), suggesting that the moderating effect of product price sensitivity on goodwill value of commodity and purchase intention is not significant. Hence, H2 is partially supported.

Conclusions and Suggestions

This study explored the correlation between consumers' perceived value and purchase intention by adding the factor of price sensitivity to analyze the moderating effects. Based on the results, the conclusions are proposed as follows:

Conclusions

Relationship between perceived value and purchase intention

This study found that consumer's perceived value has a significant effect on purchase intention. Regarding factors of perceived value, quality value of commodity and monetary value have significant and positive effects on consumer's purchase intention. With rising consumption awareness and transparency of consumption information, the perceived improvement in quality value of commodity by the consumer will enhance purchase intention. Grunert (2005) proposed that, the rising perceived quality of product by the consumer will further increase consumer intention to repurchase. In other words, rising quality of product can enhance consumer's purchase intention. In addition, the factor of monetary value of commodity also has a significant positive impact on consumer's purchase intention. In other words, when the perceived monetary value of the product rises, the consumer's pur-

chase intention will be enhanced. This indicates that the monetary judgment of the product utility in external market will also affect the consumer's purchase intention in addition to the utility of the product. Regarding the factor of goodwill value of commodity, it has a significant and negative impact on consumer's purchase intention, suggesting that the transparency of commodity information can help consumers understand commodity value. Once the consumers are aware of the problem of the product, the reputation of the enterprise and commodity as well as the purchase intention in the future will be affected.

The moderating effects of price sensitivity on perceived value and purchase intention

According to the data analysis results, the effects of consumer's perceived quality value of commodity and price sensitivity on purchase intention will be moderated by price sensitivity. Overall, when the consumers are aware of the change in commodity quality, the price sensitivity of the consumer will be higher, which is helpful to commodity purchase intention. Goldsmith, Kim, Flynn and Kim (2005) pointed out that the product knowledge and price are positively correlated. Wakefield and Iaman (2003) suggested that, if the consumer makes extra efforts for lower price, it means that the consumer is price sensitive. In other words, the consumer is going to purchase products of high quality. Consumers of a higher level of price sensitivity will have a higher level of purchase intention. However, the effects of consumer's perceived monetary value of commodity, perceived goodwill value and price sensitivity on purchase intention are insignificant. When purchasing commodities of quality value of commodity, consumers are more likely to make extra efforts for reasonable prices. Hence, when selecting products of quality value, consumers will have more price knowledge to make reasonable price judgment to purchase what they expect. Purchase confusion will be

more unlikely. Thus, its effects on purchase intention are significant and positive.

Management Implications

Due to the increasing number of channels of information in the consumption market, consumers can access information in very easy ways to compare the prices. The search for information means higher price sensitivity of the consumer. Hence, manufacturers are suggested to provide detailed price information to make consumers want to search and improve their purchase intention.

The quality of products should be improved to enhance the acceptance of rising prices and customer loyalty to gain higher profits for the enterprise. In addition, as consumers may have different reactions to purchased commodities, enterprises are suggested to make different pricing policies for products of quality value, products of monetary value and products of goodwill value to satisfy consumer needs.

Research Limitations

This study used the convenience sampling method, which fails to evenly distribute in terms of demographic statistical variable. Future studies can conduct sampling by stratum, nationality or region. Second, the questionnaire is filled by consumers who may be subject to environment, emotion, attitude, and subjective cognitive or external factors. Future studies can conduct detailed survey on contents relating to purchase behavior to understand the level of correlation of various purchase behavior. It can help enterprises in developing and producing products consistent with consumer expectations and the efficiency of their business operations.

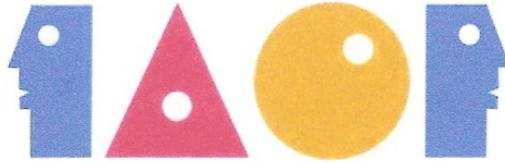
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EXPLORING THE SERVICING EFFECTIVENESS OF SOCIAL
MEDIA IN CUSTOMERS' ELECTRONIC
WORD OF MOUTH (eWOM)

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Abstract

This study mainly explores the servicing effectiveness of social media in customers' electronic word of mouth (eWOM). The idea behind the concept of eWOM is very important to the visibility of individuals and businesses seeking exposure on the Internet. A survey method tests the casual effects between those contracts. The predicting results are that (1) community engagement self-efficacy positively affects social outcome expectations and eWOM ; (2) intrinsic motive (concern for others) has a significant and positive impact on eWOM ; (3) service quality has a significant and positive impact on customer satisfaction ; (4) customer satisfaction significantly and positively affects customer commitment and eWOM. Social outcome expectations and customer commitment are mediating variables in this study.

Keywords: electronic word-of-mouth; service quality; community engagement
self-efficacy; social outcome expectations; customer commitment

Introduction

Virtual community participation and User Generated Content (UGC) are the prevailing social activities in virtual spaces. Along with such trends, word-of-mouth (WOM) transactions have also increased dramatically. WOM information on the Internet (henceforth e-WOM) has become an important information source for shopping (Yoo, Sanders, & Moon, 2013).

The online brand community has been paid much attention by both marketing practitioners and scholars. With the recent popularity of social networking sites (e.g., Facebook, MySpace, Twitter, etc.), the online brand community has expanded its boundary to the virtually networked society. In such a social networking site, both marketers and consumers can easily create online communities and promote the consumer-brand relationships with current and potential community members (Hung & Li, 2007; Lee et al., 2011; Schau, Muniz, & Arnold, 2009; Leimeister, Sidiras, & Krcmar, 2006). One particular approach to promoting the active membership participation is to encourage the community members to advertise the positive benefits of the membership to potential members by spreading their words. This line of approach can be termed electronic word of mouth (eWOM), one of the most reliable sources of information for consumers (Bickart & Schindler, 2001; Brown, Broderick, & Lee, 2007; Hung & Li, 2007).

This study mainly explores the servicing effectiveness of social media in customers' electronic word of mouth (eWOM). The idea behind the concept of eWOM is very important to the visibility of individuals and businesses seeking exposure on the Internet. A structural equation model (SEM) is developed to test the casual effects between those constructs. We explore that if (1) community engagement

self-efficacy positively affects social outcome expectations and eWOM ; (2) intrinsic motive (concern for others) has a significant and positive impact on eWOM ; (3) service quality has a significant and positive impact on customer satisfaction ; (4) customer satisfaction significantly and positively affects customer commitment and eWOM. Social outcome expectations and customer commitment are mediating variables in this study.

Literature Review

Lee, Kim & Kim (2012) propose that consumers' interdependent self-construal increases their consumers' community engagement self-efficacy, which in turn affects their eWOM behaviors for the online brand community directly as well as indirectly through their social outcome expectations associated with the particular behavior for the online brand community.

Hypothesis 1. Community engagement self-efficacy positively affects social outcome expectations.

Hypothesis 2. Customers' social outcome expectations positively affects customers' eWOM.

Hypothesis 3. Customers' community engagement self-efficacy positively affects their social outcome expectations associated with eWOM.

Yoo, Sanders, & Moon (2013) examine "concern for other customers" that are posited to facilitate e-WOM participation behavior.

Hypothesis 4. Intrinsic motives will have a positive impact on e-WOM.

‘Commitment’ is ‘an exchange partner’s belief that an ongoing relationship with another is so important as to warrant maximum efforts at maintaining it, that is, the committed party believes the relationship is worth working on to ensure that it endures indefinitely’ (Morgan & Hunt, 1994). Researchers have treated customer commitment as a mediating variable. Customer satisfaction, mediated by customer commitment, has been shown to influence future intentions (Garbarino & Johnson, 1999). Brown, Barry, Dacin, and Gunst (2005) argue that a consumer’s cumulative evaluation of his satisfactory consumption experiences makes a positive impact on the degree of his commitment in a marketing relationship. Fullerton (2011) in his study of banking, hairstyling, and auto-repair industries proposes that satisfaction is significantly and positively related to affective commitment.

Hypothesis 5. Service quality has a positive impact on customer satisfaction.

Hypothesis 6. Customer satisfaction relates positively to positive eWOM.

Hypothesis 7. Customer satisfaction relates positively to customer commitment.

Hypothesis 8. Customer commitment relates positively to positive eWOM.

Research Model and Methodology

Research Model

See Figure 1. for the Research Model.

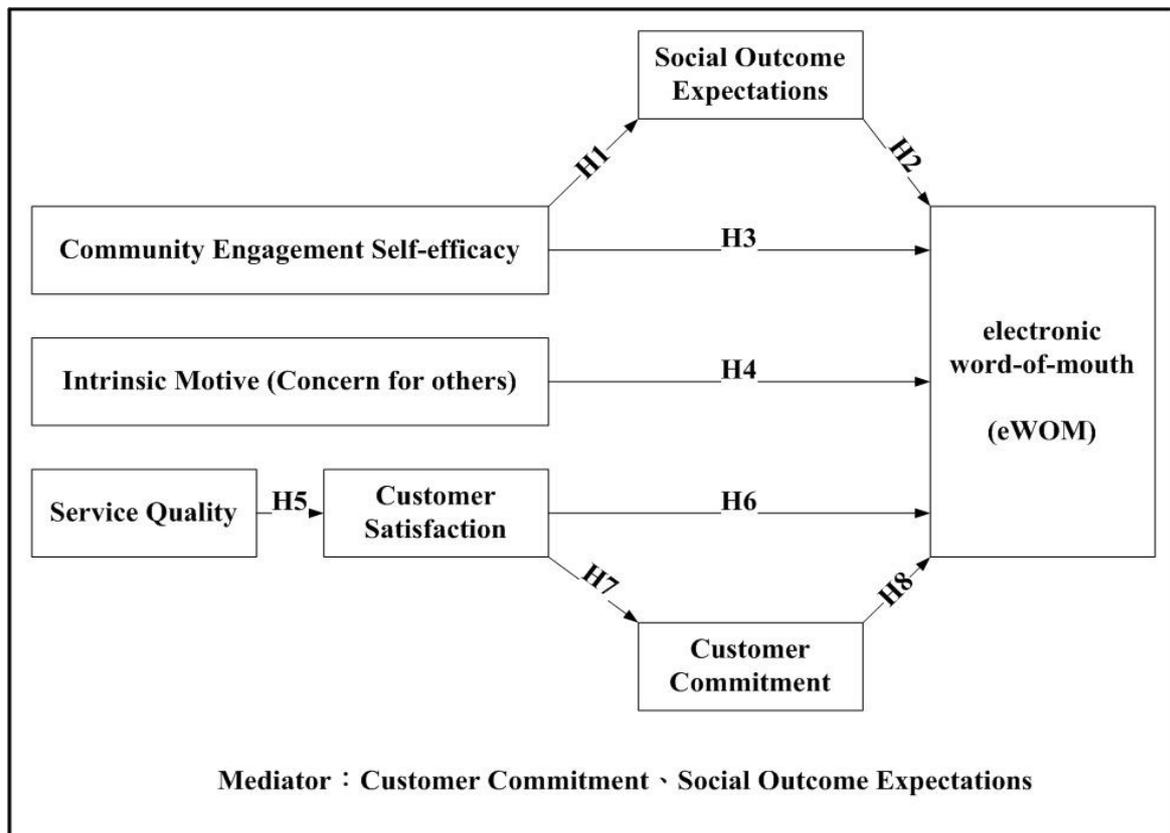


Figure 1. Research Model

Research Methodology

Sampling and Data Collection.

A questionnaire, cover letter, and postage paid return envelope were mailed to these 500 industrial firms. Following Dillman's (1999) total design method, reminder postcards were sent out approximately two weeks after the initial mailing, followed by a second survey mailing approximately one month later to those who had not returned questionnaires. The test of the hypotheses employs a survey sample of industrial firms in Taiwan, with community members as the key informants. The researchers sent personalized e-mails containing a link to an online questionnaire, as well as the offer of a summary of the results and a practitioners' purchasing book in return for their participation.

The survey included two questions to assess the informants' ability to answer the questionnaire (Kumar et al., 1993). These questions measured (on five-point Likert scales, anchored at 1 =fully disagree; 5=fully agree) managers' degree of knowledge about (1) the specific project and (2) the ongoing relationship with the respective supplier.

Survey instrument and measures.

The development of the survey instrument and measures proceeded through several stages and followed standard tech-

niques (Churchill, 1979; Dillman, 2007). First, the preliminary draft questionnaire derives from existing literature and the findings of case study interviews with community members. Second, several academics with diverse research backgrounds and a few practitioners commented on the items in the questionnaire. Third, the pretest of the survey instrument consisted of interviews with purchasing executives from several firms. To ensure clarity, half of these informants provided their comments while answering the questionnaire, and the other half offered responses after they completed the questionnaire. The relevant comments entered the final version of the survey instrument. Existing scales serve to measure the constructs, with some slight

Results

The results are that (1) community engagement self-efficacy positively affects social outcome expectations and eWOM ; (2) intrinsic motive (concern for others) has a significant and positive impact on eWOM ; (3) service quality has a significant and positive impact on customer satisfaction ; (4) customer satisfaction significantly and positively affects customer commitment and eWOM. Social outcome expectations and customer commitment are mediating variables in this study.

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THE RELATIONSHIP AMONG CORPORATE SOCIAL
RESPONSIBILITY, SERVICE QUALITY, CORPORATE
IMAGE AND PURCHASE INTENTION

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Abstract

Previous studies about corporate social responsibility generally explore how corporate social responsibility affects a company's financial performance and employee behavior, and rarely explore the effect of corporate social responsibility on consumer behavior. This study attempts to explore the relationship among corporate social responsibility, service quality, corporate image, and purchase intentions. In addition, this study also examines whether corporate image has a mediating effect on purchase intentions through corporate social responsibility and service quality. This study distributed 400 questionnaires, and after removing 69 questionnaires that were invalid, there were 331 valid questionnaires. The important conclusion of this study is that corporate social responsibility has a significantly positive effect on corporate image, service quality, and purchase intentions. In addition, service quality has a positive effect on corporate image and purchase intentions. The other important finding of this study is that corporate image has a mediating effect between corpo-

rate social responsibility and purchase intentions, as well as between service quality and purchase intentions.

Keywords: Corporate social responsibility, Service quality, Corporate image, Purchase intentions, Mediating effect

Introduction

Corporate social responsibility (CSR) has become a key factor to corporate value creation and sustainable operations, as well as a common value in the world. International organizations have established relevant standards to be followed, including the UN Global Compact and OECD Guidelines for Multinational Enterprises, to guide corporations in implementing CSR in their operational strategies and to establish organizational values for society (Porter, 2006). Many studies point out that CSR has a positive effect on financial performance (Mill, 2006; Mishra and Suar, 2010; Simpson and Kohers, 2002), and can enhance customer satisfaction and maintain good customer relationships (Bhattacharya and Sen, 2003; Darigan and Post, 2009; Lacey and Kennett-Hensel, 2010; Loureiro et al., 2012), as well as increasing the quality of products or services and promoting brand performance (Lai et al., 2010; Xueming and Bhattacharya, 2006). In turn, this can enhance organizational cohesion and organizational commitment by employees and, at the same time, enhance work efficiency (Boddy et al., 2010; Collier and Esteban, 2007; Kim et al., 2010; Lin, 2010). Thus, many scholars believe that incorporating CSR into the core values for operations can help acquire a competitive advantage and achieve sustainable operations.

Hill and Knowlton (2002) investigated the corporate reputation from 800 European and North American CEOs showed that corporate leaders believe that corporate reputation and corporate social responsibility are important tools for the im-

provement of sales and profitability. Clearly, if corporations can carry out their social responsibilities, it would certainly have positive effects on their corporate image (Zair and Peters, 2002). Some marketing experts believe that the role played by corporations in society as a whole would affect the perception of consumers regarding corporate image. Thus, how corporations treat their employees, shareholders, community residents, and others, would all contribute to consumer corporate image for the corporation (Keller, 1998). In addition, as the world faces internationalized competition, corporate success and failure depends on how to use good service quality and enhance the purchase intentions of consumers. Parasuraman et al. (1988) pointed out that service quality would directly affect consumer behavior. Therefore, "customer first" has generally become the top principle for the service industry, customer service and customer complaint centers are crucial departments in corporations; any behaviors that displease consumers are magnified and evaluated, even becoming important indicators that affect performance. Thus, service quality is very important for corporations. Previous studies about CSR generally explore how CSR affects a company's financial performance and employee behavior, and rarely explore the effect of CSR on consumer behavior. Thus, this study aims to examine the relationships among CSR, service quality, corporate image, and purchase intentions. In addition, the study will explore how CSR and service quality affect consumer purchase intentions through corporate image.

According to Taiwan's Fair Trade Commission, by 2010 there were over 4800 President 7-ELEVEN Chain Stores in Taiwan, and it is a large platform suitable for promoting public welfare concepts and events. At every 7-ELEVEN in Taiwan, there are donation boxes at the check-out counter, so that when people pay for products they can donate change for public welfare events; this has continued for over 18 years. 7-ELEVEN Chain Stores have helped 57 charitable organizations for youths away from home, underage prostitutes, abused women, to international war refugees by raising 670 million NT in funds. Using 7-ELEVEN Chain Stores as the channel to raise funds for minority groups is just one of many public welfare activities by which 7-ELEVEN Stores give back to society. 7-ELEVEN believes that public welfare events are not for marketing, but rather manage it like an enterprise. Thus, in the CSR survey of the service industry in Taiwan, every year President has very good scores. Thus, this study uses convenience store consumers as research subjects to explore how the performance of CSR of convenience stores affects service quality, corporate image, and purchase intentions. In addition, the study explores the effect of service quality on corporate image and purchase intentions. Finally, it is hoped that this study can be used to understand whether corporate image has a mediating effect on purchase intentions through corporate social responsibility and service quality.

Literature Review

Corporate Social Responsibility

The concept of CSR originated in the 1950s, when many people believed that the actions of corporations are closely related to society and the public, and should conform to and satisfy social values and expectations (Bowen, 1953). Traditional perspectives believe that when corporations

provide cheap services and maximize profits it is to meet their social responsibility. However, the socio-economic view believes that corporations are citizens of society. The operational process affects the economy, society, and environment, so their responsibilities should not just be to increase profits, but should bear further responsibility to balance society (Davis, 1973). Thus, CSR is also known as corporate citizenship, leading to issues such as corporate ethics, corporate governance, and green marketing. WBCSD (2008) defines CSR as corporate commitment to the continued fulfillment of moral norms, contribution to economic development, as well as improvement of the quality of life for employees, their families, the overall local community, and society. Ferrell et al. (2010) believed that corporations must be responsible to their interested parties, including internal shareholders, the board of trustees, operational teams and employees, external consumers, suppliers, channels, partners, competitors, local communities, and interest groups.

Carroll (1979) believed that corporate social responsibility is the social expectation for corporations at specific times, including economic responsibility, legal responsibility, ethical responsibility, and philanthropic responsibility. Economic responsibility is that corporations should effectively utilize resources and provide products or services at reasonable prices, maintain fair and stable industrial competition order, and satisfy the interests and needs of interested parties, in order to create employment, profit, and growth; these are the most fundamental responsibilities of corporations (Carroll, 1998; Lin, 2010; Maignan, 2001; Rego et al., 2010). Legal responsibility is that corporations must abide by legal regulations; this is the minimum social requirement for corporate responsibility, and they need to incorporate regulations into operational strategies and management, including obligations in

manufacturing, consumption, labor safety, and environmental protection, to avoid harming interested parties (Carroll, 1998; Lin, 2010; Maignan, 2001; Maignan and Ferrell, 2000; Ramasamy and Yeung, 2009). Ethical responsibility is that corporate core values and ideals must conform to moral norms in society, conform to social expectations or prohibitions in order to protect the rights and public good of interested parties (Branco and Rodrigues, 2006; Carroll, 1998; Lin, 2010; Maignan, 2001). Philanthropic responsibility is corporate activities beyond economic, legal, and ethical norms; it is the active and proactive giving back to society for the improvement of the overall quality of life, support of national policy, and the creation of a harmonious society (Carroll, 1998; Lin, 2010; Maignan, 2001).

Service quality

Service quality is one of the issues most emphasized by various industries at the present time, and is an important factor affecting whether an industry is sustainable. Parasuraman et al. (1985) described the four important characteristics of “service”, which are intangibility, inseparability/simultaneous, heterogeneity, and perishability. Sasser et al. (1978) were in the vanguard of service quality research. Based on the characteristics of the service industry, they divided service quality into the three dimensions of material, personnel, and equipment. Churchill and Suprenant (1982) believed that service quality is the gap between satisfaction actually felt by customers after accepting services and their expectations. Later, most relevant studies cite Parasuraman et al. (1985), who define service quality as the “expectation” before customers accept service and the “perception” after customers accept service; in other words, service quality is equal to the expected service subtracted by perceived service.

Based on the results of in-depth interviews, Parasuraman et al. (1985) proposed ten measurement dimensions of service quality, which are tangibility, reliability, responsiveness, credibility, security, competence, courtesy, understanding, access, communication. Parasuraman et al. (1988) further extracted five major dimensions from the ten dimensions of service quality, for the SERVQUAL scale using 22 questions. These include tangibility, which refers to the hardware facilities of service and the external appearance of service personnel. Reliability refers to the correct execution of the promised service content. Responsiveness refers to the intention of service personnel to help customers and provide timely services. Assurance refers to service personnel with professional knowledge and etiquette to make the customers feel trust and calm. Finally, empathy refers to care and providing individualized services to customers. The modified SERVQUAL scale is more comprehensive, and its reliability and validity are significantly better than the original scale.

Corporate image

Corporate image is an abstract concept that reflects the public’s general evaluation of a corporation. However, since the concept is very broad, there has long been an absence of definitions agreed upon by the public, and different scholars have defined it differently as well. Boulding (1956) believed that image may not be able to fully reflect the genuine content of matters, but are subjective consciousness, based on the information received by an individual, and may be perspectives derived from incomplete or incorrect information. Bayton (1959) attempted to use a human perspective to interpret the dimensions of corporate image, such as amiability and friendliness. Mazzarol (1998) pointed out that corporate image is an indicator that attracts potential or existing customers to be willing to come into con-

tact with a corporation. Nguyen and Leblanc (2001) believed that the factors forming corporate image may come from customer perception of the corporation and its behavior, including the corporate name, traditions, operational visions, and diversity of product services; these are the results of the interactive influences of all experiences, feelings, ideas, and knowledge of customers. Tang (2007) proposed a similar definition, pointing out that corporate image is the customer's total offering toward organizations, and is the sum of the public's beliefs, ideas, and impressions toward specific organizations.

Walters (1978) divided corporate image into the three dimensions of institution image, functional image and commodity image. Riordan et al. (1997) used a single dimension to measure corporate image. Pina et al. (2006) used eight dimensions to measure corporate image, which are respect, professionalism, success, adequate establishment, stability, trustworthiness, reliability, and concern for customers.

Purchase intention

Fishbein and Ajzen (1975) believed that purchase intentions can be used as an indicator to predict customer consumption behavior, representing the subjective consciousness or possibilities of customer purchases (Dodds et al., 1991). Schiffman and Kanuk (2000) also believed that purchase intentions measure the possibilities of consumers purchasing a certain product, and there is a positive correlation between purchase intentions and actual purchase. Zeithaml (1988) proposed using three questions in possible purchase, want to purchase, and considering purchase to measure the level of purchase intentions. Sirohi et al. (1998) pointed out that purchase intentions should be measured by customer loyalty, such as repurchase intentions, intention to buy more products in the

future, and intention to recommend products to others.

Research Methods

Sampling

Data for this study were accumulated via convenience sampling from consumers who have used products or services at convenience stores, asking them to answer questionnaire items based on the convenience stores they most often visit (or most prefer). This study distributed 400 questionnaires, and after removing 69 questionnaires that were invalid, there were 331 valid questionnaires; the overall response rate was 82.8%. Tuncalp (1988) found that convenience sampling is appropriate for exploratory research designed to gain a better understanding of final consumers. A summary of the sample characteristics is presented in Table 1. The majority of the respondents were female (61.9%). Most subjects (89.1%) were 21 to 50 years old. The predominant education level was College or University (66.2%), and their average wage per month was less than NT\$ 60,000 (81.3%).

Measurement

The questionnaire in this study includes four sections of "corporate social responsibility," "service quality," "corporate image," "purchase intentions". A five-point Likert scale ranging from (1) mostly false to (5) mostly true was used. If the score is high, it means that they agree with the questionnaire content to a greater extent. Completed data were entered and processed by using the software of the Statistical Package for the Social Sciences (SPSS) version 12.0, and the questionnaire sources and results of factor analysis and reliability are as follows.

Table 1. Sample characteristics.

Variable	Demographics	Number	Valid percent
Gender	Male	126	38.1
	Female	205	61.9
Age	Under 20 years	26	7.9
	21~35 years	130	39.3
	36~50 years	165	49.8
	Over 51 years	10	3.0
Education level	High school or below	29	8.8
	College or University	219	66.2
	Graduate school or above	83	25.0
Average wage	Under NT\$ 20,000	38	11.5
	NT\$ 20,001~40,000	92	27.8
	NT\$ 40,001-60,000	139	42.0
	Over NT\$ 60,000	62	18.7

The Corporate Social Responsibility Questionnaire refers to the study by Carroll (1979), with 17 questions. The Service Quality Questionnaire refers to the SERVQUAL scale by Parasuraman et al. (1988), and includes 22 questions. The Corporate Image Questionnaire refers to the study by Riordan et al. (1997), and includes 7 questions. The Purchase Intentions section refers to the study by Zeithaml (1988), and consists of 5 questions.

The KMO values of the four variables in this study (CSR, service quality, corporate image, and purchase intentions) are all greater than 0.8, and the Bartlett's sphericity test is lower than 0.005, which is suitable for factor analysis. Principle components analysis was employed and Varimax was used as an orthogonal rotation to extract eigenvalues of factors equaling or exceeding 1 and factor loadings equaling or exceeding the accepted criterion of 0.5 (Hair et al., 2006). The factor analysis, reliability, and validity analyses of the four variables are shown in Table 2.

The Corporate Social Responsibility Questionnaire was used to extract 3 fac-

tors. The cumulative percentage of variance was 70.695 and the Cronbach's alpha ranged from 0.756 to 0.887, which shows that the scale has good reliability. The factors represented the three different dimensions of CSR: (a) economic and legal responsibility, (b) philanthropic responsibility, (c) ethical responsibility.

The Service Quality Questionnaire was used to extract 3 factors. The cumulative percentage of variance was 65.278 and the Cronbach's alpha ranged from 0.760 to 0.887, which shows that this scale has good reliability. The accumulated explanatory power is 65.278%, with good validity. The factors represented the three different dimensions of service quality: (a) service, (b) reliability, (c) tangibles.

The Corporate Image Questionnaire is used to extract a single factor. The cumulative percentage of variance was 72.239 and the Cronbach's alpha was 0.872, which means that this scale has good reliability.

The Purchase Intentions is used to extract a single factor, the cumulative percentage of variance was 73.560 and the

Cronbach's alpha was 0.878., with cumulated explanatory ability of 73.560%,

which means that this scale has good reliability.

Table 2. Factor analysis and reliability

Construct	Dimension name and Items	Mean	Factor Loading	Cumulative percentage of variance	Cronbach's α
CSR	<i>Economic and legal responsibility</i>			25.119%	0.791
	The convenience store can guarantee investor benefits.	3.75	0.850		
	The convenience store can enhance corporate operational performance.	4.04	0.710		
	The convenience store would make public its information such as financial conditions and performance in good faith.	3.67	0.705		
	The convenience store can abide by the law and pay taxes honestly.	3.80	0.659		
	<i>Philanthropic responsibility</i>			49.345%	0.879
	The convenience store would sponsor artistic and cultural events.	3.82	0.893		
	The convenience store can sponsor charitable groups.	3.90	0.882		
	The convenience store would emphasize and accommodate charitable and public welfare events.	3.90	0.741		
	<i>Ethical responsibility</i>			70.695%	0.756
	The convenience store would emphasize employee education and development.	3.82	0.855		
	The convenience store would save energy and reduce waste of resources.	3.34	0.732		
	The convenience store would devote itself to protecting personal data of customers.	3.61	0.717		
Service Quality	<i>Service</i>			31.122%	0.887
	Service personnel can give customers individualized care.	3.65	0.824		
	Service personnel can understand customer needs.	3.67	0.746		
	Service personnel can gain corporate support to do their work well.	3.78	0.739		
	The convenience store can provide customers with personalized service.	3.76	0.730		
	The customer can trust the service personnel.	3.82	0.724		
	Even if busy, service personnel would provide suitable services to customers	3.75	0.719		
	The convenience store will consider customer interests as a priority.	3.53	0.647		

Table 2. Factor analysis and reliability (continued).

Construct	Dimension name and Items	Mean	Factor Loading	Cumulative percentage of variance	Cronbach's α
	Reliability			48.827%	0.808
	The convenience store can fulfill commitments to the customers.	3.89	0.809		
	The convenience store can provide appropriate services within the promised time.	3.95	0.764		
	The services of the convenience store are reliable.	3.92	0.740		
	Tangibility			65.278%	0.760
	The convenience store's facilities usually have an attractive appearance.	4.14	0.842		
	The convenience store has modernized facilities.	4.28	0.826		
	The convenience store's employees are dressed neatly.	4.19	0.641		
	Corporate image			72.239%	0.872
Corporate Image	I have a better impression of the convenience store.	4.12	0.867		
	The convenience store has good will and is trustworthy.	4.03	0.858		
	The convenience store has a better reputation than the other chain convenience stores.	4.21	0.839		
	I think that the convenience store has a good overall image.	4.16	0.835		
	Purchase intentions			73.560%	0.878
Purchase Intentions	If I want to buy something at a convenience store, there is a high probability that I would buy products at this store.	3.92	0.890		
	If I want to buy something at a convenience store, I would consider the store's products.	4.04	0.879		
	If I want to buy something at a convenience store, the store would be my first choice.	3.78	0.862		
	I am willing to recommend the store's products or services to other people.	3.60	0.797		

Theoretical background and hypotheses

This study primarily explores the relationships among corporate social responsibility, service quality, corporate image, and purchase intentions. Corporate image is the mediating variable in exploring how corporate social responsibility and service quality affect the purchase intentions of

consumers through corporate image; the research framework of this study is shown in the following figure (Figure 1).

There have been few past studies that explore whether CSR would affect service quality of corporations. Only the study by Chiu (2009) pointed out that if consumers have a high degree of perception of CSR,

they would have higher perceived service quality as well as higher repurchase intentions. In addition, Morf et al. (1999) pointed out that there is a positive correlation between social responsibility and corporate image. Brammer and Millington (2005) discovered that corporations engag-

ing in charitable events can help enhance corporate image and reputation. Fombrun and Shanely (1990) found that CSR has an external effect on organizational reputation, helping the organization project positive images to external groups.

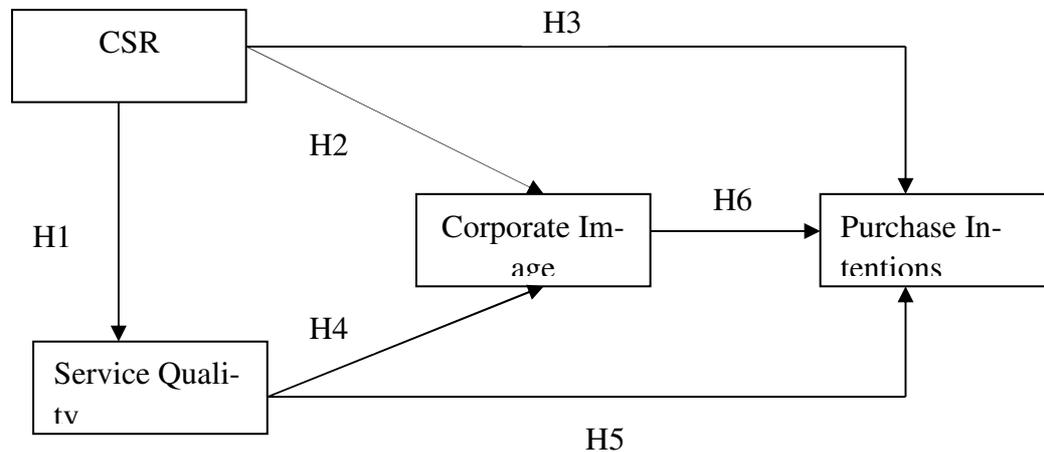


Figure 1. Research model

Lichtenstein et al. (1993) found that implementing CSR activities can bring good results to corporations, such as improving consumer views and purchasing behavior for corporations. Kolkailah et al. (2012) found that consumers in Egypt tend to develop positive attitude towards socially responsible companies. Chang (2009) pointed out that CSR can enhance consumer purchase intentions. In addition, Huang (2001) surveyed corporate image and service quality in the banking industry, finding that service quality has a positive effect on corporate images. Lin (2005) pointed out that when service quality increases, it not only enhances corporate image but also enhances customer satisfaction and loyalty. The study by Peng (2011) showed that service quality has a significant positive effect on corporate image.

Loudon and Bitta (1988) believed that consumers are more inclined to buy products with a good corporate image to lower purchase risk. Fornell (1992) believed that service quality would have a significant effect on customer purchase intentions. Jang

and Namkung (2009) point out that restaurants' service quality would positively affect consumer behavioral intentions. The study by Hsieh and Tseng (2010) pointed out that the service quality of internet phones has a significant positive effect on customer behavioral intentions. Finally, Han and Schmitt (1997) believed that corporate image is as important as product quality; businesses with good images would have better sales of their products.

Thus, based on the above research framework and the literature on the relationship among variables, this study proposes the following hypotheses.

H1: CSR has a significant positive effect on service quality.

H2: CSR has a significant positive effect on corporate image.

H3: CSR has a significant positive effect on purchase intentions

H4: Service quality has a significant positive effect on corporate image.

H5: Service quality has a significant positive effect on purchase intentions.

H6: Corporate image has a significant positive effect on purchase intentions.

H7: Corporate image has a mediating effect in the relationship between CSR and purchase intentions.

H8: Corporate image has a mediating effect in the relationship between service quality and purchase intentions.

Data Analysis

Regression results

The first regression model investigated the relationship between CSR and service quality. As can be seen in Table 3, the independent variable of CSR explained 52.1 percent of the variance of service quality ($R^2=0.521$). From the equation, it can be seen that CSR ($\beta=0.772$, $p<0.001$) has a significantly positive effect on service quality, which means that if consumers have a higher perception of CSR, they will have higher perceived service quality. Thus, Hypothesis H1 is supported. From the second regression model, the independent variable of CSR explained 42.0 percent of the variance of service quality ($R^2=0.420$). From the equation, it was found that CSR ($\beta=0.648$, $p<0.001$) has a significantly positive effect on corporate image, which means corporations with better CSR performance would also have a better corporate image. Therefore, Hypothesis H2 is supported. From the third regression model, the independent variable of CSR explained 28.3 percent of the variance of service quality ($R^2=0.283$). From the equation, it was found that CSR ($\beta=0.532$, $p<0.001$) has a significantly positive effect on purchase intentions, which means that if consumers have greater per-

ception of CSR, they also have higher purchase intentions. Thus, Hypothesis H3 in this study is supported.

In addition, the fourth regression model investigated the relationship between service quality and corporate image. As can be seen in Table 3, the independent variable of service quality explained 43.4 percent of the variance of service quality ($R^2=0.434$). From the equation, it can be seen that service quality ($\beta=0.659$, $p<0.001$) has a significantly positive effect on corporate image, which means if corporations have good service quality, they will also have good corporate image. Therefore, Hypothesis H4 is supported. Meanwhile, from the fifth regression model, the independent variable of service quality explained 27.2 percent of the variance of service quality ($R^2=0.272$). From the equation, it can be found that service quality ($\beta=0.521$, $p<0.001$) has a significantly positive effect on purchase intentions, which means when corporations have higher service quality, consumers will have higher purchase intention. Thus, Hypothesis H5 is supported. Finally, the sixth regression model investigated the relationship between corporate image and purchase intentions. As can be seen in Table 3, the independent variable of corporate image explained 40.0 percent of the variance of purchase intentions ($R^2=0.400$). From the equation, it was found that corporate image ($\beta=0.632$, $p<0.001$) has a significantly positive effect on purchase intentions, which means when corporate image is good, consumers also have higher purchase intentions. Consequently, Hypothesis H6 in this study is supported.

The Mediating Effect Of Corporate Image

This study uses the mediating effect confirmation model by Baron and Kenny (1986) to evaluate whether corporate image is the mediating variable between CSR and purchase intentions; the follow-

ing four conditions must be met: 1) CSR must have a significant influence on purchase intentions; 2) CSR must have a significant influence on corporate image; 3) When CSR and corporate image are simultaneous prediction variables in a regression analysis on purchase intentions, cor-

porate image must have a significant influence on purchase intentions; 4) in the mediating variable model, the regression coefficient of CSR must be smaller than the regression coefficient of the independent variable model.

Table 3. Regression analysis results

Independent variable	Dependent variable	β	R^2	F	DW
CSR	Service quality	0.772***	0.521	357.223***	1.907
CSR	Corporate image	0.648***	0.420	238.216***	1.811
CSR	Purchase intentions	0.532***	0.283	129.662***	1.912
Service quality	Corporate image	0.659***	0.434	252.248***	1.788
Service quality	Purchase intentions	0.521***	0.272	122.871***	1.859
Corporate image	Purchase intentions	0.632***	0.400	219.351***	1.923

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$

First, this study evaluates whether corporate image has a mediating effect between CSR and purchase intentions. Table 3 shows that there is a significant influence between CSR and purchase intentions ($\beta = 0.532$, $p < 0.001$). In addition, there is a significant influence between CSR and corporate image ($\beta = 0.648$, $p < 0.001$). Table 4 shows that there is a significant influence between corporate image and purchase intentions, and there is a significant influence between CSR and purchase intentions ($\beta = 0.210$, $p < 0.001$), but the β value is smaller than 0.532 from the first step, which means that corporate image has partial mediation between CSR and purchase intentions. Thus, Hypothesis H7 in this study is supported.

In addition, this study explores whether service quality would affect pur-

chase intentions through corporate image. Table 3 shows that there is a significant influence between service quality and purchase intentions ($\beta = 0.521$, $p < 0.001$). In addition, there is a significant influence between service quality and corporate image ($\beta = 0.659$, $p < 0.001$).

Table 4 shows that there is a significant influence between corporate image and purchase intention, and there is a significant influence between service quality and purchase intentions ($\beta = 0.185$, $p < 0.01$), but the β value is smaller than 0.521 from the first step, which means that corporate image has partial mediation between service quality and purchase intentions. Thus, Hypothesis H8 in this study is supported.

Table 4. The mediating effect of corporate image

Independent variable	Dependent variable	β	R ²	F
CSR	Purchase Intentions	0.210***	0.426	121.517***
Corporate image	Purchase Intentions	0.496***		
Service quality	Purchase Intentions	0.185**	0.419	118.479***
Corporate image	Purchase Intentions	0.510***		

*P<0.05; **P<0.01; ***P<0.001

Conclusion and Limitations

Conclusion and Suggestions

This study finds that CSR has a significantly positive effect on corporate image, service quality, and purchase intentions. Other than protecting the interests of various interested parties (employees, shareholders, consumers, suppliers, governments, and environment) corporations also need to abide by laws. Corporations can enhance their corporate image by actively giving to charitable and social welfare events or giving back to society and caring for minorities. Welford (2004) pointed out that an important part of CSR is using professional training to cultivate and develop employees, and educate them to be concerned with consumer rights, which can enhance service quality. In addition, when consumers believe that a corporation is not only seeking profit without concern for others, it would strengthen consumer purchase intentions. Promoting public welfare events can always resonate with consumers in inspiring their benevolent feelings, and cause consumers to engage in actual purchasing behavior. The mean values of three dimensions of CSR show that “philanthropic responsibility” earned higher scores, which means that if corporations can sponsor charitable and minority groups, participate in public welfare, artistic, and cultural events, participate in community environment improvement, corporate volunteers, or donate resources, it would certainly make the public sense corporate sincerity in giving back to

society, thereby creating a win-win situation between corporations and society. Thus, the emphasis and implementation of philanthropic responsibility would certainly be a crucial issue for corporations.

In addition, this study finds that service quality has a positive effect on corporate image and purchase intention. In an age of “customer first”, corporations that can succeed in service quality would find it easier to defeat competitors. Understanding customer needs and providing customers with fast, reliable, and customized services can enhance consumer identification with corporations and establish a corporate image of excellent service, which would naturally help in establishing customer loyalty and promoting them to buy again. The mean values in three dimensions of service quality show that the dimension of “service” has lower scores, which means consumers have greater doubts about whether corporations place customer interests first. Therefore, if corporations can help consumers feel well-attended and respected, and provide customer-centered services, it would certainly move them to become loyal; this is a very important issue for corporations as well.

Finally, corporate image has a positive effect on purchase intentions. Corporate professionalism and a good and trustworthy image can keep consumers, who in turn increase in numbers and sales due to word-of-mouth; more importantly, compared to other corporations, this can better help expand market share, enabling a cor-

poration to remain successful. The other important finding of this study is that corporate image has a mediating effect between CSR and purchase intentions, as well as between service quality and purchase intentions, which means that even though CSR has a positive influence on purchase intentions, corporate image can lower the effect of CSR on purchase intentions. Thus it can be seen that corporate image plays an instrumental role in influencing consumer choices, even though a corporation has good performance in CSR. In addition, although service quality has a positive effect on purchase intentions, corporate image can be used to lower the effect of service quality on purchase intentions; consequently the establishment and maintenance of corporate image should be conducted more carefully. Thus, corporations are all working on strengthening CSR, making their financial information transparent, using CSR reports to disclose non-financial information, following regulations and laws, lowering resource waste,

and devoting themselves to social contributions to establish good corporate images.

Limitations

Since this study uses five sections of questionnaires as measurement tool, it is difficult to avoid respondents producing an overestimated result due to social expectations (Crowne and Marlowe, 1960). Due to errors that may arise from this point, this study applies the suggestion by Spector and Fox (2003), modifying the more sensitive questions or wordings in the process of compiling the research tool, in order to ask for more precise concepts with activity descriptions that are fact-oriented to prevent this type of error. CSR and corporate image are both views from long-term observation of corporations, but it is possible that corporations violated their corporate social responsibility, or events affecting corporate image took place, influencing the public's view. This is something that this study cannot predict or control

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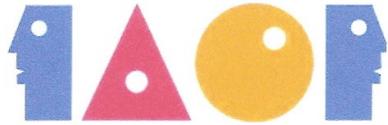
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TECHNOLOGY EVOLUTION, TECHNOLOGY DIFFUSION, AND
REGIONAL DEVELOPMENT: THE FLAT PANEL DISPLAY
INDUSTRY IN EAST ASIA

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Abstract

As a new and thriving high technology industry, the flat panel display (FPD) industry has rapidly emerged and developed over the past two decades in East Asia. However, rather than developed as a global industry, it has grown to emerge as a regional high technology industry. The primary objective of the present study is to shed light on the developmental process, technological evolution, as well as technological diffusion of this significant industry. It also discusses about the experience of the technology latecomer countries like Korea and Taiwan, striving to achieve the development of the FPD industry. To date, the FPD industry has not been proliferated and diffused in the rest of the world, even in the advanced regions including the U.S. and Europe. This fact has further intensified the evidence that the FPD industry is purely a unique high technology industry in East Asia. Some policies and managerial implications are drawn.

Key words: Flat panel display industry, technology evolution, technology diffusion, regional development

Introduction

Over the past two decades, a new and flourishing high technology industry --the FPD industry has rapidly developed and emerged. However, contrary to being a global industry, it has totally developed and risen in East Asia, as an East Asia-themed high technology industry (Lee, et al., 2011). In the setting of the FPD industry, the segment technology of the thin film transistor liquid crystal display (TFT-LCD) has been firmly recognized as one of the most important and influential high technologies in the world. It is the key driving IT products to be colorful, light, thin, mobile, environmental friendly, low radiation, and high density (Hung, 2006). It has now accounted for more than 90 percent of the entire FPD output per annum, and is regarded as the most representative and leading technology in the FPD industry.

Compared with development of other prevailing high technology industries in the world; for example, the semiconductor industry developed in the 1970s, the personal computer, 1980s; the internet, 1990s, the TFT-LCD also commenced in the 1990s and was considered as the most emerging industry in the world. It has currently been applied to produce a variety of electronic products, ranging from the large-sized LCD TV, to cell phones, digital cameras, personal digital assistances, as

well as to the large outdoor LED devices in the cities (Hart, et al., 2000; Semenza, 2000; Spencer, 2005). In the meantime, TFT-LCD has also widely applied in the industrial equipment, transport equipment, medical equipment, and military equipment (Polgr, 2003; Mathews, 2005). In the early beginning, its market size was quite limited, and even negligible without the future. In 1983, the global FPD market size was merely US\$500 million, with US\$2 billion, in 1987. Since 2000, the FPD industry grew significantly and explosively with US\$21 billion in 2001; US\$35 billion, 2003; US\$84 billion, 2006; and US\$103 billion, 2012 (see Table 1).

The TFT-LCD industry is a very capital intensive, technology intensive and knowledge intensive. It is also an industry with high investment threshold, and a high risky industry that is easily influenced by the fluctuation of the global economy (Semenza, 2000; Chang, 2005). TFT-LCD is one of the high technology industries that are highly affected by the fluctuation of the global economy. To date, the TFT-LCD industry has experienced several industrial cycles. The occurrence of the industrial cycle has always led to the advancement and foster of the industrial technological capabilities, and has also resulted in the robust growth for the industry. The most brilliant industrial feature of this industry is that most of the industrial investors have always adopted a

Table 1. Global FPD market (unit: billion)

Year	1987	1991	1998	2001	2002	2005	2006	2007	2008	2009	2010	2011	2012
Amount	2	5	11	21	29	71	84	105	105	88	93	97	103

Source: DisplaySearch (2013)

forward looking investment strategy, by making the reverse investment at the downturn of the industrial recession to successfully enter the industry. None of them has entered the industry at the upturn. More predominantly, the newcomers of the industry have also engaged in their business through the mode of industrial

clustering, thus successfully surpassing the investment and development obstacles (Mathews, 2004). Table 2 displays the technological evolution of the TFT-LCD industry in terms of the technology generation, the size of glass substrate, and the amount of required investment for the industry.

Table 2. Technological evolution of the TFT-LCD industry

Generation	Time for mass production	Dimension of glass substrate	Required investment amount
G1	1991	30cm x 40cm	US\$100-200 millions
G3	1995	55cm x 65cm	US\$500 millions
G4	2000	68cm x 88cm	US\$700-900 millions
G5	2002	110cm x 130cm	US\$1 billions
G6	2003	150cm x 185cm	US\$1.5 billions
G7.5	2006	195cm x 225cm	US\$2 billion
G8.5	2008	220cm x 250cm	US\$3 billions

Source: Murtha, et al. (2004); AUO (2013)

The industrial evolution of the FPD industry has offered an interesting research topic in investigating about the important industrial matters about the technology evolution, technology diffusion, as well as the regional development. This has inspired the interest of the present study to undertake the research. Today, the world's leading FPD supply countries are those countries located in the region of the East Asia, including Japan, Korea and Taiwan. Currently, the three far eastern countries totally dominate around 95 percent of the world's FPD output, with Korea holding 50 percent of market share; Taiwan, 45 percent; and Japan, 5 percent.

Wong and Mathews (2004) have indicated that certain Asian newly industrialized countries have rapidly emerged and gained significant position in the global settings of high technology development. However, the international literature about how can these emerging countries catch up with the advanced counterparts and even surpass them in certain high technology sectors have been limited. This argument has also motivated the present study to conduct the analysis.

The present study is naturally a qualitative case study. The present study is to take the TFT-LCD industry as the major research industry, without covering the research about other segment industries of the FPD industry. In the meantime, the present study will not discuss about the development of FPD industry in China, as the Chinese FPD industry is mainly oriented by low-end and small-size FPD manufacture. The present study primarily focuses on the high-end and large-size FPD. The large size FPD industry in China has not completed developed; there-

fore, the present study excludes China for the study.

United States -- the Original Inventor of FPD

To date, most of the technologies in the global electronics sector were originally invented in the U.S., and were also driven for mass-production and commercialization by the U.S. enterprises (Hart, et al., 2000). However, in pursuit of low-cost manufacturing for sustaining industrial competitiveness and proceeding industrial globalization, the industrial supply chain started to transfer and move to the East Asian countries such as Japan, Korea, and Taiwan for mass-production, as they are comparatively competitive in the production and manufacturing settings. The technological development process of the FPD industry is almost similar to other electronics sectors. The original FPD technology was invented in the laboratory in the U.S. in 1960s (Spencer, 2003). In the decade, the leading U.S. MNEs, including RCA, Westinghouse, and General Electric had undertaken the crystal technology to research and develop the FPD technology. However, at that time, RCA considered the FPD as a threat technology that would replace its leading business—CRT. Therefore, RCA had not endeavored to further conduct the research for the development of FPD technology for commercialization.

In late 1970s and early 1980s, some U.S. enterprises, including Beckman Instruments, Fairchild, Hewlett-Packard, Motorola, Texas Instruments, and Timex had also considered the research of FPD technology. However, due to the requirement for tremendous financial budget for

the research and development, they all had suspended to conduct the project. Since then, none of American enterprises had continued to engage in the research of FPD technology (Flamm, 1994). In 1980s, IBM commenced the research and development of LCD technology, in a hope to replace CRT to be applied for the manufacture of personal computer. It appointed its Japanese affiliate—IBM Japan to cooperate with Toshiba to form a technical strategic alliance to jointly develop the large-sized FPD technology. They jointly set up a joint venture—Display Technologies Inc. (DTI). Since IBM had not undertaken commercialization for the manufacture of FPD in the territory of the U.S., it was therefore not able to produce spill-over effects of the technology and knowledge diffusion to make the FPD industry burgeon and proliferate in the U.S. (Barfield, 1994).

In early 1990s, the emergence of a wide range of IT products led the world to enter the information age and the knowledge economy era. The demand for notebook computer was very strong. However, most of the scale of the U.S. FPD manufacturers was very small and they could not meet the huge demand for FPD at home. At that time, the high end FPD was still under the research and development. Leading American IT MNEs, such as Apple, Compaq, and IBM all had a very strong demand for FPD. However, the local supply was not in a position to meet their needs. Therefore, they had to import the large quantity of high-end of FPDs from Japan for the manufacture of notebook computers. In 1990, a few American FPD manufacturers sent petition to the Department of Commerce of the U.S. in charging Japanese FPD sup-

pliers for antidumping of FPD. In such, between 1991 and 1993, the U.S. government accordingly imposed the anti-dumping tax on the Japanese firms as a punishment. However, the development and result of this antidumping case had nothing to do with the development of FPD industry in the U.S. On the contrary, this antidumping case had reversely pushed the American IT MNEs to seek the procurement from overseas, particularly Japan (Flamm, 1994). During the period, the government of the U.S. had perceived a fact that the FPD industry is essential to the nation, with particular application in the defense sector. FPD is widely recognized as a friendly human interface device with a broad application in a number of military, industrial and commercial appliances. Particularly, the U.S. government had foreseen that the FPD would definitely replace the CRT to be used in the majority of the U.S. weapon systems by the end of the twenty century (Hart et al., 2000). Therefore, the U.S. government had commenced its intention to develop the FPD industry in the nation. In early 1990s, by injecting a large sum of public research fund, the U.S. government had intended to develop a FPD industrial development alliance. In addition, the U.S. government had also enlarged its defense procurement program to stimulate the civilian research and development of FPD, in order to reverse its industrial disadvantage in this sector. However, its endeavor for such effort had not accomplished at all.

Japan -- the Pioneer for FPD Commercialization

In 1970, RCA was the first U.S. enterprise that conducted the technology

transfer of LCD technology to Japanese Sharp. This activity had therefore encouraged many Japanese firms, including Hitachi, NEC, and Seiko Epson to engage in the research and development of crystal technology for commercialization (Murtha, et al., 2004). In 1973, Sharp was the first Japanese enterprise that invented the TN-LCD technology for the manufacture of electronic desktop calculators, which post the age for commercialization of the crystal technology. In the middle of 1970s, a number of Japanese enterprises had successfully developed a wide range of consumer electronic products, including calculators, and watches (Borrus and Hart, 1994). The enthusiastic and innovative Japanese enterprises had further accordingly upgraded and expanded the application of LCD technologies for a variety of electronic products. In 1980s, the government of Japan had commenced the formulation of certain industrial policies and strategies for the development of FPD industry. The most prominent undertake was to invite well-known enterprises, including NEC, Sharp, Casio, and Sanyo to establish a FPD industrial consortium. In addition, a group of seventeen firms was collected to form a LCD research alliance to research the development of LCD for HDTV. The main objective for setting up these alliances was in a hope to enable the participant firms to jointly share the research resources and results from the alliances, and disseminate the LCD technology to the setting of Japanese commercial sector. The government of Japan had therefore aimed to construct a comprehensive FPD supply chain, including raw materials, components, and production equipment in Japan (Wong and Mathews, 1998).

In 1990s, the Japanese FPD industrial strategy was concentrated to expand the application domain of FPD, as well as the improvement of the technological characteristics of LCD, especially the dynamic application in notebook computer. This development has therefore boosted the rapid and robust development of notebook computer in the world. The vigorous development of the global computer industry has clearly evidenced a fact that the Japanese enterprises have successfully implemented the development and innovation of the high technology in the setting of practical market in driving the robust growth of the global IT industry. In 1991, Sharp partnered with DTI to proceed the first generation TFT-LCD technology for commercialization, commencing the technology development path for the global FPD industry (Semenza, 2000; Lin, et al., 2006). The TFT-LCD technology was originally applied for the manufacture of notebook computer, and enabled this device to be full colorized, large-sized with better solution and induced the booming of the desktop computer in the world. However, the industrial phenomenon would produce the industrial imbalance between demand and supply, causing the FPD industry to confront the first industrial recession in 1993-1994. In addition, the downturn posted an opportunity to attract more and more Japanese firms to invest and enter the industry. To date, Japan has developed a comprehensive supply chain that has fostered the significant competitive advantage and competitiveness of the FPD industry in Japan, firmly strengthening the nation's leading global position (Borrus and hart, 1994; Bowonder et al., 1996).

Korea -- the Leader for FPD Mass Production

In early 1990s, the global FPD market started to boom. Three leading Korean cabols, including Samsung, LG and Hyundai all considered the TFT-LCD technology that was the new emerging business sector with high market and commercial opportunities. Especially, it was a technology that could take advantage of their indigenous capabilities and expertise in the manufacture of DRAM, and a new investment setting that can enhance and intensify their market competitiveness in the business of electronic end products (Hart, et al., 2000; Park, et al., 2008). In 1995-1996, Japanese enterprises undertook the construction of TFT- LCD substantially and excessively to lead to the oversupply of FPD, causing the global FPD industry to experience the second industrial recession. In such, the Japanese firms had therefore hauled the investment for the construction of FPD facilities. Samsung had then made use of this business opportunity to make reverse investment in constructing the FPD facilities heavily, and acquired the source of technology transferred from Japanese Fujitsu and successfully enter the industry to construct the FPD facilities. In addition, Hyundai also gain the technology transferred from Toshiba to successfully construct the FPD business. These moves marked the milestones for Korean firms to establish the FPD industry. In 1999, by transferring the display technology, Dutch Philips invested in LG by jointly setting up a joint venture—LG Philips which becomes the second largest global FPD manufacturer following Samsung (Semenza, 2000; Park et al., 2008). As a consequence of strategic

corporate reengineering and structuring, Hyundai identified that it should focus its core business mainly on the settings of mechanical engineering and heavy industry which were competitive strong. In 2001, it sold and transferred the FPD business to Chinese firm---BOE (Murtha, et al., 2004). Since then, there are only two main Korean firms—Samsung and LG that dominate the manufacture of FPD. They are the two largest TFT-LCD suppliers in the world.

In 1997, at the outbreak of the Asian financial crisis, the Japanese firms as well as Korean firms were heavily influenced by the turmoil, leading to the severe deterioration of their financial standing. On the contrary, the Korean firms aggressively engaged in the massive investment to sustain the expansion of the next generation FPD facilities, subverting the ordinary market expectation. In the meantime, Korean enterprises made use of the price advantage derived from the sharp depreciation of Korean won by conducting the low-price market strategy to acquire a significant market share from the Japanese firms and eventually surpassed the Japanese counterparts as the industrial leader (Semenza, 2000). In 1999, Korea replaced Japan as the largest FPD supplier in the world. Korean success in implementing the aggressive business strategies to exceed and replace Japan's leading position had surprised Japanese expectation. As the original technology and mass production pioneer in the setting of global FPD industry, Japan was caught up by the technology late comer country—Korea.

Taiwan -- the Follower in FPD Industry

In late 1970s, Taiwan started to develop the personal computer industry and emerged as the world's second largest notebook computer supplier, with a strong demand for TFT-LCD in late 1990. At that time, the most important and the key component for the manufacture of the notebook computer-- TFT-LCDs were mainly imported from Japan and Korea, and they were the key commodity that caused Taiwan to incur the huge trade deficit with the two neighboring countries (Mathews, 2001). In the middle of 1990s, TFT-LCD was regarded by the government of Taiwan as the key industrial component in the development of the national strategic high technology industries, in order to reduce the massive trade deficit with the adjacent countries. This strategy was not only aimed to establish the independent high technology industry, as well as to lessen the dependence on the foreign technology (Hart, et al., 2000), but also to construct a complete supply chain for the nation's electronics sector. In 1997, the outbreak of Asian financial turmoil had deteriorated the financial standing of the Japanese firms. In addition, the leading position of Japanese FPD industry had also met strong adverse challenges from Korean low-price competition. The Japanese firms had accepted the petition for the establishment of strategic alliance proposed by the Taiwanese firms to commence the transfer of TFT-LCD technology to the Taiwanese counterparts in order to acquire large sum of loyalty fees to alleviate their financial burden. In addition, the Japanese firms were also in a position to gain the steady supply of TFT-LCDs from Taiwan on behalf of the establishment of business partnership. In such, the Japanese were therefore able to avoid the spending of significant amount

of capital on the expansion of manufacturing facilities to smoothen their financial standing to retain their industrial position. On the other hand, the Japanese firms were also able to cope with the sever challenges and threats from the Korean counterparts by allying with the Taiwanese firms (Amsden, and Chu, 2003; Chang, 2005; Hung, 2006; Hu, 2008).

In foreseeing the eventual replacement of CRT by FPD, Taiwan's leading CRT supplier --Chinese Tube Corporation was the first enterprise that acquired the TFT-LCD technology transferred from Japan's Mitsubishi in 1998. This was the first case that the Japanese firm successfully engaged in the transfer of TFT-LCD technology to Taiwan, posting a good demonstration effect to other Japanese firms to conduct the transfer of TFT-LCD technology to Taiwan in pursuit of the establishment of strategic alliance and business partnership. In the same year of 1998, in view of the optimistic development of the FPD sector, four other leading business groups in the traditional industries as well as the leading IT firms, including Acer, Chimei, Hannstar and Quanta had also endeavored to make significant investment in the manufacturing facilities of TFT-LCD (Chang, et al, 2002). The four companies had also respectively acquired the technology from the Japanese firms to rapidly construct their TFT-LCD facilities and technological capabilities. In such, the Taiwanese firms were therefore enabled to acquire the state-of-the-art TFT-LCD technologies to establish the TFT-LCD industry.

The competition of the TFT-LCD industry in Taiwan has been very intensive and fierce. The activities of industrial

M&A have been very prevalent, as the industry has experienced three major industrial reorganizations and has evolved into a fact that the large firm becomes larger and stronger, due to the expansion of the product line to sustain their competitive advantage and competitiveness. Currently, there are four TFT-LCD manufacturers in Taiwan, including New Chimei, AUO, Chunghwa Picture Tube, and Hannstar. Since 1998, Taiwan commenced the investment in constructing the facilities for TFT-LCD with a small global market share of 2%, while in 2000, its market share soared significantly to 12%. In 2002, Taiwan surpassed the technology parental country—Japan, as the second largest TFT-LCD supplier in the world, fully demonstrating its technological absorptive and innovative capacity. In 2006, Taiwan ever exceeded Korea to become the largest TFT-LCD supplier. Taiwan is able to rapidly catch up with Japan and Korea to successfully establish its FPD industry at the global downturn to become one of the most important players in the world.

Discussion and Conclusions

To create and establish a new industry, especially a new high technology one often requires a very complex development process, as it will face a number of significant factors in cultural, political, economic, social, scientific and technological level (Bowonder, et al., 1996; Jan and Chen, 2005). Typically, the developing countries will face more complex industrial risks and obstacles, as they need to invest huge funds to acquire cutting-edge high technology skills, sophisticated production techniques, intensive R & D activities, diffusive knowledge networks,

and high level human resources (Hung, 2006). As the latecomer nations, Korea and Taiwan do not simply follow the path of technological development of the advanced countries, but perhaps skip some stages or even create their own individual path that is different from the advanced countries (Lee and Lim, 2001).

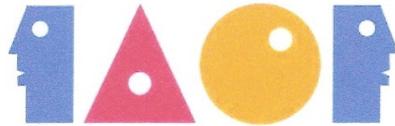
They indigenously established their own unique high technology industry development policies and measures in line with their exclusive features and capabilities of enterprise competitive strategies to successfully overcome industrial barriers and challenges to develop the FPD industry. Significantly, they catch up with and even exceed Japan to be the leaders in the production setting of FPDs. Mathews (2004) indicated that this is a remarkable empirical fact. Murtha, et al. (2004) also mentioned that from the evidence of the global evolution and development of FPD industry, it has shown that even a high technology industry is concentrated in a particular country or region, it will still not prevent other countries to develop this industry, unless they are off from the outside. Although being technology latecomers, the success of the two nations in developing the industry enables them to compete with the advanced countries is thoroughly verified. Murtha, et al. (2004) also argues the fact that Korea and Taiwan can become the important global technology product suppliers is resulting from their abilities to take advantage of international knowledge transfer and the developmental trend of the international division of labor. It is evident that able to cope with the advanced counterparts in developing high technology, East Asian countries clearly demonstrated that the comprehensive regional cooperation can

foster and enhance the regional economic development. The FPD industry is the best evidence case.

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THE EFFECT OF WORD-OF-MOUTH, KNOWLEDGE, AND
PROMOTIONS ON PURCHASE INTENTION OF MEDICAL COSMETICS

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Abstract

In Asia, if cosmetics are described as “medical cosmetics” care items, they tend to easily attract consumers. This study attempts to explore whether online word-of-mouth and consumer knowledge relating to medical cosmetics would affect consumer purchasing behavior. In addition, this study also incorporates promotional methods for online shopping, hoping to provide businesses with a tool for marketing their products.

Key Words: medical cosmetics, online word-of-mouth, purchase intention, promotion

Introduction

Based on the 2012 comscore survey on internet users, there are currently more than 1.4 billion internet users in the world, among whom 40% are Asian. In 2011, the percentage of internet users in Japan was 79.1%, 78.0% in South Korea, 71% in Singapore, and 23.7% in Thailand; even though China only has 36.2%, but it has 500 million people, half of the internet users in Asia. As for Taiwan, 71% of the population is internet users, which increased to 73% in 2012 (R.D.E.C., 2012). Among them, about 60% of the internet users have shopped online, and they mainly shop online because of convenience and cheap prices (TWNIC, 2012), thus online shopping has promoted the rise of “otaku economy.”

In Taiwan, if cosmetics are described as “medical cosmetics” care items, they tend to easily attract consumers, and medical cosmetics are developing by 20% each year. In 2009, “For Beloved One” medical cosmetics just entered the Chinese market, and in 2010 it has surpassed renowned international brands to become the top brand in sales in skin care products (CommonWealth, 2011). Micro cosmetic surgery has motivated this wave in medical cosmetics, since according to Maslow’s theory of needs, when people have met their biological and safety needs, they tend to desire an improvement on their appearances to increase their self-confidence and enhance their interpersonal relationships. With limited funding, the efficacy of medical-grade cosmetics is the optimal tool for improving appearances.

Women are more willing to conduct internet shopping, and female consumers are easily affected by online promotional methods, but male consumers are more likely to purchase prices with high unit prices online (Lu et al., 2006). Thus, in

response to the natural pursuit of beauty, there are many online sales on medical cosmetics. The main issue of this study is which types of medical cosmetics can attract consumers. Since there is a high volume of information on the internet, consumers usually use the internet to search for information relating to care products, and this study attempts to explore whether online word-of-mouth and consumer knowledge relating to medical cosmetics would affect consumer purchasing behavior. In addition, this study also incorporates promotional methods for online shopping, hoping to provide businesses with a tool for marketing their products.

Literature Review

Online word-of-mouth and purchase intention

In the past, word-of-mouth transmission means communication between individuals, it is slow and smaller in scale. Modern technology has allowed people to communicate globally using media such as computers and cell phones; it is faster and broader in scale. Many people establish their own blogs online to share their product usage experiences. In blogs, positive promotions of tasty or fun products or negative promotions of displeasing services are all sources of information needed by people. Popular blogs have many readers and attract many product advertisers, who request writers to write promotional posts after trial use; there are also advertisers who actively request linked advertisements. These commercial behaviors are all due to product promotions. The purchase intentions of consumers originate in a series of experience sharing of purchase factors (Harrison-Walker, 2001). Scholars suggested that positive word-of-mouth would significantly influence the travel intentions of tourists (Jalilvanda et al., 2012). In addition, online word-of-

mouth can significantly influence brand establishment, product development, and quality guarantees (Dellarocas, 2003). People would have different responses to positive and negative signals, which significantly affect the consumers' purchase intention for a product (Chen, 2010). Huang and Chen (2006) pointed out that sales volumes and customer comments would affect the choice of consumers online, and the comments from regular shoppers are more powerful than expert comments. Thus, this study proposes Hypothesis 1:

H1: overall evaluation in online word-of-mouth would affect consumer purchase intention toward this product

Product knowledge and purchase intention

According to scholarly categories, product knowledge can be divided into two types. The first is objective knowledge: product category information in the long-term memories of consumers. The second is subjective knowledge: the self-perception of consumers about how much they know about products (Mothersbaugh, 1994). Lin et al. (2012) pointed out that product knowledge has a significant positive effect on advertising attitude, brand attitude, and purchase intention, if consumers have more product knowledge, there is greater influence on advertising effect, different product knowledge about different products also affect purchase intention in different ways. Rao and Monroe (1988) suggested that product knowledge would affect consumer evaluation of products, and product knowledge would affect consumer purchasing decisions, in turn affecting their purchase intention. Thus, this study proposes Hypothesis 2:

H2: Product knowledge has a significant positive influence on purchase intention

Promotions and purchase intention

Kotler (2003) pointed out that promotions are the combinations of various incentive tools to stimulate the acceleration of sales or expansion of sales volumes, including: coupons, samples, raffles, free trials, and gifts. Monetary or non-monetary promotions can all bring different utility and enjoyment to consumers. Monetary promotions primarily provide functional benefits such as savings and convenience; non-monetary promotions primarily elevate enjoyment value (Chandon et al., 2000). For consumers, scholarly research pointed out that if products with high unit prices can have lowered prices, they would be more attractive, but consumers prefer percentage discounts for prices with low unit prices (Chen et al., 1998). Lin et al. (2009) pointed out that when consumers face price reduction activities, a high price discount would make consumers doubt the overall evaluation of the product, in turn leading to negative quality perceptions; but when perceived price sacrifice is lower, perceived value would be higher, and purchase intention would increase. Thus, this study proposes Hypothesis 3:

H3: Different promotional methods would significantly affect purchase intention

Methodology

After a discussion of related literature reviews, this study is ready to understand the influences of consumers of electronic word-of-mouth, product knowledge, and promotion on their intention to purchase products. Thus, this paper proposed the following framework, in Figure 1.

Reliability and Validity

To measure the consistency of scale, a pre-test was carried out over 50 qualified students. The reliability and validity of pre-testing results were then analyzed, and items with a lower correlation coefficient were deleted. The revised questionnaire consisted of 12 questions: 3 for electronic word-of-mouth (revised from Babin et al., 2005), 4 for product knowledge (revised from Cheng, 2010), 2 for promotion (revised from Lu et al., 2006), and the last three for purchase intentions (revised from Maxham, 2001). Cronbach's α values were 0.889, 0.919, 0.877, and 0.810, respectively. All of them were greater than 0.7, which indicated high reliability. This study applied average variance extracted (AVE) into the analysis of the reliability and validity of the scale. If the AVE value of a latent variable is high enough, it can better measure the latent variables. Generally, the value must be higher than 0.7. In this study, the value of the latent variables meets the requirement.

Sample Design and Research Object

This study collected samples by means of a questionnaire to find out the factors influencing consumers' purchase intentions. The respondents of this questionnaire mainly consisted of consumers who had purchased medical aesthetic products on the Internet. Adopting the convenience sampling method, this study distributed a total of 209 questionnaires, of which ten were ineffective. Consequently, the effective return rate was 95.2%. This study utilized SPSS18.0 and Amos17.0 to carry out the analysis.

Results

Purposive sampling was used in this study. The subjects were students who have purchased medical cosmetics online, and their age distribution was between 18 and 21 years. In terms of gender distribution, among 199 valid sam-

ples, 151 are female, at 75.9%, and 48 are male, at 24.1%, which shows that in this study; the ratio of women is greater.

This study further used variance analysis to test the hypotheses, with results shown in Table 1. Fit of the overall model reaches a statistically significant level (F value = 11.623, $p < 0.001$). The level of online word-of-mouth has a significant influence on purchase intention (F value = 14.964, $p < 0.001$), thus Hypothesis 1 is supported. T test analysis is further conducted to show that products with higher online word-of-mouth can better affect consumer purchase intentions (4.32 vs 3.71, $p < 0.001$). The level of product knowledge has a significant influence on purchase intention (F value = 38.799, $p < 0.001$), thus Hypothesis 2 is supported. The t test is further conducted, finding that products with higher product knowledge have greater purchase intention for medical cosmetics (4.50 vs. 3.53, $p < 0.001$). Different promotional methods do not produce a significant difference in purchase intention (F value = 1.404, $p = 0.238$), thus Hypothesis 3 is not supported. Figure 2 shows that regardless of high or low product knowledge, consumers prefer price promotions among promotional methods. Figure 3 shows that regardless of high or low online word-of-mouth, consumers prefer price promotions among promotional methods.

Discussion and Conclusion

This study explored whether internet user word-of-mouth and consumer knowledge about medical cosmetics would affect consumer purchasing behavior. In addition, this study incorporated promotional methods in online shopping. Empirical results showed that the influence of online word-of-mouth and the level of consumer knowledge about medical cosmetics do have an influence on the purchase intention of

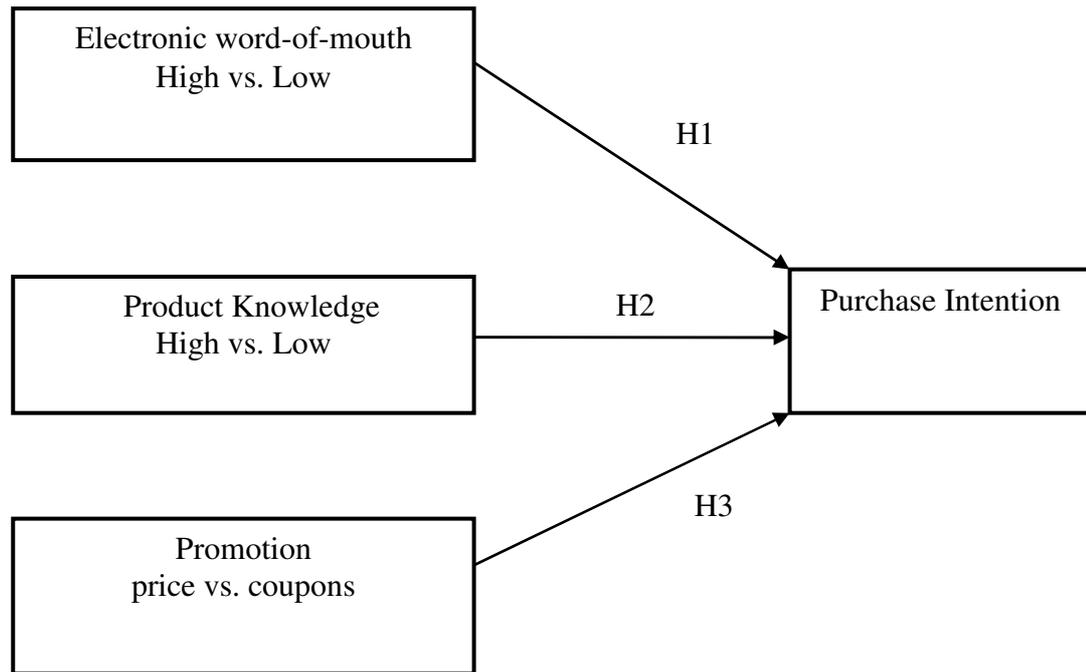


Figure 1. Conceptual model

Table 1. Analysis of effect of electronic word-of-mouth, product knowledge and promotion methods on purchase intention

Variables	Type III Sum of squares	df	Mean Square	F value	P value
overall	85.073	7	12.153	11.623	0.000*
intercept	2741.320	1	2741.320	2621.627	0.000*
eWOM	15.647	1	15.647	14.964	0.000*
product knowledge	40.571	1	40.571	38.799	0.000*
promotion	1.468	1	1.468	1.404	0.238
eWOM * product knowledge	0.652	1	0.652	0.624	0.431
eWOM * promotion	0.198		0.198	0.189	0.664
product knowledge * promotion	0.260	1	0.260	0.248	0.619
eWOM * product knowledge * promotion	0.274	1	0.274	0.263	0.609

*P<0.05

subjects. The research findings are discussed as follows.1.

The influence of online word-of-mouth on purchase intention (H1)

1. Research results showed that the level of online word-of-mouth comments would affect consumer purchase intention for medical cosmetics. Therefore, Hypothesis 1 of this study is established, consistent with the view in Jalilvanda et al. (2012). Since medical cosmetics are between care products and medical products, showing significant price differences, many medical cosmetics have not established brand recognition. Hence, consumers tend to only be able to gain relevant information from trial usage, making word-of-mouth marketing very important. When consumers intend to purchase medical cosmetics, if relevant websites have brands that are recommended by more people, consumers would increase their purchase intention.

2. The influence of product knowledge on purchase intention (H2) Since medical cosmetics involve medical ingredients, consumers would spend more time finding information on unknown or unfamiliar products. When consumers use various means to enrich their product knowledge, they would increase their purchase intention, thus establishing Hypothesis 2, consistent with Rao and Monroe (1988).

3. The influence of promotional methods on purchase intention (H3) Lin (2009) pointed out that using coupons would better strengthen consumer purchase intention than can price reductions, but results of this study show that price reduction and added products do not produce statistically significant differences on consumer purchase intention, thus Hypothesis 3 is not established. However, subjects of this study prefer price reduction methods for

medical cosmetics, which is worthy of further research.

Practical suggestions

This study found that with medical cosmetic products as an example, products with greater online word-of-mouth would produce greater positive purchase intention in consumers. Development of modern technology has allowed the internet to condense information of the world at one's fingertips. There are many issues discussed online, and internet users can use discussions to obtain product information or evaluate product quality. If businesses hope to maintain good brand images, they not only need to maintain the curative effects of products, but also need to have trial users who convey positive messages on products. Using inexpensive word-of-mouth marketing methods can bring significant business opportunities.

In addition, medical cosmetics knowledge is not fully popularized. Consumers use recommendations from experts in the past to choose products, but this may not benefit their appearance. Thus, vendors should use various channels to elevate the product knowledge abilities of consumers, fully disclosing the benefits and applicability of products to consumers, so that they can choose products based on which benefits they desire. When consumers have comprehensive product knowledge, then they can buy suitable care products to reduce subsequent product disputes.

Although the result in this study did not reveal how promotional methods affect the purchase intention of consumers, but consumers are inclined toward price promotions. This may be because medical cosmetics on the market are more expensive than ordinary care products, so when product prices are lower, consumers would show greater preference.

Research Limitations

In consideration of time and cost limitations, this study used purposive sampling with students as the main sample for the questionnaire survey. Therefore, it could only represent the purchase intentions toward medical cosmetics in young people, and could not be generalized to the purchase intention of other

age groups. Thus, future studies can conduct stratified sampling and responses to generalize the research results. In order to prevent other factors from interfering with the research results, this study only manipulated two types of promotional methods. Future studies can further explore how different promotional methods would affect purchase intention.

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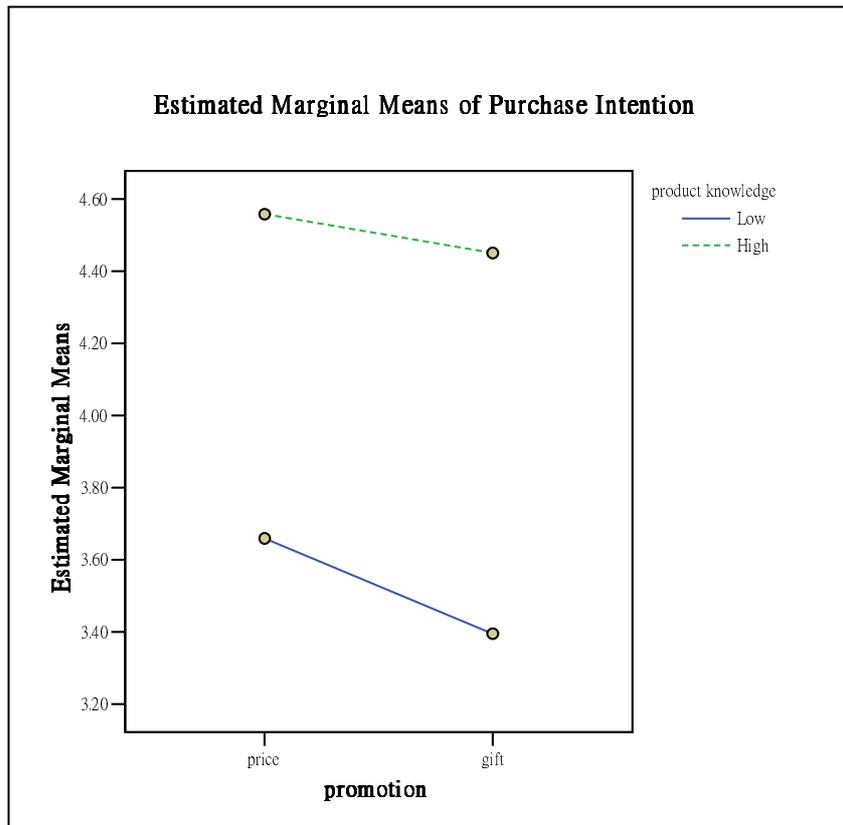


Figure 2. Estimated marginal means of product knowledge and promotion on purchase intention

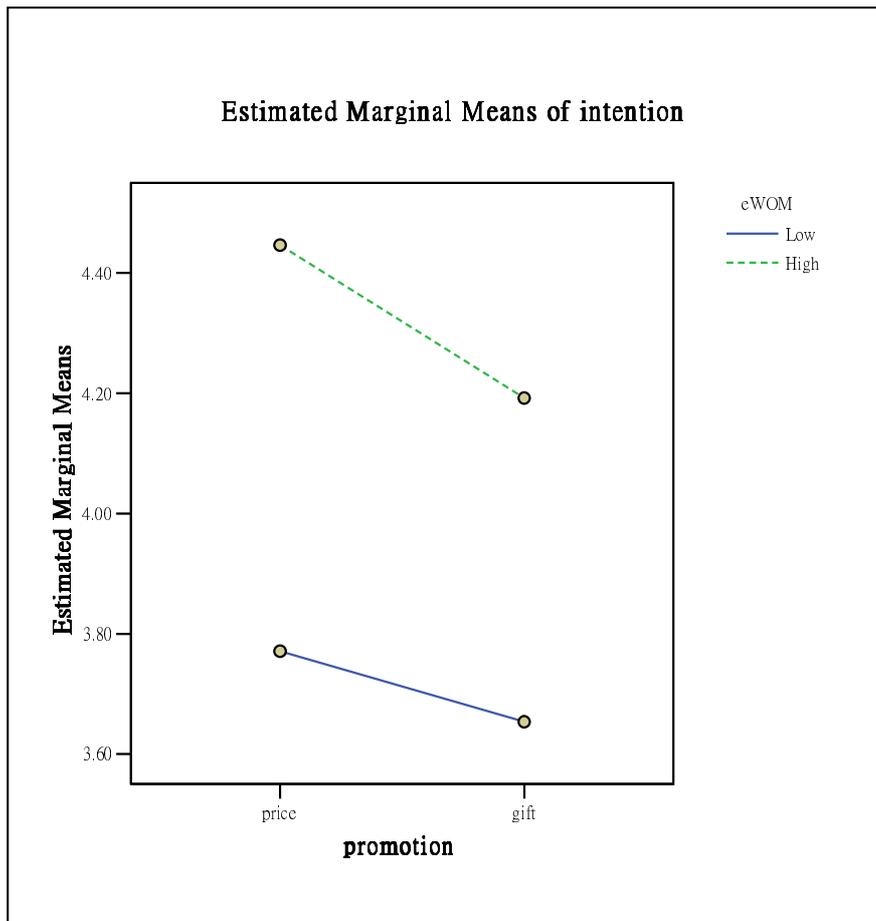


Figure 3. Estimated marginal means of eWOM and promotion on purchase intention

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THE RELATIONSHIP AMONG BRAND EQUITY, CUSTOMER
SATISFACTION, AND BRAND RESONANCE TO
REPURCHASE INTENTION OF CULTURAL
AND CREATIVE INDUSTRIES IN TAIWAN

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Abstract

This study used a successful example of cultural and creative industry, Pili Puppet Show, to explore the effect of brand equity, customer satisfaction, and brand resonance on repurchase intention. The results of this study are as follows: 1) the two dimensions of brand equity and customer satisfaction can both enhance consumer brand resonance for the product, and the effect of customer satisfaction on brand resonance is greater than that of brand equity; 2) the three dimensions of brand equity, customer satisfaction, and brand resonance all directly affect consumer repurchase intention; 3) brand resonance has a partial mediating effect in the influence of brand equity on repurchase intention, and brand resonance has a complete mediating effect on the influence of customer satisfaction on repurchase intention. The findings can serve as references to future studies and the marketing strategies of cultural and creative industry in Taiwan.

Keywords: Brand equity, customer satisfaction, brand resonance, repurchase intention, Pili Puppet Show

Introduction

Many studies have discussed consumers' brand resonance elicited by famous brands, but few have explored brands in cultural and creative industries in terms of the influence of brand resonance. Thus, this study uses a local industry, Pili Puppet Show, as the research subject, Pili Puppet Show Troupe was popular all over Taiwan in the 1980s, where there were Pili clubs in schools, many people renting videos from rental stores, related merchandise became popular symbols of passions among adolescents, and even political elections used characters for insinuations. During this period, even though "Xiao Xi Yuan," "I Wan Jan" and other puppet troupes also received attention, Pili Puppet Show Troupe is the only one that continues to have a large fan base. Keller (1993) emphasized that research on the effect of brand resonance must choose "famous" brands, because after consumers identify with the brand, they will further develop resonance for the product. Thus, in terms of the specific environment, among the puppet show industries in Taiwan, the "Pili" brand are certainly the most well known, thus this study uses it as the research subject.

The main purpose of this study is to use the local specialty industry, Pili Puppet Show, in attempt to understand the effect of brand equity and customer satisfaction of Pili Puppet Show fans on brand resonance, exploring the effect of brand equity, customer satisfaction, and brand resonance theory on repurchase intention, to serve as a reference for future industries in establishing marketing strategies. Thus, the purposes of this study are as follows:

1. Explore the effect of brand equity and customer satisfaction on brand resonance.

2. Explore the effect of brand equity, customer satisfaction, and brand resonance on repurchase intention.
3. Explore whether brand resonance mediates the effect of brand equity and customer satisfaction on repurchase intention.

Literature Review

Brand equity

Tauber (1988) suggested that brand equity is the added value of a corporate brand's market position that exceeds the physical assets. Farquhar (1990) also proposed similar views, believing that brand equity is the added value produced by the brand names or symbols for the physical products. Aaker (1991) indicated that brand equity is a combination of assets and liabilities of brand, brand name, and symbols, which may increase or decrease the product or service's value for corporations or consumers, or change assets and liabilities. Kim et al. (2009) argued that brand equity refers to brands can inspire a special combination of thinking, feeling, perceiving, and associating of people paying attention, in turn affecting purchase ability. Lassar et al. (1995) proposed that brand equity comes from consumers' overall value association and perceptions toward a brand, believing that brand equity is not absolute, but comes from comparing with competitors. Tauber (1988) indicated that brand equity is the market position constructed by the brand; establishment of brand equity will bring added value of products that exceed the physical asset value. Keller (2001) pointed out that brand equity not only affects consumer purchase decisions, but is also an important source for corporations to obtain competitive ad-

vantages and profits, developing a consumer-based brand equity model (CBBE), which believed that brand equity includes brand significance, brand performance, brand image, brand determination, brand sense and brand resonance.

Customer satisfaction

Cardozo (1965) was the first scholar to propose the concept of customer satisfaction, believing that customer satisfaction would elevate customer repurchase behavior, and they would purchase other products. Howard and Sheth (1969) then defined customer satisfaction as whether they can reach a satisfied psychological state after comparing what they paid for the product and what they gained. Oliver (1981) suggested that customer satisfaction is determined by the extent to which customers expect product benefits will be realized, or the consistency between expected and actual results. Dovidow and Uttal (1989) also mentioned the gap between expected treatment and perceived treatment from customers. Kotler (1991) argued that customer satisfaction is a post-sale evaluation of product quality compared to expectation before purchase. Tzeng (2009) proposed that customer satisfaction is the gap between expected service standards and actually sensed service standards, and the emotional response produced based on this gap. The above research literature shows that, customer satisfaction is related to customer expectation; customer expectations include a company's tangible service commitments, intangible service commitment, buzz, and past purchase experience and these form the basis to form customer expectation standards. Parasuraman et al. (1993) mentioned that the gap between sensed ser-

vices and expected services determine customer satisfaction.

Brand resonance

In the customer-based brand equity (CBBE) model proposed by Keller (1993), the brand resonance was officially proposed. Later, Keller (2001) defined brand resonance as the relationship between consumers and brands, or the extent to which consumers sense the brands, and there are differences in the "potency" consumers' emotional resonance with brands, which can be divided into four levels, which are attachment, behavioral loyalty, sense of community, and active engagement. Keller (1993) indicated that in order to resonate with a certain brand, consumers need to not only frequently use products of the brand, but also need to actively be concerned about information relating to the brand, forming a strong psychological attachment to the brand. Chang (2011) further explained brand resonance, believing that consumer loyalty caused by brand resonance can be expressed in two ways, which are behavioral loyalty and emotional loyalty. It was believed that emotional loyalty necessitated the existence of behavioral loyalty, but the vice versa may not be true.

Repurchase intention

According to Cronin and Morris (1989) and Cronin and Taylor (1992), repurchase intention refers to psychological commitment toward the product or service that arises after using them, resulting in the idea for consumption again. Jones and Sasser (1995) discovered that repurchase intention is very important for the profit and evaluation of stores. Seiders et al.

(2005) indicated repurchase intention refers to the extent to which consumers are willing to buy the product or service again, and is a simple, objective, and observable expected purchase behavior. Collier and Bienstock (2006) also pointed out that repurchase intention is not only the possible inclination of buying products, but may also include the intention to recommend it to relatives and friends.

Research Methods

Research structure

This study explored the correlations among variables of brand equity, customer satisfaction, brand resonance, and repurchase intention, in turn developing the following research framework (Figure 1).

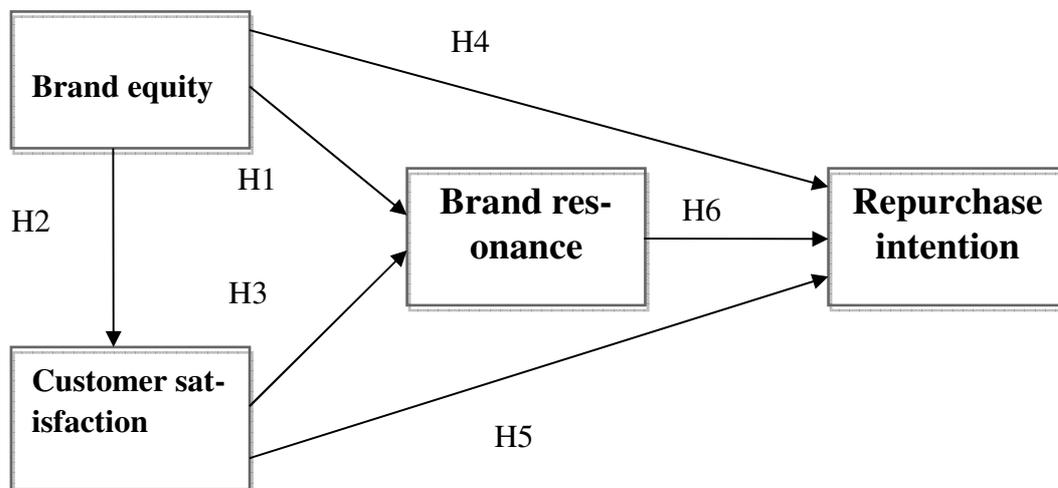


Figure 1. Research Framework

Research hypotheses

Among the six dimensions of the brand equity pyramid model proposed by Keller (2001), brand resonance is at the top of this pyramid, which means that when consumers identify with the brand, brand equity takes effect, resulting in brand resonance.

Lassar et al. (1995) suggested that brand equity makes customers increase perspective utility and benefits in their minds toward the brand, and the study also mentioned that the three main elements that affect the internal value assessment of customers not only include the non-specific cognition, value association of brand, and the position of the

name. In order to form customer perceptions and concepts, other than buzz by other people's promotions, the feelings of usage experiences are necessary, so customer views toward this brand would affect the perception of brand equity, the formation of this view, especially the subjective image, has a close relationship with customer satisfaction.

Aaker (1991) argued that perceptive sources for brands come from objective elements that arise from the stimulus, as well as personal subjective psychological elements. Relative to brand equity that forms from the different choices in brand, satisfaction is more inclined toward the subjective identity of customers, and the effect of consumers' personal expecta-

tions comprises the consumer feeling dimension in brand resonance.

Keller (1993) proposed that the effect of brand equity is that it can help consumers gain the effect of premium prices, or that consumers usually have greater product evaluation for brand products with high name recognition. Neal (1999) indicated that when decision-makers decide on purchase behavior, they generally consider maximization of brand traits and benefits that they can perceive. Thus, in terms of customer purchase intentions, brand value has a positive effect, and there would be greater purchase intention for products or services with better brand equity.

Oliver (1997) proposed that satisfactory shopping experiences can affect future purchase intention and attitudes, while unsatisfactory purchase experiences would reduce the repurchase intention for customers. Neal (1999) suggested that when decision-makers decide on purchase behavior, their internal brand preferences would be a reference for purchase. Kotler (2010) emphasized that customer satisfaction would prompt customer willingness to repurchase, even overlooking advertisements of competing brands and not purchase products from other companies; this demonstrates the relationship between customer satisfaction and repurchase intention.

Keller's (1993) focus in brand resonance is that the customers devote deep feeling to the brand, even seeing it as a life partner. Thus, when consumers purchase the brand, it expresses personal consciousness or style, and the creation of brand must be connected to the self-imagined of consumers. Chang (2008) further explained that the effects of brand resonance are: more easily move consumers, high loyalty toward a brand, increase the number of supporters, easier development of surrounding products, and

causing consumers to have more accommodation for the brand. Huang (2006) suggested that brand resonance would establish psychological attachment, in turn protecting behavioral loyalty, which affects purchase intention. Based on the research purpose, research framework, and relevant literature review, this study proposes the following research hypotheses.

H1: Brand equity has a significant positive effect on brand resonance.

H2: Brand equity has a significant positive effect on customer satisfaction.

H3: Customer satisfaction has a significant positive effect on brand resonance.

H4: Brand equity has a significant positive effect on repurchase intention.

H5: Customer satisfaction has a significant positive effect on repurchase intention.

H6: Brand resonance has a significant positive effect on repurchase intention.

H7: Brand resonance has a mediating effect in the relationship between brand equity and repurchase intention.

H8: Brand resonance has a mediating effect in the relationship between customer satisfaction and repurchase intention.

Sampling

This study used snowball sampling, through the recommendations of homogeneous consumption groups for questionnaire surveys. Related consumption groups include the members of puppet theatre clubs in schools, members provided by the Pili Company, known aficiona-

dos of puppet theatre, and visitors to Huwei Puppet Museum as subjects of data collection. For the four types of data collection subjects, members of puppet theatre clubs in schools and members provided by the Pili Company used mailed questionnaire release and retrieval. This study released 420 questionnaires, 306 questionnaires were retrieved, after discarding 32 invalid questionnaires, there were a total of 274 valid questionnaires.

The male-female ratio of samples in this questionnaire is 186:88, approximately 2:1. In terms of age distribution, most are adolescents under 19 years old (30.7%), followed by the 25-29 age group (19.3%), which add up to 50%. If the 20-24 age group is also added (9.1%), it comprises of 59.1% of the age groups, which means the questionnaire can express the views and inclinations of the younger generation. Due to snowball sampling being started in Yunlin, Jiayi, and Tainan, most of the samples were accumulated in these areas, and 54.7% of the residences were in these areas. In terms of the relationship between subjects and Pili Company, among the survey samples, the ratio of members to non-members was 39: 61, approximately 1: 1.6. In terms of the consumption situation of the surveyed sample, most test subjects have not actually purchased (32.5%), and most of those who do spend only spend less than 600 NTD (67.9%). This study primarily presents the younger generation under 29 years of age, who are mostly geographically congregated in Yunlin, Jiayi, and Tainan, where Pili Company is located; most of the opinions expressed were from males.

Measurement of the Constructs

The questionnaire on brand equity in the study referred to Aaker (1991), after

modification there were 22 questions. The questionnaire on customer satisfaction in referred to Anderson et al. (1994) with 12 questions, brand resonance in the study referred to Huang (2006), with 12 questions. In addition, repurchase intention referred to Tsai and Huang (2007) with 8 questions. All the questions in this study use the Likert 5-point scale for scoring. Cronbach's α reliability analysis was used to delete questions with poor reliability, the reliability values of the scales ranged 0.926-0.958, which means that the questionnaires in this study have good reliability.

Data Analysis

Liability

The factor analysis results show that in this study the dimensions' KMO values are all greater than 0.8, and the Bartlett test of sphericity results are all smaller than 0.05, showing significant results. From Table 1, brand equity which after factor analysis derives the two principal factors of "name association" and "perceived quality," which can explain 64.54% of this dimension, and the reliability tests for the Cronbach's α of this two factors are all above 0.8. Hair et al. (2010) indicated that a satisfactory value of Cronbach's α is required to be more than 0.70 for the scale to be reliable. Table 2 explains that in the customer satisfaction dimension, the principal factors are "customer feelings" and "expected performance," which can explain 72.25% of this dimension, and the Cronbach's α of the two factors are all above 0.8. Table 3 explains that in the "brand resonance" dimension, the principal factors are "active pursuit" and "behavioral attachment," which can explain

Table 1. Brand Equity Factor Analysis

Dimension	Factor	Item	Mean	Factor loading	Accumulated explained variance (%)	Cronbach's α
Brand equity	Name association	I know that Pili has many "fans."	3.785	0.840	33.90	0.871
		Pili products are the mainstream in its industry.	3.661	0.775		
		I believe that Pili products have considerable quality.	3.595	0.727		
		When discussing puppet theatre, I often hear the brand Pili.	4.172	0.718		
		I can associate with Pili product characteristics.	3.361	0.710		
		I believe that if I purchase defective items, it would affect my confidence in Pili products.	3.354	0.687		
	Perceived quality	Using Pili products can reflect personal taste.	3.011	0.832	64.54	0.854
		Using Pili products is a symbol of social status.	2.511	0.775		
		I would specifically go to specialized stores or counters to purchase.	2.858	0.736		
		I would regularly take note of new Pili products.	2.902	0.729		
Using Pili products means the pursuit of trends.		3.029	0.721			

Table 2. Customer Satisfaction Factor Analysis

Dimension	Factor	Item	Mean	Factor loading	Accumulated explained variance (%)	Cronbach's α
Customer satisfaction	Customer feelings	The experience of using Pili products is pleasurable.	3.427	0.844	40.81	0.921
		The decision to choose Pili products is right.	3.412	0.839		
		I think that Pili products conform to my expectations.	3.339	0.802		
		I would be happy about buying (renting) Pili products.	3.339	0.792		
		I believe that the price of Pili products makes them worth it.	3.329	0.783		

Expected performance	I like the puppet manipulation techniques and filming techniques of Pili.	3.679	0.864	72.25	0.836
	I think that Pili puppet show performances are professional.	3.850	0.841		
	I think that Pili products are sufficiently supplied.	3.285	0.666		
	I think it is convenient to rent from Pili product stores.	3.201	0.653		

Table 3. Brand Resonance Factor Analysis

Dimension	Factor	Item	Mean	Factor loading	Accumulated explained variance (%)	Cronbach's α
Brand resonance	Active pursuit	I would actively search for information on Pili products.	2.967	0.856	42.23	0.883
		I would join communities formed by fellow aficionados.	2.971	0.837		
		I would do as much as I can to purchase Pili products.	2.799	0.828		
		I am willing to devote more time and money to Pili products.	2.675	0.822		
		I actively share information about Pili products with other people.	2.993	0.674		
	Behavioral attachment	When talking about puppetry theatre, I immediately think of Pili productions.	3.788	0.909	73.17	0.869
		The brand Pili has a positive image for me.	3.701	0.889		
		I am overall satisfied with Pili.	3.482	0.804		

Table 4. Repurchase Intention Factor Analysis

Dimension	Factor	Item	Mean	Factor loading	Accumulated explained variance (%)	Cronbach's α
Repurchase intention	Revisit intention	I intent to purchase (rent) Pili products on a regular basis.	2.759	0.902	46.89	0.892
		Whenever there are new Pili products, I would purchase (rent) them.	2.726	0.845		
		I intend to purchase (rent) Pili products in the near future.	2.971	0.778		
	Additional purchase intention	I would help others to purchase (rent) Pili products.	3.153	0.890	85.24	0.873
I would join group purchases (rent) of Pili products.		2.945	0.876			

73.17% of this dimension, and the Cronbach's α of the two factors are all above 0.8. Table 4. explains that in the "repurchase intention" dimension, the principal factors are "revisit intention" and "additional purchase intention," which can explain 85.24% of this dimension, and the Cronbach's α of the two factors are all above 0.8.

Regression Analysis

Regression analysis results in Table 5 show that brand equity has a significant positive effect on brand resonance ($\beta=0.863, p<0.001$). In addition, customer satisfaction also has a significant positive ef-

fect on brand resonance ($\beta=0.863, p<0.001$), thus hypotheses H1 and H3 are established. Next, the second regression analysis shows, brand equity has a significant positive effect on customer satisfaction ($\beta=0.887, p<0.001$), thus hypotheses H2 is established. In addition, regression four and five show, the two dimensions brand equity ($\beta=0.731, p<0.001$) and customer satisfaction ($\beta=0.733, p<0.001$) both have significant positive effects on repurchase intention, thus hypotheses H4 and H5 are supported. Finally, regression six shows brand resonance ($\beta=0.731, p<0.001$) has a significant positive effect on repurchase intention, thus hypothesis H6 is established.

Table 5. Regression Analysis Results

Regression	Standard β	Adjusted R^2	F	Hypothesis
Regression 1 Brand equity→Brand resonance	0.863***	0.744	795.789	H1
Regression 2 Brand equity→Consumer satisfaction	0.847***	0.716	687.688	H2
Regression 3 Consumer satisfaction→Brand resonance	0.887***	0.786	1005.448	H3
Regression 4 Brand equity→Repurchase intention	0.731***	0.533	312.102	H4
Regression 5 Consumer satisfaction→Repurchase intention	0.733***	0.535	315.316	H5
Regression 6 Brand resonance→Repurchase intention	0.789***	0.621	449.016	H6

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

Analysis of Mediating Effects

In order to confirm the mediating effect of brand resonance between brand equity and repurchase intention, this study uses the mediating effect confirmation model by Baron and Kenny (1986) to test whether brand resonance is the mediating variable between brand equity and repurchase intention. The following four conditions must be met: 1. brand equity must be significantly correlated with repurchase intention; 2. brand equity must be significantly correlated with brand resonance; 3. When brand equity and brand resonance are both predictive variables, and regression analysis is conducted for repurchase intention, brand resonance must be significantly correlated with repurchase intention; 4. In the mediating variable model, the regression coefficient of brand equity must be smaller than the regression coefficient of the independent variable model. In addition, if the relationship between the independent variable and dependent variable would be weakened due to the existence of mediating variable, it is a partial mediation; and if

the influence is insignificant and the coefficient is close to 0, there is full mediation.

As Table 6 shows, there is a significant positive relationship between brand equity and repurchase intention ($\beta = 0.731$, $p < 0.001$), brand equity can explain repurchase intention 53.4% of variance. Second, there is a significant positive relationship between brand equity and brand resonance ($\beta = 0.863$, $p < 0.001$), brand equity can explain brand resonance 74.5% of variance. Third, when brand equity and brand resonance are both predictive variables, there is a significant relationship between brand resonance and repurchase intention ($\beta = 0.621$, $p < 0.001$), the two predictive variables can explain repurchase intention 79.5% of variance. Fourth, after adding the mediating variable (brand resonance), the relationship between brand equity and repurchase intention is weakened, the β value of brand equity is decreased from 0.731 to 0.195, but the explanatory ability increases from 0.534 to 0.795, and part of the effect is replaced by that of brand resonance. Thus,

it conforms to the four standards for mediating variable testing, proving that

brand equity can indeed produce a full mediating effect

Table 6. The Mediating Effect of Brand Resonance between Brand Equity and Repurchase Intention

Dependent Variable	Brand Resonance	Repurchase Intention	
		Regression	Mediating Effect
Brand Equity	0.863***	0.731***	0.195**
Brand Resonance			0.621***
F	795.789	312.102	233.171
R ²	0.745	0.534	0.795
Adjusted R ²	0.744	0.533	0.630

*P < 0.05 ; **P < 0.01 ; ***P < 0.001

through brand resonance, to form a relationship with repurchase intention.

As Table 7 shows, first, there is a significant positive relationship between customer satisfaction and repurchase intention ($\beta=0.733, p < 0.001$), customer satisfaction can explain repurchase intention 53.7% of variance. Second, there is a significant positive relationship between customer satisfaction and brand resonance ($\beta=0.887, p < 0.001$), customer satisfaction can explain brand resonance 78.7% of variance. Third, when brand equity and brand resonance are both predictive variables, there is a significant positive relationship between brand resonance and repurchase in-

tion ($\beta=0.653, p < 0.001$), the two predictive variables can explain repurchase intention 62.8% of variance. Fourth, in the mediating variable model, after adding the mediating variable (brand resonance), the relationship between customer satisfaction and repurchase intention is weakened, the β value of brand equity is lowered from 0.733 to 0.153, but the explanatory ability increases from 0.537 to 0.628, and part of the effect is replaced by that of brand resonance. Thus, it conforms to the four standards for mediating variable testing, proving that customer satisfaction can indeed produce a full mediating effect through brand resonance, to form a relationship with repurchase intention.

Table 7. The Mediating Effect of Brand Resonance between Consumer Satisfaction and Repurchase Intention

Dependent Variable	Brand Resonance	Repurchase Intention	
		Regression	Mediating Effect
Consumer Satisfaction	0.887***	0.733***	0.153
Brand Resonance			0.653***
F	1005.448	315.316	228.501
R ²	0.787	0.537	0.628
Adjusted R ²	0.786	0.535	0.625

*P < 0.05 ; **P < 0.01 ; ***P < 0.001

Conclusion and Suggestions

Results of this study prove that the two dimensions of brand equity and cus-

tomers satisfaction can both elevate the extent of consumer brand resonance, and the effect of customer satisfaction on brand resonance is greater than that of

brand equity. Thus, the establishment of the Pili Puppet Show brand, and establishment of the “Pili Club” for fan members caused many fans of the “Pili Club” believe that pursuing such products can represent personal taste and trendiness, which greatly elevates brand equity for show fans. In addition, the professionalism, manipulation techniques, and filming methods in Pili Puppet Show performances have developed many Pili products to elevate the customer satisfaction of fans; these are important factors. Furthermore, this study finds that when brand equity is better, customers would have greater satisfaction for the brand, which means that brand equity is an important antecedent variable that affects customer satisfaction. This is similar to the studies by Aaker (1991) and Schreuer (2000), proving that there is a significant positive relationship between brand equity and customer satisfaction.

The other important conclusion of this study is that the three dimensions of brand equity, customer satisfaction, and brand resonance would directly affect customer repurchase intention; this result is consistent with that by Parasuraman et al. (1993), Jones and Sasser (1995), Aaker (1991) and Schreuer (2000). However, this study finds that brand resonance is the mediating variable of brand equity and repurchase intention, with partial mediating effects, or that brand equity would affect repurchase intention through brand

resonance. In addition, brand resonance is the mediating variable between customer satisfaction and repurchase intention, with a full mediating effect, or that customer satisfaction would affect repurchase intention through brand resonance. This shows, for brand equity and customer satisfaction to have a positive effect on repurchase intention, brand resonance plays a very important mediating role. According to Keller’s (2001) assessment of brand resonance, the source of brand resonance is the consumers’ internal emotional attachment to the brand and external involvement of activities relating to the brand. Thus, an important issue is how to increase consumer brand resonance for the brand, in turn causing consumers to form deep connections to the brand psychologically. Thus, it is important to let Pili Puppet Show fans actively participate in relevant communities or share information on Pili products to others, and if they form attachment and brand resonance for the brand, Pili Puppet Show fans would purchase (or rent) Pili products.

The sample of this study is set to the Pili Puppet Show fans, thus it is not possible to be conducted through random sampling. Also, because Yunlin is the origin of puppet theatre, most subjects live in Yunlin, thus limiting the ability of results of this study to be generalized.

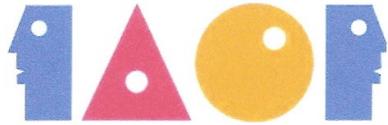
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A FRAMEWORK FOR A
TECHNOLOGY-ORGANIZATION-ENVIRONMENT
IMPLEMENTATION MODEL IN TAIWAN'S TRADITIONAL
RETAIL SUPERMARKETS

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Abstract

This paper draws upon a technology-organization-environment (TOE) framework and recent conceptualizations of information technology adoption methods to apply a systematic strategy for services innovation in Taiwan's traditional retail supermarkets. Traditional supermarkets are chain stores. In Taiwan, they are facing a negative situation: sluggish shopping, the decline of consumers' purchasing power, heavy competition, insufficient enterprise e-commerce, and non-system procurement problems. In addition, the case of a traditional supermarket that introduced information technology is presented herein. Affected by the challenging economic environment, the supermarket decided to seek help from the government, and cooperated with its suppliers to enhance its competitiveness. This paper presents an in-depth discussion of the strategies, models and important factors used to upgrade its efficiency and business performance. This study represents a valuable reference for other enterprises that wish to introduce information systems in their companies.

Keywords: technology-organization-environment, strategy, information technology, business performance

Introduction

Retail is defined as general merchandise retailing sales, in the form of a non-specific monopoly variety series such as supermarkets, department stores, etc. Overall the total amount of turnover, despite a slight growth, is slowing down. Domestic demand for retail market services is vulnerable to the impact of changes in Taiwan's economy, the global economic recession with its serious impact on exports. As a result of these factors, business investment has also been substantially reduced, seriously impacting the job market; the relatively narrow private consumption capacity of the integrated retail commodities has caused a considerable shock.

The current socio-economic era is based on the invisible, dynamic intellectual capital performance point of view, i.e. the value-added aspect of the economy; the emphasis is on enhancing knowledge management (KM) and technology integration. Due to rapid consumer demand changes and IT development, different industry types and formats, and different business models, such as convenience stores, 24-hour mode of operation and commercial demands for social and night life, discount stores and supermarkets require marketing channels to shorten the process of improvement. The purpose is to lower cost, and enhance production and marketing efficiency.

However, for the retail supermarket, due to environmental competitive factors, the original general merchandise retail formats have become increasingly blurred with the conflicting trends, diversity in the service, price transparency, emphasis on fast, convenient times and formats all working in the information technology (IT) and using more services and integration. In addition to strengthen internal management mechanisms and processes, to identify positive innovation in the business model and integrate goods and services of the actual situation gaps.

Literature Review

Tornatzky and Fleischer are credited with being the first to develop the TOE framework to study the adoption of technological innovations. The Technology-Organization-Environment (TOE) framework is described the entire process of innovation - stretching from the development of innovations by engineers and entrepreneurs to the adoption and implementation of those innovations by users within the context of a firm. The TOE framework represents one segment of this process – how the firm context influences the adoption and implementation of innovations.

The TOE framework is an organization – level theory that explains that three different elements of a firm's context influence adoption decisions. These three elements are the technological context, the organizational context, and the environ-

ment context. All three are posited to influence technological innovation: (1) the technological context - both the internal and external technologies relevant to the firm; (2) the organizational context - descriptive measures regarding the organization, such as firm size and scope, managerial structure and internal resources; and (3) the environmental context – the arena in which a firm conducts its business: its industry, competitors and dealings with government.

The TOE framework has been examined by a number of empirical studies in various information systems (IS) domains, such as electronic-business in the Financial Services Industry (Zhu et al., 2004), internet / e-business technologies adoption by SMEs (Zhu et al., 2003; Ifinedo, 2011), e-commerce adoption (Hong and Zhu, 2006; Tan et al., 2007), adoption of enterprise resource planning (ERP) (Pan and Jang, 2008; Zhu et al., 2010), e-procurement (Teoa et al., 2009), green information technology (Bose and Luo, 2011). Although specific factors identified within the three contexts may vary across different studies, the TOE framework has consistent empirical support. Drawing upon the empirical evidence combined with the literature review, this paper believes that the TOE framework is an appropriate theoretical foundation for studying information technology in the retail supermarket adoption.

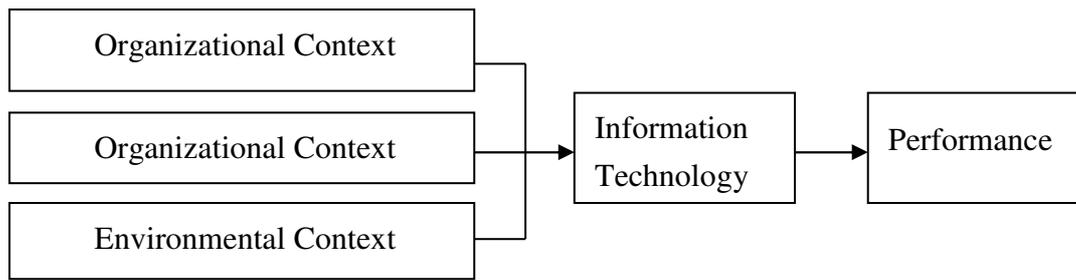
To summarize the TOE framework, these three contextual factors were postulated to affect organizational decisions regarding technological innovation (Tornatzky and Fleischer, 1990). Innovation services of information technology exchanges to strengthen the cause between firm's contact and information sharing through e-commerce platform to build value-added services and IT applications, statistical analysis, and query functions, change previous dealings with suppliers mode, using IT and internet, upgrade the original way to the online automated queries and click to enhance the business performance and efficiency of a traditional supermarket. Therefore, this paper adopts the TOE framework.

Methodology

Model Development

Reviewing the relevant literature, the conceptual model for information technology in a traditional retail supermarket based on the TOE framework in Figure 1.

The traditional retail supermarket discussed in this paper have established a special zone where fresh, daily transported vegetables from local farmers are sold, in order to a create market segmentation. This strategy has succeeded in attracting consumers concerned with



As-Is Model Analysis

Figure 1. A Conceptual Model

freshness and health. With the development of northeast and eastern Taiwan for tourism, the purchasing needs of tourists have arisen in recent years. The four supermarket branches investigated in this paper provide excellent environments for the tourists, as well as locals, to buy anything they need. The current operating conditions are as follows:

Organizational policy: An operating center with four supermarkets.

Inventory policy: The inventory is independently managed by the branch. The purchasing needs are reported to the operating center for general control; the commodity transfers among the branches are conducted in the form of transactions.

Price policy: Price is decided by each branch according to its area's competition.

Financial policy: Headquarters is in charge of financial management, while tax-related affairs and accounting are the responsibility of each branch.

IT policy: The operating center has currently established a system of accounting, with a POS system working independently by each branch, waiting to be integrated into the headquarters' system.

The traditional retail supermarket's current operating conditions are in Figure 2 and Figure 3.

Presently, the communication and documents delivery between the operating center depends on emails and logistics vehicles (Figure 4). The communication with suppliers relies on fax, emails, and phone calls. Such means of communication require key-ins and data filing, which is time-consuming and error-prone. Faced with the fierce competition of large-scale chain supermarkets, traditional supermarkets should further create market segmentation and stress their differences from chain supermarkets in order to improve operating performance and development.

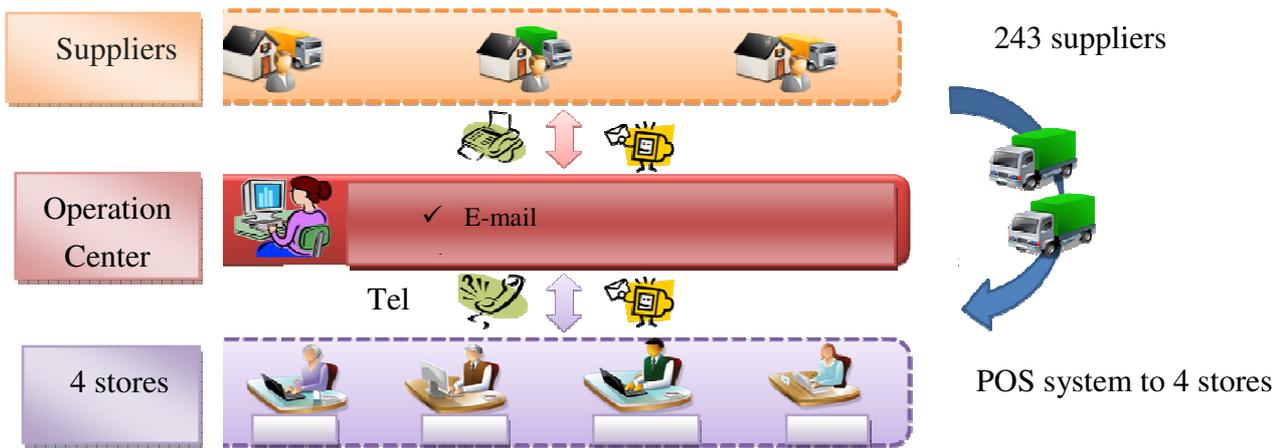


Figure 2. The current operating model of the traditional retail supermarket

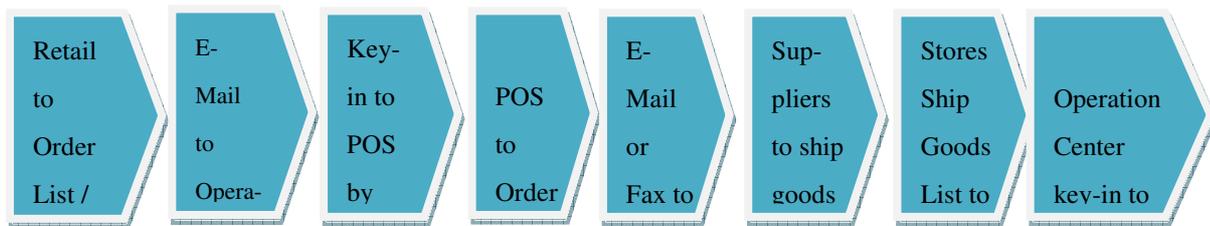


Figure 3. The procurement process of the traditional retail supermarket

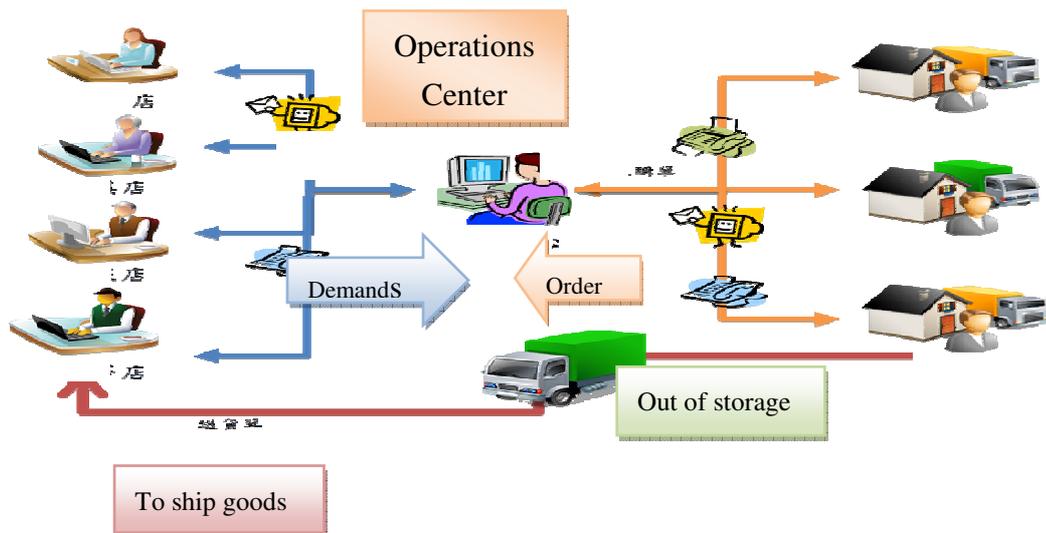


Figure 4. The current situation of the information flow

To-Be model analysis

A firm's existing technologies are important in the adoption process because they set a broad limit on the scope and pace of technological change that a firm can undertake (Collins et al. 1988). Ellinger (2000) examined the relationships among the organizational evaluation and rewards systems, cross-functional collaboration, effective marketing / logistics interdepartmental integration, and distribution service performance. Sanders (2007) also proposed and tested the relationship between organizational use of e-business technologies, organizational collaboration, and performance, using empirical data. Whipple et al. (2010) examined collaborative and transactional relationships in buying firms, and showed collaborative relationships offer greater benefits than transactional ones, while relational factors drive satisfaction and performance for both collaborative and transactional relationships. Therefore, based on the above analysis of the literature review, the traditional retail supermarket competitive strategy and breakthrough method showed in Figure 5.

This study suggests that the traditional supermarket should develop approaches to gain competitive advantages. In the area of IT integration, integration of the internal information of directly subordinate branches and a communication platform with suppliers should be improved in order to increase the efficiency of resource integration, reduce cost of communication and

labor, and improve the effectiveness of headquarter decision making. Meanwhile, through the spontaneity of inventory control and information provided by the integrative system, the cycling rate of commodities and effectiveness are expected to increase, which will lower costs. In the aspect of innovation and development, service quality should be improved, and virtual sales channels should be expanded, and cross- industry alliance can be formed to broaden the customer sources from other cities.

Conclusions

Today, most large retailers have morphed into multichannel firms, where the same customer visits the retailer via different channels for different purposes (e.g., obtains information online, makes purchases offline, and contacts customer support via telephone). Most have also expanded their focus from selling products to engaging and empowering customers, with the ultimate goal of creating a rewarding customer experience.

Innovations in business models are increasingly critical for building sustainable advantage in a marketplace defined by unrelenting change, escalating customer expectations, and intense competition (Sorescu et al. 2011). This paper applies the traditional retail supermarket is innovation development of internal and external technology. The successful implementa-

tion of traditional retail supermarket's information technology system depended on involving the suppliers as partners and proceeding step by step to reach the goal of transformation. The traditional retail supermarket procedure of implementation was a framework for technology-organization- environment conceptual

model to managerial structure of centralization. The quality of customer service is in addition to the original physical channel by increasing virtual, cross-industry cooperation mode and other counties to expand customer base.

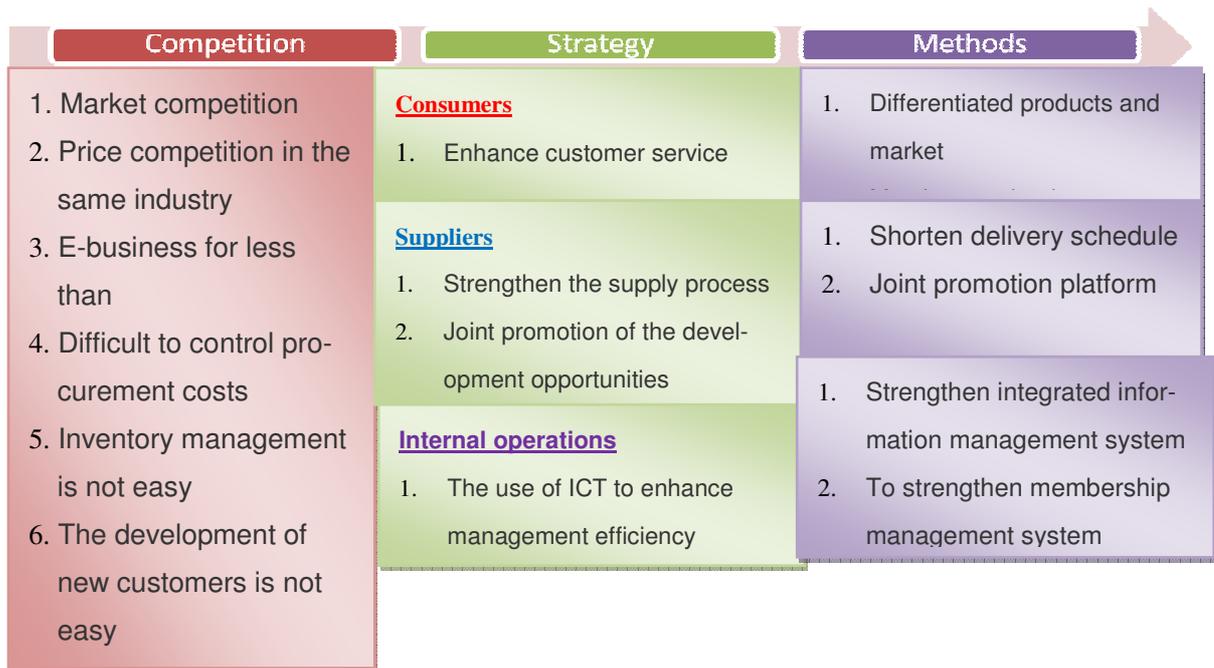


Figure 5. The supermarket competitive strategy and breakthrough method

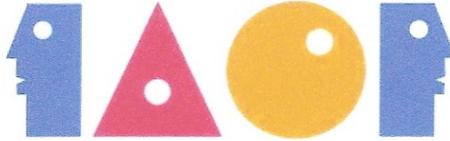
The actual purpose of the traditional retail supermarket in choosing to seek government support was to compensate for the enterprise's inadequate experience and understanding in strategies and models by learning from the government committee's

experience and expertise. The model used for the implementation procedure of supermarket in this case should provide a useful reference for other traditional retail that want to introduce information systems to their companies.

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A STUDY ON THE CORRELATION BETWEEN FURNITURE PRODUCT
KNOWLEDGE AND CONSUMERS' SATISFACTION BY
FUZZY LINGUISTICS

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Abstract

This study was aimed to investigate the correlation between the furniture product knowledge and satisfaction of consumers by means of fuzzy linguistic and examine the relationship between them by means of Pearson correlation coefficient. In addition, Cronbach's α and the multiple linear regression analysis were employed to explore the influence of product knowledge and consumers' satisfaction and establish appropriate regression equations. The research result showed that the fuzzy linguistics of furniture product knowledge and consumers' satisfaction were significantly correlated. Through the fuzzy linguistic mean equation, fuzzy linguistic was found to be between "agree" and "more agree." Furthermore, by the multiple linear regression analysis, independent variables, such as subjective knowledge, objective knowledge, and experience knowledge, were used to significantly forecast the fuzzy linguistic value of consumers' satisfaction.

Research Background and Motives

The management of furniture enterprises currently encounters a rapidly changing environment. The internet era changes rapidly. When consumers select furniture in the market, they usually look

for suitable products through their own understanding, information obtained from the external environment, and their experience of using similar products. After the evaluation, they will use the product and further generate satisfaction at the product. Rao and Monroe (1989) argued that

being familiar with the importance of product information, consumers having more product knowledge, they judge less by their stereotypes, and, instead, they tend to use intrinsic cues to determine the quality of a product, which further influences the consumers' satisfaction. Product knowledge has always been a critical issue in the study of consumers' behavior. Consumers' perception of furniture products exists in product knowledge; product knowledge is closely related to consumers' satisfaction and corporate profits. In terms of product knowledge, Rao and Monroe (1989) also found that product knowledge will influence consumers' evaluation. Scribner & Weun (2000) addressed that the quantity of product knowledge of consumers will influence the process of satisfaction perception formed by the attitude and further influence the following responses of satisfaction perception. Therefore, this study was aimed to investigate and understand how product knowledge influences consumers' satisfaction in order to help enterprises understand consumers' need and design furniture products which meet consumers' need, and, further, advance the operating performance.

Research Purposes

This study was aimed to investigate the correlation between the furniture product knowledge and consumers' satisfaction by means of fuzzy linguistic in hopes of providing the research result for

enterprises, designers, and consumers as a reference. If the research result is employed by the research, development, and design department and the marketing department of a company as a reference, it will be helpful for the departments to understand the product knowledge of consumers, increase consumers' understanding of product knowledge, and satisfy the demand of consumers, and enhance corporate performance.

Research Limitations

In this study, the fuzzy linguistic of consumers satisfactions at furniture product knowledge was investigated from the viewpoints of consumers after purchasing and using furniture products. The samples were randomly selected from the consumers of furniture discount stores in Taiwan.

Literature Review

Furniture Product Knowledge

Consumers sort the concepts from diversified information, form furniture product knowledge, and remember it in their mind. Their perception of furniture product knowledge also influences their purchase of furniture products. Brucks (1985) addressed that when consumers select products, they usually search product information through the memory related to themselves and the products or make purchase decisions by means of relevant experience of using similar products.

Therefore, different consumers usually have different levels of product knowledge of a product which will influence the satisfaction. Mazursky & Jacoby (1986) mentioned that the furniture product knowledge of consumers consists of the familiarity with furniture products and the professional knowledge. Hence, when consumers purchase furniture products, their own product knowledge tends to be applied to the furniture product evaluation and influence the satisfaction at the products. Brucks (1985) divided the definitions of product knowledge into three categories:

1. Subjective knowledge: the knowledge of products which consumers think they own, that is, the confidence of consumers in products.
2. Objective knowledge: consumers' real understanding of products, which is used to their actual perception of product knowledge, namely the product knowledge that consumers actually own.
3. Experience knowledge: the experience of consumers in purchasing or using products, which is used to measure the product knowledge.

Consumers' Satisfaction

Woodruff (1983) argued that consumers' satisfaction indicates an immediate reaction that a consumer generates for the overall value of a product in a particular purchase or use. Fornell(1992) considered that consumers' satisfaction is an

overall attitude based on experience. Thus, consumers' satisfaction depends on consumers' overall evaluation of all of their purchase experience in products or service, and it is the operating performance index of an enterprise. Anderson, Fornell & Lehmann (1994) brought up the overall consumer satisfaction, which indicates all of the experience of a consumer in purchasing or consuming a product or service and the overall evaluation formed by the accumulation of time. Yeh (2005) addressed that consumers' satisfaction indicates the feeling of consumers that their requirements have been satisfied. Consequently, overall satisfaction is an accumulative construct summing up the satisfaction at a particular product or service of an organization and the satisfaction at different dimensions of the organization. Therefore, it is a critical issue for enterprises to value consumers' satisfaction in corporate management and marketing at present.

Furniture Product Knowledge and Consumers' Satisfaction

Zeithaml (1988) considered that when consumers can only understand a product through the limited use experience before purchasing it, they will enthusiastically search the internal features of the product and try to link the product with the features, so internal clues become relatively important. Bolton & Drew (1991) considered consumers' satisfaction as the emotional factor generated

by the post-purchase experience of consumers, and they were of the opinion that the factor may influence consumers' evaluation of service quality and post-purchase willingness and behavior. Engel, Blackwell & Minidard (2001) argued that consumers' satisfaction indicates that after using a product, consumers evaluate the consistency between the product performance and the pre-purchase belief. When considerable consistency exists between them, consumers will be satisfied. On the other hand, consumers will not be satisfied if their opinions on the belief in the product and the actual performance of the product.

Coulter et al. (2005) addressed that the product knowledge of consumers influences their purchase intentions, so when they understand a product more, their purchase intentions will also increase. When consumers become more familiar with the knowledge of a product, their faith in and attitude toward the product will become better, so their purchase intention will increase, and the satisfaction will further increase. Hence, if furniture product knowledge is regarded as an important communication bridge between consumers and products, consumers' satisfaction will be directly influenced, consumers' understanding and use of a product will be influenced by furniture product knowledge, and the satisfaction will be further influenced.

Research Methodology

Research Design

1. Research Framework.

This study was aimed to investigate the correlation between furniture product knowledge and consumers' satisfaction. The research framework is displayed in Figure 1.

Research Hypothesis and Question

The research hypotheses are listed as follows:

Research Hypothesis H₁: The fuzzy linguistics of furniture product knowledge and consumers satisfaction are significantly correlated.

Research Question: The multiple linear regression was applied to the furniture product knowledge analysis in order to anticipate the fuzzy linguistic of consumers' satisfaction.

Questionnaire Design

The research questionnaire design was aimed to investigate the influence of furniture product knowledge on the fuzzy linguistic of consumers' satisfaction in Taiwan. The levels included respectively "strongly agree," "more agree," "agree," "disagree," and "strongly disagree." The first part of the questionnaire was the personal information of a participant, includ-

ing gender, age, education background, and monthly income. The second part was the opinions of the participants about furniture product knowledge, including subjective knowledge, objective knowledge, and experience knowledge. The values of fuzzy linguistic respectively represented the following agreement: “0-1” indicated “strongly disagree;” “1.1-2” indicated “disagree;” “2.1-3” indicated “agree;”

“3.1-4” indicated “more agree;” “4.1-5” indicated “strongly agree.” The third part showed the satisfaction evaluations of the participants, which were based on the subjective feelings of the participants, after understanding furniture product knowledge. The representations of the fuzzy linguistic values were identical to those in the second part.

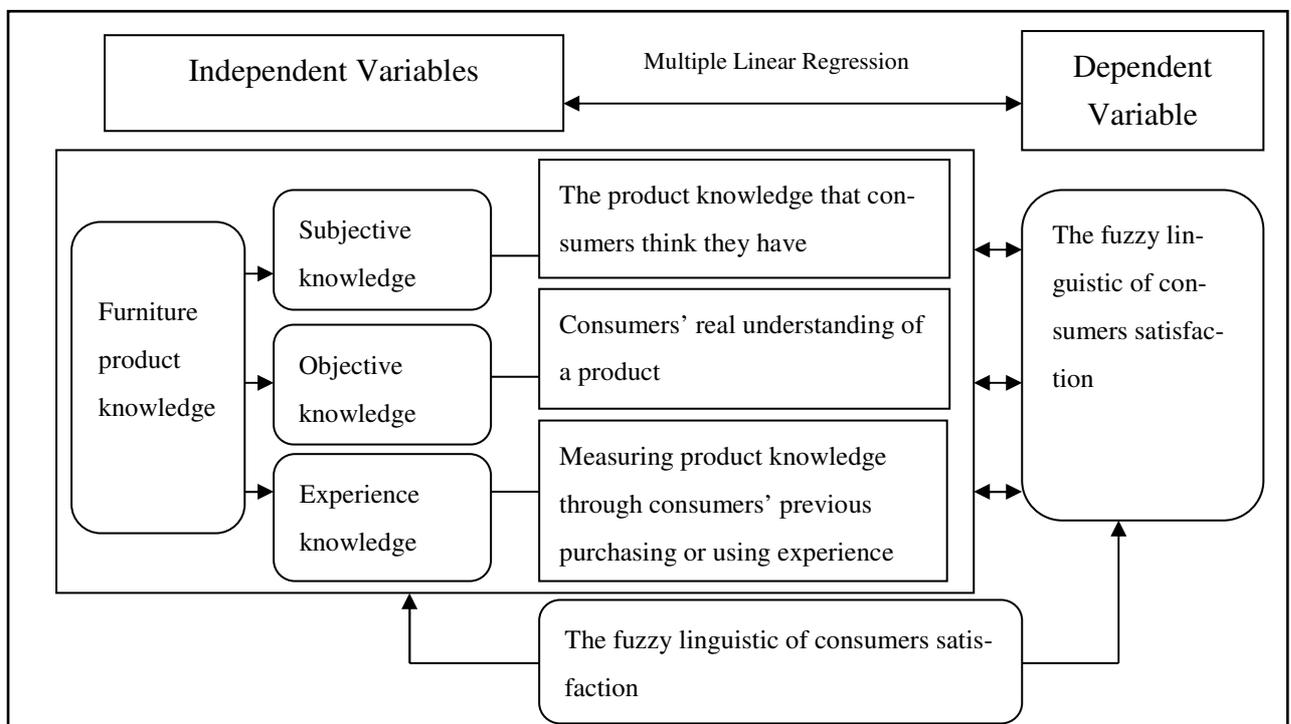


Figure 1. Research framework

The Fuzzy Linguistic Statistics of the Questionnaire Data

Matarazzo and Munda (2001) argued that traditional linguistic decisions were all limited to the use of triangular number, so they brought up the method of using the integration method to calculate fuzzy numbers, which are categorized into the

following types: triangular fuzzy number, trapezoidal fuzzy number, and normal fuzzy number. In this study, the triangular fuzzy linguistic numbers of a Likert five-point fuzzy linguistic scale were used to indicate the weights of the indexes. Based on the viewpoint of fuzzy linguistic, the fuzzy linguistic scale was designed, and an approach of fuzzy linguistic evaluation

was employed to measure the feelings of the participants.

A fuzzy linguistic approach was applied to the questionnaire survey in this study to conduct multiple linear regression for forecasting the fuzzy linguistic of consumers' satisfaction by means of the factor of furniture product knowledge. Wu, Hsiao, and Kuo (2004) proposed the data processing of a fuzzy rule database; respectively giving the linguistic variables of the satisfaction of pre-test expectation five linguistic phrases, namely "strongly agree," "more agree," "agree," "disagree," and "strongly disagree," to respectively represent a triangular fuzzy linguistic number. It was assumed that a, b, and c

represented the numbers of the expected triangular fuzzy linguistic coordinates, so $F = (0, 0, 1), (0, 1, 2), (1, 2, 3), (2, 3, 4),$ and $(3, 4, 5)$, which respectively represented the five linguistic phrases. The data were outputted after fuzzy inference and defuzzification (Klir & Yuan, 1995). That is, the fuzzy statistics obtained by fuzzifying the satisfaction were defuzzified in order to obtain specific values for the following research and analyses. The center-of-area approach used by Kaufmann and Gupta(1991), Chien and Tsai (2000), and Hsu and Lin (2005) was applied to the defuzzification. The triangular fuzzy linguistic numbers were and found as follows (Figure 2.)

The de-satisfaction linguistic fuzzification formula, namely \tilde{F} , is listed as follows: Assume $\tilde{F} = (a, b, c)$, $V_{\tilde{x}}$ is the coordinate mean of triangular fuzzy linguistic,

$V_{\tilde{x}} = (a + 2b + c) / 4$, $u(x)$ is the fuzzy membership function, and the value of $u(x)$ is 0~1.

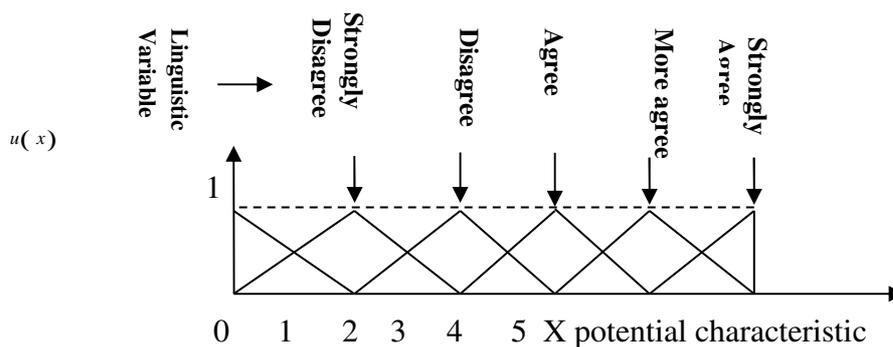


Figure 2: The membership function diagram of five-level fuzzy linguistic variables

$a_1 \quad b_1 \quad c_1 \text{ ---- } \tilde{F} = (a_1, b_1, c_1) \rightarrow$ The fuzzy linguistic calculation of the second part of the questionnaire

$a_2 \quad b_2 \quad c_2 \text{ ---- } \tilde{F} = (a_2, b_2, c_2) \rightarrow$ The fuzzy linguistic calculation of the third part of the questionnaire

Equation (1) was induced from the fuzzy linguistic descriptive statistic equation of the second part of the questionnaire: $\tilde{F} = (a_1, b_1, c_1)$, and $V_{\tilde{x}} = (a_1 + 2b_1 + c_1)/4$ can be converted into

$$\text{Fuzzy Linguistic Mean} = \left[\sum_1^n (a_1 + 2b_1 + c_1) \right] / 4N, N=702(\text{participants}) \text{ ----(1)}$$

Equation (2) was induced from the fuzzy linguistic descriptive statistic equation of the third part of the questionnaire: $\tilde{F} = (a_2, b_2, c_2)$;

$V_{\tilde{x}} = (a_2 + 2b_2 + c_2)/4$ can be converted into

$$\text{Fuzzy Linguistic Mean} = \left[\sum_1^n (a_2 + 2b_2 + c_2) \right] / 4N, N=702(\text{participants}) \text{ ----(2)}$$

The fuzzy linguistic values of the questionnaire were analyzed by means of Equations (1) and (2).

The Reliability and Validity of the Questionnaire

The validity of this questionnaire was confirmed through the interview of expert panel. Moreover, sixty-nine copies of the questionnaire were applied to the pilot study, and then, the questionnaire was appropriately amended and adjusted. According to the standard suggested by Nunnally (1995), the content of a questionnaire will be reliable when the Cronbach's α is higher than 0.7. The second part of this questionnaire was the

opinions of the participants about furniture product knowledge, including subjective knowledge, objective knowledge, and experience knowledge. The Cronbach's α obtained from the pilot study was 0.926, which was higher than 0.7. The third part of the questionnaire was the satisfactory evaluations of the participants after buying and using furniture products. The Cronbach's α obtained from the pilot study was 0.937, which was higher than 0.7. The two parts of the questionnaire were both highly reliable in the pilot study.

The Descriptive Statistic Results of the Questionnaire

In terms of sample structure, 702 participants came from various areas in Taiwan. The male participants accounted for 48.3% while the female participants accounted for 51.7%. For age, “20-29 years old” accounted for 34.6%, which was the maximum, and “60 years old and the above” accounted for 8.1%, which was the minimum. In terms of education, “college” accounted for 39.7%, which was the maximum, whereas “junior high school and the below” accounted for 17.1%, which was the minimum. For in-

come, “USD5,00 - 1,000” accounted for 36%, which was the maximum whereas “USD 3,000 and the above” accounted for 5.6%, which was the minimum.

The Fuzzy Linguistic Descriptive Statistic Analysis of the Questionnaire

Based on the second and third parts of the questionnaire of the subjective knowledge, objective knowledge, and experience knowledge of furniture product knowledge on the fuzzy linguistic of consumers’ satisfaction (Table 1), the consumers attached the most importance to

Table 1. The fuzzy linguistic descriptive statistics of the questionnaire of furniture product knowledge

	N	Mini- mum	Maxi- mum	Mean	Std. Devia- tion
Subjective knowledge	702	2.00	5.00	3.7350	.65931
Objective knowledge	702	2.00	5.00	3.7236	.69066
Experience knowledge	702	2.00	5.00	4.1197	.68814
Furniture product knowledge	702	3.00	5.00	3.8704	.54105
Valid N (listwise)	702				

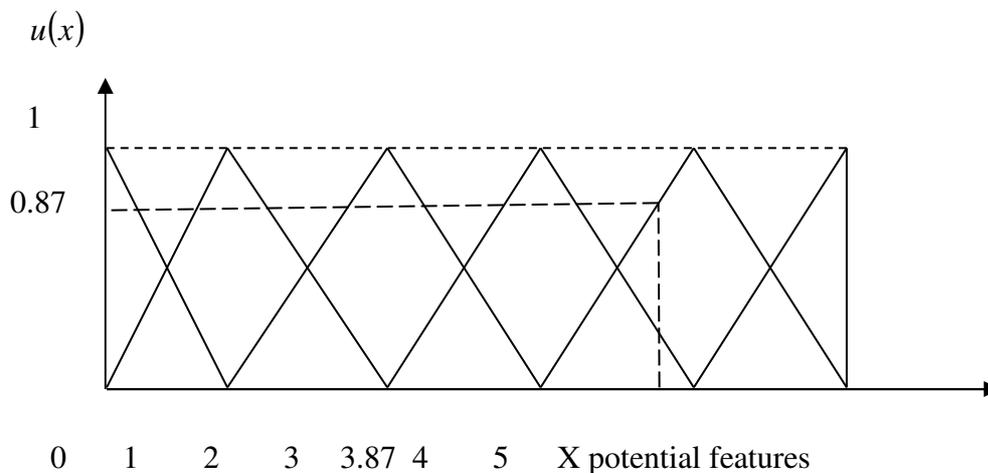


Figure 3. The membership diagram of the linguistic variables of satisfaction

Table 2. The Pearson correlation analysis of the fuzzy linguistics of subjective knowledge, objective knowledge, experience knowledge in furniture product knowledge and consumers' satisfaction

Factors		Subjective knowledge	Objective knowledge	Experience knowledge	Consumer's Satisfaction
Subjective knowledge	Pearson Correlation	1	.290(**)	.447(**)	.244(**)
	Sig. (2-tailed)	.	.000	.000	.000
	N	702	702	702	702
Objective knowledge	Pearson Correlation	.290(**)	1	.124(**)	.387(**)
	Sig. (2-tailed)	.000	.	.001	.000
	N	702	702	702	702
Experience knowledge	Pearson Correlation	.447(**)	.124(**)	1	.407(**)
	Sig. (2-tailed)	.000	.001	.	.000
	N	702	702	702	702
Consumer's Satisfaction	Pearson Correlation	.244(**)	.387(**)	.407(**)	1
	Sig. (2-tailed)	.000	.000	.000	.
	N	702	702	702	702

** Correlation is significant at the 0.01 level (2-tailed).

experience knowledge in furniture product knowledge, and the fuzzy linguistic mean was 4.1197. They attached less importance to objective knowledge in furniture product knowledge, and the fuzzy linguistic mean was 3.7236. The fuzzy linguistic means of furniture product knowledge on consumers' satisfaction were all higher than the fuzzy linguistic means of subjective knowledge and objective knowledge. The fuzzy linguistic mean was 3.87, as shown in Table 1 and Figure 3. The expression of the fuzzy membership function was $u(x):1 = (3.87-3.0):(4-3)$, and the obtained fuzzy membership function was $u(x)=0.87$. It was found that the fuzzy

value of the questionnaire was between 3 and 4, namely between "more agree" and "agree," indicating that the consumers were considerably satisfied with furniture product knowledge.

The Pearson Correlation Analysis of the Fuzzy Linguistics of Furniture Product

Knowledge and Consumers' Satisfaction

According to Table 2, the fuzzy linguistics of subjective knowledge, objective knowledge, and experience knowledge in furniture product knowledge were significantly correlated. Among them, subjective

knowledge and experience knowledge were the most correlated; $r(702) = .447$, $p < .00$. The fuzzy linguistics of objective knowledge and experience knowledge in furniture product knowledge were the least correlated; $r(702) = .124$, $p < .00$. In addition, the fuzzy linguistics of consumers' satisfaction and subjective knowledge, objective knowledge, and experience knowledge in furniture product knowledge were all significantly correlated. Among them, the mean and the satisfaction correlation of experience knowledge were the highest; $r(702) = .407$, $p < .00$.

The Multiple Linear Regression Analysis of the Fuzzy Linguistics of Furniture Product Knowledge and Consumers' Satisfaction

The multiple linear regression approach was employed to establish a mathematical functional relationship between the fuzzy linguistics of furniture product knowledge and consumers' satisfaction, and the functional relationship was then used as a dependent variable to forecast satisfaction. The independent variables were (ki_1, ki_2, ki_3) furniture product knowledge (subjective knowledge, objective knowledge, and experience knowledge), and the fuzzy linguistic (Si) of consumers' satisfaction was regarded as the dependent variable to forecast the fuzzy linguistic of consumers' satisfaction as time changed. The obtained equation of multiple linear regression is listed as follows:

$$Si = x + q_1 ki_1 + q_2 ki_2 + q_3 ki_3$$

in which, Si = the fuzzy linguistic forecast of consumers' satisfaction; x = additive constant; ki_1 (subjective knowledge), ki_2 (objective knowledge), and ki_3 (experience knowledge) = predictors; q_1, q_2, q_3 = linear slopes.

The multiple linear regression equation was used as the forecast equation of consumers' satisfaction in order to transform into Predicted Consumer Satisfaction value = $x + q_1 * \text{subjective knowledge} + q_2 * \text{objective knowledge} + q_3 * \text{experience knowledge}$.

The multiple linear regression equation was employed in this study as the relational equation for forecasting the influence of furniture product knowledge on the fuzzy linguistic of consumers' satisfaction. According to Tables 3, 4, and 5, there were three predictors in this multiple linear regression, respectively subjective knowledge, objective knowledge, experience knowledge, which were significantly correlated with the fuzzy linguistic of consumers' satisfaction. $R^2 = .530$, adjusted $R^2 = .278$, $F(3,701) = 91.109$, and $p = .000$. Through the multiple linear regression analysis, furniture product knowledge was used to forecast the fuzzy linguistic of consumers' satisfaction. The obtained multiple linear regression equation was Predicted Consumer Satisfaction value = $1.704 - .020 \text{ subjective knowledge}$

Table 3. The model summary of multiple linear regression analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.530(a)	.281	.278	.44791

a Predictors: (Constant), Experience knowledge, Objective knowledge, Subjective knowledge

Table 4. The ANOVA of multiple linear regression analysis

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	54.836	3	18.279	91.109	.000(a)
	Residual	140.036	698	.201		
	Total	194.872	701			

a Predictors: (Constant), Experience knowledge, Objective knowledge, Subjective knowledge

b Dependent Variable: Consumer's Satisfaction

Table 5. The coefficients of multiple linear regression analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.704	.135		12.637	.000
	Subjective knowledge	-.020	.030	-.025	-.667	.505
	Objective knowledge	.266	.026	.348	10.382	.000
	Experience knowledge	.287	.027	.375	10.454	.000

a Dependent Variable: Consumer's Satisfaction

+ .266 objective knowledge + .287 experience knowledge.

Conclusions and Suggestions

It was found in this study that the consumers attached the most importance to experience knowledge and paid less attention to objective knowledge in terms of furniture product knowledge. The fuzzy linguistics of subjective knowledge

and experience knowledge were the most correlated, and they were significantly correlated with each other. The fuzzy linguistics of objective knowledge and experience knowledge were the least correlated. Furthermore, consumers' satisfaction was significantly correlated with the fuzzy linguistics of subjective knowledge, objective knowledge, and experience knowledge. (2) The fuzzy linguistic mean of furniture product knowledge on consumers' satisfaction was higher than the fuzzy linguistic means of subjective knowledge and objective knowledge. The result showed that the fuzzy linguistic of consumers for experience knowledge in furniture product knowledge was the highest. (3) In this study, multiple linear regression was used to forecast the influence of furniture product knowledge on the fuzzy linguistic of consumers' satisfaction. There were three forecast independent variables, respectively subjective knowledge, objective knowledge, and ex-

perience knowledge, which were significantly correlated to the fuzzy linguistic of consumers' satisfaction. The obtained multiple linear regression was significantly established. Subjective knowledge, objective knowledge, and experience knowledge in furniture product knowledge can be used to forecast the correlation of the fuzzy linguistic of consumers' satisfaction.

The conclusion of this study can be used by designers as a reference to furniture product design and development, and factors, such as subjective knowledge, objective knowledge, and experience knowledge, which were accepted by all consumers should be included the design consideration of furniture products in hopes of designing the products which meet the demand of consumers, can increase consumers' satisfaction, and further increase the development performance and profits of enterprises.

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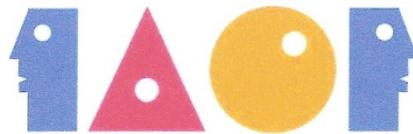
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INVESTIGATING INFLUENCES OF SEA-LAND CIRCULATION ON
OZONE POLLUTION IN SOUTHERN TAIWAN BY COUPLING CLUSTER
ANALYSIS WITH BACK - TRAJECTORY SIMULATION

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Abstract

This study employs cluster analysis on the coordinate numbers of the back trajectories of the stations by choosing Kao-Ping air quality basin, the most severely polluted air quality basin in Taiwan, as the subject. By making analysis of the back trajectories of the 14 stations during spring and autumn (183 days in total), we realized the correlation between the categorization of back trajectories and ozone concentration. The results of cluster analysis indicated that the agglomeration employed by Ward's method works better than average linkage method. Back trajectory routes consist of four types, namely, slow monsoon, sea breeze, stagnation and fast monsoon types. If take the average daily ozone value into account, 57% of the monitoring stations, located downtown or satellite metropolis areas, showed that sea breeze reached maximum concentrations, whereas 43% of the surveyed stations, located in industrial areas, reached their highest value when a slow monsoon blew. From the analytical results of the topology, weather and back trajectory of the Kao-Ping air quality basin, the stations that contributed to the high-concentration ozone pollution were mostly located in the coastal areas of Kaohsiung City, especially when the backward trajectory brought by westerly sea breeze.

Keywords: Backward Trajectories, Cluster Analysis, Ozone

Introduction

A variety of factors may affect air quality; as such factors have multi-dimension features. Cluster analysis has been widely applied to categorize and analyze the causal relationship between air quality and pollution source, whilst back trajectory model is often employed to explore the causal relations between the concentration of the air pollutants and its emitted sources. Hence, making the back trajectory's positions as the measurable variables for cluster analysis can be an effective tool to grasp the interactions among weather, emission source and air quality. Moody and Galloway (1988) was the first to set the trajectory's coordinate number as the measurement variable to undertake cluster analysis as they thought differing trajectory routes would have similar wind directions, wind speed and areas with emission sources. Fernau and Samson (1990 a, b) further integrated cluster analysis and trajectory model and applied them both to ten stations situated across the eastern areas of North America, so as to define seven weather types and chemical sedimentary zone, discover the transmission route of air pollutants and successfully pinpoint the various change of time according to differing trajectory types of chemical sedimentation. Moody et al. (1995) conducted the research on Bermuda's ozone transmission by categorizing the 540 back trajectory routes, each of which lasted for 120 hours with a coordinate number being showed every twelve hours. The distribution of ozone concentration with differing trajectories displays huge difference.

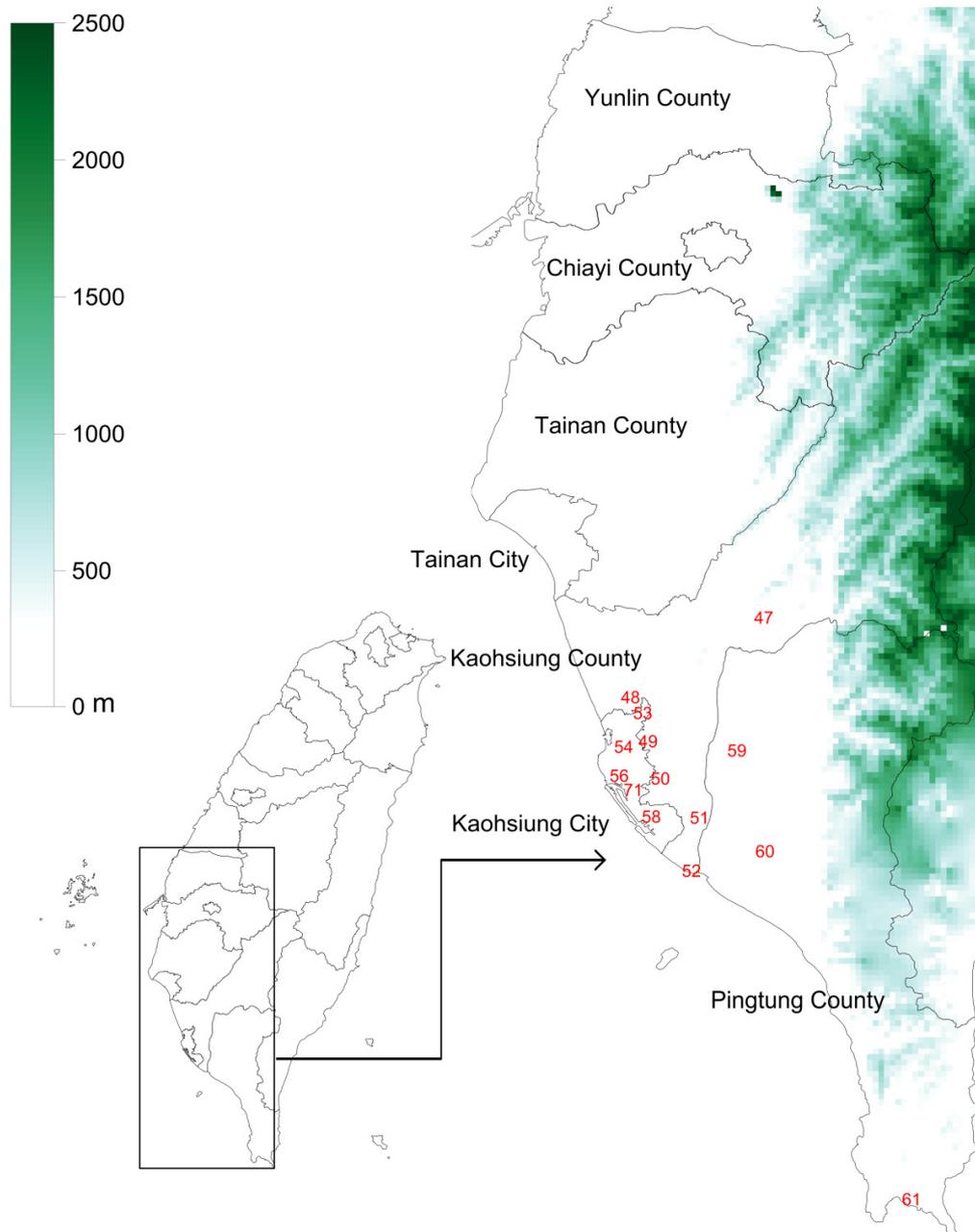
Kahl et al. (1997) analyzed the condition of the air transmission and visibility of the Grand Canyon with five-year duration's data. Each trajectory route lasted for 72 hours, which showed that northwest/ southwest/ south wind mostly affected the visibility in summer and winter. Brankov et al. (1998) classified the 72-

hour back trajectories that passed Whiteface Mountain in five years before discovering the difference of ozone concentration by means of nonparametric method so as to elucidate the long-term transmission of ozone. This paper aims to conduct the cluster analysis of back trajectories of the ozone monitoring stations within 72 hours in areas where air quality is most seriously polluted. By adequately categorizing such routes, we come to clarify the characteristics of every back trajectory routes and ozone concentration in an attempt to make them as reference for future's regulatory strategies for ozone pollution.

Research Domain and Data

The research data comprises the information of weather and air quality. The ground weather data includes the 25 ground stations of the Central Weather Bureau and the 57 stations of the Environmental Protection Administration (hereunder referred to as EPA), which provide hourly data. Airsonde weather data is found in the monitoring data from stations Benciao and Hualien (at 8:00 am and 8:00 pm) by employing temporal interpolation method. Currently Taiwan is divided up into seven air-quality basins, of which Kao-Ping air quality basin has seen the most serious pollution in 20 years. Viewed from the percentage of days with $PSI > 100$, from 2001 through 2010, the percentage of PSI across Taiwan was 2.5-4.3%, whereas that of Kao-Ping air quality basin was 4.8-10.0% with the indicative pollutant being ozone. Kao-Ping air quality basin was consisted of Kaohsiung County, Kaohsiung City and Ping-Tung County. To improve the air quality, this study selects ozone as the subject of research so as to pinpoint the characteristics of back trajectories that affect ozone concentration. Formulated by the EPA in 1990, Taiwan Air Quality Monitoring began to operate in September 1993, with presently 77 stations in total (nine actinic stations excluded).

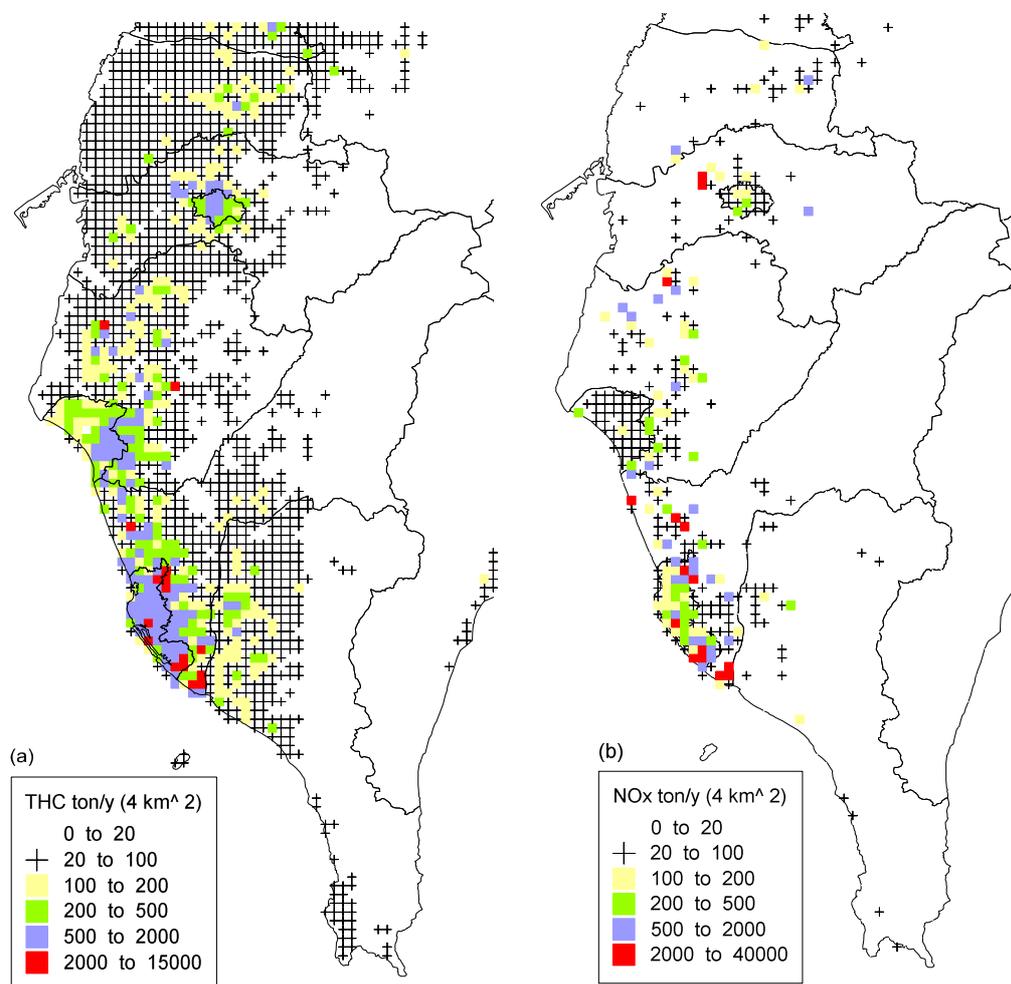
Figure 1. Locations and topography of monitoring stations.



Monitoring items include sulfur dioxide, carbon monoxide, ozone, suspended particles, nitrogen oxides, hydrocarbon, wind direction, wind speed, and temperature etc. The Kao-Ping air quality basin is equipped with 14 stations (Figure 1). The Tainan City, Tainan County, Chiayi County and Yunlin County are political jurisdictions that located in the northern part of Kao-Ping air quality basin.

The geographic locations of emission inventory for THC (Fig. 2a) and NO_x (Fig. 2b), established by Taiwan EPA [11], could play an important role to form high ozone levels. The size of individual cells used in analysis is 2 km x 2 km. The THC and NO_x emission presented high values over coastal regions of Tainan County, Tainan City, Kaohsiung County and Kaohsiung City. Especially, the coastal areas in Kaohsiung City and County

Figure 2. Emission inventory of (a)THC and (b)NOx, ton/y (cell size = 2 km x 2km)



showed the highest levels of emission inventory for THC and NOx. The contour map of exceeding rate for daily maximum hourly ozone levels over 120 ppb (Fig. 3a) represented an increasing trend from sea to land; the contour map for 80 ppb (Fig. 3b) also showed the same trend. Then, land-sea breeze circulation could be a dominant factor to cause high ozone levels over Kao-Ping air quality basin.

Methods

The back trajectory model comprises three steps—objective analysis, variation analysis, and trajectory back-tracing, objective analysis grids the data of the ir-

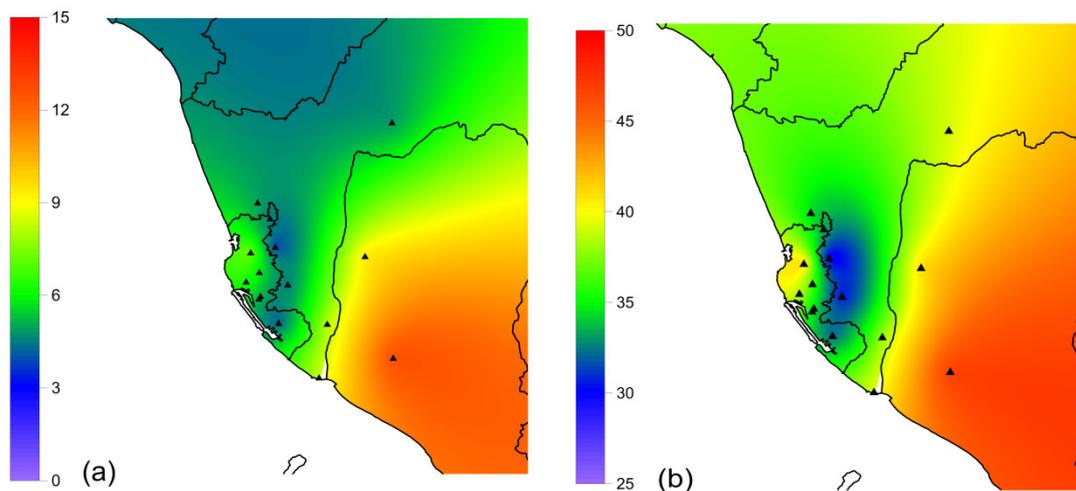
regular stations, with the benefits of filtering effect and the consistency of the weather data from previous stations. Variation analysis modulates the effect produced from flow-fields passing through complicated topography. Year 2007 is the goal year that the EPA chose for simulation of ozone episodes. As spring and autumn are two seasons in which ozone pollution occurred most frequently, the starting time for each station was during the hour that highest hourly values occurred per day, with 72 hours as the trace duration.

Cluster analysis selects samples from the coordinate number of each sta-

tion's hourly backward trajectory separately. The process of cluster analysis consists of three steps: first, the similarity value should be decided, with the application of Euclidean distance. Secondly, connection method should be decided, and in this study, we compare two common methods, that is, Ward's method and average linkage manner, before selecting stations that should be connected first. Ward's method

gets the root mean square (RMS) value by combining the stations with minimum variances, while average linkage chooses average distance. Lastly, the number of clusters could be determined by using pseudo-F, pseudo-t2, relevant coefficients and total RMS variation [10]. This study uses total RMS variation as the indicator of the number of clusters.

Figure 3. Contour map of exceeding rate (%) for daily ozone levels over (a) 120 ppb (b) 80 ppb in 2001-2010

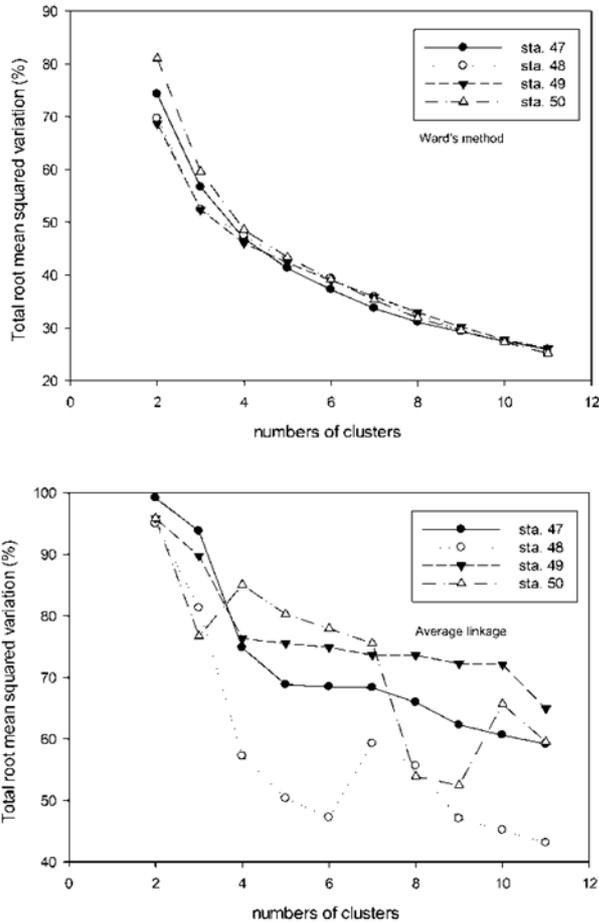


Results and Discussion

According to the categorization of the cluster analysis, we make Figure 4 on the ratio of the categorized number of the four stations (#47-50) and the total explained variance as a comparison of Ward's method and average linkage manner. In regard with the ratio of percentage, Ward's method has a higher decreasing ratio than average linkage method; therefore, if we adopt the same categorized number, the total explained variance will be higher than that of average linkage, and is more suitable for this study. As the agglomeration employed by Ward's method combines stations with variances, the ratio of total variance will decrease in accord-

ance with the increase of the categorized number. On the other hand, the ratio of total variance of the average linkage will irregularly decrease as the categorized number sees a growth. For instance, when the categorized number of the station #50 is three, the total explained variance will be 76.7%, and when the categorized number of the station #50 is four, the total explained variance is 85.1%. As the former becomes five, the latter drops to 80.2%. If consider the suitability of the categorized number, then in the example of the station #49, the total explained variance will be 46.1% and 42.3% respectively when the categorized number is 4 and 5. Put differently, the increased explained

Figure 4. The correlation between the number of clusters and total RMS variation.



variance is short of 5%. Hence here we recommend taking four as the categorized number. Upon the ground of the above cluster analysis, the back trajectory of each station in the 183-day period is classified into four types, while the six-hour average back trajectory can be divided into slow monsoon (Figure 5a), sea breeze (Figure 5b), stagnation (Figure 5c) and fast monsoon types (Figure 5d). The weather condition of the station # 61 immensely differs from that of any other station; hence its analysis of back trajectory is not included here. Thus stated, the average daily ozone value of each type of back trajectory is shown in Figure 6.

Compare the back trajectory of each type and its average daily ozone value and we know that:

- (1) The 57% of the surveyed stations' back trajectories have the highest average daily ozone value when a sea breeze occurs; these stations are located in downtown or satellite metropolis areas. The remaining 43% of the stations reach the highest average daily ozone value when a slow monsoon occurs. These stations are mostly situated round the industrial zones.
- (2) Compare the average daily ozone value of the back trajectory of each type by taking into account all stations over the Kao-Ping air quality basin, the highest concentration is sea breeze type, followed by slow monsoon, stagnation and fast monsoon types.

With regard to the average daily ozone value of various back trajectories,

Figure 5. The average back trajectories of the stations of the four types.



blowing wind will alleviate the emission and concentration of the ozone particles. Meanwhile, 36% of the stations have the lowest value when a stagnation takes place, as the backward trajectory of a stagnation is shorter and even lingers at the same spot, thus absorbs relatively little ozone precursors.

(3) The stagnation type usually appears in the form of a weak monsoon or south wind. 50% of the stations (stations #50, 51, 52, 53, 54, 56, 58) whose back trajectories show that the wind direction is south wind.

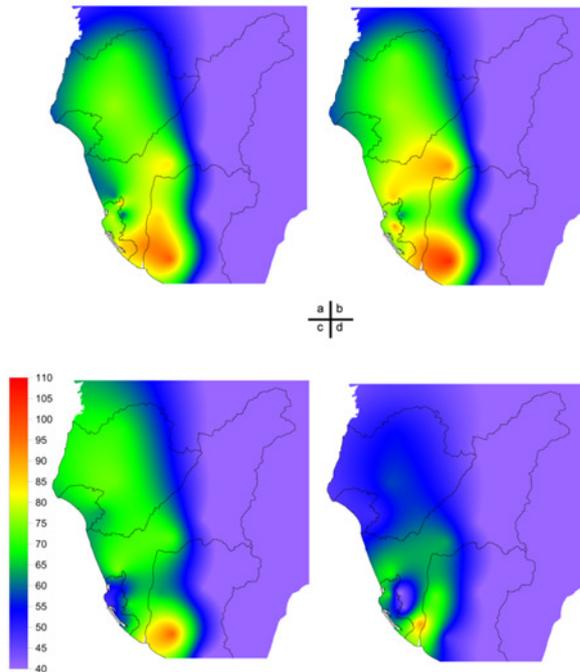
The sea breeze type (westward) occurs before the highest concentration ozone hourly value, lasting for three hours on average. The initial point of time of each station's back trajectory is at the duration when the highest hourly value of ozone appears. As the wind blows across Kao-Ping air quality basin from 10:00 till 11:00 in the morning, the highest concentration ozone appears during the time of 1:00 pm to 2:00 pm. If take the duration

into consideration, then the seven coastal stations (stations #50, 52, 53, 54, 56, 58, 71) have the highest concentration ozone 1-2 hours earlier than three interior stations (stations #47, 59, 60).

Conclusions

From the analytical results of the topology, weather and back trajectory of the Kao-Ping air quality basin, the stations that contributed to the high-concentration ozone pollution were mostly located in the coastal areas of Kaohsiung City, especially when the sea breeze back trajectories brought by westward wind. As to whether the ozone pollution in the Kao-Ping air quality basin can be transmitted for subsequent days, we need more data regarding ozone concentration, back trajectory and the emissions of ozone precursors to clarify the causal relationship between high-concentration ozone pollution and regional emission. As to the contributory ratio of the ozone precursors for ozone episodes is yet to be found in the future research.

Figure 6. The average daily ozone value obtained by the four types.



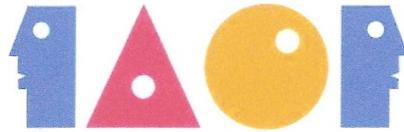
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EXAMINING THE MECHANISMS LINKING BEHAVIORAL INTEGRITY
AND AFFECTIVE COMMITMENT: THE MEDIATING ROLE OF CHAR-
ISMATIC LEADERSHIP

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Abstract

In this study, we theoretically identify the relationships among behavioral integrity, charismatic leadership, and affective commitment. Integrating the behavioral integrity-charismatic leadership-affective commitment framework, we propose that behavioral integrity not only has a direct positive influence on affective commitment, but also indirectly influences affective commitment through charismatic leadership. This study uses employees of an international automotive company located in Taiwan as the research subject, collecting 427 effective questionnaires. The results support our hypotheses. Overall, the results of this study can provide the international automotive company located in Taiwan with a reference for human resource management decisions, and clarify the relationship between behavioral integrity and affective commitment through charismatic leadership. Therefore, the results of this study contribute to human resource management theory and research for the international automotive company located in Taiwan.

Key Words: Behavioral Integrity, Charismatic Leadership, Affective Commitment, Job Satisfaction, Role Conflict, Role Overload

Introduction

In recent years, behavioral integrity (BI) has become an emerging field of empirical research. Simons (2002) proposed a BI model, where BI is defined as the trust of employees toward their managers (i.e., doing as they are instructed), or the image of managers perceived by their employees (i.e., the perception that a person acts in ways that are consistent with their words). Employees are influenced by their perceptions of managers' word-deed alignment patterns.

Therefore, this study defines BI as the perceived pattern of a person's word-deed alignment. Simons (2002) asserted that BI typically involves affective components (Kramer, 1996), such as benevolence (Cummings & Bromiley, 1996) and behavioral intentions, that differ from general concepts of trust. Dineen et al. (2006) contended that BI is a construct of word-deed alignment patterns, rather than a specific instance. Apparent in the personality of managers, BI is basically a differing reciprocal obligation (Shore et al., 2004). Simons (2002) further defined BI as a subjectively perceived intrapsychic phenomenon that includes the two subdimensions of (a) espoused and enacted values, and (b) promises fulfilled. Subsequently, both parties must possess a perceived consensus.

Perceived BI is a type of actor perception. For example, managers engage in certain behaviors that are consistent with their value statements, priorities, expectations, and management styles (Simons, 1999, 2002) and correlate with trust, reliability, and psychological contracts (Simons, 2002; Davis & Rothstein, 2006). BI can also influence employees' trust in management, perceptions of interpersonal justice, affective commitment, overall satisfaction, and intentions to remain (Simons et al., 2007).

Because these variables are potentially influenced by BI, Allen and Meyer (1990) introduced the concept of affective commitment with their proposed organizational commitment model. Allen and Meyer (1990) contended that organizational commitment comprises three entirely different subscales, that is, affective commitment, continuance commitment, and normative commitment. According to Iverson and Buttigieng (1999), the construct and operational definition of affective commitment indicates the involvement of a continuance factor known as attitude commitment. Affective commitment can be defined as employees' affective or emotional attachment to the employing organization (Allen & Meyer, 1996; Rhoades et al., 2001). Low affective commitment enables employees to fulfill their duties effectively (Meyer et al., 2002).

Therefore, when employees possess strong affective commitment to an organization, their turnover intentions decline (Allen & Meyer, 1996; Vandenberghe & Tremblay, 2008). In addition, when employees possess high levels of commitment, they tend to identify with the organization and actively participate in work (Allen & Meyer, 1990). High affective commitment includes employee-job fit, self-esteem, and loyalty perceptions (Rousseau & Aube, 2010). Previous empirical studies of affective commitment have shown that employees who receive desirable benefits are more likely to possess affective commitment to an organization (Mowday et al., 1982; Meyer & Allen, 1997). Additionally, employees tend to develop affective commitment when encouraged by supervisors inside the organization (Mottaz, 1988; Podsakoff et al., 1996; Schaubroeck & Fink, 1998; Kidd & Smewing, 2001; Stinglhamber & Vandenberghe, 2003; Rafferty & Griffin, 2004).

A review of relevant literature indicated that in an organization, the word-deed alignment and behavior of supervisors can significantly influence employees and the organization. Therefore, when the words and deeds of supervisors within an organization generate employee commitment and approval, employees' affective commitment to the supervisor and organization can be increased.

Reviewing previous studies regarding leadership, charismatic leadership has emerged as a prominent and widely adopted theory (Dvir et al., 2002), and the feasibility and maturity of charismatic leadership skills continues to increase (Shamir et al., 1993; Jacobsen & House, 2001). Currently, charismatic leadership has become a mainstream of contemporary leadership theory (Mumford et al., 2008). Bass (1997) contended that the personal expressive behaviors of charismatic leaders stimulate followers to develop a strong emotional attachment, contribute additional effort, and exhibit high performance levels. Shamir et al. (1998) found that charismatic leadership is positively correlated to employee identification, organization dependency, social identification, team dependency, and identity maintenance among members, and thus influences employee organizational commitment. Conger & Kanungo (1987) and Jackobsen & House (2001) stated that the typical psychological features of charismatic leadership include high performance, energy, and desire for power and achievement, as well as extraordinary communication techniques.

Charismatic leaders exercise a diverse and intense social influence over others through their beliefs and unique behaviors (Weber, 1947; House, 1999). Waldman et al. (2001) highlighted that charismatic leadership specifically denotes a vision, sense of mission, demonstrations of determination, and the cultivation of high expectations for fulfillment. By providing

information and understanding and confirming the organizational goals, managers motivate subordinates to achieve excellent outcomes (Shamir et al., 1993). Middleton (2005) indicated that charismatic leadership depends on the unique psychology and behavioral characteristics exhibited by leaders, and is a relationship developed between leaders and their subordinates. Sosik (2005) highlighted that charismatic leaders are skilled in observing the environment; identifying their followers' needs, expectations, and requests; and clarifying their values. In summary, charismatic leaders possess firm beliefs and consider themselves to be indicators of appropriate behavior and the organizational vision, which motivates followers to perform beyond the expectations of supervisors.

According to the above studies, when supervisors' words and deeds are aligned with the organizational goals, employees' identification with and trust in supervisors' behavior and vision can be enhanced, which increases their affection for supervisors and the organization. Although previous studies have verified that a correlation exists between BI and affective commitment (Simons et al., 2007), no research has identified the mediating mechanism between them. Thus, this study focuses on BI and affective commitment and uses charismatic leadership as the mediating variable to explore how employees of an international automotive company develop affective commitment for supervisors and the organization, which increases their intentions to voluntarily devote themselves to the organization. This study is the first to examine supervisors' charismatic leadership behavior in an effort to verify the relationship between BI and affective commitment. Therefore, the results of this study can compensate for gaps in previous research. In summary, using the mediating mechanism of charismatic leadership, this study clarifies the overall process by which supervisor BI influences employees'

affective commitment.

During this era of rapid changes in the global political, economic, and industrial environments, competition has intensified gradually. In addition, multiple enterprise scandals involving supervisors have emerged, resulting in political insecurity and market fluctuations. These scandals have reduced public confidence in enterprise leaders and significantly influenced the organizations' employees. For example, in 2010, an international technology corporation experienced successive employee suicides, which prompted high-level managers to propose and implement employee benefit strategies. Consequently, the employees ceased to exhibit such destructive behavior. In another example, an international automotive company establishing manufacturing firms in China experienced a workers strike.

Interviews with the participating employees indicated that the entire protest was prompted by employee dissatisfaction with the working environment, meals, and wages. After a series of strikes and scandals had erupted, the internal managers of the enterprise began considering their behavior and actions, assessing whether the promises given to employees influence their behavior. Therefore, considering these events, employee consciousness has been gradually manifested. When employees disagree with an organization's benefits and strategy perceptions, they initiate specific activities that protest against company policies to express their dissatisfaction.

In the current competitive global industry environment, enterprises are extremely likely to be internationalized and crucial norms regarding enterprise scale and cultural systems must be established. Under this context, we explored why employees of large-scale and internationalized companies still exhibit dissatisfaction

with the internal operations of an organization and supervisor behavior, and behave inappropriately. This study explored whether employees agree with managers' words, deeds, and value perceptions in a working environment with differing cultures. In addition, we also examine whether the emotions exhibited by these employees toward internal operations prompted them to consider the significance of their company. Therefore, whether employees are willing to devote greater or even twice as much effort and loyalty to a company that they identify with and that provides supervisor encouragement is worthy of further discussion.

The automotive industry is a capital- and technology-intensive industry that involves complex manufacturing processes. Thus, the automotive industry has a broad impact on industry and can influence the development of peripheral industries. With the characteristics of a high industry connection and high labor and market demands, the automotive industry is vital for supporting and sustaining national economies, and plays a crucial role in livelihood, economy, and social development processes. Confronted with global industrial competition, Taiwan must promote the automotive industry to achieve comprehensive and sustainable upgrades and development. Therefore, managers should focus on maintaining a favorable internal culture, environment, and systems within the enterprise they serve at. The words and deeds of staff are crucial for building a desirable working environment. Specifically, manager behavior has the most significant influence on employee behavior.

Thus, this study selected an international automotive company located in Taiwan as the research subject to explore whether employee perceptions of manager BI are shaped by the charismatic leadership of managers, thereby subsequently enhancing employees' affective commit-

ment to the organization and managers. The results can compensate for the gaps in previous research and clarify the relationship between managers' word-deed alignment and employees' affective commitment. The results can also provide a reference for international automotive industries to adjust their organizational culture and systems in response to global competition and to identify the behaviors of managers. The results are expected to be beneficial in both theoretical and practical aspects.

Literature Review

The Relationship Between Behavioral Integrity and Affective Commitment

In recent years, numerous studies have explored BI using innovative empirical research. In addition, the correlation between BI and commitment has been verified (Simons et al., 2007). The interaction between managers and employee commitment exhibits a significantly positive correlation (Wayne et al., 1997; Kacmar et al., 1999). Simons et al. (2007) highlighted that BI influences organizational commitment. Simons and McLean Parks (2000) also found that manager BI is correlated to organizational commitment and employee trust in managers. Folger and Konovsky (1989) and Meyer and Allen (1997) contended that perceptions of justice are correlated to organizational commitment. Simons et al. (2007) further reported that the variables mentioned previously exhibit a correlation with BI. Furthermore, they highlighted that manager BI is correlated with trust in management, satisfaction with supervision, interpersonal justice, procedural justice, commitment, compensation satisfaction, benefits, the work tasks, and coworkers.

BI also influences numerous aspects, including trust, interpersonal justice, organizational commitment, satisfaction, and

intention to remain. Therefore, BI is a logical antecedent that has been repeatedly shown to influence organizational commitment (Mathieu & Zajac, 1990). Prottas (2008) cited Chatman (1991) and O'Reilly et al. (1991), explaining that when people attempt to adjust themselves to an external environment, they begin to perceive that employee attitude, well-being, and absenteeism is correlated to their individual value. A consistent correlation between individual value and employee attitudes and behaviors (e.g., work satisfaction, organizational commitment, adjustment relaxation, turnover intentions, and turnover) within an organization has been observed. Therefore, BI is considered to correlate with organizational commitment.

McAllister (1995) contended that the basis of perception is personal reliability and dependability. Davis and Rothstein (2006) extended the theory proposed by McAllister (1995) and explained the correlation between commitment and BI perceptions. BI differs from general trust concepts regarding affective factors (Simons, 2002). Based on these concepts, we proposed the following hypothesis:

Hypothesis 1. Behavioral integrity has a significant positive influence on affective commitment.

The Relationship Between Behavioral Integrity and Charismatic Leadership

Simons (2002) asserted that BI represents the perception patterns regarding managers' words and deeds, which easily influence employees. However, BI differs from the characteristic bases allocated to managers (Shore et al., 2004). Previous studies have regarded integrity-inclined construct as synonymous with reliability and honesty (Butler & Cantrell, 1984; Yukl & Van Fleet, 1992). When managers attempt to build charismatic images, their behavioral performance is important. Most

studies related to charismatic leadership have emphasized the psychological perceptions (House, 1977) and leader charisma (Jung & Sosik, 2006) that causes followers to identify with the core vision of managers (Jacobsen & House, 2001). Huang et al. (2005) indicated that the specific types of leadership involve concrete and observable behaviors. For example, leaders can successfully motivate followers to implement internal changes.

Therefore, charismatic leaders may significantly influence followers and prompt transforms in their behavior. Through their behaviors and actions, charismatic leaders can invigorate their subordinates to demonstrate higher goal and purpose fulfillment (Shamir et al., 1993; Dvir et al., 2002). Leaders use a diffusive method and substantial social influence to communicate their beliefs and behaviors (Weber, 1947; House, 1999). Based on the perspective of charismatic leadership proposed by Bass (1997) and House (1999), Peterson and Seligman (2004) highlighted that positive psychology and practical leadership can enhance the significance of value perceptions and transform ideas to actions. In summary, we infer that employees first develop trust in managers before they consider manager behavior. Subsequently, the employees identify with and internalize the perspectives and visions of managers. Based on the concepts discussed above, we proposed the following hypothesis:

Hypothesis 2. Behavioral integrity has a significant positive influence on charismatic leadership.

The Relationship Between Charismatic Leadership and Affective Commitment

Charismatic leaders use their relationship with subordinates to demonstrate an optimistic attitude and challenge unachieved targets (Thompson, 2000). Mich-

aelis et al. (2009) contended that the concept of charismatic leadership differs from traditional leadership theories. For subordinates, charismatic leadership focuses on affection and value and the importance of identifying with the symbolic and meaningful behaviors of leaders. Guided by manager behavior, employees' affection toward the organization can be enhanced. Bass (1997) stated that individual charismatic leadership behavior can prompt followers to develop intense affective attachments, exert extra effort, and exhibit high levels of performance that benefit the organization.

In previous studies, many scholars believed that charismatic leadership involved symbolic and meaningful behaviors, such as task meaning, conceptual value promotion, and extensive vision. Consequently, charismatic leadership influences the affection and identification between leaders and subordinates, including the aspects of emotional attachment, trust in the leader, motivation stimulation, and increased self-efficacy (Shamir et al., 1993; Conger & Kanungo, 1998; House et al., 1999). In addition, Shamir et al. (1998) indicated that charismatic leadership is positively correlated with employee identification and unit dependency. Charismatic leadership is also correlated to social identity, team dependency, and the maintenance of relationships between members; thus, it contributes to members' organizational commitment. Kets de Vries and Miller (1985) also indicated that charismatic leaders can evoke an emotional response in followers. Based on this discourse, this study proposed the following hypothesis:

Hypothesis 3. Charismatic leadership has a significant positive influence on affective commitment.

The Relationships Among Behavioral Integrity, Charismatic Leadership, and Affective Commitment

Gore (1978) highlighted that charismatic leaders can resolve the negative perceptions of subordinates and have a tendency to develop positive and concrete relationships with their subordinates (Waldman et al., 2001). Conger and Kanungo (1998) asserted that charismatic leadership and charisma facilitate the identification of core leadership values. Subsequently, leaders that demonstrate charismatic characteristics possess the exceptional ability to influence followers and develop leader-subordinate relationships.

A number of scholars have indicated that charismatic leadership is a value congruence of collective thinking and charismatic leaders can significantly increase followers' social identity and group dependency (Shamir et al., 1993; Conger et al., 2000). Therefore, charismatic leaders attain high appraisals and express and regulate their and others' emotions (Adams, 1963; Blau, 1964; Gergen, 1969; Homans, 1974). Accordingly, charismatic leadership used in organizational management is considered perceived benefits of employees. Based on social exchange theory, employees perceive motivation by exchanging this benefit. Thus, we contended that when employees perceive their managers to possess high BI, demonstrating manager charismatic leadership behavior can increase employees' affective commitment to the manager or organization. As such, this study proposed the following hypothesis:

Hypothesis 4. Charismatic leadership has a mediating effect on the relationship between behavioral integrity and affective commitment.

Methods

Participants and Procedure

The primary participants of this study were employees of an international automotive company located in Taiwan. A questionnaire survey was administered to participants who were selected using purposive sampling. The official questionnaires were distributed to employees of the case company located in major cities throughout northern, central, and southern Taiwan.

Before the questionnaires were distributed, the items included in the questionnaires were explained to the respondents via telephone calls and personal visits. Thus, the researchers ensured that the respondents were fully aware of the questionnaire content and consented to participation. These questionnaires are implemented to determine the actual correlation among variables, thereby enhancing the validity of this study.

Measures

This study used a seven-point Likert scale ranging from 1, which denoted *strongly disagree*, to 7, which denoted *strongly agree*. Negatively worded items were scored in reverse. The subjects were instructed to answer each item by selecting an appropriate score based on actual situations. After collecting the participants' responses, the average scores and standard deviations were calculated. We adopted SPSS 12.0 and AMOS 7.0 for statistical analysis of the scale items.

Behavioral Integrity.

This study adopted the definition of BI proposed by Simons et al. (2007); that is, BI refers to the alignment between managers' words and deeds and is a subjectively perceived intrapsychic phenomenon. When defining BI, the scale established by Simons et al. (2007) was also referenced. Examples of the items include "my supervisor fulfills his/her promises,"

“my supervisor implements by his/her ideals,” and “my supervisor abides by his/her own instructions,” for a scale comprising a total of eight items. Higher scores for this scale indicate that employees perceive greater BI characteristics in their supervisors.

Charismatic Leadership.

Based on Conger and Kanungo (1987), this study considers charismatic leadership to be beneficial in understanding the effects of religious, political, and social leaders. The charismatic leadership scale developed by Bass and Avolio (2000) was adopted as the research instrument. Examples of the items include “since employment, my ideals are more closely related to those of my supervisor,” “I obey my supervisor because he commits to his vision,” and “I obey my supervisor because we have similar visions,” for a scale comprising a total of four items. Higher scores for this scale indicate that employees perceive their supervisor to be a charismatic leader.

Affective Commitment.

Adopting the perspective of Vandenberghe and Bentein (2009), this study defined affective commitment as the perception of identifying with, being involved in, and emotionally attached to the organization. The scale established by Meyer et al. (1993) was employed in this study. Examples of the items include “I respect my supervisor,” “my supervisor is significant to me,” and “my supervisor and I are proud of our positions,” for a scale comprising a total of six items. Higher scores for this scale indicate that employees possess substantial affective commitment to the supervisor.

Control Variables

Job Satisfaction. According to Bateman

and Strasser (1984), Jenkins and Thomlinson (1992), Clugston (2000), Meyer et al. (2002), Yousef (2002a), and Boles et al. (2007), job satisfaction and affective commitment are positively correlated. This study used job satisfaction as a control variable. Adopting the perspective of Christen et al. (2006), job satisfaction was defined as a joyous and positive emotional perception induced by a task or other perceptible means. This study employed the scale established by Hackman and Oldham (1975). Examples of the items include “I feel satisfied in a regular working environment,” “I advise my friends to secure a job similar to mine,” and “I dread going into work in the morning,” for a scale comprising a total of three items. Higher scores for this scale indicate better employee job satisfaction.

Role Conflict and Role Overload.

According to Stevens et al. (1978), Singh et al. (1994), Yousef (2002b), and Jones et al. (2007), role conflict and role overload are negatively correlated to affective commitment. Therefore, role conflict and overload were also employed as control variables; an explanation is provided below.

Referencing Christen et al. (2006), we defined role conflict as conflicts between the levels, targets, goals, and responsibilities of two parties. This study used the scale established by Lusch and Serpkenci (1990), which included the following three items: “you must make decisions in work that influence your personal life,” “you feel that you are not liked or recognized by your coworkers,” and “when working, you perform actions that contradict your judgment.” Higher scores for this scale indicate greater employee perceptions of role conflict.

Adopting the perspective of Fineman and Payne (1981), role overload was defined as excessive work tasks that exceed

personal skills, knowledge, and capacity. This study adopted the scale established by Lusch and Serpkenci (1990), which included the following items: “a heavy workload prevents you from completing your task within the allocated time,” “you must consider how to adequately complete your workload,” and “you feel that your workload negatively impacts your family life,” for a scale comprising a total of three items. Higher scores for this scale indicate greater role overload perceived by employees.

Results

Descriptive Statistics

Data were collected for this study by distributing questionnaires to employees of an international automotive company located in Taiwan. A total of 500 questionnaires were distributed. Employing questionnaire tracking and reminders, a total of 481 completed questionnaires were returned, for an overall retrieval rate of 96%. After excluding 54 invalid questionnaires, a total of 427 effective questionnaires were retained, for an effective retrieval rate of 85%. This figure suggests that the sample data is representative.

Common Method Variance (CMV)

Samples were measured by conducted exploratory factor analysis (EFA) according to Harman’s single-factor method (Podsakoff et al., 2003). Results demonstrated that 6 factors could be extracted and that the explanatory power of the first factor did not reach 50%. Therefore, CMV was not a problem in the sample used for this study. Results showed that not all of the item’s loading reached the significant level of .5. Also, the observed single-factor CFA value ($\chi^2 = 1742.639$, $DF = 317$, $GFI = .682$, $AGFI = .605$, $IFI = .708$, $CFI = .707$, $RMR = .073$) was poor. Therefore, CFA was conducted by separating each

construct. Results indicated that the goodness-of-fit ($\chi^2 = 84.924$, $DF = 47$, $GFI = .967$, $AGFI = .943$, $IFI = .984$, $CFI = .983$, $RMR = .026$) demonstrated better than that of single-factor. Therefore, CMV was not a problem in this study.

Reliability and Validity Analysis

Reliability Analysis.

This study used Cronbach’s reliability coefficients and CFA to examine the composite reliability (CR) of latent variables and explore the reliability of research constructs. In the behavioral integrity scale, Cronbach’s was .964. In the charismatic leadership scale, Cronbach’s was .874. In the affective commitment scale, Cronbach’s was .924. In the job satisfaction scale, Cronbach’s was .856. In the role conflict scale, Cronbach’s was .858. In the role overload scale, Cronbach’s was .937. All of the above Cronbach’s were over the threshold of .70 suggested by Nunnally (1978).

In terms of CR and average variance extracted (AVE), Table 1 demonstrates that the CR of each dimension was above .859 and AVE was above .671. These values were greater than the threshold of .70 and .50, respectively, suggested by Hair et al. (2009, 2010). As a result, the internal consistency of the variables used in this study is within the acceptable range.

Validity Analysis.

Convergent validity and discriminant validity were both examined. To measure convergent validity, this study adopted Anderson and Gerbing’s (1988) proposed standard, Bagozzi and Yi’s (1988) CFA standard, and Gefen’s et al. (2000) goodness-of-fit indicators. For all the constructs, behavioral integrity, charismatic leadership, affective commitment, job satisfaction, role conflict, and role overload,

GFI, NFI and CFI were all higher than .90. RMSR were all lower than .05. Also, all factor loadings reached significance level, CR values were all higher than .70, and AVE were all higher than .50. Therefore, the measurement model of behavioral integrity, charismatic leadership, affective commitment, job satisfaction, role conflict, and role overload possessed convergent validity. Discriminant validity was meas-

ured using the standard proposed by Fornell and Larcker (1981): two dimensions possess discriminant validity if the correlation coefficient of the two dimensions is smaller than the square root of AVE for each dimension. Table 1 indicates that all dimensions fulfill the discriminant validity standard proposed above. This result demonstrates good discriminant validity for all dimensions.

Table 1. Discriminant Validity and Correlation Coefficient.

Construct	BI	CL	AC	JS	RC	RO	CR	AVE
BI	.875						.963	.766
CL	.857**	.865					.882	.749
AC	.861**	.846**	.827				.926	.684
JS	.721**	.748**	.731**	.819			.859	.671
RC	-.545**	-.558**	-.498**	-.447**	.852		.869	.726
RO	-.491**	-.528**	-.468**	-.520**	.841**	.913	.937	.834
Mean	4.831	3.624	4.565	3.472	3.588	3.446		
Variance	.608	.351	.648	.241	.295	.190		
Cronbach's α	.964	.874	.924	.856	.858	.937		

BI = behavioral integrity; CL = charismatic leadership; AC = affective commitment; JS = job satisfaction; RC = role conflict; RO = role overload; CR = composite reliability; AVE = average variance extracted. ** $p < .01$.

Hypothesis Testing

This study used hierarchical regression analysis to explore the influence of BI on affective commitment, as well as the mediating effect that charismatic leadership has on the relationship between BI and affective commitment. The analysis results are shown in Table 2. Model 2 is the regression analysis of the influence that BI has on affective commitment. The results show that BI has a significantly positive influence on affective commitment ($\beta = .682, p < .001$) with an F value of 350.444 ($p < .001$). Thus, Hypothesis 1 is supported, suggesting that when participants perceive high supervisor BI, their affective commitment increases. Model 3 shows the regression analysis of the influence that BI has on charismatic leadership. The results show that BI exhibits a signifi-

cantly positive influence on charismatic leadership ($\beta = .613, p < .001$) with an F value of 372.064 ($p < .001$). Thus, Hypothesis 2 is supported, further indicating that when participants perceive high supervisor BI, the supervisor tends to demonstrate charismatic leadership behavior.

Model 4 shows the regression analysis of the influence that charismatic leadership has on affective commitment. The results show that charismatic leadership significantly and positively influences affective commitment ($\beta = .657, p < .001$) with an F value of 301.471 ($p < .001$). Thus, Hypothesis 3 is supported, suggesting that when participants perceive their supervisors to possess high levels of charismatic leadership behavior, their affective commitment to the supervisor and organization increases. Model 5 shows the analysis results the interactive effects of BI and

affective commitment with the addition of charismatic leadership. The results indicate that after adding charismatic leadership to BI, the positive correlation between BI and affective commitment declined from .682 to .473, with an accumulated R^2 of 79.1% and an F value of 325.398 ($p < .001$). According to the statistical results for Hy-

potheses 1, 2, and 3, Hypothesis 4 is also supported. The demonstration of charismatic leadership behavior by supervisors has a partially mediating effect on the relationship between supervisors' BI and employees' affective commitment (Baron & Kenny, 1986). The hypothesized model were shown in Figure 1.

Table 2. Hierarchical Regression Analysis Result.

	Model 1	Model 2	Model 3	Model 4	Model 5
Dependent Variables	AC	AC	CL	AC	AC
Control Variables					
JS	.665***	.233***	.255***	.242	.146***
RC	-.335***	-.041	-.104*	-.094	.006
RO	.160**	.023	-.007	.084	.025
Independent Variable					
BI		.682***	.613***		.473***
Mediator Variable					
CL				.657***	.342***
R^2	.575	.766	.776	.737	.791
ΔR^2		.191		.162	.025
F	194.226***	350.444***	372.064***	301.471***	325.398***

BI = behavioral integrity; CL = charismatic leadership; AC = affective commitment; JS = job satisfaction; RC = role conflict; RO = role overload.

* $p < .05$; ** $p < .01$; *** $p < .001$.

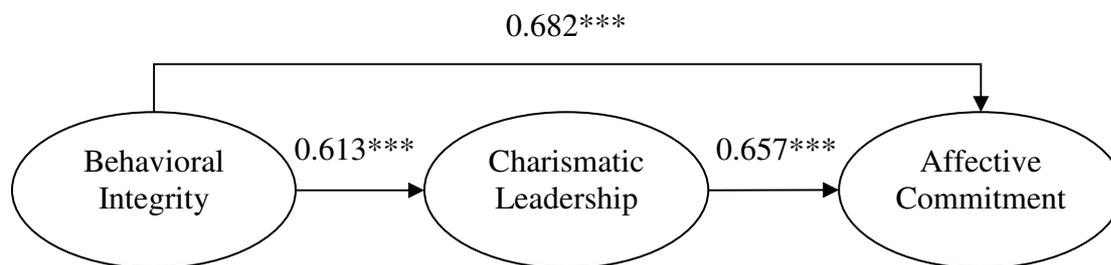


Figure 1. Hypothesized Model. *** $p < .001$.

Discussion

The results supported all the hypotheses proposed in this study. Detailed analysis of the results is provided below.

Hypothesis 1, that is, BI has a significant positive influence on affective commitment, is supported. Therefore, if an internal supervisor of an automotive company can achieve an alignment between their words and deeds, employees' affective commitment to the supervisor and the organization can be increased, which reduces the likelihood of employees exhibiting irrational behaviors. These results are consistent with those reported by Simons et al. (2007).

Hypothesis 2 (behavioral integrity has a significant positive influence on charismatic leadership) proposed in this study is supported. The results indicate that by achieving word-deed alignment in their ideals and promises, the internal supervisors of an automotive company can demonstrate ideal exhibitions of their individual beliefs and unique behavior based on their value perceptions and code of conduct.

Hypothesis 3 (charismatic leadership has a significant positive influence on affective commitment) proposed in this study is supported. The results indicate that personal characteristics, value perceptions, and the behavior of supervisors employed at an automotive company can cultivate the affection and confidence of subordinates, which support the results reported by Bass (1997). Hypothesis 4, that is, charismatic leadership has a mediating effect on the relationship between behavioral integrity and affective commitment, is also supported. The results indicate that if the internal supervisors of an automotive company can achieve word-deed alignment in their thoughts and promises, they can exhibit amicability and trustworthiness

to employees, which enhances the affective attachment that subordinates have for the supervisor.

In summary, the methods employed by supervisors to manifest their BI and execute timely demonstrations of charismatic leadership behavior to thus enhance employees' affective commitment to supervisors and the organization and improve the overall organizational performance is worthy of further consideration by automotive companies experiencing global competition. In addition, although previous studies have emphasized the influence that BI has on affective commitment, few studies have explored the mechanism that mediates the relationship between BI and affective commitment.

This study used the perceptions of supervisor BI held by employees of an automotive company as antecedents of charismatic leadership. Employee perceptions of supervisor BI and personality characteristics were also observed to assess whether employee perceptions of supervisors' charismatic leadership behavior influence their affective commitment and attitudes. The empirical results of this study can effectively explain the theoretical model of supervisor BI characteristics, charismatic leadership behavior, and employee affective commitment. This is the primary contribution to related theories provided by this study.

Practical Implications

When an organization's employees perceive that their supervisors possess BI characteristics, the implementation of supervisor vision and promises made to employees can increase employees' affective commitment to supervisors. Regarding enterprise development, supervisor leadership is a critical element that significantly influences organizational interactions and performance. Therefore, supervisors must

achieve an alignment between their words and deeds within the organization based on their personal beliefs, and endeavor to gradually fulfill their promises. By demonstrating amicability and trustworthiness to employees, supervisors can enhance the affective attachment of their subordinates. Charismatic leadership highlights the establishment of leaders' vision, mission objectives, and innovative concepts. These characteristics not only cultivate the trust, respect, and admiration of subordinates, but also motivate them to pursue the realization of personal and organizational goals. We contended that when supervisors exhibit BI, their charismatic leadership behavior prompts employees to develop affective commitment, increasing supervisors' overall influence compared to that of supervisors without charismatic leadership traits.

Moreover, enterprise supervisors must have a profound understanding of their organizational environment and individual employee characteristics. In addition to timely demonstrations of confidence to cultivate employee trust, supervisors must serve as a behavioral example for employees. Supervisors who exhibit charismatic leadership characteristics should personally execute the standard tasks of an organization and share their vision and specific goals for future development with their subordinates. These supervisors must also confidently announce the events and items set to be completed in the future to increase the shared value of the group, thereby motivating employees to actualize the enterprise vision together. When enterprises or organizations recruit supervisors, they must fully understand whether the applicant possesses BI and the unique characteristics of a charismatic leader, in addition to analyzing the applicants' suitability. In such situations, the recruiters hope that the employees of an organization can be influenced by the words, deeds, and leadership characteris-

tics of supervisors, and thus develop a high affective attachment to supervisors and the organization. Consequently, employees may be willing to devote additional effort to increasing their performance, or even improving the overall organization performance, thereby establishing the potential for thriving organizational development in collaboration with supervisors. The managers of automotive companies must consider the recruitment of suitable leaders and carefully assess their personality characteristics.

The automotive industry has experienced increasingly severe external competition and threats in the globalized world of the twenty-first century. To survive and develop, automotive companies must learn, reform, and innovate consistently; otherwise, they cannot distinguish themselves in a rapidly changing and competitive market environment. The results of this study indicate that for an automotive company, supervisor BI positively influenced employees' affective commitment (.682). This finding suggests that the influence of supervisors' word-deed alignment on subordinates' affective dependency and attachment to supervisors should be prioritized in response to current global competition. The results also showed that supervisor BI positively influenced charismatic leadership behavior (.613), which positively influenced employees' affective commitment (.657) and had a partially mediating effect on the relationship between BI and affective commitment.

Based on the results of this study, if supervisors can exhibit BI by achieving an alignment between their words and deeds that increases their subsequent charismatic leadership behavior to effectively influence employees and improve their affective commitment to them and the organization, the organizational performance can be improved, while cultivating a reputation as an excellent enterprise leader. Supervi-

sors can also exploit the performance management system to motivate employees and improve their working efficiency. By establishing a group vision and exhibiting charisma, supervisors' interpersonal appeal perceived by the employees can be enhanced. By actively and closely cooperating with their subordinates, supervisors can increase organization members' identification with supervisors and prompt members to rapidly reach a consensus, facilitating the implementation of organizational goals. In the long-term, this system is expected to generate synergies that exceed expectations.

Limitations and Future Research

Limitations.

This study used employees of an international automotive company as the participants. However, because of factors such as the multinational enterprise system and cultural aspects, samples were not collected from domestic automotive companies located in Taiwan. Therefore, the results derived from the questionnaire are only relevant to the foreign automotive companies located in Taiwan and cannot be extended to the local automotive industry or other industries in Taiwan. Furthermore, the participants were employees of foreign automotive companies located in the major cities of northern, central, and southern Taiwan. Surveys were conducted with foreign automotive companies located in non-metropolitan areas. The research participants did not represent all employees of foreign automotive companies in Taiwan.

This study adopted cross-sectional data to establish an empirical foundation, and only a single-time point was extracted. However, because studies regarding BI, charismatic leadership, and affective commitment require long-term observations, the influence of changes in long-term su-

perervisor behavior and employee attitudes and emotions could not be sufficiently understood. The devised questionnaire was presented as a 7-point Likert scale. The advantage of such a scale is that it prevents respondents from providing neutral responses. However, the disadvantage is that the respondents tend to be influenced by subjective perceptions and retrospective factors, resulting in the scale information not matching the actual situation. This consequently affects the scale validity and reliability.

Moreover, because the scales for measuring various constructs referenced in this study were developed by foreign scholars, internal and external interference, such as differing national cultures, customs, industry and organizational climates, cognition, and temporal and spatial backgrounds, may distort the overall measurement results during actual applications.

Future Research.

Because the participants were employees of foreign automotive companies in Taiwan, which features an organizational culture that differs from that of local enterprises, and the questionnaires were only distributed in the major cities of Taiwan, the results cannot completely and reasonably explain the perceptions and thoughts of employees regarding automotive companies in Taiwan.

Subsequent studies can expand the types of participants and extent of research to include other industries and a wider questionnaire distribution to enhance the depth and scope of the research. Consequently, the applicability and generalizability of research results can be improved. Furthermore, unlike this study, where cross-sectional data was used to establish an empirical foundation, future studies can adopt longitudinal methods to collect data (Rindfleisch et al., 2008) and conduct

long-term tracking surveys to determine the essence of the causal relationship between BI and affective commitment.

Furthermore, this study focused on the relationship between BI, charismatic leadership, and affective commitment, and employed a quantitative questionnaire to measure differing variables. Thus, the participants were required to complete questionnaires based on their subjective perceptions, although the implications of their

responses were not explored. Current studies regarding the mechanism mediating the relationship between BI and affective commitment should be allocated with greater attention and consideration. Therefore, future scholars can adopt qualitative research methods, such as in-depth interviews and observation methods, to further explore other mediating variables. This approach may improve the theoretical and empirical research applications.

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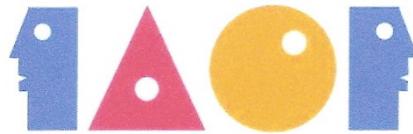
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LEISURE BEHAVIOR IN SPORTS TRAINING ON PSYCHOLOGICAL
SKILL AND REFEREEING PERFORMANCE

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Abstract

The rationale behind this study is to investigate the effect of sports training behavior based on psychological skills training and refereeing performance. Two volleyball referees are recruited from the Taiwan volleyball association to undergo psychological skill training for a period of half a year. This training includes rational emotive therapy, self-talk, stop negative thinking, self-awareness as well as breath control. The researcher collected data using structured interviews and questionnaires. The findings of the study were as follows; the two referees self-assessed themselves and improvements noted in concentration and self-confidence after

the tournament, additionally the referees' anxiety level dropped during the tournament. The referee considered their refereeing performance to have significantly improved and the referee committee confirmed the same through observation.

Keywords: Leisure Behavior, Psychological skill training, Volleyball referee, refereeing performance

Introduction

Research Motivation & Professional Development

There are five critical parts of professional development: psychological quality, professional self-development, game management, physiological quality as well as refereeing enforcement capability. According to Hsieh (1999), the only way to improve professional development is by building on refereeing experience. He further adds that professional development is the lasting professional training and uses the professional knowledge on capacity building. Enforcement ability in refereeing involves understanding the rules, hand signals, resolute attitude, response to listening and watching, using the whistle, and knowledge of tactics and skills. The referee must understand the rules of the game, professional tactics and skills in order to make sound judgment.

Psychological quality signifies the spirit of the referee which comprises loyalty for the game, passion, and professional ethics of the game, interpersonal relationships, correct, fair and firm. The researcher will

examine the psychological skill training to assist referee improving performance and psychological ability. Referees should have a passion for the game and be willing to make a sacrifice as the game decreases their leisure and family time.

Refereeing work is not easy, as the referee may bow down to pressure from coaches, players, or even spectators, it is significant that the referee remains firm to resist such pressure. The referee also has the responsibility of coordinating and fully cooperating with other referees and maintaining a good relationship and balanced communication between the coaches and players to keep the competition worthwhile.

Physiological quality includes physical appearance and fitness; a referee must be well behaved and neat in clean official uniform to signify the correct image. All games are physical and as a result the referee should be fit and have the spirit and energy to manage the game. Games management requires adequate preparation; score controlling, time scheduling, and cooperation with other officials to run the game smoothly. It's the responsibility of the referee to make adequate preparation before the game to

observe the character of individual players or team.

Self-development involves advancing the referee knowledge of rules of the game as professional skills and tactics rapidly change overtime.

According to Chen (2003), the most visible shortage in refereeing is the lack of confidence amongst the referees. All referees irrespective of their level and experience get some sort of pressure from the players, coaches, or fans. Chang (2008) argues that less experienced and international referees experience more pressure as they try to avoid any mistake. Referees feel this pressure mainly because of lack of confidence which may significantly affect the outcome of the game. In some cases the referee may be affected by silly behaviors from the players, coaches, or the fans.

Psychological Skill Training (PST)

Previous research has shown that elite players encounter psychological problems particularly during finals that affect their performance. Chou (1998) argues that the performance of a professional player is not affected by the physical or skill factor but by the psychological factor of the player. Williams and Krane (2001) revealed that the psychological condition of a player is the most critical factor that affects sport performance. To deal with this problem and improve performance, psychological experts assist the players as well as the coaches to

have active and positive competitive psychological capability. These professionals use methods such as imaginary training, cohesion, concentration, pressure process, and self confidence (Anderson, 1999; Crocker & Graham 1995). Several scholars and experts have indicated that referee, players, and coaches can increase their performance after long-term and serious organized psychological skill training (Laguna & Ravizza, 2003; Burton & Raedeke, 2008).

According to Weinberg and Comar (2004), psychological skill training is very helpful for referee performance as well as improving their confidence. In highly competitive matches, the most important thing for any referee is the psychological condition and not his or her physical fitness or skills. According to Chen (2002), referees make mistakes not because they are inexperienced but because they lack psychological training. He argues that it is the psychological anxiety and pressure that result in mistakes or a wrong call during the game. To boost referee motivation, increase concentration and self-confidence, and reduce anxiety, sports psychologists recommend that training is administered in cognitive and physical aspects (Ji, 2000; Qui & Sheng, 2001). Both referees and players experience anxiety and pressure when in playing, psychological training helps reduce this pressure as well as anxiety (Wang, 2008).

Psychological training involves education, motivation, adversity and pressure adaptation, self-confidence, and concentra-

tion (Qui, 2001). Butler and Hardy (2002) used a theory of players' psychological skills training to assist players in minimizing the competition pressure. Wang (2001) pointed out that the refereeing skills depend on both the physical and psychological factors and both play a critical role on refereeing performance. Psychological skill training is employed in referee development; psychologists use this type of training to assist both the referees and athletes to have active and positive ability to face every game. To enforce psychological skill training, sport psychologists must first understand the referee's psychological ability.

Purpose of Research

Main Purpose

- Evaluate the impact of psychological skill training on refereeing performance
- Examine the effects of psychological skill training on referee's match psychological ability.

Research Questions

1. To examine the effect of psychological skill training on referee's psychological ability.

H1: There is a positive impact of psychological skill training on increasing psychological ability.

2. To investigate the impact of psychological skill training on referee's performance.

H2: There is a positive effect on referee performance after psychological skill training.

Limitation of Research

This study primarily compares the psychological skill training with the refereeing performance but doesn't consider the innate psychological characteristics as well as personal values. The other key drawback of this research is that it doesn't consider the referee's age and gender.

Definition of Terms

Psychological Skill Training: A strict and long-term organized psychological training which helps improve sport performance.

Psychological Ability: A set of trainable mental methods and abilities held to strengthen performance and learning. The basic psychological skills include self-talk, concentration, relaxation, and goal-setting.

Rational Emotive Therapy: A type of therapy in which an athlete, in the case of this study, is asked to get rid of irrational

assumptions and attitudes in order to effectively handle pressure.

Self-Talk: the practice or act of talking to oneself either mentally or silently and can sometimes be aloud.

Literature Review

Psychological Ability

Psychological ability according to Chen (2002) includes self-confidence, motivation, and arousal level control. All of them require organized practice for a number of times just like any other form of physical training. The main purpose of psychological skill training is to improve sport performance and increase psychological ability of referees and athletes. Orlick (2006) argues that professional athletes and referees should learn how to develop their psychological and physical status. He further adds that when one is aware of his best or worst performance, he or she can develop certain feelings that relate to their performance. Some of the attributes of best sport performance include; not worrying about the outcome, focusing early, self-confidence, awareness of rhythm change, and effortless performance. According to Nie (2000), psychological ability has a positive relationship with sport performance, he argues that when athletes adjust to pressure, concentrate better and set goals, they are more likely to perform well.

Professional referees need to develop psychological attributes such as concentration, passion, mental fortitude, and motivation to manage the game well. Psychological ability includes pressure process and hardship adaptation, teaching, motivation, self-confidence, and concentration. Hardy, Jones, and Gould (2006) note that simulation training can be employed to assist in pressure management and the main reason is to help the athletes develop anti-pressure strategies. Motivation can be defined as intensity and direction of personal effort, intensity refers to the number of times while direction signifies the looking for the right method. Often experienced referees have a higher motivation level compared to inexperienced referees. Most of the scholars have defined self-confidence as the perceived ability of an individual to finish a task successfully or not. According to Bandura (2007), there are several sources of self-confidence which include experience, cognitive arousal, excitement, and achievement. When self confidence is raised, the performance of the referee or athlete improves.

Psychological Skill Training

Sports experts argue that athletes, coaches, and referees can improve their performance if they undergo psychological training. Williams and Krane (2001) argue that it is indeed the biggest factor that determines the referee performance in games. Psychological training helps the referee to learn how to rise above refereeing pressure. A referee can minimize the anxiety of the

game by calming down and getting rid of mistakes or wrong calls that result from pressure. As explained above in highly competitive matches, the most critical factor that determines the referee performance is his or her psychological status and not the physical fitness or skills. Antonina, Maurizio, and Tulio (2004) undertook a test on 10 baseball players aged 19 to 26, their results indicated that those who had undergone psychological skills training were less anxious before the match and performed better. On his part, Lian (2005) surveyed 14 high school tennis players and found out that those who had undergone the psychological skills training performed better and had a reduced heart rate.

Previous research indicated that most of the sports psychologists believed that self-awareness, emotive therapy, breath control as well as self-talk helped athletes reduce anxiety and pressure (Chang & Mao, 2004). Lee (2009) conducted a study to examine the effects of psychological skills training on Taekwondo athlete's performance and psychological ability. The findings revealed that those participants who were trained reported improved concentration and confidence after the match, in addition, their level of anxiety decreased during the game. The athletes also reported that their performance in the games had significantly improved and their teammates and coach confirmed this.

Another study was carried out to determine the coping tactic of psychological

skills training used on female volleyball players' somatic and cognitive anxiety. The findings of this study revealed that psychological status of female players comes from somatic and cognitive anxiety factors. According to Chien (2009), the cognitive anxiety are caused by negative self-fulfilling foretell, lack of concentration, and self-confidence. Somatic anxiety is the rapid heart rate as well as the palm sweating. The findings showed that getting rid of the negative thinking amongst the female volleyball players promotes their concentration and reduces the negative thoughts during the match. Psychological skills training can help the players to relax their nerves and reinstruct normal thought. Talking to them helps in boosting their self-confidence whereas breathing control training helps them minimize somatic anxiety.

A survey on the movement performance and psychological skills of collegiate basketball players examined the impacts of positions, experiences as well as training periods on their performance and psychological skills. The findings of the research showed that there was a huge disparity between coping with adversity and peaking under pressure depending on the experience of the players. Further, the survey showed that different training periods to a great extent affected dealing with adversity and pressure as well as the players' motivation. In conclusion, the study indicated that the results could be of benefit to basketball players and coaches, recommending that psychological skills training should be

included in other training to improve player's performance. Yi (2008) carried out a research on stress management and coping tactic of Taiwan professional tennis players. He found out that the key source of stress of these players wasn't failure to break their records but sponsorship. Stress prior to the game arises from their ranking, significance of the match, and poor condition. However, stress during the match arises from opponents, prize money, their self condition, and referees. Professional players must always cope with the competitiveness of the game, fight for their record as well bear their fans expectations. Hence, methodic and systematic psychological skill training is very crucial to performance.

Summary of Literature Review

According to the above review of psychological skills training literature, no matter the sport, athletes need psychological training before competitions. Studies have shown that referees and athletes who undergo psychological training exhibit improved performance as they are in a position to cope with adversity, pressure, and increase their self-confidence level. In the recent past, more and more players, coaches, and referees are seeking the help of sport psychologists to improve their performance. Psychological skills training as indicated by most of the researchers helps in improving the referees and players psychological ability. Referees work under intense pressure from the players, coaches, and fans, if not managed; this pressure may lead to wrong

calls or mistakes that may affect the caliber of the game or even the results. Psychological skills' training therefore is very important in helping the referees adapt to the pressure.

Method and procedure

Description of Research Object

According to Patton (1998), qualitative research may have several or a single object. The researcher chose global volleyball referee as the research objects in this research. Previous studies have shown that referees who possess over a decade of refereeing experience have a higher refereeing evaluation than their counterparts who have less experience. International referees are categorized according to the years of experience with a national A referee having the highest while a national C has the least. In a bid to examine the professional development of referees, the researcher's target population was the international volleyball referees in Taiwan. Further the sample population included those referees who had over 10 years of experience who hoped the psychological skill training could help improve their performance.

Measurement tool

The researcher used psychological skill training scale to assess the impact of the training on the referee performance. A test was administered before the psychological skill training; the training lasted for a

period of six months. After the training, all the referees will be subjected to a second test and a third test will be administered after the Asian volleyball competition. The findings of all these tests will be presented in descriptive statistics to help comprehend the difference of psychological status of the referees after the training. The researcher used the psychological skill training scale which has five key factors namely concentration, motivation, education, pressure process, and self confidence. After every tournament, the researcher interviewed the referees to know their psychological status during the competition as well as review their performance. An ordinal scale of 1-10 was used to assess their concentration, self-confidence, and anxiety.

Research Procedure

The study used Thomas (2000) athlete psychological skill training method which focuses on motivation, education, concentration, confidence, and pressure process. The researcher interviewed the sampled referees during every volleyball match and had consultations with them to establish a good relationship with them. The first test was meant to identify the psychological status of the sampled referee through interviews, psychological skill training scale, observation, and the personal information. The researcher looked at the five procedures of psychological technique training which include breathe control, self talk, self awareness, stop negative thinking, and rational emotive thinking.

Breath-control

According to Lee (2007), smooth breath ensures that that the blood has enough oxygen to provide the needed energy. However, as a result of strong emotive reaction, anxiety, and pressure, the referee's breathing system is interfered with. Therefore referees need appropriate respiratory skills to minimize this avoidable reaction while under pressure. Harris (2006) noted that a lot of referees don't know how to control their breath and that while they are under pressure they undermine their performance because of the tension exerted on their muscles. Nidefer (2008) argued that abdominal breath helps referees focus on the game, concentrate, and overcome anxiety.

Rational Emotive Therapy

This type of therapy helps improve the referees' rational thoughts as well as minimize personal anxiety. Rational emotive therapy helps the referees face life positively through positive thinking. Referees often experience negative thoughts that are caused by the pressure from the players, coaches, and fans. When a referee starts evaluating his or her psychological status, it results to negative thinking that leads to negative impacts (Ji, 1996). The performance of a referee is often influenced by his or her thinking, particularly if the game is very competitive. Positive thinking helps the referee to get rid of trepidation and anxiety.

Self-Talk

Weinberg and Gould (2007) state that self-talk influences on how the referees feeling and behavior. They argue that the thoughts of the match don't lead to anxiety however; how the referee interprets the game determines the psychological reaction. Self-talk plays a significant role in emotional reaction, there are two types of self-talk: positive and negative. Positive self-talk helps the referee to minimize the pressure while negative self-talk increases doubt and anxiety (Gill, 2000). Sports psychologists recognize the fact that self-talk improves referee performance through anxiety control and pressure management.

Data process and analysis

According to Huang (2001), both quantitative and qualitative research as well as descriptive statistics can be presented together. Quantitative research is basically used to test a theory, ascertain the fact, and give descriptive statistics and the correlation between variables. Qualitative research on the other hand is used to clarify as well as confirm the findings of quantitative research. The quantitative findings of this research were presented in descriptive statistics discussing self-confidence, concentration, motivation, education, and pressure process. The qualitative analysis of the research used an ordinal scale to help understand the psychological status of the referees. It also involved the interview conducted

by the researcher to further understand the referees.

Result and Analysis

The Effect of Psychological Skill Training on Referees Psychological Ability

This section discusses the impacts of psychological skill training on the referee psychological ability; the findings are presented both qualitatively and quantitatively. The quantitative method compares the three tests administered to the referee and the psychological status of the referee after the psychological training. The table below shows a summary of the three psychological scale tests of the first referee.

Figure 4.1 clearly shows that the five psychological factors have improved after the training. Education, confidence, and pressure process got slight improvement while self confidence has the highest improvement followed by pressure and education respectively.

Table 4.2 below shows the psychological skill training results of the second referee. Just as in the first object, education, motivation, concentration, and confidence showed some significant changes. However, it is important to note that pressure process doesn't have significant changes. To further understand the two referees' psychological ability while under competition, the researcher interviewed them after each game.

An ordinal scale was used to measure the scores of anxiety, concentration, and confidence of every tournament. The first referee, R1, refereed five tournaments, the first two games were international volleyball matches while the others were national volleyball competition. Figure 4.3 below shows the confidence score for every tournament.

Figure 4.3 shows that the confidence level of the first referee improved significantly after the first match. Although the score

slowed down, the overall confidence of the referee was improving.

Figure 4.4 shows that the concentration level of the referee improved from the first tournament to the last, signifying the importance of psychological skill training. The referee confidence as well as concentration level is improving and as per Figure 4.5, the anxiety level of the referee gradually reduces with experience.

Table 4.1

R1 First referee	First test	Second test	Third test
Pressure process	3.55	4	4
Self-confidence	2.75	3.25	3.25
Concentration	3.75	3.5	3.75
Motivation	3.22	3.44	3
Education	3.6	3.6	4

Figure 4.1 Scores of R1 first referee on psychological skill training scale

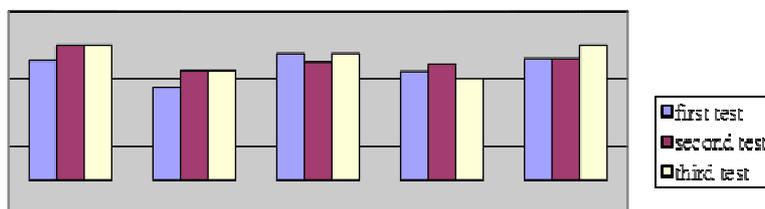


Table 4.2

R2 second referee	First test	Second test	Third test
Pressure process	3.44	3.55	3.55
Self-confidence	2.75	2.75	4
Concentration	4.5	4	4.75
Motivation	3.55	3.22	4
Education	4.25	5	

Figure 4.2 Scores of second referee on psychological skill training scale

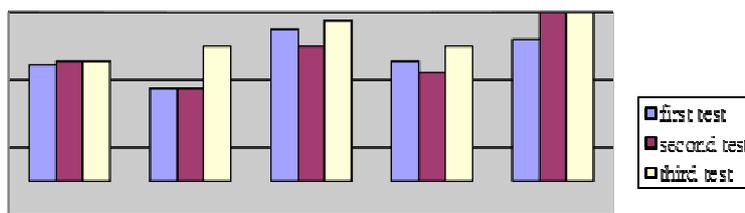


Figure 4.3 The confidence score of the first referee (R1)



Figure 4.4 Concentration scores of first referee

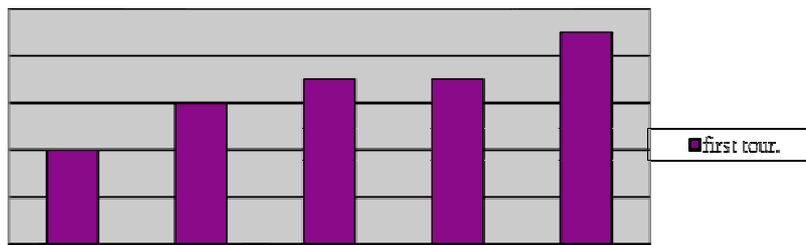
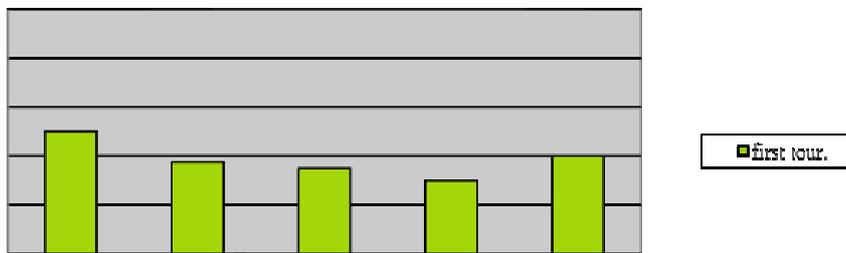


Figure 4.5 Anxiety score of first referee



The second referee participated in six tournaments, which the first three were national and the other three being international. Figure 4.6 below shows the referee confidence scoring during each tournament. Similar to the first

referee, the confidence level of this referee increased significantly from the first to the last tournament. Figure 4.7 clearly shows that the concentration level of the referee improved particularly during the last three tournaments.

Figure 4.6 Confidence score of second referee

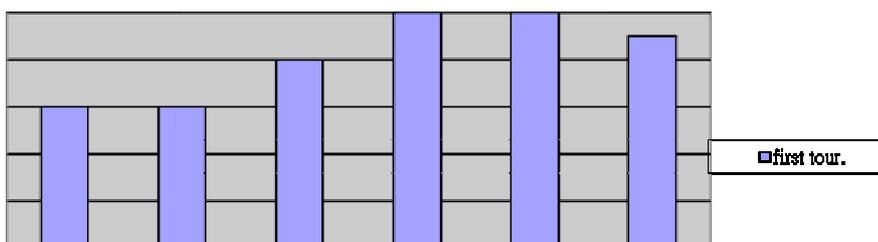


Figure 4.7 Concentration score of second referee

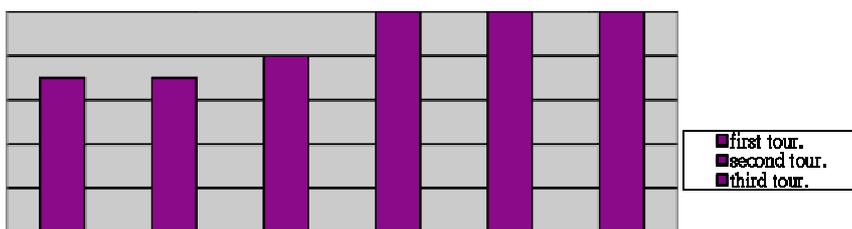
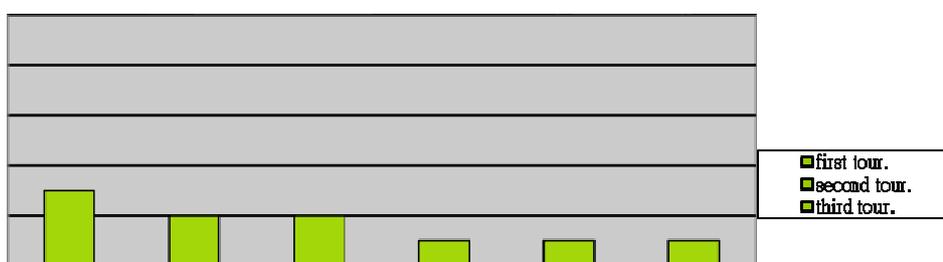


Figure 4.8 Anxiety score of the second referee



Discussion

The above Figure shows that as the concentration and confidence level improve with the tournaments, the referee's anxiety level gradually reduces particularly for the last three tournaments. The above data clearly shows that the performance and psychological ability of the two referees improved significantly after the psychological skill training. The findings indicate that the first referee has greatly improved on pressure process, education, and self-confidence however the concentration and motivation have not improved. This can be attributed to the fact that the referee engaged in interna-

tional matches before the national tournament. The referee concentrated more and is motivated to participate in international duties than national ones. In the case of the second referee there is noticeable improvement in education, motivation, concentration, and confidence but pressure hasn't improved.

The study has revealed the effectiveness of psychological skills training on the performance of referees during various stages of volleyball competition. Psychological skill training plays a huge role in the improvement of referee performance at different levels of competition.

Conclusion and Recommendations

Conclusion

The main reason for carrying out this study was to examine the impacts of psychological skill training on refereeing performance and psychological ability. Although the literature review focused much on athlete training and very little about referee training, the findings of this study provide significant message for the volleyball referees across Taiwan. Psychological skill training helps referee improve their concentration, confidence level, and positive thinking as well as decrease pressure, anxiety, and negative thinking.

Recommendations

This study was carried out for a period of six months to allow the psychological skill training to be administered to test its effects on referee performance and psychological status. The researcher makes the following recommendations.

(a) The researcher recommends that before a sports psychologist administers this type of training to the referee, he or she

must have a clear understanding of the referees' task to help boost the performance.

(b) Despite the positive results within this research, the data wasn't able to inform the sport psychologists and the researcher why the referee performance improved after the training throughout the tournament or how the psychological skills were alleged to have been of benefit.

(c) This study took a period of half a year to train the two referees and it clearly shows the benefits of the training on the referees' psychological status and performance. The researcher therefore suggests that all referees should undertake psychological skills training regularly before every volleyball competition.

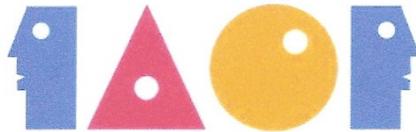
(d) Since psychological technique training is very critical in the role of a referee then the referee committees should include this training as part of referee training course.

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THE INFLUENCE OF REPETITIVE ADVERTISING ON EFFECT OF COMMUNICATION: AN EMPIRICAL STUDY ON RECYCLING

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Abstract

The repetitive advertising exposure is a commonly adopted strategy to promote products in commercial marketing. It is worth to explore how well the same approach applied to promote one of important pro-environmental and social marketing issues, recycling. This study explores the revolution in human behavior using the well-researched Theory of Planned Behavior (TPB). In each trial experiment, a single sheet with an elaborate recycling advertisement was shown to volunteer sample students, after which they completed a questionnaire. The advertising exposure/questionnaire answering process was repeated three times with a two-week interval between each trial. The statistical comparisons for each dimension of the TPB model, between the first and third advertisement exposure, concludes that 1) the repetitive advertising has a positive impact for all TPB dimensions toward recycling, except for attitude, and 2) the attitude and perceived behavioral control are significant positive predictors for behavioral intention toward recycling.

Keywords: Repetitive Advertising, Social Marketing Communication, Effect of Communication, Theory of Planned Behavior, Recycling

Introduction

Recycling is one of the most important approaches to reduce both household and industrial waste in order to help protect and maintain a sustainable environment. Since individuals and organizations need to invest a certain amount of resources for recycling, although the performance of critical pro-environmental behavior has been improving for years, it is still not enough to pursue a green earth policy. There is a long way for people to progress from the recognition of the importance of environmental protection to real action. Therefore, how to inspire people to induce a positive behavioral change has become an essential social topic. Researchers have previously investigated and applied theories and methods, commonly employed in commercial marketing, for social issues, known as social marketing (Dann, 2010; Kotler & Zaltman, 1971; Lee & Kotler, 2011), i.e. to "sell" ideas related to specific social issues, such as "recycling protects our environment and the next generation", to the public, just as firms market their products to customers.

Many non-profit organizations now communicate with the public by utilizing social marketing skills, which are similar to techniques often used in business. For example, repetitive advertisements are utilized through various media to propagate and educate people about definite ideas, including recycling, anti-smoking, stop drunk driving, HIV prevention and sexual responsibility, etc. However, the eventual goal for these social issues is to encourage people's "action" rather than "understanding". There are many theories expounded to explain human behavior. One of the most accepted is the Theory of Planned Behavior (TPB) applied frequently by social marketers to depict the human transition from recognition to action, or at least behavioral intention, toward a particular social issue (Ajzen, 1991; Ajzen & Sheikh, 2013; Sniehotta, 2009). Since the purpose of so-

cial marketing communication is to change people's behavior, it is important for social marketers to understand the mechanism of the behavioral change process or to find valid procedures that influence behavior significantly for targeted audiences. This study employed the PBT framework to investigate ways to ensure effective social marketing communication about one pro-environmental subject, recycling, so as to decrease the negative impacts on the natural environment and preserve a sustainable future for our offspring.

Literature Review

Theory of Planned Behavior and Recycling

Ajzen (1985) pioneered, developed, and continues to improve, the Theory of Planned Behavior, which illustrates the extent to which humans will behave in a certain way, and which is controlled by three independent determinants; attitude, subjective norm, and perceived behavioral control. The influence of these three antecedents are non-equivalent for various behaviors, or for the same behavior but under different conditions. It may be that only one antecedent is dominant for some behavior while two or all three antecedents have a crucial impact on others. Researchers have used the TPB, or developed new models based on the TPB, to investigate changes in human behavior for many public subjects, for example, environmental protection (Cordano, Welcomer, Scherer, Pradenas, & Parada, 2010; Hom-burg & Stolberg, 2006), anti-smoking (Guo, Unger, Azen, MacKinnon, & Johnson, 2012; Van De Ven, Engels, Otten, & Van Den Eijnden, 2007), stop drunk driving (Beul-lens, Roe, & Van den Bulck, 2011; Hornik & Yanovitzky, 2003), sexual responsibility (Rittenour & Booth-Butterfield, 2006), HIV prevention (Bull, Pratte, Whitesell, Rietmeijer, & McFarlane, 2009), and so on.

In particular, the TPB is one of the most commonly used models in research on pro-environmental behavior, such as recycling (Chen & Tung, 2010; Cordano & Frieze, 2000; Greaves, Zibarras, & Stride, 2013). Chowdhury (2009) indicated that humans have perceived that reducing waste and recycling are effective ways to decrease the negative impact on the natural environment, and the idea is now socially acceptable and desirable (Barr & Gilg, 2005). This tendency creates pressure on an individual, especially if they dislike recycling but their neighborhood doesn't, and this becomes the subjective norm. Nonetheless, Cordano and Frieze (2000) argued that norms are not always positive for pollution prevention activities, including recycling, as "These norms potentially inhibited source reduction activities because these practices often exceeded regulatory requirements". The extent to which a person possesses a favorable or unfavorable evaluation of recycling determines their attitude toward recycling, which then interacts with subjective norm.

Greaves et al. (2013) showed that behavioral intention is a faithful predictor of actual behavior as the context of the attitude and behavior are well defined. Whether people have the motivation to recycle waste eventually depends on the expected ease or difficulty to do so, which is the perceived behavioral control. They support and undertake recycling only if they can use their free will to perform the behavior. In general, a more favorable attitude and subjective norm, as well as greater perceived behavioral control, results in stronger behavioral intention for recycling (Cordano & Frieze, 2000), and, in turn, a higher possibility for true behavior (Greaves et al., 2013). Dealing with recyclable waste may be associated with unpleasant mess, odor, and extra effort and, as a consequence, many people do not have a high enough intention to act, although they own high levels of attitude and subjective norm. The TPB interprets the transition of such typical low volitional con-

trol behavior using perceived behavioral control (Ajzen, 1991; Cordano & Frieze, 2000).

The Effect of Communication and Repetitive Advertising

Lee and Kotler (2011) have mentioned that the purpose of social marketing is to change people's behavior toward public issues rather than stay at the cognition stage. Consequently, it is important to persuade the public using appropriate and effective communication strategies (Hawkins, Bulmer, & Eagle, 2011; Reichert, Heckler, & Jackson, 2001). Many contexts show that communicating with the target audience via intelligible advertising is a key success factor in changing people's attitude and behavior regarding recycling (Chen & Tung, 2010; Shrum, Lowrey, & McCarty, 1994; Timlett & Williams, 2008), while behavioral intentions include certain motivational factors to influence actual behavior and these are affected backward by the three antecedents (Ajzen, 1991; Ajzen & Sheikh, 2013). Hence, in this study, the whole TPB construct was treated as a legitimate measurement of the effect of communication, similar to works related to organizational change (Jimmieson, Peach, & White, 2008; Jimmieson, White, & Peach, 2004). It is proposed that the manipulation of appropriate advertising messages may influence the effect of communication with the target audience and, in turn, cause changes in recycling behavior.

The effect of repetitive advertising for commercial brands has been investigated extensively (Ehrenberg, 1974; Rahmani, Mojaveri, & Allahbakhsh, 2012; Tellis, 1988) and social marketers have also employed the same strategy to promote social issues (DeBar et al., 2009; Olshefsky, Zive, Scolari, & Zuñiga, 2007; Shrum et al., 1994). Ehrenberg (1974) stated that advertising plays two roles in communication. The information role increases consumers'

awareness of products and the persuasive role stimulates their desire to own products. An identical mechanism can be applied to a specific social issue by introducing a social change campaign and then helping people to behave in a certain way that facilitates the planned social goal. One method of examining the effect of communication by advertising is to observe and recognize people's attitude, which is an intermediary stage for changing their behavior and is determined by the content and frequency of the advertising exposure. For example, Timlett and Williams (2008) concluded that a positive and optimistic communication message is better than a negative and pessimistic appeal when promoting recycling, and Rahmani et al. (2012) reported that a proper repetitive advertising program is more likely to tempt customers to pay attention to and habituate the selection of commercial brands.

However, there is an inverted-U shape relationship, called the wear-out effect, between the frequency of the message exposure and people's affective response. The public are stimulated by elaborate messages initially, and reinforcement by several subsequent exposures about a certain issue may continue to gather a favorable and significant response. Yet these responses will tire and slacken off the promoted behavior if the frequency of the repetitive messages continues to increase over a latent threshold (Kirmani, 1997; Tellis, 1988). The optimal number for advertising message exposure, however, has a large range under different circumstances and varies in researches from three exposures (Kirmani, 1997) to ten exposures (Nordhielm, 2002). Moreover, Tellis (2010) summarized that the wear-out effect of repetitive advertising also depends on other factors, such as the campaign duration, campaign break, content, and the interval between exposures. Accordingly, two hypotheses are proposed regarding the manipulation of the advertising message exposure about recycling:

H1: Repetitive advertising has a positive impact on people's attitude, subjective norm, perceived behavioral control, and behavioral intention toward recycling.

H2: By repetitive advertising, people's attitude, subjective norm, and perceived behavioral control positively influence the behavioral intention toward recycling.

Methodology

The prior literatures conclude and posit that people's behavioral intentions toward recycling can be observed and explained by the TPB construct, while behavioral intention is predicted by the three antecedents of attitude, subjective norm, and perceived behavioral control. Social marketers can measure the effect of communication with the public regarding recycling by examining the variation of each dimension of the TPB under the hypothesized repetitive advertising manipulation, as illustrated in Figure 1. One experiment was conducted to test the suggested hypotheses using a convenience sample containing undergraduate students at a medium-size university. Subjects were told that their careful response would help environmental protection and the maintenance of a sustainable homeland. After a brief introduction to the survey, the subjects were asked to read a single sheet of recycling-relevant advertising context within five minutes and were then required to complete a questionnaire, which consisted of items that measured all the dimensions of the TPB framework.

The experiment was designed to be repeated, with the exact same procedure mentioned above, three times for all sixty five volunteer students, with a two-week interval between each advertising exposure

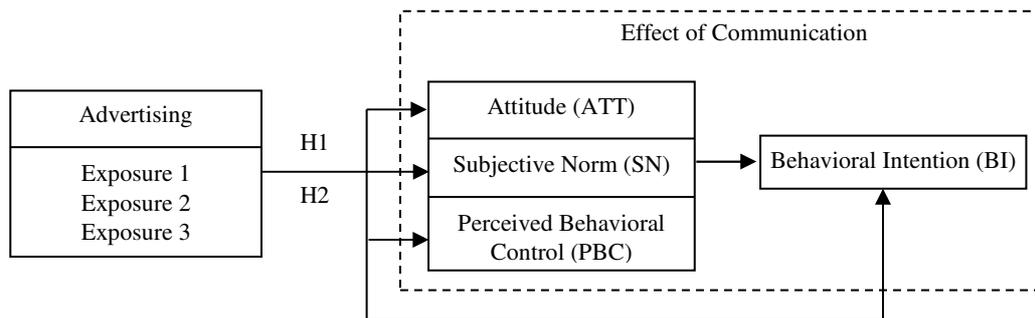


Figure 1: Repetitive advertising positively influences the effect of communication

/ questionnaire answering process. However, only forty eight subjects persisted until the last stage of the experiment, resulting in an effective response rate of 73.85%. The questionnaire was comprised of items employing a 5-point Likert-type scale, ranging from 1 (strongly disagree) to 5 (strongly agree), to measure respondents' attitude, subjective norm, perceived behavioral control, and behavioral intention regarding recycling. All questionnaire items referred to Ajzen (2010) and were amended from Chow and Chen (2010) with a well-accepted validity. The Cronbach's alpha for attitude, subjective norm, perceived behavioral control, and behavioral intention were .882, .867, .837, and .874, respectively, revealing good reliability.

Results and Discussion

A paired *t*-test of the mean difference for the dimensions of TPB, attitude (ATT), subjective norm (SN), perceived behavioral control (PBC), and behavioral intention (BI) between the first and third advertising exposure, were implemented to verify the first hypothesis shown in Table 1. The subjective norm ($p = .012$), perceived behavioral control ($p = .009$), and behavioral intention ($p = .012$) toward recycling increased significantly as the number of exposures increased but attitude showed no apparent difference ($p = .488$) between the first and third advertising exposures.

Nevertheless, the subjects' attitudes still increased slightly, conforming to the trend predicted. This result partially certified the first hypothesis.

The second hypothesis was tested by a multiple regression analysis, using behavioral intention as the dependent variable and all three TPB antecedents as independent variables, to see whether the TPB model is significant regarding the increase in advertising exposure. From Table 2, the 74% increment of the adjusted coefficient of determination revealed a great improvement in the goodness of fit caused by repetitive advertising exposure. Furthermore, the regression relationship of the TPB model was not obvious at the first advertising exposure but was somewhat significant ($p = .008$ for ATT and $p = .001$ for PBC) with all positive path coefficients by the third advertising exposure. This result partially approved the hypothesis that repetitive advertising positively influences the effect of communication toward recycling. The significant relationships of ATT-BI and PBC-BI are very similar as previous studies related to pro-environmental behaviors such as Chow and Chen(2010).

The valid sample size is somewhat inadequate to get persuasive conclusion. Enlarging the sample pool to reconfirm current results is one future movement. Another limitation of this study is the

Table 1: The *t*-test of difference for dimensions of the TPB between the first and third advertising exposure (*n* = 48).

Dimensions of TPB	Advertising Exposure	<i>M</i>	<i>SD</i>	<i>p</i>
Attitude (ATT)	1	3.86	.813	.488
	3	3.99	.942	
Subjective Norm (SN)	1	3.26	.873	.012*
	3	3.69	.752	
Perceived Behavioral Control (PBC)	1	3.35	.729	.009*
	3	3.78	.819	
Behavioral Intention (BI)	1	3.67	.851	.012*
	3	4.10	.831	

* *p* < .05

Table 2: Comparison of the regression relationships for the TPB model between the first and third advertising exposure (*n* = 48).

Advertising Exposure	Path	<i>R</i> ²	Adjusted <i>R</i> ²	Path Coefficient**	<i>t</i>	<i>p</i>
1	ATT-BI	.419	.379	.281	1.713	.094
	SN-BI			.220	1.273	.210
	PBC-BI			.260	1.842	.072
3	ATT-BI	.683	.661	.363	2.794*	.008
	SN-BI			.130	1.120	.269
	PBC-BI			.429	3.392*	.001

** Dependent Variable: Behavioral intention toward recycling

* *p* < .05

adoption of convenience sample including only undergraduate students. The comparison of communication effect between several homogeneous sample groups, for example, students, housewives, and white-collar workers under identical research frames is an interesting extension of existing work.

Repetitive advertising is an important way to increase brand awareness, choice, equity, and perceived quality for commercial products (Rahmani et al., 2012). However, Tellis(2010) concluded that the effect of the advertising exposure is related to frequency and campaign duration,

and is less valuable and prompt than other tactics, such as price or the promotion of brand choice.

Nevertheless, it is natural for social marketers to adopt the advantages and avoid the disadvantages of advertising to facilitate social ideas. Since recycling is a pollution prevention activity that usually needs to change current organizational practices, it becomes a potential barrier to real action, not only for the regular public but also for environmental managers, and this is barely overcome by repetitive advertising communication alone (Cordano & Frieze, 2000). There are plenty of factors to influence peo-

ple's pro-environmental behavior in addition to one way repetitive communication. For example, the content of the communication messages should include positive viewpoints, such as connecting personal and environmental benefits, and exclude negative viewpoints, such as exhortation and blame statements. In addition, relying on images rather than words only, and so on, is also a critical element for a successful recycling campaign (Timlett & Williams, 2008).

Shrum et al. (1994) argued that advertising alone is not a particularly effective approach but could be a complementary tool when combined with other schemes to promote recycling. The approach to exploring people's recycling behavior using the TPB model could be more significant statistically if there was a mixture of a variety of activities rather than just relying on repetitive advertising.

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INNOVATION AND ALLIANCE EFFECTS FOR TOURISM
INDUSTRY IN TAIWAN

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Abstract

The tourism industry has been developed and seriously pays attention for many decades in Taiwan. This research explores the recent few years' international tourism activities and evolution in Taiwan which include the expenses of travel transportation, accommodation, food and beverage, entertainment, shopping and others. We analyze the study by using qualitative method that deepening insight of the phenomenon base on the perspective of innovation and strategic alliance which comprise the element of resource interdependence. We collect the

most popular activities which list on tourism bureau in Taiwan of 5 years data as the information. According to the data form 2006 up to 2010, the study analyzes international sight-seers' consumption power, motivation, information obtaining, favorite place to go, and other activities in Taiwan. We find that the favorite travel spot is more attractive and very important issues than other concerning. The average expenses for the 5 years are largely in hotel, then shopping, food and beverage outside of hotel, transportation, then entertainment and others thereafter. More than 90% tourists would like to come again since the joyful and satisfactory experience in Taiwan. Base on the study, we posit the innovation and strategic alliance effects between academy and industry is extremely important to foster useful manpower and stimulate tourism industry in Taiwan. We develop propositions and suggestions around the argument.

Key words: Innovation, strategic alliance, tourism industry, resource interdependence

Introduction

It is tendencies that people like to travel abroad are prevailing in the world. Nowadays, travel and spend leisure time to enjoy off work life during their weekend or vacation which is prevailing activity that stimulates tourism and hospitality industry in Taiwan. The tourism industry has been developed and seriously pays attention for many decades in Taiwan. Furthermore, it is one of the money creative machines for the country. Since the government of Taiwan announces and performs working five days a week instead of six days at the year of 2001 (Hong Kong in 2006, China in 1995) which means weekend off duty and that promotes labor and consumption markets move from working hard to leisure hard. Accordingly, tourism industry is become more prevailing and important than before in Taiwan, also, the productivity of tourism industry ascent their role and position than ever. During

the last two decades, Taiwan's tourism service industry not only pay more attention on tourism but also hospitality that concentrates in related peripherals industries such as hotel, transportation, restaurant, shopping, entertainment, foods and beverage and many others that attracts many colleges and high schools to construct new majors and /or classes to train more students in order to offer new and fresh labor force to fill in the industry's demand.

The question is that fresh labor force graduate from school by training to become an expertise or to be quickly used for the market, need more time and experiences which may never catch up the fast growth market. Prior studies have focused on firm resources and capabilities that show tourist reliance on the technology of internet to search information before they visit or sightseeing (Sparks & Browing 2011). Some studies emphasize on travel

motivation and participation in a tourist activity (Crompton & McKay, 1997; Fodness, 1994; Kim & Eves, 2012; McIntosh, Goeldner, & Ritchie, 1995). Relatively little attention has focus on innovation policy and alliance to stimulate tourism industry. How can school and industry cooperate to foster fresh labor forces for the demand market? Can these labor forces be trained well while they at school? Is there any better motivation or strategy to stimulate tourism industry that affects students from education training to become more familiar with the market? Particularly, the tourism industry in Taiwan has become more internationalization and activation which is dynamic and diversified. This research attempts to fill the gap. Base on these questions that arouse this research motivation which we believe it is a very important issue.

According to the report of Tourism Bureau of Taiwan that the inbound foreign tourist (the number of visitors) from the year of 2006 to 2010 is consistent growth every years (see the table 1), even at the year of 2008 the financial storm strongly impact world economy. Apparently, the tourism industry contributes national income is playing an important role in Taiwan. Recently, most business has been across countries and without boundary, especially tourism business for international sightseers. More and more countries are looking forward to stimulate tourism industry in order to attract more international tourist to their countries. For exam-

ple, the well known big country, the United States of America even put more energy to stimulate the entertainment and tourism industry to contribute their country income (Gross Domestic Production) such as Disney world, Universal studio and many others famous sightseeing spot. Not long ago, the President of the United States of America, Barack Obama has stated that welcome Taiwanese tourist to sightseeing the U.S and further put Taiwan into the observation country of free visa to stimulate the tourism industry in America. Today, Taiwanese tourists do not need visa may entry into the United States of America freely.

The intention of this paper tries to find out a better way to stimulate tourism industry in Taiwan that connects with innovation and strategic alliances between the industry and academy. We review and explore the phenomenon of tourism industry that is developing and seriously pay attention in Taiwan for many years. During the last two decades, since Taiwan and mainland China has open their citizens freely communicate to each other, more and more tourists not only groups but also limited personal tourist of China has consistent growth that Taiwan government has favored the open policy with permission which contribute and stimulate huge national income. The evidence shows that it is really stimulate the tourism and hospitality related industry become much well than couple years ago that open policy for Mainland China tourists not only groups but also limited single tourist. The tourism

and hospitality related industry such as hotel, an amusement park, department store, restaurant, famous night market around the country, sightseeing spot, transportation and others has become prevailing and make more money ever since. Thus, this paper tries to discuss the interesting issue with innovation and alliance for academy and practice. This study analyzes the phenomenon by applying the qualitative method that deepens insight of the research by using the data from Tourism Bureau of Taiwan that report the data of information from the year of 2006 to 2010.

The Rapid Growth of Tourism Industry

The world tourism industry has been growth rapidly during the last two decades. Taiwan also feels the atmosphere and follows the step to growth. Indeed, Taiwan is an Island that around with Pacific Ocean and a beautiful views of landscape and sea. That is the reason why Taiwan has another name long time ago which is called Formosa, a beautiful Island. Taiwan used to have a conservative tourism policy because of the military nervous tense against between Taiwan and mainland China, until the recent years of open policy of the government that is cooling down the nervous tense. The government of Taiwan realizes that tourism is commonly used as a tool to stimulate marginal economies and to promote development through the jobs and incomes that it can foster (Liu & Wall 2006) and training.

As the prior research, most tourists have the motivation to travel and may follow a certain way to attend or choose where to visit by the desire or need (Crompton & McKay, 1997, Kim & Eves, 2012, Fodness, 1994). Thus, the industry and government should find out the strategy to satisfy the tourists need is very important issue. Perhaps, that is currently doing by most countries. Nowadays, sightseers would search information from the Web page before they decide where to visit. Meanwhile, the government of China has seriously face the dramatic growth in outbound travel from Asian countries in recent years, fueled by the region's rapid economic growth and rising income levels (China National Tourism Administration, 2005, March, 1997).

Particularly, the tourism industry in the Asia Pacific region is rapidly growing and is recognized as one of the most significant economic resources in the region (Horng, et al., 2012). Besides, the tourism related industry has become more popular and important of many countries government for national income, according to the report, the ascent of tourism to the position of the world's largest industry has been rapid, and the growth of global travel continues to be robust (UNWTO, 2006; WTTC, 2005). Accordingly, not only Taiwan but also world countries recognizes the important role of tourism and in response, the government has rapidly developed its tourism policies to meet demand

and produce related benefits (Liu, et al., 2012).

The Tourism Bureau of Taiwan, the central administrative authority overseeing national tourism affairs and facilitating the development of the tourism industry, has launched a series of policies for tourism development. According to the research of Liu, et al (2012), in the new millennium of Taiwan, some famous policies are presented in 'Project Vanguard for Excellence in Tourism (2009-2012); the 'Medium-term Plan for Construction of Major Tourist Sites (2008-2011), 'Taiwan Ease Go' and other similar materials (Taiwan Tourism Bureau, 2010 a,b). Obviously, the tourism related industry has been placed into important position compare with other industries. Other than Taiwan, due to mainland China's economic rise sharply, people travel outbound much more than ever. Especially, the easing restrictions on outbound travel by China, the Chinese are likely to be enthusiastic tourists in the future. Taiwan, the neighbor of China, flow the same blood and speak almost the same language and with the same culture that favors by open policy which attract many tourists from China. Needless to say, it helps a lot for tourism industry. The big chance of great tourists group from China brings a great opportunity for many weak and old hotels turn around the business and even shining because China's tourists come to travel and consumption. It is really stimulating the tourism related industry during these couple years.

The question is how long it can be last longer of the China tourists sightseeing in Taiwan. Does the tourism industry can be improved if the government connects with industry and education? Does the tourism relate industries of labor force are good enough to apply in the industry?

According to the World Travel and Tourism Council (WWWTTC, 2006) estimates that the travel and tourism industry generated jobs represent 8.7 percent of total employment, growing to 9 per cent of total employment globally by 2016. It means the tourism industry will be dramatically growth in the near future and is worth for us to think highly and deeply. Accordingly, the country should find out the strategy, specifically innovation other than traditional way to attract tourists to visit. Nowadays, sightseers would search information from the Web page before they decide where to visit. The first image of the country's information about sightseeing will come from Website. Thus, the internet browser should be easily and nicely to function is much important issue. We argue that the first innovation should focus on the Website design and usage function.

Taiwan Tourism Data Analysis

This research adopts the data that collects from the Tourism Bureau open information which focus on the year of 2006 to 2010 that includes the index of inbound foreign tourists, income of foreign exchange from inbound tourism, country

of foreign tourist, average of tourist expense each day, items expense , overall satisfaction.. Etc. (see Table 1.)

The rank of number one inbound foreigner visitors' average expense each day

is Japan at the year of 2010, 2009, 2008 and 2006 which is very steady state situation, except 2007. It is weird that Japan at the year of 2007 fall to number three which is behind Korea that rank first and China rank the second.

Table 1. The items of record index for each year

Items \ Year	2010	2009	2008	2007	2006
Top one country average spending each day	Japan	Japan	Japan	Korea	Japan
Income of Foreign Exchange (US dollars)	8.719 billion	6.816 billion	5.936 billion	5.214 billion	5.136 billion
Average spending per person (US dollars)	1,566.19	1,550.87	1,543.66	1,403.17	1,459.22
Growth rate	27.92%	14.82%	13.85%	1.52%	3.19%
Overall satisfaction for inbound tourist	93%	90%	88%	86%	89%
Purpose visit Taiwan after AD	Sightseeing	Sightseeing	Sightseeing	Sightseeing	Sightseeing
Most popular place to go	Night market				
Most important reason to come	Views	Views	Food	Views	Food

Table 2. The items of spending record for each year (2006~2010).

Items \ Year	2010	2009	2008	2007	2006
Hotel spending	37.83%	39.33%	43.9%	43.96%	45.67%
Eating outside of hotel spending	11.43%	11.6%	12.34%	11.02%	13.62%
Transportation spending	8.62%	8.37%	8.09%	8.16%	8.81%
Entertainment spending	6.35%	5.76%	6.63%	7.64%	7.69%
Others spending	1.22%	1.16%	1.69%	1.92%	2.78%
Shopping spending	34.55%	33.78%	27.35%	27.3%	21.43%

The income of foreign exchange from tourism of the last 5 years is increasing for each year from 5.136 billion up to 8.719 billion US dollars. From the record of the report, we realize how importance and contribution of tourism industry for Taiwan. The average spending of each tourist during she/he stays is rising from 1459.22, up to 1566.19 each year, except the year of 2007 with 1403.17 decrease, we believe it is the financial storm affect the intention of consumption.

The growth rate of inbound tourist is increasing from 3.19%, 1.52%, 13.85%, and 14.82% to 27.92%. The year of 2007 growth rate is just a little rise that we purely guess is perhaps the financial storm strongly impact world economy which cause travel decrease that year.

The overall satisfaction for inbound tourist is not stable as other items that show the index are 89%, 86%, 88%, 90%, and 93%. The year of 2007 satisfaction drop we also think it is because the reason of financial storm.

The main purpose of international traveler that has checked advertisement or travel report, then decide to come to Taiwan for 2010 is sightseeing earn the highest score, also for the rest of other 4 years. The top three of travel activities and/spot for sightseeing during the 5 years are as follow.

2010: 1) Night market, 2) Taipei 101, 3) National palace museum

2009: 1) Night market, 2) Taipei 101, 3) National palace museum

2008: 1) Night market, 2) Taipei 101, 3) National palace museum

2007: 1) Night market, 2) National palace museum, 3) Taipei 101

2006: 1) Night market, 2) Taipei 101, 3) Chiang-Kai Shek Memorial Hall

It is very clear that night market is the most popular and favorite which attract by foreign tourist. According to the prior papers, we believe and agree that most of the tourists are conscious of something “beyond”, something “hidden”, within their tourist experience such as the inner workings of the back-stage production (Hsieh, & Chang 2006).

The most important reason that attraction tourist to visit Taiwan for 2010 is the country views, also for the year of 2009 and 2007, except 2008 and 2003 that most attraction reason for tourist to visit Taiwan is food. The most spending is hotel, then shopping, eating outside of hotel, transportation, entertainment and other spending thereafter. It is about the same from the year of 2006 to 2010 (See Figure 1.)

Typically, base on the data analysis to make a short statement that Taiwan tourism industry is really increasing during these few years, especially up to the year of 2010, the record shows that income of foreign exchange comes from the inbound tourist, average spending per person and the growth rate is also steady state rise. The record is kind of evidence that shows international tourist love and willingness to pay and to go. The government and industry managers should realize what can make international tourist to stay and come back again when they have the chance next time.

Innovation and Strategic Alliance Effects

Nowadays, there are many issues disturbing and attracting the attention of academy and practice, especially in a quick response to the market requirements for today's enterprises because of the rapid change in the business environment, short product lifecycle and global competition (Lee, & Ding 2010). Therefore, how to attract tourist willingness to spend leisure time to sightseeing other than business trip and spend money is a big issue. Innovation is a better way and short cut to success for enterprises. For instance, Apple Inc starts up the business in 1970 by the founder of Steve Jobs. In the later stage, the company successfully revoluted innovation which creates a new function of phone so call smart phone and further develop the product of Ipad that change people's habitude of usage and life. 3M Company also have

many revoluted innovation inventions that bring human's life more convenient than ever. In Disney world, the theme park creates the FASTPASS to solve the long line of waiting which is the innovation solution.

In order to improve and stimulate industry of tourism, it is very important to connect school with enterprises and government to cooperate and integrate necessary resources efficiency and effective. In the rapid change environment today, strategic alliance becomes more prevail between companies to improve their competitive position and performance by sharing resources. Furthermore, the benefits of strategic alliances include conserving resources, sharing risk, reducing product development costs and improving technological capabilities. Thus, in order to fast expanding and foster Taiwan tourism industry labor force to fit into the market, innovation and strategic alliance with resources interdependence will be the prevailing way to consider.

This paper tries to explore the phenomenon of developing situation of Taiwan tourism with a new thinking and strategy. Basically, there are couple ways to think innovation.

First, this paper argue with human resource management of labor force from school, in order to foster the future labor force that classify into hardware and software facilities from education one way or another. Hardware is including the high

school and/or college of educating that trains students skill and knowledge to study that cooperate with firms in related industry in Taiwan. However, does school facilities solid and good enough? Consider with cost, students stay at school to study and train that may save time and money, or school alliance with industry or government to train students gets more experience. Learning by doing and doing by learning will be good way for school and industry, not only reciprocity for both but also cost saving, students have experience from internship and industry has cheaper labor to use. Software is emphasizing on train or education program setting which is good for rapid change in the dynamic environment in the short term.

By using high technology training assistant with computer (hardware) or other possible programs which include teacher (software), colleagues or simulation practice? Does it worth and cost? It is worth for expertise to think, in order to robust students' capability to stimulate tourism industry in Taiwan. Base on the authors knowledge, most schools have connect with related industries, such as hotel, restaurant, related stores to train and internship when students are in a certain level of learning in order to get real experience and familiar with the standard procedure of working which is absolutely good for students in the long term. Thus, we have the propositions as below.

P1: The more innovation thinking and alliance strategy, the more attractive tourism business and successful rate.

P2: Strategic alliance education and training students' success or failure depends on the reciprocity characteristics with tourism industry, the longer of relationship the more successful rate.

Second, the paper argues the tourism industry such as hotel; restaurant and/or department stores adopt strategic alliance with the Tourism Bureau of Taiwan government or tourism industry union to promote activities. For example, the government of Bureau and hotel could have the promotion from website before the tourists come or in the airport right after the international tourist landing and pay attention on shopping and tourism discount information after they come to visit the country. For example, accumulation of staying, purchasing, the more spending the more discounts they get which would attractive and stimulate tourist. Such as, tourist are shopping in department store, as long as they purchase over a certain money, they will have not only duty free benefit when they leave the country but also have free shuttle bus ride them to international airport would be one of the innovation activities. Besides, hotel, Department stores or others tourist spot may cooperate with Taiwan high speed railway company with strategic alliance that if tourist live, shopping and take the transportation up to

a certain money and get certain discounts that would attract and stimulate tourist consumption also. Therefore, we have other propositions.

P3: The more of the tourism related industry strategic alliance, the better chance to stimulate tourist purchase.

P4: The more marketing promotion, the better chance for tourist to purchase.

Third, this paper proposes that tourism industry union connect with firms to attend international tourism and hospitality display. To make tourism industry chance to expose international in order to have more chance to earn international tourist to come. We believe that tourism related firms should trust union and cooperate with them which have more chance to catch international sightseers' attention. Thus:

P5: Trust is the key success factor for Strategic alliance between tourism firms and union.

Discussion and Implications

The data collects from Taiwan Tourism Bureau shows that the tourism industry is growing every year. It is a huge and potential market in the future for Taiwan that is worth to pay more attention on it. Overall, the effect of innovation and strategic alliance can create competitive

advantages. First, it results from an innovation idea and successful collaboration in which complementary resources are integrated to create value. Second, creating value by effectively managing the related firms or industry's ability to absorb and imitate to form competitive advantage.

Finally, school and/or related industry can create value by learning how to successfully manage strategic alliance to stimulate the tourism industry by knowledge sharing, risk reduction, and resource interdependence, and then create competitive advantage.

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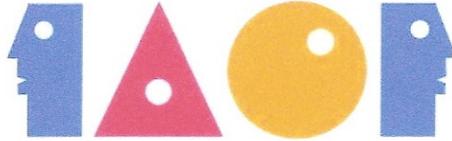
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A STUDY ON DESIGN DECISION MAKING RESULTED FROM THE
FORM FEATURES OF FURNITURE PRODUCTS AND THE AESTHETIC
EVALUATIONS OF CONSUMERS THROUGH FUZZY LOGIC

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Abstract

This study was aimed to investigate the relationship between the form features of furniture products and the aesthetic evaluations of consumers and the differences between the backgrounds of consumers in terms of the forms features of furniture products and the aesthetic evaluations of consumers. In this study, the degree of similarity between fuzzy semantic values was analyzed. Cronbach α and Pearson correlation coefficient were used to examine the correlation between the form features of products and the aesthetic evaluations of consumers. According to the research findings, furniture products were significantly influenced in terms of the form features of furniture products, respectively integrity, sequence, visual balance, rhythm, and size and ratio as well as the fuzzy semantics of the aesthetic evaluations of consumers. Consumers had very consistent opinions. From the analysis of the degree of similarity for fuzzy semantic values, it is found that consumers attached the greatest importance to size and ratio, a form feature of products, whereas they attached the least importance to visual balance, a form feature of products.

Key words: Form features of products; Aesthetic evaluations of consumers; Fuzzy semantics; Degree of similarity

Background

In the global economic competition, the demand of consumers for furni

ture products gradually changes. Under the customer- and market-oriented tailor made product development model, when supervisors make design decisions, the product

designs should first conform to the demand of consumers; furniture product value should not be neglected in furniture product design and development. When enterprises would like to increase the product value, the best method is to profoundly understand the evaluation of consumers for the products, that is, the evaluation of consumers is the best basis (Bloch, 1995). In this study, fuzzy logic was adopted to explore the influence of the form features of products on the fuzzy semantics of the aesthetic evaluations of consumers in the furniture industry in order to provide supervisors with a reference to the design decision making of product design and development and further improve the development and design of furniture products so as to fit customer requirements and enhance enterprise performance.

Research purposes

The research purposes are summarized as follows.

1. Applying fuzzy logic to investigate the relationship between the form features of furniture products and the aesthetic evaluations of consumers.
2. Investigating the differences caused by different consumer backgrounds in the form features of furniture products and the aesthetic evaluations of consumers.

Literature Review

The form features of products

The forms of products convey people's psychological feeling about the products, and the influence lasts long and continuously. The aesthetic features of products tend to influence consumers and non-consumers for many years, just like turning the products into a part of sensory environment (Bloch, 1995). McDonagh, Bruseberg, and Haslam (2002) argued that the function of design lies in form design features, namely the design method of attracting consumers to purchase products through the form features of the products, including modeling, color, size, and material. Yang (1997) explained the meaning of modeling through three points, that is, modeling is the process of creating shapes; it indicates specific shapes apparatuses and functions; it comprises shape, color, material, and texture, and it emphasizes the overall integrated shape. Bowman (1990) generalized five fundamental elements, respectively point, line, tone, texture, and shape. Qiu (1987) summed up that modeling consists of three elements, that is, form, color, and material. Whiling generalizing the elements of modeling, Wang (2009) mentioned that Tjalve classified the features of modeling as integrity, sequence, visual balance, rhythm, and size and ratio. For integrity, fragmentary architecture and small components are assembled through product modeling. For sequence, complicated product components are simplified and neatly configured. Visual balance includes symmetrical balance

and asymmetrical balance. Rhythm can be created by the combinations of quantities, configurations, dimensions, shapes, and colors, and the golden ratio indicates an aesthetic size and ratio. To summarize, Tjalve's modeling features mentioned by Wang (2009), including integrity, sequence, visual balance, rhythm, and size and ratio, were employed as the form features of products in this study.

Aesthetic Evaluation

In terms of product design, modern consumers want not only basic functions but also aesthetics. The aesthetics of product design is an interactive relationship between human beings and objects. Veryzer (1995) addressed that the aesthetics of design is an aesthetic response by consumers to product forms. An aesthetic response indicates the interaction between product appearance and consumers' perception of an object. Therefore, good interactive responses bring consumers not only aesthetic experience but also a pleasant feeling. Zhuang (2008) addressed that the criteria of aesthetic evaluation should include originality, unity, integrity, pleasure, conciseness, and satisfaction at modeling. Wanger (1999) pointed out that aesthetic experience is interaction between subjects (consumers) and objects (products) in which subjects indicate consumers' value whereas objects indicate product design. Thus, consumers will generate aesthetic evaluation for products in the experience. In summary, the criteria of aesthetic evalua-

tion focus on expressing creativity, harmonizing colors, and bringing consumers a pleasant feeling. Hence, originality, pleasure, and pleasure were applied to aesthetic evaluation in this study.

Fuzzy Logic

Zadeh (1965), a professor in the University of California, Berkeley, developed the fuzzy sets theory, in which the relationship between elements and sets are indicated by membership functions. The fuzzy sets theory quantifies the fuzzy concept to mainly deal with the fuzzy psychological feelings of some research objects for extending the membership of elements for sets to any value in the single interval (0,1). Voxman (2001) divided the canonical representations of discrete fuzzy numbers into two types and brought up calculation methods respectively. Herrera, Lopez, Mendana, & Rodriguez (2001) studied the solution to the linguistic decision model and brought up the genetic algorithm for the fitness function of the goal of semantics. In addition, Wu (2010), Tang (2009), Wei (2003), and Su (2007) investigated the application of fuzzy logic to product design. Fuzzy numbers are often used in research including: triangular fuzzy number, trapezoidal fuzzy number, and normal fuzzy number.

To count the degree of similarity between generalized fuzzy numbers, Hsu & Chen (1996) pointed out that the task of measuring the degree of similarity between

fuzzy numbers plays an important role in fuzzy decision making. Chen - and-Chen's method (2001) also explored a new similarity measure between generalized fuzzy numbers. It combines the concepts of geometric distance, the perimeter and the height of generalized fuzzy numbers for calculating the degree of similarity between generalized fuzzy numbers.

Design Decision Making

Design is one type of special mental behavior, and the theme of the activities is to make design decisions (Hsu, 1996). Personal intuition is frequently involved in the design decision making of product design and development projects. Cooper (1993) proposed five decision-making points, which help control design procedures and quality, in the design and development process as a reference to design decision making. Zhang and Wang (1996) addressed that design decision-making points

are after evaluation, and they include (1) design preparation, (2) initial design, (3) detailed design, (4) idea concretization, and (5) idea materialization.

Research Methodology

Research Design

This study was aimed to investigate the relationship between the form features of furniture products and the fuzzy semantics of the aesthetic evaluations of consumers and the differences between consumers in terms of the form features of products and the fuzzy semantics of the aesthetic evaluations of consumers.

Research Framework

The research framework is illustrated in Figure 1.

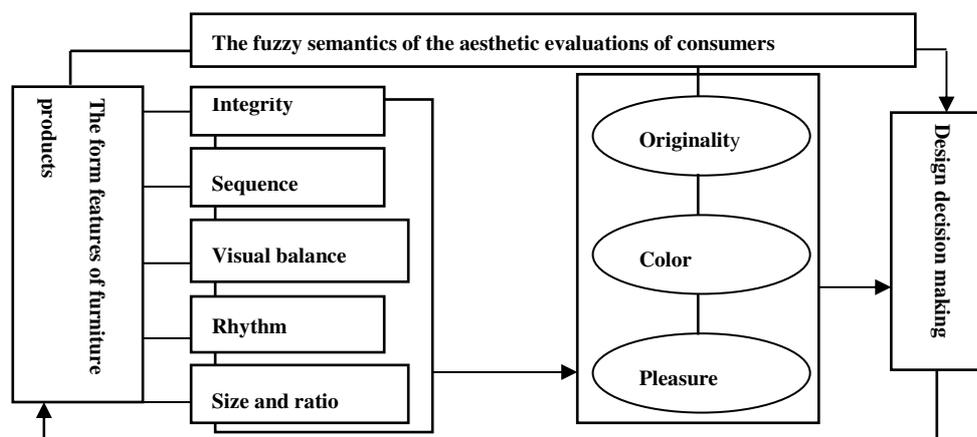


Figure 1. The research framework of the relationship between the form features of furniture products and the fuzzy semantics of the aesthetic evaluations of consumers

Research hypotheses and questions

H₁: Different form features of furniture products significantly influence the aesthetic evaluations of consumers.

H₁₋₁: Integrity significantly influences the aesthetic evaluations of consumers.

H₁₋₂: Sequence significantly influences the aesthetic evaluations of consumers.

H₁₋₃: Visual balance significantly influences the aesthetic evaluations of consumers.

H₁₋₄: Rhythm significantly influences the aesthetic evaluations of consumers.

H₁₋₅: Size and ratio significantly influences the aesthetic evaluations of consumers.

Research Question: The analysis of the degree of similarity for the form features of furniture products and the fuzzy semantics of aesthetic evaluation

Research objects

The consumer groups in Taiwan were targeted for the convenience of obtaining research objects. In total, 905 copies of questionnaire were investigated and analyzed.

Questionnaire Design and Implementation

Questionnaire data and fuzzy semantic statistics and analysis

The relationship between the form features of furniture products and the fuzzy semantics of the aesthetic evaluations of consumers investigated in this study belongs to the mental perception of human beings,

and it is fuzzy, subjective, and uncertain. Thus, a fuzzy evaluation questionnaire was employed to obtain the aesthetic evaluations of consumers for the samples to effectively quantify subjective judgments. Scholars studied fuzzy semantic scaling and Likert scaling (Lin, 2003, 2004) in which the Likert scale used to measure the semantic meanings of participants (5 represented “strongly agree,” 4 represented “considerably agree,” 3 indicated “agree,” 2 indicated “agree disagree,” and 1 represented “strongly disagree”) unlikely reasonably described the differences and fuzziness expressed by human semantic meanings. The fuzzy semantic scale used in this study was divided into five levels. The participants chose an appropriate level according to each investigation item. A fuzzy evaluation method was used to calculate the fuzzy mode, which better expressed the opinions of most of the participants. When an evaluation result was highly unlikely decided, a fuzzy evaluation method was employed to calculate the mean of the fuzzy semantic values of the aesthetic evaluations of consumers, which can be used by furniture designers and supervisors as a reference to design decision making in design management. Based on Klir and Yuan’s (1995) fuzzy system framework, a complete fuzzy process usually contains four steps: (1) fuzzification mechanism (data input), (2) fuzzy rule base (data processing), (3) fuzzy inference engine (fuzzy inference), and (4) defuzzification mechanism (data output). Hence, the fuzzy processing steps of the fuzzy semantic questionnaire data in this study were summarized as follows:

Step 1. (Fuzzification Mechanism): triangular fuzzy numbers were used to represent the

form features of furniture products and the expected and actual semantic variables of the fuzzy semantics of the aesthetic evaluations of consumers. A great number of scholars (Wu, Hsiao and Kuo 2004; Xu and Lin, 2005) used triangular fuzzy numbers to represent semantic variables.

Step 2. (Fuzzy Rule Base): triangular fuzzy numbers were attached to the five semantic terms of the expected semantic variables, respectively “strongly agree,” “considerably agree,” “agree,” “agree disagree,” “strongly disagree.” Now, A is used to represent an expected triangular fuzzy number. When A is divided by 5 and then transformed into a value between 0 and 1, $X=(0, 0,0.2), (0, 0.2, 0.4), (0.2, 0.4, 0.6), (0.4, 0.6, 0.8)$ or $(0.6, 0.8, 1)$, which respectively represent the five se-

semantic terms. The membership function graph is illustrated in Figure 2. Moreover, triangular fuzzy numbers were attached to the five semantic terms of the actual semantic variables, respectively “strongly disagree,” “agree disagree,” “agree,” “considerably agree,” and “strongly agree.”

Step 3. (Defuzzification): the fuzzy statistics obtained from the fuzzification were defuzzified to acquire specific values for following research and analyses. Center of area (CoA) used in the studies of Kaufmann and Gupta (1991) and Xu and Lin (2005) was employed in this study. The triangular fuzzy numbers (Figure 2) were calculated as follows.

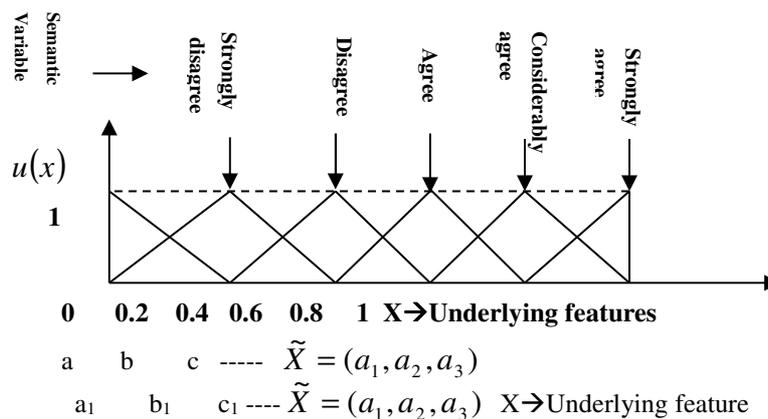


Figure 2. The membership function graph of five semantic levels

The defuzzification formula of \tilde{X} is as follows:

Assume $\tilde{X} = (a_1, a_2, a_3)$,

$$V_{\tilde{X}} = (a_1 + 2a_2 + a_3) / 4x5$$

The fuzzy descriptive statistic equation for the second part of the fuzzy semantic questionnaire was deduced into Equation (1):

$$V_{\tilde{X}} = (a_1 + 2a_2 + a_3) / 4x5, \text{ which can be}$$

transformed into

$$\text{Fuzzy Linguistic Mean} = \left[\frac{\sum_1^n (a_1 + 2a_2 + a_3)}{1} \right] / 4Nx5, \\ N=905(\text{participants}). \quad (1-1)$$

The fuzzy descriptive statistic equation for the third part of the fuzzy semantic questionnaire was deduced into Equation (2):

$$\tilde{X} = (a_1, b_1, c_1),$$

$V_{\tilde{x}} = (a_1 + 2a_2 + a_3) / 4x5$ can be transformed into Fuzzy Linguistic Mean = $\left[\sum_1^n (a_1 + 2a_2 + a_3) \right] / 4Nx5$, $N=905$ (participants) (1-2)

The fuzzy semantic values of the questionnaire were analyzed through Equations (1-1) and (1-2).

Questionnaire design

The first part of the questionnaire in this study was the basic personal background information of each participant, including sex, age, education level, and monthly income. In the second part, the form features of products were divided into five categories, namely integrity, sequence, visual balance, rhythm, and size and ratio. For integrity, the framework of product design, product components, and small parts were connective and integrative instead of being fragmented. For sequence, furniture design brought a neat and simple feeling. For visual balance, furniture design was in

either symmetric or asymmetric balance. For rhythm, quantities, colors, dimensions, and shapes were altered to create combinations. For size and ratio, either the length or the width of a design was in golden ratio. In total, there were 13 questions.

The third part was the aesthetic evaluation of the participants for the form features of furniture products, including originality, pleasure, and pleasure. In terms of originality, consumers thought furniture product combinations and components were connective, neat, and in order; they were in either symmetrical or asymmetrical balance; quantities, configurations, dimensions, shapes, colors, and golden-ratio product designs were used to create better form features; they were creative. In terms of color, consumers thought that the overall form features of products were in order; they were in either symmetrical or asymmetrical balance; quantities, dimensions, golden-ratio product

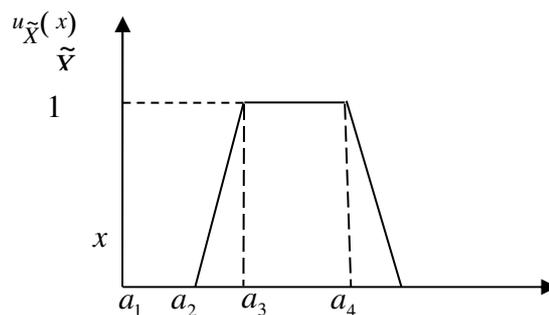


Figure 3. The graph of the trapezoidal fuzzy number, \tilde{X} , and the membership function

designs were applied; colors were added, which expressed aesthetics. In terms of pleasure, consumers thought that the overall

form features of products were neat and visual balanced; quantity configurations were applied; the designs were in golden ratio,

which made people generate a pleasant feeling. Totally, there were 15 questions.

The membership function of the trapezoidal normal fuzzy

In this study, it explored a new method to count the degree of similarity between generalized fuzzy numbers. The applied method combines the concepts of geometric distance; the perimeter and the height of generalized fuzzy numbers for counting the degree of similarity between generalize fuzzy numbers.

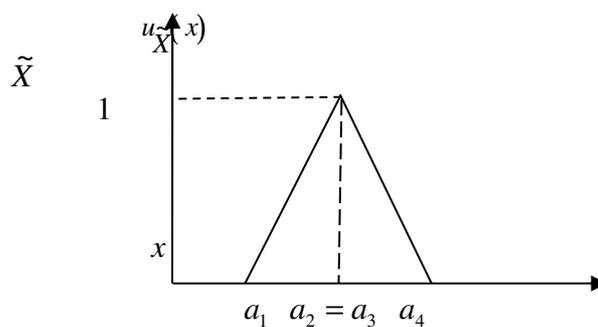


Figure 4. The graph of the triangular fuzzy number, \tilde{X} , and the membership function

In this study, it assumed that there are two generalized trapezoidal fuzzy numbers \tilde{X}_1 and \tilde{X}_2 , where $\tilde{X}_1 = (a_1, a_2, a_3, a_4; W_{\tilde{X}_1})$, $\tilde{X}_2 = (b_1, b_2, b_3, b_4; W_{\tilde{X}_2})$, $0 \leq a_1 \leq a_2 \leq a_3 \leq a_4 \leq 1$ and $0 \leq b_1 \leq b_2 \leq b_3 \leq b_4 \leq 1$. Then, the degree of similarity $S(\tilde{X}_1, \tilde{X}_2)$ between the generalized fuzzy numbers \tilde{X}_1 and \tilde{X}_2 can be counted as follows:

This trapezoidal fuzzy number model (Figure 3.) significantly indicates that:

- (1) Assume $a_1 = a_2 = a_3 = a_4$, but the fuzzy number, \tilde{X} , is a crisp value.
- (2) Assume $a_1 < a_2 = a_3 < a_4$, but the fuzzy number \tilde{X} is a triangular fuzzy number, and $\tilde{X} = (a_1, a_2, a_3)$ (See Figure 4.)

$$S(\tilde{X}_1, \tilde{X}_2) = \begin{cases} \left(1 - \frac{\sum_{i=1}^4 |a_i - b_i|}{4}\right) x \frac{\min(L(\tilde{X}_1), L(\tilde{X}_2)) + \min(W_{\tilde{X}_1}, W_{\tilde{X}_2})}{\max(L(\tilde{X}_1), L(\tilde{X}_2)) + \min(W_{\tilde{X}_1}, W_{\tilde{X}_2})} \end{cases}$$

if $\min(W_{\tilde{X}_1}, W_{\tilde{X}_2}) \neq 0, 0$

Otherwise,

(2-1)

where $S(\tilde{X}_1, \tilde{X}_2) \in [0, 1]$ and $L(\tilde{X}_1)$ and $L(\tilde{X}_2)$ are defined as follows:

$$L(\tilde{X}_1) = \sqrt{(a_1 - a_2)^2 + W_{\tilde{X}_1}^2} + \sqrt{(a_3 - a_4)^2 + W_{\tilde{X}_1}^2} + (a_3 - a_2) + (a_4 - a_1),$$

(2-2)

$$L(\tilde{X}_2) = \sqrt{(b_1 - b_2)^2 + W_{\tilde{X}_2}^2} + \sqrt{(b_3 - b_4)^2 + W_{\tilde{X}_2}^2} + (b_3 - b_2) + (b_4 - b_1),$$

(2-3)

where $L(\tilde{X}_1)$ and $L(\tilde{X}_2)$ represents the perimeters of the generalized trapezoidal fuzzy numbers \tilde{X}_1 and \tilde{X}_2 deduced from (2-1), (2-2), and (2-3), respectively.

Fuzzy semantic questionnaire statistics and analysis

The “form features of products” of furniture and the fuzzy semantics of “aesthetic evaluation”

In this study, SPSS12.0 was adopted to analyze the data of the fuzzy semantic questionnaire. According to Table 1, integrity significantly influenced the fuzzy semantics of the aesthetic evaluations of consumers ($r(903)=.396$ and $p<.01$), so H_1-1 was tenable. Sequence significantly influenced the fuzzy semantics of the aesthetic evaluations of consumers ($r(903)=.422$ and $p<.01$), so H_1-2 was tenable. Visual balance signifi-

cantly influenced the fuzzy semantics of the aesthetic evaluations of consumers ($r(903)=.343$ and $p<.01$), so H_1-3 was tenable. Rhythm significantly influenced the fuzzy semantics of the aesthetic evaluations of consumers ($r(903)=.451$ and $p<.01$), so H_1-4 was tenable. Size and ratio significantly influenced the fuzzy semantics of the aesthetic evaluations of consumers ($r(903)=.716$ and $p<.01$), so H_1-5 was tenable. According to the aforementioned results, the form features of products, respectively integrity, sequence, visual balance, rhythm, and size and ratio, all significantly influenced the fuzzy semantics of the aesthetic evaluations of consumers. Among the form features of products, size and ratio had the most significant fuzzy semantic influence on the aesthetic evaluations of consumers whereas visual balance had the least fuzzy semantic influence on the aesthetic evaluations of consumers. In conclusion, H_1 was tenable.

Table 1. The relationship between the “form features of products” of furniture and the “fuzzy semantics of the aesthetic evaluations of consumers”

Variable	Method of SPSS Analysis	Integrity	Sequence	Visual Balance	Rhythm	Size and Ratio
Fuzzy Semantics of Aesthetic Evaluation	Pearson Correlation	.396(**)	.422(**)	.343(**)	.451(**)	.716(**)
	Sig. (2-tailed)	.000	.000	.000	.000	.000
	N	905	905	905	905	905

** Correlation is significant at the 0.01 level (2-tailed).

The calculation and analysis of the degree of similarity for fuzzy logic

The fuzzy descriptive statistic equations for the form features of products in the second part of the fuzzy semantic question

naire and aesthetic evaluation in the third part of the questionnaire were deduced into the following equation (1):

$$V_{\tilde{x}} = (a_1 + 2a_2 + a_3) / 4 \times 5$$

can be trans-

formed into Fuzzy Linguistic Mean= $\left[\sum_1^n (a_1+2a_2+a_3) \right] / 4Nx5$,
 $N=905(\text{participants})$.

Assume the six triangular fuzzy numbers $\tilde{X}_1, \tilde{X}_2, \tilde{X}_3, \tilde{X}_4, \tilde{X}_5$ and \tilde{X} , where $\tilde{X}_1=(0.60,0.80,0.80,1.00;1.00)$,

$\tilde{X}_2=(0.40,0.69,0.69,1.00;1.00)$,
 $\tilde{X}_3=(0.60,0.74,0.74,1.00;1.00)$,
 $\tilde{X}_4=(0.40,0.63,0.63,1.00;1.00)$,
 $\tilde{X}_5=(0.20,0.67,0.67,1.00;1.00)$ and
 $\tilde{X}=(0.52,0.72,0.72,0.96;1.00)$ as shown in Figure 5.

Table 2. Descriptive Statistics for the generalized triangular fuzzy numbers of a_1, a_2, a_3 for the form features of products

Fuzzy Semantic Variable	N	Triangular Fuzzy Number a_1 (Minimum)	Triangular Fuzzy Number a_3 (Maximum)	Triangular Fuzzy Number a_2 (Mean)
\tilde{X}_1 Integrity	905	.60	1.00	.8044
\tilde{X}_2 Sequence	905	.40	1.00	.6875
\tilde{X}_3 Visual Balance	905	.60	1.00	.7394
\tilde{X}_4 Rhythm	905	.40	1.00	.6265
\tilde{X}_5 Size and Ratio	905	.20	1.00	.6718
\tilde{X} Form Features	905	.52	.96	.7059

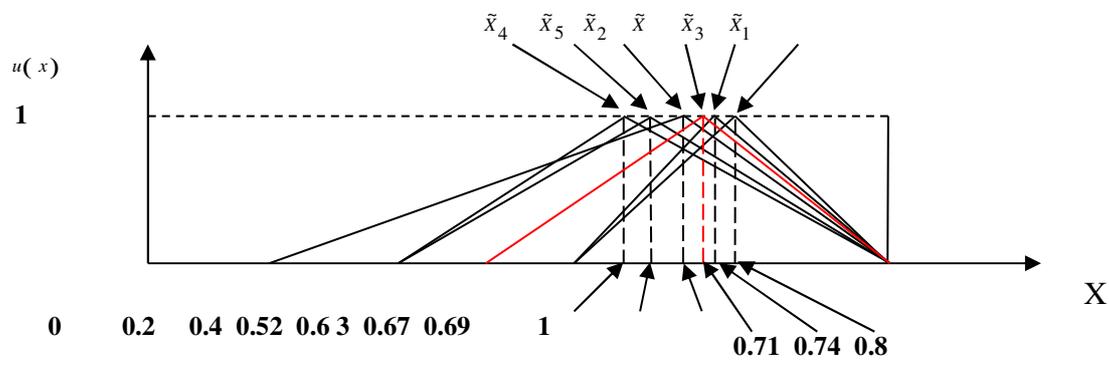


Figure 5. Three generalized triangular fuzzy number $\tilde{X}_1, \tilde{X}_2, \tilde{X}_3, \tilde{X}_4, \tilde{X}_5$ and \tilde{X} .

In accordance with Table 2., the fuzzy linguistic means were transformed into triangular fuzzy numbers, \tilde{X} , and a membership function graph.

According to the formula (2-1), (2-2), and (2-3), the study can count the values of $S(\tilde{X}, \tilde{X}_1), S(\tilde{X}, \tilde{X}_2), S(\tilde{X}, \tilde{X}_3), S(\tilde{X}, \tilde{X}_4)$,

and $S(\tilde{X}, \tilde{X}_5)$, respectively, and be described as follows. First of all, count the perimeter $L(\tilde{X}), L(\tilde{X}_1), L(\tilde{X}_2), L(\tilde{X}_3), L(\tilde{X}_4)$ and $L(\tilde{X}_5)$ of $\tilde{X}_1, \tilde{X}_2, \tilde{X}_3, \tilde{X}_4, \tilde{X}_5$ and, \tilde{X} respectively.

$$L(\tilde{X}) = \sqrt{(0.52-0.72)^2+1^2} + \sqrt{(0.72-0.96)^2+1^2} + (0.72-0.72) + (0.96-0.52) = 2.5076$$

$$L(\tilde{X}_1) = 2.4396, L(\tilde{X}_2) = 2.6881, \\ L(\tilde{X}_3) = 2.4402, L(\tilde{X}_4) = 2.6924, \\ L(\tilde{X}_5) = 2.9579$$

Then, the degree of similarity $S(\tilde{X}, \tilde{X}_1)$, $S(\tilde{X}, \tilde{X}_2)$, $S(\tilde{X}, \tilde{X}_3)$, $S(\tilde{X}, \tilde{X}_4)$, and $S(\tilde{X}, \tilde{X}_5)$ can be counted, respectively, as follows:

Then, the degree of similarity $S(\tilde{X}, \tilde{X}_1)$, $S(\tilde{X}, \tilde{X}_2)$, $S(\tilde{X}, \tilde{X}_3)$, $S(\tilde{X}, \tilde{X}_4)$, and $S(\tilde{X}, \tilde{X}_5)$ can be counted, respectively, as follows:

$$S(\tilde{X}, \tilde{X}_1) = \left\{ \frac{\sum_{i=1}^4 |a_i - b_i| \cdot \min(L(\tilde{X}), L(\tilde{X}_1)) + \min(W_{\tilde{X}}, W_{\tilde{X}_1})}{(1 - \frac{\sum_{i=1}^4 |a_i - b_i|}{4}) \cdot \max(L(\tilde{X}), L(\tilde{X}_1)) + \min(W_{\tilde{X}}, W_{\tilde{X}_1})} \right\} \\ = (1 - \frac{|0.52-0.60| + |0.72-0.80| + |0.72-0.80| + |0.96-1.00|}{4}) \cdot \frac{2.4396+1}{2.5076+1} \\ = 0.9120$$

$$S(\tilde{X}, \tilde{X}_2) = 0.8988, S(\tilde{X}, \tilde{X}_3) = 0.9808,$$

$$S(\tilde{X}, \tilde{X}_4) = 0.8692, S(\tilde{X}, \tilde{X}_5) = 0.7843$$

According to Figure 5, the study can explore that the degrees of similarity $S(\tilde{X}, \tilde{X}_3)$ between the generalized triangular fuzzy numbers \tilde{X} and \tilde{X}_3 should be larger than the degrees of similarity $S(\tilde{X}, \tilde{X}_1)$, $S(\tilde{X}, \tilde{X}_2)$, $S(\tilde{X}, \tilde{X}_4)$, and $S(\tilde{X}, \tilde{X}_5)$ between the generalized triangular fuzzy numbers. The Study can get $S(\tilde{X}, \tilde{X}_3) > S(\tilde{X}, \tilde{X}_1) > S(\tilde{X}, \tilde{X}_2) > S(\tilde{X}, \tilde{X}_4) > S(\tilde{X}, \tilde{X}_5)$ of the results, which is analyzed from the survey.

Table 3. The generalized triangular fuzzy numbers of a_1, a_2, a_3 for aesthetic evaluation

Fuzzy Semantic Variable	N	Triangular Fuzzy Number a_1 (Minimum)	Triangular Fuzzy Number a_3 (Maximum)	Triangular Fuzzy Number a_2 (Mean)
\tilde{X}_{111} Originality	905	.60	1.00	.7883
\tilde{X}_{112} Color	905	.60	1.00	.7741
\tilde{X}_{113} Pleasure	905	.60	1.00	.7808
\tilde{X}_{11} Aesthetic Evaluation	905	.60	1.00	.7811

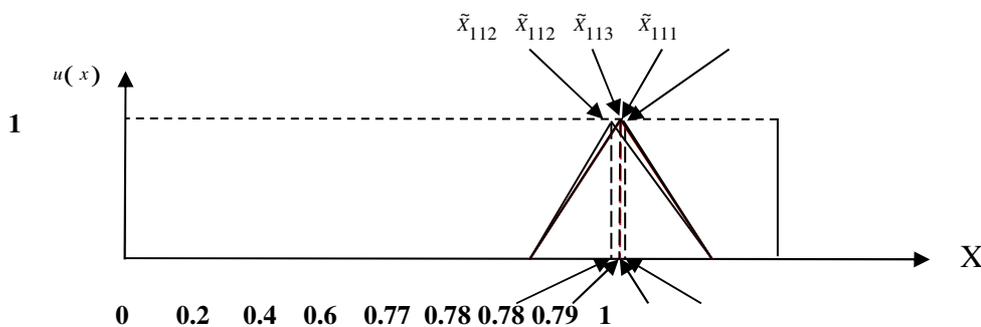


Figure 6. Four generalized triangular fuzzy numbers $\tilde{X}_{111}, \tilde{X}_{112}, \tilde{X}_{113}$ and \tilde{X}_{11}

From the calculation and analysis of the degree of similarity, it is found that consumers attached the greatest importance to size and ratio whereas they attached the least importance to visual balance.

According to Table 3, fuzzy linguistic means were transformed into triangular fuzzy numbers and a membership function graph. Assume the six triangular fuzzy numbers \tilde{X}_{111} , \tilde{X}_{112} , \tilde{X}_{113} and \tilde{X}_{11} , where $\tilde{X}_{111}=(0.60,0.79,0.79,1.00;1.00)$, $\tilde{X}_{112}=(0.60,0.77,0.77,1.00;1.00)$, $\tilde{X}_{113}=(0.60,0.78,0.78,1.00;1.00)$ and $\tilde{X}_{11}=(0.60,0.78,0.78,1.00;1.00)$ as shown in Figure 6.

According to the formula (2-1), (2-2), and (2-3), the study can count the values of $S(\tilde{X}_{11}, \tilde{X}_{111})$, $S(\tilde{X}_{11}, \tilde{X}_{112})$ and $S(\tilde{X}_{11}, \tilde{X}_{113})$, respectively, and be described as follows. First of all, count the perimeter $L(\tilde{X}_{11})$, $L(\tilde{X}_{111})$, $L(\tilde{X}_{112})$ and $L(\tilde{X}_{113})$ of \tilde{X}_{11} , \tilde{X}_{111} , \tilde{X}_{112} , and, \tilde{X}_{113} , respectively.

$L(\tilde{X}_{11})=\sqrt{(0.6-0.78)^2+1^2}+\sqrt{(0.78-1)^2+1^2}+(0.78-0.78)+(1-0.6)=2.4400$
 $L(\tilde{X}_{111})=2.4397$. $L(\tilde{X}_{112})=2.4404$,
 $L(\tilde{X}_{113})=2.4400$. Then, the degree of similarity $S(\tilde{X}_{11}, \tilde{X}_{111})$, $S(\tilde{X}_{11}, \tilde{X}_{112})$ and $S(\tilde{X}_{11}, \tilde{X}_{113})$ can be counted, respectively, as follows:

$$S(\tilde{X}_{11}, \tilde{X}_{111})=0.9949,$$

$$S(\tilde{X}_{11}, \tilde{X}_{112})=0.9949, S(\tilde{X}_{11}, \tilde{X}_{113})=1.$$

According to Figure 6, the study can explore that the degrees of similarity $S(\tilde{X}_{11}, \tilde{X}_{113})$ between the generalized triangular fuzzy numbers \tilde{X}_{11} and \tilde{X}_{113} should

be larger than the degrees of similarity $S(\tilde{X}_{11}, \tilde{X}_{111})$ and $S(\tilde{X}_{11}, \tilde{X}_{112})$ between the generalized triangular fuzzy numbers. The Study can get $S(\tilde{X}_{11}, \tilde{X}_{113})=1 > S(\tilde{X}_{11}, \tilde{X}_{111}) = S(\tilde{X}_{11}, \tilde{X}_{112})$ of the results, which is analyzed from the survey.

It is found that the aesthetic evaluations respectively for originality, color, and pleasure that consumers had were very consistent with their overall aesthetic evaluation.

Conclusions and Recommendations

Based on this model, the research results are summarized as follows.

1. The research results show that integrity, sequence, visual balance, rhythm, and size and ratio, which were the form features of furniture products, significantly influenced the fuzzy semantics of the aesthetic evaluations of consumers. Size and ratio had the most significant fuzzy semantic influence on the aesthetic evaluations of consumers whereas visual balance had the least significant fuzzy semantic influence on the aesthetic evaluations of consumers. It was found in this study that the aesthetic evaluations of consumers were profoundly influenced by the form features of products.
2. The form features of products caused significant fuzzy semantic differences between

the aesthetic evaluations of consumers with different sexes, education levels, and incomes and in different ages. Therefore, when corporate decision makers make design decisions, they should consider the aesthetic demand of different consumer groups for the form features of products to meet the demand of different consumers for the form features of products.

3. Based on the analysis of the degree of similarity for fuzzy semantic values, consumers attached the greatest importance to size and ratio, a form feature of products, while they attached the least importance to visual balance, a form feature of products. Thus, when corporate decision makers decide the form features of products, they should pay more attention to the proportion that consumers account for in size and ratio.

4. According to the analysis of the degree of similarity for the fuzzy semantic values of the questionnaire, the aesthetic evaluations of consumers respectively for originality, colors, and pleasure, which were the form features of furniture products, were very consistent with their overall aesthetic evaluation. Hence, when corporate decision mak-

ers decide the form features of furniture products, they should pay more attention to the aesthetic evaluation demand of consumers for originality, color, and pleasure.

In summary, designers are suggested to consider the form features of furniture products, including integrity, sequence, visual balance, rhythm, and size and ratio, which are generally valued by consumers, when the designers decide the designs of new products in order to improve the aesthetic evaluations of consumers for the furniture products and further advance the design and development performance of new products. While making the design decisions in the stage of product development, supervisors and furniture designers can first use the “model for evaluating the relationship between the form features of furniture products and the fuzzy semantics of the aesthetic evaluations of consumers” as the basis for design decision making in hopes of increasing the aesthetic evaluations of consumers for the form features of furniture products, advancing the willingness to buy and enhancing the success rate of sales in order to increase enterprise profits and performance in the furniture marketing.

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