

The Research of Taiwanese TFT-LCD Industry's Competitive Strategies in

Facing of The Financial Turmoil

Ming-Lang Wang <sup>a,\*</sup>, Hsing – Fu Lin <sup>b</sup>

<sup>a</sup> Department of Industrial Engineering & System Management, Chung Hua University, No. 707, Sec. 2, WuFu Rd. Hsinchu, Taiwan, ROC

<sup>b</sup> Ph.D student of Institute of Technology Management, Chung Hua University, No. 707, Sec. 2, WuFu Rd. Hsinchu, Taiwan, ROC

Lecturer of Department of Health Sciences and Management Food & Beverage Management, Chung- Jen College of Nursing, No.1-10,

Hubei Village, Dalin Township, Chiayi County 622, Taiwan, ROC

Corresponding author/address:

Ming-Lang Wang <sup>a,\*</sup>

Associate Professor

Chung-Hua University

Department of Industrial Engineering & System Management

No. 707, Sec. 2, WuFu Rd, Hsinchu, Taiwan, ROC.

Tel: +886-3-5186578 Fax: +886-3-5186575

E-mail: marlon@chu.edu.tw

Formatted: Font: (Default) Arial Unicode MS

Formatted: Left: 2 cm, Right: 2 cm, Different first page header

Formatted: Font: (Default) Arial Unicode MS, 12 pt, Not Bold

Formatted: Space After: 0 pt, Line spacing: Double

Formatted: Font: (Default) Arial Unicode MS

Formatted: Font: (Default) Arial Unicode MS, 12 pt

Formatted: Font: (Default) Arial Unicode MS

Formatted: Font: (Default) Arial Unicode MS, 12 pt, Not Bold

Formatted: Font: (Default) Arial Unicode MS, 10 pt, Italic

Formatted: Font: (Default) Arial Unicode MS, 8 pt, Italic

Formatted: Font: (Default) Arial Unicode MS, 8 pt, Not Bold, Italic

Formatted: Font: (Default) Arial Unicode MS, 8 pt, Italic

Formatted: Font: (Default) Arial Unicode MS

Formatted: Font: (Default) Arial Unicode MS, Italic, Superscript

Formatted: Font: (Default) Arial Unicode MS, 8 pt, Italic

Formatted ... [1]

Formatted ... [2]

Formatted ... [3]

Formatted ... [4]

Formatted ... [5]

Formatted ... [6]

Formatted ... [7]

Formatted ... [8]

Formatted ... [9]

Formatted ... [10]

Formatted ... [11]

Formatted ... [12]

Formatted ... [13]

Formatted ... [14]

Formatted ... [15]

Formatted ... [16]

Formatted ... [17]

Formatted ... [18]

Formatted ... [19]

Formatted ... [20]

Formatted: Font: 12 pt

# The Research of Taiwanese TFT-LCD Industry's Competitive Strategies in Facing of The Financial Turmoil Analysis of TFT-LCD Industry – A Study of Taiwanese Firms

Formatted: Font: 14 pt  
Formatted: Font: 14 pt  
Formatted: Space After: 0 pt, Line spacing: Double  
Formatted: Font: 14 pt  
Formatted: Font: 14 pt

## Abstract

With the economic crisis sweeping across the whole world, all Taiwanese industries are confronting challenges from crunch even the semiconductor industry, the leading industry of Taiwan for many years. Thus far, the steadily-grown TFT-LCD industry keeping admirable output values has demonstrated the “Thin-Film Transistor-Liquid Crystal Display (TFT-LCD)” as the major industry on Taiwan’s market. Due to applications of TFT-LCD panels extended to various fields such as mobile phone, GPS, and medical treatment in addition to LCD TVs in place of traditional CRT TVs thoroughly, the industrial competitiveness and future development is prosperous. Against this reason, the issue with respect to competitive strategies and competitive advantages is further investigated in this study.

Formatted: Font: 12 pt  
Formatted: Left, Space After: 0 pt  
Formatted: Font: 12 pt  
Formatted: Font: 10 pt  
Formatted: Indent: First line: 2 ch, Space After: 0 pt, Line spacing: Double

Expected to become references and be favorable to relevant industries at Taiwan, the best competitive strategy for Taiwan’s TFT-LCD industry is induced with the analyses in this study for 4 leading Taiwanese manufacturers of TFT-LCD industry, AUO, CHIMEI, Chunghwa Picture Tubes, and INNOLUX, compared to comprehensive analyses existing in current literatures. Because of the major competitive advantages in management capability for flexible manufacture and good channels for marketing demonstrated in this study, Taiwanese TFT-LCD manufacturers have optimized relevant value activities and strength competitive advantages by actively constructing vertical strategic alliances for vertical connections to suppliers and channels. Against this background, the manufacturers grasping the enterprise’s core competitiveness and comprehending the cyclic trend of the TFT-LCD industry for initiation of the enterprise’s competitive strategies should further seek opportunities for merges of enterprises and vertical integrations of upstream, midstream and downstream manufacturers, and recommend the government supplying stable environment instrumental to investment and manufacturers’ R&D capability as the basis of sustaining constant competitive advantages of the TFT-LCD industry.

Confronting strong competition from Japan and Korea, the optoelectronic industry attracting the overwhelming majority of investments at Taiwan should change the passive attitude of relying on foreign technical transfer in the past to active technical R&D, for instance, the strategic alliance model by cooperating foreign leading manufacturers to maintain out superiority. According to Porter's theory, a country's competitive advantage depending on the industrial cluster, the industrial cluster will provide complement to enterprises, generating spillover effects in technologies.

~~According to the research's findings, in the future,~~ only constant research, development and innovation and industrial cluster effects to construct excellent environment for industrial development and to attract more competent people and resources as abundant tangible and invisible capitals accumulated are the best way of sustaining perpetual competitiveness for the TFT-LCD industry ~~at in~~ -Taiwan.

**Key words:** ~~TFT-LCD industry, Competitive strategy, C~~ompetitive advantage

## ~~Chapter~~ 1 Introduction

### 1.1 Background for research

#### Current status for the TFT-LCD industry at Taiwan

As members of one capital-intensive, technology-intensive, and talent-intensive industry, the TFT-LCD manufacturers under competitions from global rivals take more pressure compared with those of the traditional industry. Against this background, how to enhance technical levels and competitiveness is ~~the first task for major~~ Taiwanese ~~major~~ manufacturers' first task.

In 2008, the expansion for the target market of the TFT-LCD industry is still in the ascendant. According to calculation for displays' areas, the requirement for TFT-LCDs accounts for 30% because of strong growth in LCD TVs and other applications in electronic products leading to new demands for 10-inch ~~or smaller~~ panels ~~or smaller~~.

### 1.2 Motivation for research

The major motivation for the TFT-LCD industry selected as the object of this study is to discover:

1. ~~Power~~Motivation for growth of Taiwanese manufacturers facing enormous chances and challenges in the global market despite a short history of ~~the~~ TFT-LCD industry ~~at in~~ Taiwan but constant progress in

Formatted: Font: 10 pt, Bold

Formatted: Font: 10 pt

Formatted: Font: 12 pt

Formatted: Left

Formatted: Font: 12 pt, English (U.K.)

Formatted: Font: 10 pt

Formatted: Line spacing: Double

Formatted: Font: 12 pt

Formatted: Font: 12 pt

Formatted

Formatted: Font: 10 pt

Formatted

Formatted: Line spacing: Double

technologies.

2. Reasons of economies of scale and economies of scope materialized by Taiwanese major TFT-LCD manufacturers.

### 1.3 Objectives of research

As a result of swift changes and unstable requirements from global customers, enterprises manufacturing TFT-LCDs are devoting their entire thoughtfocus to adjusting strategies and integrating resources. For instance, most system manufacturers' adjustment in inventories at Q3 2008 caused suppression of growth in delivery of TFT-LCDs due to substantial increase in TFT-LCDs at Q2 and weak requirements from terminal users against expected at Q3. On the other hand, the amount of large size TFT-LCDs shipped by Taiwanese manufacturers fell behind Korean manufacturers slightly by 0.05% because Korea Won was down 13.9% against the Dollar at Q3 compared with New Taiwan Dollar's 6.8% against the Dollar. As one important issue to ensure Taiwan's status in the TFT-LCD industry, the development strategy in the future depends on Taiwanese enterprisers' wisdom to evaluate international industrial situations, find optimal opportunities, and manipulate current competitive advantages within an environment full of variance in requirements, internationally industrial specialization and competitions.

As a result, considering the overall trend of the TFT-LCD industry, our team provides the following issues as objectives explored in this study:

1. Investigations-Discuss of the competitive ecology in the TFT-LCD industry atin Taiwan.
2. Investigations-ofDiscuss the manners for constant growth chased by Taiwanese major LCD manufacturers.
3. Investigations-ofDiscuss the trend for competitions of the Taiwanese TFT-LCD industry.

### 1.4 Procedure for research

Formatted: Font: 10 pt

Formatted: Line spacing: Double

Formatted: Line spacing: Double

Formatted: Font: 10 pt

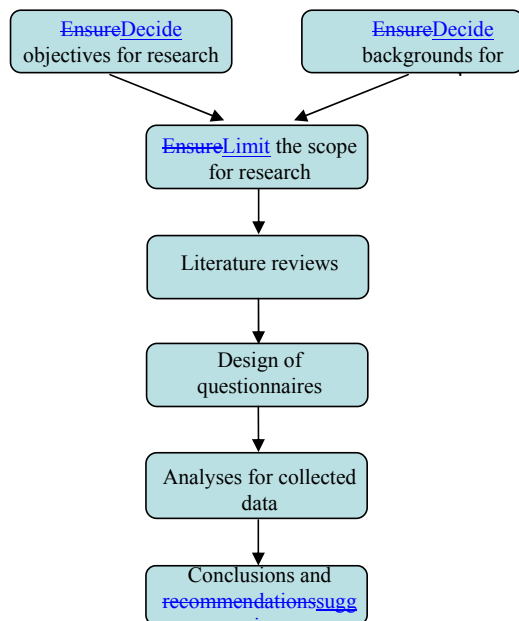


Fig. 1, Flow chart for research

Formatted: English (U.S.)

## II. Chapter 2 Literature Reviews

Formatted: Font: 12 pt

### 2.1 Competitive strategy

Formatted: Left, Space Before: 0 pt, After: 0 pt, Line spacing: Double

#### 2.1.1 Definitions for competitive strategy

Formatted: Font: 10 pt

Table 1, Definitions for competitive strategy

Formatted: Line spacing: Double

Scholar	Definition for the <u>competitive</u> strategy
Von Neumann & Morgenstern (1947)	A strategy is <u>one</u> complete plan explaining which option needs to be chosen under <u>one</u> every probable context.
Seehitou, Dah-Hsian (2001)	A strategy is a feature under an enterprise's operations and a trajectory assembled with changes of these features.
Mintzberg & McHugh (1985)	A strategy is one style of policy-making naturally generated from a series of actions <u>ordered</u> made by one organization.
Ansoff (1965)	Interpreting important properties of commercial behavior planned by one organization in the past or future, a strategy is one line connecting one organization's activities <u>or</u> and manufacture to the market.
McNichols (1972)	A strategy is science or art for accomplishment of basic targets by one enterprise manipulating its own technologies and resources under the most favorable situations.
Steiner & Minef (1977)	A strategy is one systematical statement for one organization's tasks, targets, measures, and resource deployment.
Glueck (1980)	A strategy is one uniform, overarching, integrated plan to ensure materialization of one enterprise's basic target.

Formatted: Line spacing: 1.5 lines

#### 2.1.2 Levels and types for strategies

Formatted: Font: 10 pt

Formatted: Right: -0.04 cm, Line spacing: Double

~~Argued Brought up~~ by Porter (1980), an enterprise's three types of basic strategies are shown as follows:

Formatted: Line spacing: Double

- (1) Cost leadership strategy: Devoting to reduction and control in costs from scale, efficiency, and experience without neglect of quality and service, an enterprise spending ~~lower costs~~ less than other competitors for acquirement of rewards higher than the average value earned by trades should own "larger" relative market share first or other relevant advantages such as easy acceptance of raw materials prior to having a status of "lower" overall costs.
- (2) Differentiation strategy: Differentiation between one product (service) provided by an enterprise and those provided by other rivals is able to create a unique product (service) acknowledged by the whole industry. Despite higher value added for its customers and rewards greater than the average earned by trades because of differentiation created by an enterprise, ~~this an~~ enterprise using ~~the~~ differentiation strategy still needs to control its costs which are not regarded as the chief target here.
- (3) Focus strategy: Concentrating on special customers or products and supplying products or service matching customers' requirements to complete market segmentation, some enterprises deeply understand ~~sing~~ segmented markets and adopting a focus strategy in business have higher efficiency than their trades who compete for the same market but have no focused targets, and earn more rewards than the ~~industry~~ average ~~of the industry~~.

## 2.2 Types for competitions of enterprises

Formatted: Font: 10 pt

Type 1: Enterprises for a traditional industry ~~cross over to runs~~ the LCD industry.

Formatted: Line spacing: Double

E.g.: CHIMEI, without semiconductor technologies or products for downstream applications supporting the market emphasizes no turn key and has a strategy to actively construct the top ~~one~~ large-size TFT-LCD OEM manufacturer of the world.

Type 2: CRT manufacturers transferred to TFT-LCD manufacturers such as Chunghwa Pictures Tube and Acer Display Technology

These manufacturers enjoyed existing benefits because of technical replacement for homogeneous products (TVs and monitors for desk top computers) and original customers adopting TFT-LCD products from CRT monitors. In addition, TATUNG and ACER, their affiliates for business of laptops, ensure the downstream market and develop integration of upstream, midstream, and downstream manufacturers. To enhance competitiveness, Chunghwa Pictures Tube created a new cooperative model of the TFT-LCD industry, i.e., In House with one factory of fabricating backlight modules directly moved into ~~the~~ CPTT Taoyuan by cooperating manufacturers for backlight modules such as K-Bridge Electronics and Forhouse.

Type 3: Integration of upstream, midstream, and downstream enterprises inside one group

Invested by UMC and TECO, Unipac Optoelectronics Corporation (AUO after merges) had supports of the front-end semiconductor process from UMC and LCD driver ICs designed by Novatek, another affiliate of the

UMC group.

Type 4: A downstream industry expanding to the midstream

To grasp critical components, Kinpo Electronic and Compal Electronics which have manufactured products with multiple-size LCD monitors applied founded TPO Displays Corp. Similarly, for the sake of controlling critical components, Quanta Computer, the largest laptop manufacturer ~~in~~ Taiwan, founded Quanta Display Inc. as a resource of supplying some capacities for its parent company

### III. Chapter 3- Methodology for Research

#### 3.1 Design for research

Apart from literature reviews, the competitive strategy emphasized by manufacturers is investigated via questionnaires. With a pre-test questionnaire adopting the ~~Likert-5five-Points~~ Likert Scale issued during the period from ~~November~~December 2007~~8~~ to January 2008~~9~~, 56 effective questionnaires out of 100, an effective response rate of 56%, were collected and finally the number for questions is reduced to 23 from 44. Next, during the period of three months from February 2008~~9~~ to April 2008~~9~~ for the formal investigation, the number of questionnaires issued and questionnaires responded was 300 and 286, respectively. With 29 of them excluded ~~owing-due~~ to no answers or ineffective questionnaires, the number for effective questionnaires is 257 (a response rate of 85.7%). Questionnaire respondents were asked to rate the importance of competitive strategy variable with end points from “no emphasis “(equals 1) to “extreme emphasis “(equals 5). Among options for answering, “1” means very unimportant and “5” very important.

The analysis method adopted in this study is (1) factor analysis; (2) reliability and validity analysis; (3) independent t-test analysis, and (4) analysis of One-way ANOVA.

##### 3.1.1 Structure for research

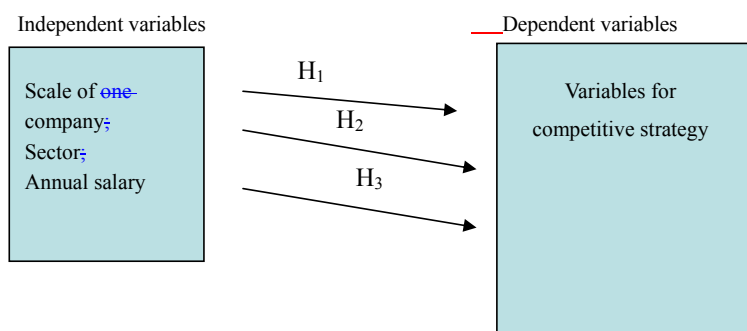


Fig. 2, Structure for research

- Formatted: Font: 12 pt
- Formatted: Left, Space Before: 0 pt, After: 0 pt, Line spacing: Double
- Formatted: Font: 10 pt
- Formatted: Line spacing: Double
- Formatted: Font color: Auto
- Formatted: Space After: 0 pt, Line spacing: Double
- Formatted: Font color: Auto
- Formatted: Font color: Auto

- Formatted: Font: 10 pt
- Formatted: Space After: Auto, Line spacing: Double
- Formatted: Indent: First line: 3.11 ch

To investigate importance of various competitive strategies emphasized by Taiwanese TFT-LCD manufacturers, we selected three basic materials such as scale of one company, sector, and annual salary of one employee in this research (Wang, 2006).

Formatted: Line spacing: Double

### 3.1.2 Hypotheses for research

Formatted: Font: 10 pt

Formatted: Line spacing: Double

Considering findings and conclusions of empirical research from reviewed literatures and concepts as well as objectives for this study, we setup three hypotheses:

Formatted: Line spacing: Double

H<sub>1</sub>: Manufacturers with different scales will have dissimilar competitive strategies.

H<sub>2</sub>: Employees in different sectors emphasize dissimilar competitive strategies.

H<sub>3</sub>: Employees with different annual salaries emphasize dissimilar competitive strategies.

### 3.1.3 Objects for research

Formatted: Font: 10 pt

#### 1. AU Optronics (AUO)

Formatted: Line spacing: 1.5 lines

Table 2, Basic materials-information for AU Optronics

Formatted: Line spacing: Double

Founded in	September 2001 (A merged new company with Acer Display Technology and Unipac Optoelectronics merged)
Capital	NTD 43.5 billion
Number of employees	Over 43,000 around the world (until as of February 2008)
Turnover in 2007	NTD 480 billion
Major products	Design, R&D, and manufacture of Thin Film Transistor-Liquid Crystal Display (TFT-LCD) modules (from 1.5 inches to 65 inches) and Low Temperature Poly Silicon (LTPS); overall solutions for TVs (from 19 inches to 52 inches).
Factories for manufacture of TFT-LCDs	Four 3.5 generation factories, one 4th generation factory, four 5th generation factories, two 6th generation factories and one 7.5 generation factory (with another one-complex 7.5/8.5 generation factory under construction).

Formatted: Space Before: 0 pt, Line spacing: Double

#### 2. CHIMEI Optoelectronics (CMO)

Formatted: Line spacing: Double

Table 3, Basic materials-information for CHIMEI Optoelectronics (CMO)

Formatted: Font: 10 pt

Founded in	Aug. 6, 1998
Capital	Equities: NTD 73.1 billion; preferred stock: NTD 15 billion
Number of employees	17,700 at in Taiwan; 35,000 around the world (November 2008)

Major products	LCDs for TVs; LCDs for IT products (desk top monitors and laptops); LCDs for special applications (small or medium size LCDs applied in industry, entertainment, aerospace, motor vehicle, and medical treatment)
Factories for manufacture of TFT-LCDs	One 3.5 generation <a href="#">factory</a> , one 4th generation <a href="#">factory</a> , one 5.5 generation <a href="#">factory</a> , and one 7.5 generation <a href="#">factory</a> and two 5th generation <a href="#">factories</a> .

Formatted: Line spacing: Double

Formatted: Font: 10 pt

Formatted: Space Before: 0 pt, Line spacing: Double

### 3. Chunghwa Picture Tubes (CPT)

Table 4, Basic [materials information](#) for Chunghwa Picture Tubes

Founded in	May 4, 1971
Capital	NTD 94.8 billion
Number of employees	22000 around the world
Major products	Liquid crystal displays (TFT-LCD, STN-LCD), picture tubes and critical components, and equipment for picture tubes and flat panel monitors.

Formatted: Font: 10 pt

Formatted: Line spacing: Double

Formatted: Space Before: 0 pt

### 4. INNOLUX Display Corp.

Table 5, Basic [materials information](#) for INNOLUX Display Corporation

Full name for the company	INNOLUX Display Corporation
Capital	NTD 31.1 billion
Number of employees	31,000 around the world
Founded in	Jan. 14, 2003
Address of the factory <a href="#">at</a>	No. 160, <a href="#">Science Ke Xuei</a> Rd., Chunan Science Park, Maioli 350 Taiwan

Formatted: Line spacing: Double

Formatted: Font: 10 pt

#### 3.1.4 Variables for research

With the content to [investigate-discuss](#) the competitive strategy emphasized by Taiwanese TFT-LCD manufacturers, the questions designed for the questionnaire are composed of competition variables extended from [the](#) three dimensions of Porter's competition strategy. These variables induced are shown [as follows](#)below:

Table 6, Competition variables for this study

Formatted: Indent: First line: 0.5 ch

1. Control of upstream materials

2. Low-cost materials
3. Government's policy to support local upstream manufacturers
4. Better economies of scale compared <del>to rival than</del> trades
5. Quality controllers' skills and abilities for inspections
6. Extent of products
7. Capability to enhance quality
8. Good marketing channels
9. Shorter production hours
10. Supply of excellent products
11. Capability for innovation, research and development in technologies
12. Control of <del>market</del> information <del>in the market</del>
13. Development of critical techniques and patent
14. Development of state-of-the-art technologies
15. Capability of acquiring technical information
16. <del>Accumulated P</del> production experience <del>accumulated</del>
17. Better cooperative relationships with foreign manufacturers supplying materials
18. Better cooperative relationships with domestic manufacturers supplying materials
19. Establishment of factories abroad
20. <del>Improvement of d</del> Domestic investment environment <del>improvement</del>
21. Economies of scale in purchase
22. Capability in financial resources
23. Capability of service for customers and logistics for products

~~Data source: this study~~

## ~~VI. Chapter 4~~ Analyses for Results ~~in Research~~

As listed companies providing equalities transacted in the Taiwan Stock Exchange or the GreTai Securities Market (or registered at the Emerging Stock), the TFT-LCD manufacturers are objects investigated in this study. Among 100 questionnaires issued ~~in~~ the first time, 75 were responded ~~to~~ and 56 of them are effective (a response rate of 56%) with 19 ineffective ones excluded.

### ~~4.1~~ Results for reliability tests

In this study, the "internal consistency" of the scale is inspected and evaluated with the Cronbach's  $\alpha$  coefficient. Based on studies of Wortzel (1979), a high reliability is equivalent to the Cronbach's  $\alpha$  coefficient with a value ~~ranging~~ from 0.7 to 0.98, and a low reliability is below 0.35 and rejected. With the Cronbach's  $\alpha$  coefficient evaluating the reliability of strategy variables, the overall Cronbach's  $\alpha$  value is 0.717 and the reliability for all dimensions are shown in tables indicating ~~that the~~ Cronbach's  $\alpha$  values ~~are closed~~ to the standards ~~s~~ for ~~a~~ high reliability. As a result, the reliability analyses for strategy variables selected in this study are reliable enough.

Formatted: Font: 12 pt

Formatted: Line spacing: Double

Formatted: Left, Space Before: 0 pt, After: 0 pt, Line spacing: Double

Formatted: Line spacing: Double

Formatted: Font: 10 pt

Formatted: Line spacing: 1.5 lines

Formatted: Line spacing: Double

#### 4.2 Results of factor analyses

Table 7, KMO and Bartlett tests

Kaiser-Meyer-Olkin measure of sampling adequacy		.727
Bartlett test of sphericity	Approximate Chi-Square Distribution	2516.235
	Freedom	253
	Significance	.000 <sup>***</sup>

Formatted: Font: 10 pt

Formatted: Line spacing: Double

Formatted: Superscript

Formatted: Line spacing: Double

As shown in the above table, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy [argued brought up](#) by Kaiser (1974) as a judgment standard is 0.727. Based on Kaiser's arguments, KMO below 0.6 is not good, from 0.6 to 0.7 acceptable, from 0.7 to 0.8 medium, from 0.8 to 0.9 valuable, and over 0.9 excellent. Because of a KMO value of 0.727, the sampling adequacy is evaluated to [be](#) medium.

With factor analyses completed, seven factors extracted from 23 variables and having their eigenvalues over 1 are taken to explain 66.610% raw materials. As shown in the following table, these seven factors have sufficient representatives.

Table 8, Factor analyses for seven items

Factor/Name	Eigenvalue	Variance explained (%)	Accumulated percentage (%)
1. Products' quality	5.851	25.440	25.440
2. Patent technology	2.697	11.728	37.168
3. Enterprises' business	1.906	8.286	45.454
4. Government's policy	1.379	5.994	51.448
5. Production experience	1.242	5.398	56.846
6. Investment environment	1.144	4.972	61.818
7. Innovative R&D	1.102	4.792	66.610

Table 9, Results for factor analyses with rotation completed

	Products' quality	Patent technology	Enterprises' business	Government's policy	Production experience	Investment environment	Innovative R&D
Supply of excellent products	<b>0.518</b>						
Extent of the products	<b>0.553</b>						
Capability to enhance quality	<b>0.634</b>						
Good marketing	<b>0.723</b>						
Control of upstream materials	<b>0.542</b>						
Low-cost material	<b>0.718</b>						
Development of critical technologies and patents		<b>0.587</b>					
Better economies of scale compared than trades		<b>0.738</b>					

Capability of service for customers and logistics for products		<b>0.782</b>					
Better cooperative relationships with foreign manufacturers supplying		<b>0.659</b>					
Better cooperative relationships with domestic manufacturers supplying			<b>0.609</b>				
Capability of acquiring technical information			<b>0.773</b>				
Economies of scale in purchase			<b>0.729</b>				
Control of information in the market			<b>0.450</b>				
Government's policy to support local upstream manufacturers				<b>0.812</b>			
Establishment of factories abroad				<b>0.617</b>			
Capability in financial resources				<b>0.511</b>			
Shorter production hours					<b>0.775</b>		
Production experience accumulated					<b>0.597</b>		
Improvement of domestic investment environment						<b>0.823</b>	
Development of state-of-the-art technologies						<b>0.564</b>	
Capability for innovation, research and development in technologies							<b>0.805</b>
Quality controllers' skills and abilities for inspections							<b>0.614</b>

#### 4.2.1 Denomination for factors

Factors denominated as follows:

Factor 1: ~~Re-denominated~~Renamed as "Product-~~s~~ quality", this factor contains variables such as "supply of excellent products", "extent of products", "capability to enhance quality", "good marketing channels", "control of upstream materials", and "low-cost materials".

Factor 2: ~~Re-denominated~~Renamed as "Patent technology", this factor contains variables such as "development of critical techniques and patents", "better economies of scale compared than trades", "capability of service for customers and logistics for products", and "better cooperative relationships with foreign manufacturers supplying materials".

Factor 3: ~~Re-denominated~~Renamed as "Enterprise-~~s~~ businessoperation", this factor contains variables such as "better cooperative relationships with domestic manufacturers supplying materials", "capability of

Formatted: Left, Right: 0 cm, Line spacing: Double

Formatted: Font: 10 pt

Formatted: Line spacing: Double

Formatted: Indent: Hanging: 3.85 ch, Left 1.64 ch, First line: -3.85 ch, Line spacing: Double

Formatted: Line spacing: Double

acquiring technical information”, “economies of scale in purchase”, and “control of information in the market”.

Factor 4: ~~Re-denominated~~Renamed as “Government’s policy”, this factor contains variables such as “government’s policy to support local upstream manufacturers”, “establishment of factories abroad”, and “capability in financial resources”.

Factor 5: ~~Re-denominated~~Renamed as “Production experience”, this factor contains variables such as “shorter production hours”, and “production experience accumulated”.

Factor 6: ~~Re-denominated~~Renamed as “Investment environment”, this factor contains variables such as “improvement of domestic investment environment”, and “development of state-of-the-art technologies”.

Factor 7: ~~Re-denominated~~Renamed as “Innovative R&D”, this factor contains variables such as “capability for innovation, research and development in technologies”, and “quality controllers’ skills and abilities for inspections”.

**4.3 Results for independent samples with the T-test completed**

Formatted: Font: 10 pt

Table 11, Results and scales for independent samples with the T-test completed

Competitive strategy	Large	Small	Total	Rank
Product’s quality	-0.0019	0.0009	0.0000	5
Patent technology	0.1158	-0.0553	0.0000	6
Enterprise’s <del>business</del> operation	0.0258	-0.0123	0.0000	7
Government’s policy	-0.1912	0.0912	0.0000	2
Production experience	-0.0854	0.0407	0.0000	4
Investment environment	-0.1238	0.0591	0.0000	1
Innovative research & development	0.0833	-0.0397	0.0000	3

Formatted: Line spacing: Double

Table 12, Results and scales for independent samples with the T-test completed (Continue)

Property	F test	Significance	<math>\alpha</math>
Product’s quality	0.00	0.49	
Patent technique	1.65	0.1	
Enterprise’s <del>business</del> operation	0.08	0.36	
Government’s policy	4.54	0.015 <sup>**</sup>	**
Production experience	0.89	0.175	
Investment environment	1.89	0.085 <sup>*</sup>	*
Innovative R&D	0.85	0.18	

Formatted: Superscript

Notes: P\* < 0.1, P\*\* < 0.05, P\*\*\* < 0.01

Depending on manufacturers’ scales, the significant difference is observed at the competitive strategy

Formatted: Line spacing: Double

“Government’s policy”. Compared with a large-scale manufacturer expecting to own differentiated technologies such as more productivity generated during shorter production hours favorable to their competitiveness, a small-scale manufacturer pays more attention on this competitive strategy of “government’s policy” and anticipates subsidies supplied by the government.

#### 4.4 One-way ANOVA

Formatted: Font: 10 pt

Table13, Results with One-way ANOVA – Department

Competitive strategy	R&D Department	QC Department	Design Department	Engineering Department	other	Total	Rank
Product’s quality	0.00	0.24	-0.10	-0.22	0.04	0.00	5
Patent technology	0.05	0.08	-0.11	-0.16	0.00	0.00	6
Enterprise’s business operation	0.06	0.08	-0.17	-0.10	-0.10	0.00	7
Government’s policy	0.18	0.03	-0.13	-0.17	-0.36	0.00	2
Production experience	-0.02	0.03	-0.06	0.13	-0.13	0.00	4
Investment environment	0.09	0.21	-0.60	-0.07	-0.18	0.00	1
Innovative R&D	-0.02	0.03	0.10	0.09	-0.19	0.00	3

Table 14, Results with One-way ANOVA – Department (Continue)

Competitive strategy	F test	Significance	< $\alpha$ (0.05)
Product’s quality	1.32	0.26	
Patent technology	0.50	0.73	
Enterprise’s business operation	0.531802	0.712476	
Government’s policy	2.408032	0.049955**	**
Production experience	0.358758	0.837805	
Investment environment	2.928016	0.021546**	**
Innovative R&D	0.42197	0.792731	

Notes: P\* < 0.1, P\*\* < 0.05, P\*\*\* < 0.01

Depending on different sectors, the significant difference is observed at two competitive strategies, “Innovative R&D” and “Product’s quality”. For instance, in contrast to other sectors, the QC Department emphasizes “Product’s quality” based on their duty to control quality of one company’s products sold because of good quality. Under their perception, good quality is equivalent to higher competitiveness compared to than other manufacturers<sup>2</sup>. On the other hand, the Design Department emphasizes more “Innovative R&D” than other sectors do owing due to their inherent opinions that one company without innovation is likely to be knocked out/eliminated.

Formatted: Line spacing: Double

Table 15, Results with One-way ANOVA – Annual salary

Factor	Below 300 thousand	310 thousand ~500 thousand	510 thousand ~600 thousand	Total	Rank

Formatted: Indent: First line: 0.5 ch

Product's quality	-0.19139	-0.01302	0.020431	-0.13933	4
Patent technology	-0.18888	-0.19139	-0.01302	0.020431	1
Enterprise's business operation	-0.02439	-0.25797	-0.25436	-0.18888	5
Government's policy	-0.25436	-0.18888	-0.19139	-0.01302	3
Production experience	0.015057	-0.02439	-0.25797	-0.25436	7
Investment environment	-0.25797	-0.25436	-0.18888	-0.19139	6
Innovative R&D	-0.01302	0.020431	-0.13933	-2.4E-16	2

Table 16, Results with One-way ANOVA – Annual salary (Continue)

Competitive strategy	F test	Significance
Product's quality	0.463	0.630
Patent technology	1.687	0.187
Enterprise's business operation	0.016	0.984
Government's policy	0.681	0.507
Production experience	2.900	0.057*
Investment environment	0.649	0.523
Innovative R&D	0.068	0.934

Notes: P\* < 0.1, P\*\* < 0.05, P\*\*\* < 0.01

Due to slightly-significant effects of production experience on employees' annual salaries and no obvious influence, this issue is excluded from discussions and probably investigated in the following studies.

## V. Chapter 5 Conclusions and Recommendations

“Only a winner controls the channels”, this wise saying reveals the ecology in the market. Any business operator, categorized to either the traditional industry or the high-tech industry, has to own smooth marketing channels for product sales earning profits in addition to state-of-the-art technologies for manufacture of products. As a result, [the role of channels' role is](#) critical to any industry. As [one](#) important factor for the competitive strategy of one industry, the quality of one product has enough influence on one company's competitiveness because of similar products produced by TFT-LCD manufacturers. However, the influence on competitiveness of the TFT-LCD industry will be positive provided that its cluster effects are strengthened by the government. In this regard, the Two-Trillion, Twin-Star Project, a plan for the purpose of integrating upstream, midstream, and downstream enterprises of the TFT-LCD industry to develop [the](#) cluster effects, will be instrumental to competitiveness of Taiwan's TFT-LCD industry. To enhance industrial competitiveness, the government due to its policy for rewarding investment and R&D shall support to cultivate professional competent people matching requirements of the high-tech industry by developing good investment environment attracting manufacturers to invest more funds for R&D and enhancement of competitiveness.

Formatted Table

Formatted: Centered

Formatted: Centered

Formatted: Centered

Formatted: Centered

Formatted: Centered

Formatted: Centered

Formatted: Centered

Formatted: Centered

Formatted: Line spacing: Double

Formatted: Font: 12 pt

Formatted: Left, Space Before: 0 pt, After: 0 pt, Line spacing: Double

Formatted: Line spacing: Double

In addition, the channels supplying components produced by original manufacturers to downstream customers should transfer to become a bridge for two-way communication by offering both downstream customers' opinions and response from the market to upstream suppliers. As a result of the categories of channels~~categories~~ and their roles as agents to sell various products, these business operators have successfully constructed their business strategies and brands according to distinct business concepts.

Despite this successful model in the past, ~~to~~ copying the identical model may not correspond to future development because a successfully competitive strategy is changed in light of different space-time background and customers' requirements. With an emerging trend for globalization and Internet making the environment factor become critical to an enterprise's policy-making, this factor should be included into subjects of the empirical studies of researchers who are interested in similar topics. In this regard, how to develop an indicator to measure industrial environment and incorporate factors affecting industrial environment among enormous variables with respect to environment in an era with fast changes in global economy will be an important issue for ~~the~~ following research.

Formatted: Left, Line spacing: Double

## References

Ansoff, H. A. (1965). *Corporate Strategy: An Analytical Approach to Business Policy for Growth and Expansion*, New York: McGraw-Hill.

Barney J. B.(2002).*Gaining and Sustaining Competitive Advantage*.2th,Prentice-Hall.  
*Behavior*. New York: Wiley.

Chao, C. Y. (2001). "Analyses for Competitive Strategies of Taiwanese TFT-LCD Industry?", Master's Thesis, Institute of Industrial Engineering and Engineering management, National Tsing Hua University

Chen, C. T. (2000). *Statistic Analysis: SPSS for Windows and Applications*, 3rd Edition, Scholars Book, Co., Ltd., Taipei

Chen, S. Y. (2004). *Multivariate Analysis*, 3rd Edition, Hwa Tai Publishing, CO., Ltd., Taipei

Chiu, H. C. (2007). *Quantification Research (2) – Statistics Theory and Analysis Techniques*, Yeh Yeh Book, Taipei

Glueck, W. E. (1980). *Business Policy and Strategic Management*. New York: McGraw-Hill.

Formatted: Font: 12 pt

Formatted: Left, Space Before: 0 pt, After: 0 pt, Line spacing: Double

Formatted: No underline

Formatted: No underline

Formatted: No underline

[Invest in Taiwan, http://investintaiwan.nat.gov.tw/zh-tw/](http://investintaiwan.nat.gov.tw/zh-tw/)

Kaiser, H. F. (1974), "An index of factorial simplicity " *Psuohometrika*, 39, :31~42.

Lin C. B. and Liu, M. T. (2002), *SPSS 10.0 and Construction of Statistic Models*, Kings Information, Taipei

Lin, C. H. (2003), *Strategy Management*, Best-Wise Publishing Co., Ltd., Taipei

Lin, C. J (2001), "A Study for Competitive Advantages of Merging Taiwanese TFT-LCD Manufacturers by the Resource-based Theory", Master's Thesis, Institute of Industrial Management, Leader UniversityUniversity

McNichols, T. J. (1972), *Policy Making and Executive Action*, 4<sup>th</sup> ed, McGrawHill, New York.

Ming-Lang Wang (2006), "The Analysis of Difference between Recognition of Importance and Level of Implementation on Competitiveness – An Example of Taiwan's TFT-LCD Firms", Unpublished PhD's Dissertation, Institute of Technology Management, Chung Hua University.

Mintzberg, H and A. McHugh (1985), "Strategy formulation in An Adhoceracy", *Administrative Science Quarterly*, 30, :160~197.

Porter, M. E. & Takeuchi H. & Sakakibara M. (2000), *Can Japan Compete?*, Hampshire, England:Macmillan Press.

Porter, M. E., 1985, *Competitive Advantage*, New York:Free Press.

Porter, M. E., 1990, *The Competitive advantage of Nations*, New York:Free Press.

Porter, M. E.,(1980), *Competitive Strategy :Techniques for Analyzing industries and Competitors*, New York: Free Press.

Seehitoo, Dah-Hsian, (20051), *New Theory for Strategy Management – Conceptual Structure and Method for Analyses*, Best-Wise Publishing Co., Ltd., Taipei.

Tai, K. L. (2003), *Strategy Management*, first Edition, Tingmao Publish Company, Taipei

Von Neumann, J. and O. Morgenstem, (1944), *The Theory of Games and Economic*.

Website of AUO Optronics, <http://www.auo.com/auoDEV/?ls=tc>

Website of CHIMEI Optoelectronics, [http://www.cmo.com.tw/openems/cmo/index.html?\\_locale=zh\\_TW](http://www.cmo.com.tw/openems/cmo/index.html?_locale=zh_TW)

Website of Chunghwa Picture Tubes, <http://www.cptt.com.tw/cptt/chinese/index.php>

Website of INNOLUX Display Corporation, <http://www.innolux.com/>

Wei, Y. K. (2004), "Analyses for Competitive Strategies of Taiwanese TFT-LCD Industry", Master's Thesis, Institute of Business Management, Taipei University

Wortzel, R.(1979), "New Life Style Determinants of Women's Food Shopping Behavior", *Journal of Marketing*, 43, pp.28~29.

[Invest in Taiwan, http://investintaiwan.nat.gov.tw/zh-tw/](http://investintaiwan.nat.gov.tw/zh-tw/)

Website of Chunghwa Picture Tubes, <http://www.cptt.com.tw/cptt/chinese/index.php>

Website of AUO Optronics, <http://www.auo.com/auoDEV/?ls=te>

Seehitoo, Dah Hsian, (2005), *New Theory for Strategy Management – Conceptual Structure and Method for Analyses*, Best Wise Publishing Co., Ltd., Taipei

Website of CHIMEI Optoelectronics, [http://www.cmo.com.tw/openems/cmo/index.html?\\_locale=zh\\_TW](http://www.cmo.com.tw/openems/cmo/index.html?_locale=zh_TW)

Lin, C. J (2001), "A Study for Competitive Advantages of Merging Taiwanese TFT-LCD Manufacturers by the Resource-based Theory", Master's Thesis, Institute of Industrial Management, Leader UniversityUniversity

Lin, C. H. (2003), *Strategy Management*, Best-Wise Publishing Co., Ltd., Taipei

Lin C. B. and Liu, M. T. (2002), *SPSS 10.0 and Construction of Statistic Models*, Kings Information, Taipei

Chiu, H. C. (2007), *Quantification Research (2) – Statistics Theory and Analysis Techniques*, Yeh Yeh Book, Taipei

Formatted: No underline

Formatted: No underline

Formatted: Font color: Auto

Formatted: No underline

Formatted: Indent: Left: 0 cm, Hanging: 2.24 ch, First line: -2.24 ch

Formatted: Indent: Hanging: 1.92 ch, Left 0.05 ch, First line: -1.92 ch

Formatted: No underline

Formatted: Indent: Left: 0 cm, Hanging: 2.1 ch, First line: -2.1 ch

Formatted: No underline

Formatted: No underline

Formatted: Underline

Formatted: No underline

Formatted: No underline

Formatted: No underline

Formatted: No underline

Formatted: Indent: Left -0.18 ch, First line: 0.52 ch

Formatted: No underline

Formatted: Indent: Hanging: 3.08 ch, Left 0.12 ch, First line: -3.08 ch

Formatted: Font: Italic

Formatted: Font: Italic, No underline

Formatted: Font color: Orange

Formatted: No underline

Chen, C. T. (2000), *Statistic Analysis: SPSS for Windows and Applications*, 3rd Edition, Scholars Book, Co., Ltd., Taipei

Chen, S. Y. (2004), *Multivariate Analysis*, 3rd Edition, Hwa Tai Publishing, CO., Ltd., Taipei

Website of INNOLUX Display Corporation, <http://www.innolux.com/>

Chao, C. Y. (2001), "Analyses for Competitive Strategies of Taiwanese TFT-LCD Industry", Master's Thesis, Institute of Industrial Engineering and Engineering management, National Tsing Hua University

Tai, K. L. (2003), *Strategy Management*, first Edition, Tingmao Publish Company, Taipei

Wei, Y. K. (2004), "Analyses for Competitive Strategies of Taiwanese TFT-LCD Industry", Master's Thesis, Institute of Business Management, Taipei University

Barney J. B. (2002), *Gaining and Sustaining Competitive Advantage*, 2th, Prentice-Hall.

Ansoff, H. A. (1965). *Corporate Strategy: An Analytical Approach to Business Policy for Growth and Expansion*, New York: McGraw-Hill.

*Behavior*, New York: Wiley.

Glueck, W. E. (1980), *Business Policy and Strategic Management*, New York: McGraw Hill.

Kaiser, H. F. (1974), "An index of factorial simplicity", *Psychometrika*, 39, :31-42.

McNichols, T. J. (1972), *Policy Making and Executive Action*, 4<sup>th</sup> ed, McGrawHill, New York.

Mintzberg, H and A. McHugh (1985), "Strategy formulation in An Adhocracy", *Administrative Science Quarterly*, 30, :160-197.

Porter, M. E. & Takeuchi H. & Sakakibara M. (2000), *Can Japan Compete?*, Hampshire, England: Maemillan Press.

Porter, M. E., 1985, *Competitive Advantage*, New York: Free Press.

Porter, M. E., 1990, *The Competitive advantage of Nations*, New York: Free Press.

Porter, M. E., (1980), *Competitive Strategy: Techniques for Analyzing industries and Competitors*, New York: Free Press.

Von Neumann, J. and O. Morgenstem, (1944), *The Theory of Games and Economic*

Wortzel, R. (1979), "New Life Style Determinants of Women's Food Shopping Behavior", *Journal of Marketing*, 43, pp.28-29.

Formatted: No underline

Formatted: No underline

Formatted: No underline

Formatted: No underline

Formatted: No underline

Formatted: No underline

Formatted: No underline

Formatted: Indent: Hanging: 2.89 ch, Left -0.75 ch, First line: -2.89 ch

Formatted: No underline

Formatted: No underline

Formatted: Underline

Formatted: No underline

Formatted: Indent: Left -0.18 ch, First line: 0.52 ch

Formatted: No underline

Formatted: Font: Italic

Formatted: Font: Italic, No underline

<b>Page 1: [1] Formatted</b>	<b>marlon</b>	<b>4/09/2009 9:27:00 PM</b>
Font: (Default) Arial Unicode MS, Italic		
<b>Page 1: [2] Formatted</b>	<b>marlon</b>	<b>4/09/2009 9:27:00 PM</b>
Font: (Default) Arial Unicode MS		
<b>Page 1: [3] Formatted</b>	<b>marlon</b>	<b>4/09/2009 9:27:00 PM</b>
Font: (Default) Arial Unicode MS, Bold, Italic		
<b>Page 1: [4] Formatted</b>	<b>marlon</b>	<b>4/09/2009 1:39:00 PM</b>
Space After: 0 pt, Line spacing: Double		
<b>Page 1: [5] Formatted</b>	<b>marlon</b>	<b>4/09/2009 9:27:00 PM</b>
Font: (Default) Arial Unicode MS, 8 pt, Bold, Italic		
<b>Page 1: [6] Formatted</b>	<b>marlon</b>	<b>4/09/2009 9:27:00 PM</b>
Font: (Default) Arial Unicode MS, Bold, Italic		
<b>Page 1: [7] Formatted</b>	<b>marlon</b>	<b>4/09/2009 9:27:00 PM</b>
Font: (Default) Arial Unicode MS, 8 pt, Bold, Italic		
<b>Page 1: [8] Formatted</b>	<b>marlon</b>	<b>4/09/2009 9:27:00 PM</b>
Font: (Default) Arial Unicode MS		
<b>Page 1: [9] Formatted</b>	<b>marlon</b>	<b>4/09/2009 9:27:00 PM</b>
Font: (Default) Arial Unicode MS, 8 pt, Bold, Italic		
<b>Page 1: [10] Formatted</b>	<b>marlon</b>	<b>4/09/2009 9:27:00 PM</b>
Font: (Default) Arial Unicode MS, Bold, Italic		
<b>Page 1: [11] Formatted</b>	<b>marlon</b>	<b>4/09/2009 9:27:00 PM</b>
Font: (Default) Arial Unicode MS, Italic		
<b>Page 1: [12] Formatted</b>	<b>marlon</b>	<b>4/09/2009 9:27:00 PM</b>
Font: (Default) Arial Unicode MS, 8 pt, Italic		
<b>Page 1: [13] Formatted</b>	<b>marlon</b>	<b>4/09/2009 9:27:00 PM</b>
Font: (Default) Arial Unicode MS		
<b>Page 1: [14] Formatted</b>	<b>marlon</b>	<b>4/09/2009 9:27:00 PM</b>
Font: (Default) Arial Unicode MS, 8 pt, Italic		
<b>Page 1: [15] Formatted</b>	<b>marlon</b>	<b>4/09/2009 9:27:00 PM</b>
Font: (Default) Arial Unicode MS, 12 pt		
<b>Page 1: [16] Formatted</b>	<b>marlon</b>	<b>4/09/2009 9:13:00 PM</b>
Left, Space After: 0 pt, Line spacing: Double		
<b>Page 1: [17] Formatted</b>	<b>marlon</b>	<b>4/09/2009 9:27:00 PM</b>
Font: (Default) Arial Unicode MS, Not Bold, Italic		
<b>Page 1: [18] Formatted</b>	<b>marlon</b>	<b>4/09/2009 9:27:00 PM</b>
Font: (Default) Arial Unicode MS		
<b>Page 1: [19] Formatted</b>	<b>marlon</b>	<b>4/09/2009 9:27:00 PM</b>
Font: (Default) Arial Unicode MS, 12 pt, Not Bold		
<b>Page 1: [20] Formatted</b>	<b>marlon</b>	<b>4/09/2009 9:27:00 PM</b>
Font: (Default) Arial Unicode MS		