

**Country Paper**  
**Republic of China (Taiwan)**

For

**SEACEN RESEARCH PROJECT ON**  
**“THE SUPERVISORY IMPACT OF TECHNOLOGY ON SEACEN**  
**FINANCIAL INSTITUTIONS : ISSUES AND CHALLENGES”**

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The views and opinions expressed in this paper do not represent the policy or stance of Central Bank of the Republic of China (Taiwan).

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## **1. Introduction**

### **1.1 Background and Objectives**

Technology has been a major part of the development of financial markets. The use of technology has broadened and deepened finance. Financial institutions implement technology to reduce cost of operation as well as provide better services. IT has become an integral part of banking operations.

The technology transformation of the banking sector presents unique challenges to bank supervisors. It not only requires the creation of new supervisory tools for many newly developed areas such as e-banking but also the evolving banking technology and its inherent associated risks can make the prevailing supervisory framework obsolete and inadequate in a short period. Bank supervisors, therefore, must strive to continue to keep up with changing technology-driven environment to harness new technology in efforts to ensure a safe and sound banking system.

In view of facts mentioned above and the need to increase the awareness of IT supervision for financial institutions, SEACEN set up this collaborative research project with objectives as follows:

- To assess banks' financial risks in association with payment and settlement systems and the overall financial stability;
- To examine country experiences with regard to the supervisory impact of technology;
- To further develop the research into case study relevant to SEACEN training courses.

### **1.2 Summary**

There are 388 banking institutions in Taiwan. IT implementations are unavoidable in these banking institutions. The IT implementations of the banks can be divided into 3 categories:

- Category A- Core Banking means computerizing all bank's business, such as deposit, loan, foreign exchange, treasury, trustee, credit cards, remittance, ATM, etc. Almost all of the banking institutions in Taiwan were qualified to the Category A.

- Category B- e-Banking is collectively referred to bank's product and services that are distributed through electronic channel. With continuing technological innovations and competitions among existing banks in last decade, e-Banking was rapidly developed. It's obvious that Internet Banking becomes the master stream; all domestic banks have been engaging in Internet Banking.
- Category C- Consists of Management Information Systems(MIS) that is implemented by banks. Facing highly competitive markets, banks strived to improve management quality with MIS, especially in Asset and Liability Management, Risks Management, Performance Management and Data Warehousing.

The major risk in IT implementation is operational risk, despite the level of IT implementation. After reviewing all the IT-related accidents occurred in domestic banks of Taiwan, we find that most risks in IT implementation are due to improper strategies, improper design, improper management, improper operation and crimes.

Though the board and senior management of banking institution should be responsible for identifying, managing and monitoring the risks in IT implementation, the impacts on the supervisory practices still exist in keeping sufficient competence, while supervisors facing rapid changes in technological and customer service innovation of banking institutions. Banks are experiencing competitive pressure to roll out new business applications in very compressed time frames. The competition intensifies the supervisory and management challenge to ensure that adequate risk assessments and security reviews are conducted prior to implementing new applications.

As internet banking provides low cost, convenient and efficient services to customers, banks continue to promote products and services via internet. At the same time, internet threats also growing rapidly, security consideration becomes the major obstacle. Though the customers of internet banking have the responsibility to manage their own computing environment in a proper state, but most of them lacked knowledge and capabilities in technology to prevent against malevolent intruders. The supervisory authorities should concern with the coverage of

the security measures that banks had taken to protect customer privacy.

Technically, the system architectures of internet banking consist of bank server systems, internet and customer computing environment. Customers play an important role in keeping a secure e-banking operating environment. The impacts to the supervisory authorities exists because their powers doesn't reach there directly.

Nowadays, the measures taken by banks were too passive to gain the benefits from internet banking. Eventually, while internet gradually becomes the main stream of human life, banks should constructively face the obstacles in developing internet banking. To resolve the security issues that customers have to be faced with when using the internet services, that is the challenge.

## 2. Overview of the Banking Institutions in Taiwan

Banking institutions in Taiwan includes 39 domestic banks, 1 trust and investment company, 27 credit cooperatives, 289 credit departments of farmer's and fishermen's associations and 32 local branches of foreign banks. The total number of branches reached 5,836 at the end of June 2008.

**Table 1. Number of banks and branches**

Categories of Banking Institutions	Head Office	Branches
Domestic banks	39	4,556
Trust & investment Co.	1	6
Credit cooperatives	27	270
Credit department of farmer's & fishermen's association	289	852
Local branches of foreign banks	32	152
Total	388	5,836

Source : Financial Statistics Monthly at the end of June 2008

Domestic banks are relatively large in terms of their assets. They accounted for 85.6% of total assets of banking institutions at the end of June 2008. The asset share in different categories of banking institution are shown in Table 2.

**Table 2. Asset of the Banking Institutions in billion of NT\$**

Categories of Banking Institutions	Assets	Share of Total Assets
Domestic banks	30,589	85.6%
Trust & investment Co.	15	0.1%
Credit cooperatives	596	1.7%
Credit department of farmer's & fishermen's association	1,516	4.2%

Local branches of foreign banks	3,004	8.4%
Total	35,720	100.0%

Source : Financial Statistics Monthly at the end of June 2008

## 2.1 Condition and Performance of Domestic Banks

### 2.1.1 Major income components

Benefited from the net revenues other than interest, the sector's net income before tax in the first quarter of 2008 grew dramatically compared with the same period of 2007; The major income components are tabulated as follows.

**Table 3. Major income components**

	NT\$ billion		
	Jan.-Mar. 2007	Jan.-Mar. 2008	% Change
<b><i>Income</i></b>			
Net interest income	84.7	87.6	3.4
Net revenues other than interest	8.0	39.6	395.0
<b><i>Expense</i></b>			
Loan loss provision	31.0	25.3	-18.4
Other expense	66.3	74.8	12.8
<b><i>Net income</i></b>	-4.6	27.0	-

Source : Condition and Performance of Domestic Banks at First quarter's end 2008  
Central Bank of the Republic of China(Taiwan)

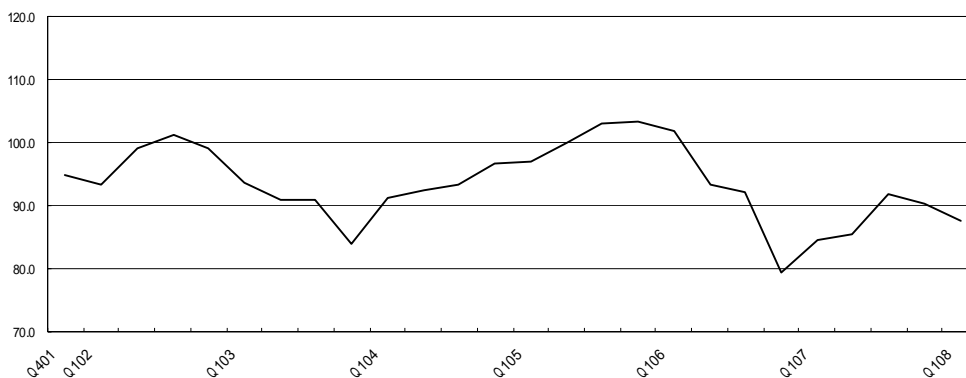
### 2.1.2 Net Interest Margin(NIM)

The NIM was NT\$ 87.6 billion during this quarter, slightly decreasing by NT\$ 2.7 billion ( -2.99% ) compared with the previous quarter(Chart 1).

**Chart 1**

### Net Interest Margin

in NTD billion



Source : Condition and Performance of Domestic Banks at First quarter's end 2008  
Central Bank of the Republic of China(Taiwan)

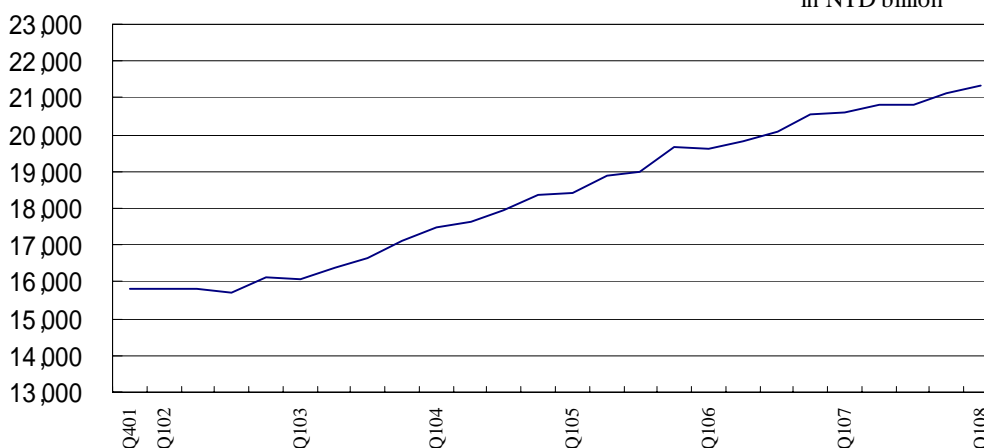
### 2.1.3 Deposits

Total deposits as of the first quarter's end of 2008 were NT\$21,333.7 billion, increasing by NT\$ 197.1 billion compared with the preceding quarter. It was mainly due to the increase in time deposits. The annual growth rate of total deposits decreased 3.23 percentage points from 7.36% as of the first quarter's end of 2007(Chart 2).

**Chart 2**

### Deposits

in NTD billion

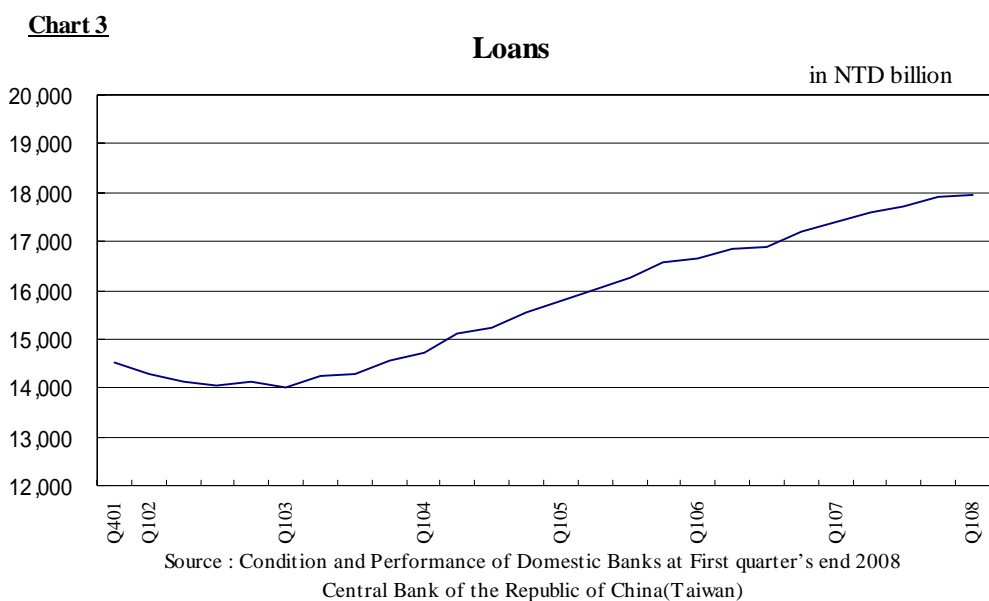


Source : Condition and Performance of Domestic Banks at First quarter's end 2008  
Central Bank of the Republic of China(Taiwan)

### 2.1.4 Loan



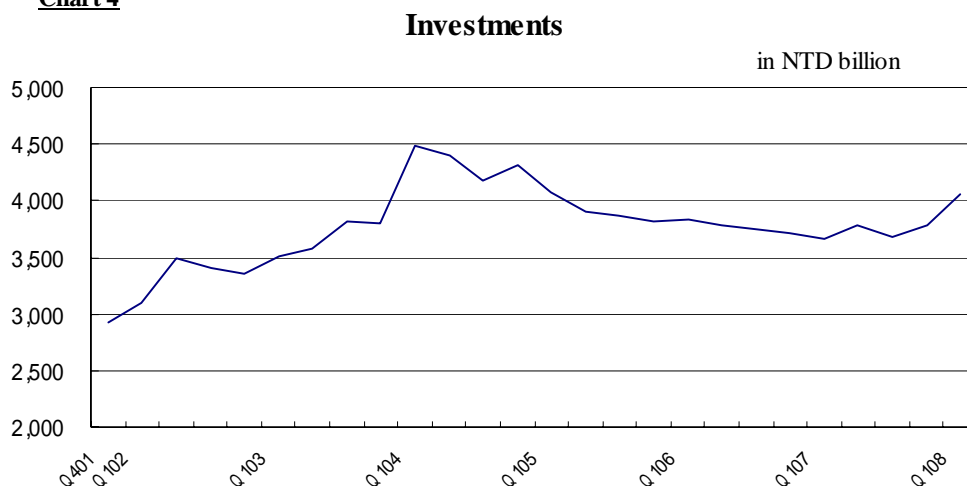
The total loans were NT\$ 17,958.0 billion at this quarter's end, increasing by NT\$ 42.9 billion (0.24%) compared with preceding quarter. The annual growth rate was 2.18%, decreasing 4.78 percentage points from 6.96% as of the same period of 2007. The trend was mainly due to a slowdown of bank claims on government and private sectors (Chart 3).



### **2.1.5 Investments**

The total investments amounted to NT\$4,049.3 billion, increasing by NT\$ 269.5 billion (7.13 %) compared with the previous quarter, mainly due to an increasing purchase on Negotiable Certificate of Deposits ( NCDs ) issued by CBC(Chart 4).

**Chart 4**



Source : Condition and Performance of Domestic Banks at First quarter's end 2008  
Central Bank of the Republic of China(Taiwan)

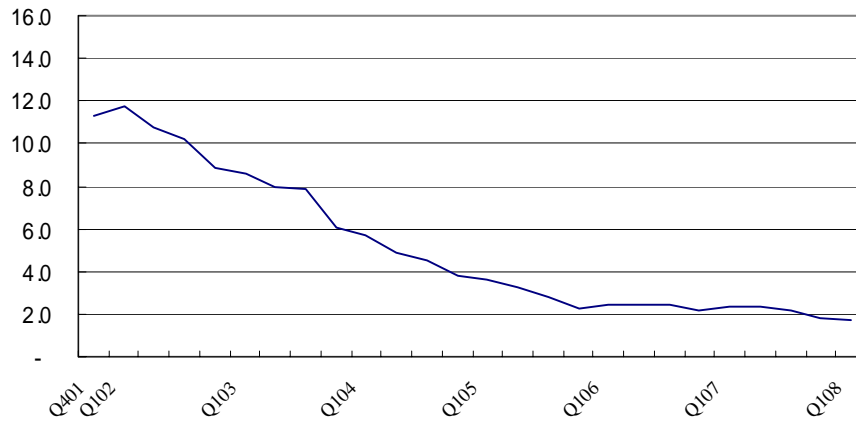
### **2.1.6 Asset quality**

The average NPL ratio at the end of this quarter went down by 0.15 percentage points to 1.68% from previous quarter. Along with the efforts to enhance risk management, the asset quality of the overall banking sector continuously kept healthy. The average provision coverage ratio was 72.32%, 4.32 percentage points up from 67.0% as of previous quarter's end. The sector's average provision coverage ratio kept on an upward trend with the strengthening capacity of risk management(Chart 5).

**Chart5**

**NPL ratio**

%



Source : Condition and Performance of Domestic Banks at First quarter's end 2008  
Central Bank of the Republic of China(Taiwan)

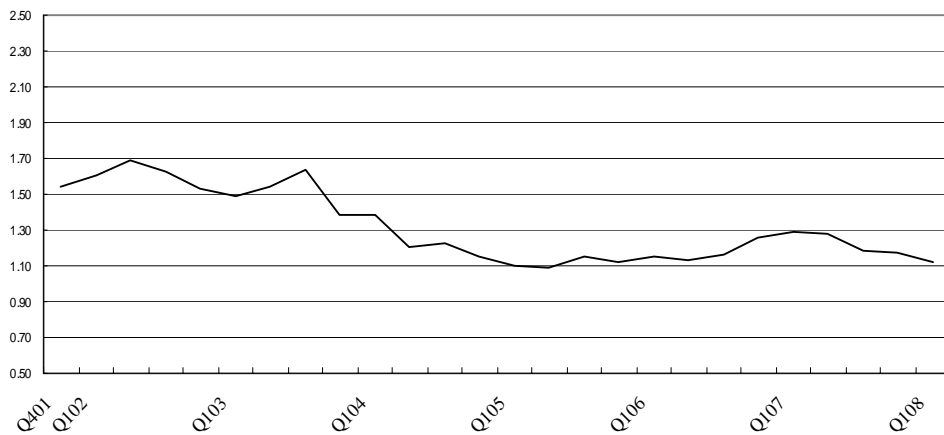
**2.1.7 Provision-to-loan ratio**

The provision-to-loan ratio was 1.13 % at this quarter's end, slightly leveled off from 1.17 % at the end of preceding quarter. It was due to the slight decrease of loan loss provisions and increase of loans, showing the banking sector's optimistic attitude for the loan policy(Chart 6).

**Chart 6**

**Provision-to-loan ratio**

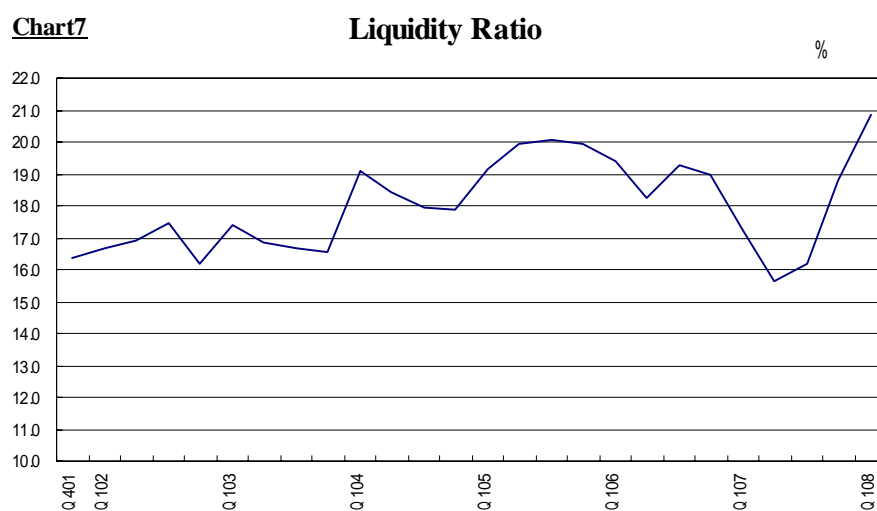
%



Source : Condition and Performance of Domestic Banks at First quarter's end 2008  
Central Bank of the Republic of China(Taiwan)

**2.1.8 Liquidity Ratio**

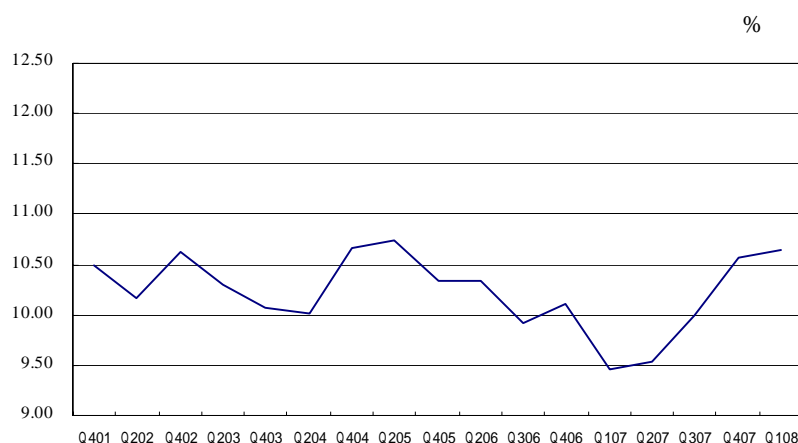
The liquidity ratios of all domestic banks were over the statutory minimum ratio (7%) in March 2008. The average liquidity ratio was 20.86%, increasing by 2.08 percentage points from 18.78% in December 2007. Generally speaking, the domestic banking sector had ample liquidity. All data were in terms of the average of the last month of quarters (Chart 7).



Source : Condition and Performance of Domestic Banks at First quarter's end 2008  
Central Bank of the Republic of China(Taiwan)

### **2.1.9 Capital Adequacy Ratio**

The average BIS capital adequacy ratio was 10.64% as of the end of March 2008, increasing by 0.07 percentage points from 10.57% at the end of December 2007. Taken as a whole, most of the domestic banks have adequate capital. The average capital adequacy ratio has been disclosed quarterly since the third quarter of 2006. The data disclosed was based on unaudited reports(Chart 8).

**Chart 8****Capital Adequacy Ratio**

Source : Condition and Performance of Domestic Banks at First quarter's end 2008  
Central Bank of the Republic of China(Taiwan)

**2.2 ATM and Credit Card**

In Taiwan, ATMs (Automated Teller Machines) provide round-the-clock service, seven days a week. Customers of banks can use a financial card at any ATM machine with the mark of Financial Information Service Co., Ltd (“FISC”) to make interbank withdrawals, account transfers, bill payments, tax payments, and balance inquiries. They can use VISA or MasterCard credit cards at any ATM machine with the “VISA” or “MASTERCARD” marks to take a cash advance. They also can use VISA or MasterCard debit cards at any ATM with the “Plus” or “Cirrus” logo to make cross-border cash withdrawals in the local currency. Statistics data are shown in Table 4.

**Table 4. ATM statistics**

End of Period	Set of ATM installed	ATM card Issued (in 1000)	Circulated ATM card (in 1000)	Count of Transactions (in 1000)	Amount of Transactions (in million NT\$)
1994	8,528	26,164	19,769	257,751	2,894,272
1995	9,536	32,512	23,658	308,061	3,498,559
1996	10,459	38,893	27,986	356,021	4,044,204
1997	11,296	46,100	32,563	398,265	4,801,748

1998	12,633	53,930	36,781	427,326	5,186,950
1999	13,683	61,639	41,698	475,666	5,882,658
2000	14,894	70,524	47,512	525,610	6,729,964
2001	15,951	79,116	53,249	539,301	6,377,504
2002	16,787	87,548	58,368	566,911	6,909,313
2003	19,097	96,898	63,760	610,372	7,180,615
2004	21,449	113,592	68,247	688,879	8,469,841
2005	24,212	130,297	73,372	727,235	9,073,712
2006	24,783	136,298	71,905	727,020	8,749,668
2007	25,121	145,178	74,252	751,266	9,440,966
2008					
Jan.	25,019	142,183	72,904	68 053	930,398
Feb.	24,989	141,070	72,678	58 325	888,881
Mar.	25,138	140,047	72,457	64 718	905,890
Apr.	25,271	140,601	72,781	62 840	926,051
May.	25,402	141,207	73,127	64 210	953,673
Jun.	25,461	141,816	73,322	63 380	980,495

Source : Financial Supervisory Commission, Executive Yuan, R.O.C

The largest credit card networks in Taiwan are Visa and MasterCard. The National Credit Card Center also provides credit cards that are only available in Taiwan. Statistics data are shown in Table 5.

**Table 5. Credit Card statistics**

End of Period	Circulated Credit Cards (in 1000)	Amount of Credit Card Transactions (in million NT\$)		
		Total Tran.	Local Tran.	Overseas Tran.
1994	2,709	131,553	-	-
1995	3,676	190,653	-	-
1996	5,467	272,387	227,386	45,001
1997	7,665	374,425	322,480	51,945
1998	10,640	491,097	441,505	49,592
1999	13,575	597,786	545,830	51,956

2000	18,276	719,770	660,934	58,836
2001	24,135	771,861	716,162	55,699
2002	31,591	873,599	813,492	60,107
2003	37,850	998,885	941,637	57,248
2004	44,182	1,254,482	1,177,015	77,467
2005	45,494	1,420,984	1,341,336	79,648
2006	38,324	1,380,462	1,299,164	81,298
2007	36,437	1,413,455	1,329,901	83,554
2008				
Jan.	36,163	129,524	122,678	6,845
Feb.	35,988	109,103	103,110	5,993
Mar.	35,947	106,360	99,848	6,512
Apr.	35,723	112,181	105,260	6,921
May.	35,576	113,625	106,697	6,928
Jun.	35,446	134,505	127,809	6,696

Source : Financial Supervisory Commission, Executive Yuan, R.O.C

### **3. Survey of the IT Implementation**

#### **3.1 The development of technology infrastructure**

##### ***3.1.1 Communication & Internet***

Chunghwa Telecom is the major provider for communication infrastructure in Taiwan. It provides following communication facilities:

- Leased Line
- Dedicated Line
- Broadband Networks
  - ADSL
  - DSL
- ATM (Asynchronous Transfer Mode) Service
- Frame Relay Service
- WLAN Services
- ISDN Dial-up
- FTTx (which includes all fiber technologies from fiber-to-the-kerb to fiber-to-the-home, such as FTTN, FTTC, FTTB and FTTH)
- Satellite ( iDirect VSAT satellite and mesh networks rental services)

According to the results of the 2007 Survey of the Current State of the level of demand for broadband, mobile and wireless applications among Taiwanese households, conducted by Institute of Information Industry and sponsored by the Industrial Development Bureau of Ministry of Economic Affairs, as of August 2007, 79% of households in Taiwan owned computers; 71% of households had Internet access; 69% of households had broadband access and 96% of online households were using broadband connections.

Data released by the National Communications Commission (NCC) indicated that there were a total of 24.3 million mobile phone subscribers (including 2G, 3G and PHS) in Taiwan by December 2007. This represents an increase of approximately 660,000 subscribers or 2.8% compared with the first half of 2007. The mobile phone penetration rate had climbed up to 106%, 3% higher than the first half-year.

Table 6 shows the communication infrastructures installed in Taiwan.



**Table 6. Communication Infrastructures installed in Taiwan**

<u>No.</u>	<u>Item</u>	<u>Yes/No</u>
1	Communication Network	
	Cable (Phone line)	Yes
	Satellite	Yes
	Fiber Optic	Yes
2	Use of Cellular Phone	
	Is it relatively wide spread?	Yes
3	Use of Internet	
	Is it relatively wide spread?	Yes

Source : Survey of this research project

### **3.1.2 Payment systems**

There are 5 major payment systems in Taiwan:

- **CBC Interbank Funds Transfer System**

The CBC Interbank Funds Transfer System (CIFS) was established in 1995, operated and governed by the Central Bank of the Republic of China(Taiwan), here after referred as CBC. Participants of the CIFS comprise banks, investment and trust companies, and bills finance companies. Those which maintain transaction accounts with the CBC may directly use the CIFS to transfer funds. Payment instructions are also sent over the CIFS for settling obligations on check clearing, adjusting reserve account balances, or making payments associated with interbank loans, bill / bond transactions.

Previously, the CIFS is operated in a dual system of designated-time netting and real-time gross settlements. To minimize settlement risk, the Bank abolished designated-time settlements in September 2002. That is, the CIFS is embedded with real-time gross settlement (RTGS) function. Payments are processed through the CIFS individually and continuously during the day in real time.

- **Interbank Remittance System**

The Interbank Remittance System (IRS), launched in August 1987, is

operated by the FISC. The IRS provides remittance services to the general public, government agencies, and banks.

- **Credit card and Shared ATM System**

The largest credit card networks in Taiwan are Visa and MasterCard. The interbank settlements of credit card transactions between card-issuing banks and the retail merchant's banks are made by the FISC, or the National Credit Card Center.

The Shared ATM System is operated by the FISC. All the participants in the IRS can join the Shared ATM System to provide services of 24-hour cross-bank withdrawal, balance inquiry, funds transfer, credit card cash advance, and IC card loading. Net positions are settled daily through a special account maintained at the CBC.

- **Clearing House System**

The CBC supervises the Taiwan Clearing House System to handle clearing and settlements of checks, promissory notes, and drafts among banks. All banks in Taiwan using these facilities should open reserve accounts at the CBC. And the net settlement balances will be debited or credited to these accounts. The Taiwan Clearing House System includes 1 headquarter located at Taipei and 15 local clearing houses outside the Taipei area.

Participants of the system include banks, credit cooperative associations, credit departments of farmers' associations and fishermen's associations. The CBC is also one of the participants in the Taiwan Clearing House System.

- **Central Government Securities Settlement System**

Since the introduction of the Central Government Securities Settlement System (CGSS) in September 1997, central government bonds have been issued in the book-entry form. In October 2001, Treasury bills were added to the system and have been issued in the book-entry form since then. The CGSS is a real-time gross settlement system (RTGS) for the issuance, transfer, redemption, and interest payment of central government bonds in the form of accounting entries on computer

records.

Ownership of book-entry central government securities is recorded in a two-tier system of accounts. Only the clearing banks are eligible to have book-entry bond accounts and fund accounts (also serve as reserve balances) directly with the Treasury Department of the CBC. All other individuals or entities are required to hold such accounts with the clearing banks.

Currently, book-entry transactions within a clearing bank can be made on a delivery-versus-payment (DVP) basis while those between clearing banks cannot. To reduce the settlement risk in interbank transactions, the CBC plans to link the CGSS with CIFS to allow clearing banks to handle related settlements on DVP basis.

Table 7 shows the information of payment systems in Taiwan.

**Table 7. Information of Payment Systems in Taiwan**

<u>No.</u>	<u>Item</u>	<u>Yes/No</u>
1	National Payment System	
	Operated by government agency / central bank	Yes
	Operated by an independent or private company	Yes
2	Automated/Computerized Payment System	Yes
3	RTGS	Yes
4	National Securities Settlement System	
	Operated by government agency / central bank	Yes
	Automated/Computerized Settlement System	Yes

Source : Survey of this research project

### **3.2 The presence of technology-supported financial products and services**

Banks are highly competitive in Taiwan. All the domestic banks provide Internet Banking service, including WebATM which provides ATM services (except cash withdraw) via internet. Table 8 shows the presence of

technology-supported financial products and services in Taiwan.

**Table 8. Technology-supported financial products and services**

<u>No.</u>	<u>Item</u>	<u>Yes/No</u>
1	Credit Card	
	National (only used in the country)	Yes
	International	Yes
2	Debit Card	
	National (only used in the country)	Yes
	International	Yes
3	ATM	
	Individual bank	Yes
	Nationally-Shared ATM	Yes
	Internationally-Shared ATM	Yes
4	Electronic Fund Transfer (EFT)	Yes
5	EFT at Point of Sale	
	National (only within the country)	Yes
	International	Yes
6	Remittance Service	
	Domestic companies	Yes
	International companies	Yes
7	Phone Banking	
	Informational	Yes
	Transactional intra bank	Yes
	Transactional inter bank	Yes
8	Mobile/SMS Banking	
	Informational	Yes
	Transactional intra bank	Yes
	Transactional inter bank	Yes
9	Internet Banking	
	Informational	Yes
	Transactional intra bank	Yes
	Transactional inter bank	Yes
10	Pre-paid card	Yes

Source : Survey of this research project

### 3.3 The heterogeneity/homogeneity of the technology implemented in the financial institutions.

In 1970's, most of the banks in Taiwan began to develop IT-related applications. With the encouragement from major authorities, all the domestic banks set up its core banking system at 1980's, which mainly operate deposit and loan business of banks.

In 1986, Financial Information Service Co., Ltd (FISC) announced Cross-Bank Systems, which provide Cross-Bank shared ATM and Cross-Bank remittance service. Banks had to develop it's own Cross-bank system to provide these services to it's customers. Banks joined into the Cross-Bank network gradually. Finally, all banking institutions including credit departments of farmer's and fishermen's associations took part in the network. It's an important progress in developing payment infrastructure for convenient and automatic banking services in Taiwan.

The major authorities encourage banks to computerized it's core business. As a result, bank's business including deposit, loan, foreign exchange, credit cards, investments, trustee, securitization, derivative and structure products were all supported by technologies.

To conduct better management and to comply with Basel II, banks also develop technologies to support various type of risk management, such as credit risk, market risk, operational risk, asset and liability management, etc..

Table 9 shows he requested survey regarding implementations of IT-related applications in addition to IT-related products.

**Table 9. Implementation of IT-related applications**

<u>No.</u>	<u>Item</u>	<u>Yes/No</u>
1	Core Banking: General Ledger, Third Party Fund, Loan, and Consumer Information File	Yes
2	Treasury	Yes
3	Remittance	Yes
4	Trade Finance	Yes
5	Corporate Online Service	Yes

Source : Survey of this research project

### ***3.3.1 Heterogeneity***

- The banking institutions using different platform to implement technologies may adopt different security management policies and procedures. It is not easy to impose a unique security standard for different platforms, that certainly increases the difficulty in supervisory tasks. The managements of bank should be responsible for monitoring the adequacy in security control.
- Commercial banks were highly competitive and develop technologies to provide services to customers with state of the art, while limited-size banking institutions still adopt technology as automatic calculator.

### ***3.3.2 Homogeneity***

- Most of the domestic banks develop technology to support it's core business by itself. The core business context supported by technologies had high similarity.
- Almost all the domestic banks adopt centralized architecture to implement technologies.

## 4. Impacts of IT Implementation on Financial Institutions

### 4.1 Risks Assessment

IT implementations are unavoidable in banking institutions of Taiwan. To increase efficiency, provide better services, obtain better profits and compete for markets, they all need supports from IT implementation. The IT implementations of banking institutions in Taiwan can be divided into 3 categories :

**Table 10. Category of IT Implementation in Banking Institutions**

Category	Scope of IT Implementation
Category A	Core Banking
Category B	e-Banking
Category C	Management Information System

Source : Survey of this research project

Category A Core Banking means computerizing all bank's business, such as deposit, loan, foreign exchange, treasury, trustee, credit cards, remittance, ATM, etc. Most of the banking institutions in Taiwan were qualified to the Category A.

Category B e-Banking were collectively referred to bank's products and services that are distributed through electronic channel, such as Phone Banking, Home Banking, Firm Banking, Mobile Banking, Internet Banking etc. With continuing technological innovations and competitions among existing banks in last decade, e-Banking was rapidly developed. It's obvious that Internet Banking becomes the master stream. All domestic banks have been engaging in Internet Banking.

Category C consists of Management Information Systems(MIS) that implemented by banks. Facing highly competitive markets, banks strived to improve management quality with MIS, especially in Asset and Liability Management, Risks Management, Performance Management and Data Warehousing.

IT implementation incurred risks to all the industries, especially in financial industry, not only for it's broadened and deepened implementations in financial institutions, but also with the consideration that it influence the stability of total financial system.

#### 4.1.1 General risks

The major risk in IT implementation is operational risk, despite the

level of IT implementation. Reviewing all the IT-related events occurred in domestic banks of Taiwan, we find that most risks in IT implementation are due to improper strategies, improper design, improper management, improper operation or crimes. In general, we assess risks from the security objectives of IT implementation:

- Integrity - When data is incomplete or inaccurate, it may cause Operational Risk, Strategic Risk, Reputation Risk, Legal Risk and Compliance Risk.
- Confidentiality - When information is not kept secret or unauthorized access to system, it may cause Operational Risk, Reputation Risk, Legal Risk and Compliance Risk.
- Availability - When the system is not available for use, it may cause Operational Risk, Reputation Risk, Strategic Risk and Compliance Risk.
- Effectiveness & Efficiency - When the system does not deliver an expected function or cause a sub-optimal use of resource, it may cause Operational Risk.

#### **4.1.2 Specific risks**

When IT system was implemented to support the management of specific risks, such as Liquidity Risk and Credit Risk, it would cause the specific risks while the IT system does not work with the expected function.

#### **4.2 Risks and Impacts of the use of IT to the supervisory practices**

Table 11 shows the risks that need to be addressed and controlled in the financial system.

**Table 11. IT-related Risks in financial system**

<u>No.</u>	<u>Item</u>	<u>Yes/No</u>
1	Operational Risk	Yes
2	Liquidity Risk	Yes
3	Credit Risk	Yes
4	Strategic Risk	Yes
5	Reputation Risk	Yes
6	Legal Risk	Yes
7	Compliance Risk	Yes

Source : Survey of this research project

Currently, the banking institutions in Taiwan do not have any



quantitative approach to measure the risks in IT implementation. As generally acknowledged, the board and senior management of banking institution should be responsible to identifying, managing and monitoring the risks in IT implementation. They should set up proper procedures to make sure risks are assessed and well managed, and that the banking operations are also compliant with the regulations.

In Taiwan, the banking institutions should acquire the approval from major authorities before providing a brand-new product or service to its customers, especially with technological innovation. The major authorities always concern with what risks were assessed and what management planned to mitigate the risks, before approving the application of a brand-new product or service.

The impacts on the supervisory practices exist in keeping sufficient competence, while supervisors facing rapid changes in technological and customer service innovation of banking institutions. Banks are experiencing competitive pressure to roll out new business applications in very compressed time frames. The competition intensifies the supervisory and management challenge to ensure that adequate risk assessments and security reviews are conducted prior to implementing new applications.

## **5. Prevailing IT Supervisory Framework and Regulations**

### **5.1 Principles**

In order to ensure the stability and safety of the financial markets, the following principles are adopted in all aspects of supervision (including IT supervision) :

- To maintain the soundness of the banking system with a liberal and predictable legal environment;
- To protect the interest of depositors;
- To develop the banking sector and enhance its market competitiveness; and
- To establish a financial management system in line with international norms and standards.

### **5.2 Regulatory framework and regulations**

#### **5.2.1 Legal Basis**

The Banking Law, Financial Holding Company Law, Securities & Futures Law, and Insurance Law are the main pillars of the legal framework for the domestic financial market. In addition, there is a separate Offshore Banking Act that governs offshore banking units and the Law governing Credit Cooperatives which regulates community financial institutions.

To improve legal basis and prevent technology-related crimes, new legislations have been developed to reinforce the foundation of the legal system of Taiwan, such as Criminal Law, Consumer Protection Law, Money Laundering Control Act, Data Protection Law, Electronic Signature Law, etc.

#### **5.2.2 Regulatory Agencies**

- Financial Supervisory Commission

Pursuant to the Regulation Governing the Establishment and Organization of the Financial Supervisory Commission of the Executive Yuan enacted on 10 July 2003, the Financial Supervisory Commission (FSC) was inaugurated and commenced operation since 1 July 2004. The authority of financial supervision has shifted from the Ministry of Finance(MOF) to the FSC since then.

The primary function of the Commission is to consolidate the supervision

and examination of the banking, securities and futures, insurance as well as the financial holding companies under one supervisory authority with greater independent power. The FSC functions as an independent agency that directly reports to the Executive Yuan. Its responsibilities include supervision, examination, and inspection of the financial market.

- The Central Bank of the Republic of China(Taiwan)

The Banking Law and the Law Governing the Central Bank of the Republic of China mandates the Central Bank of the Republic of China (CBC) to implement monetary policy and foreign exchange regulations. The CBC adjusts the national money supply to promote its policy goals of price stability and sound economic growth. The CBC also concerns with sound operation of banks and exchange rate stability.

Since the FSC was set up on 1<sup>st</sup> July 2004, the Bank stopped carrying out regular full-scope on-site examinations of individual financial institutions. To facilitate the implementation of the central bank's policies, the Bank retains the authority to carry out target examinations on issues related to monetary, credit and foreign exchange policies and payment system. In addition to on-site target examinations, the Bank implements off-site monitoring to identify the weakness of individual financial institution and to grasp the whole picture of financial system in order to response appropriately in a timely manner.

- Bureau of Agricultural Finance (BOAF), Council of Agriculture

The BOAF is responsible for supervising agricultural finance institutions, including the credit departments of farmers' and fishermen's associations.

### **5.2.3 Regulations**

In addition to laws developed to prevent technology-related crimes, the major regulations applied in technology supervision are as follows:

- Rules Governing Information Security Management of Executive Yuan and Organizations under the Yuan;
- Implementation Rules for Internal Audit and Internal Control System;
- Information System Security Standards for Financial Institution;
- Risk Management Principles for Electronic Banking; and

- Guidelines for Security Measures of Financial Institutions for Electronic Banking Services.

**Table 12. IT supervisory framework**

<u>No.</u>	<u>Item</u>	<u>Yes/No</u>
1	Is IT Implementation reported regularly?	No
2	Is IT audit conducted?	Yes
	By bank / IT supervisors from supervisory authority	Yes
	Off-site	No
	On-site	Yes
	By internal or external (third party) auditors (on-site)	Yes
	Special IT audit/examination outside regular examination (on-site)	Yes
3	Does the formal framework exist?	Yes
4	If yes, is it stipulated in a regulation?	Yes
5	Is there minimum requirement in IT Implementation?	Yes
6	Do the following items implemented:	
	Active supervision by Top Management (IT Steering Committee)	Yes
	IT Policy and Standard Operating Procedure	Yes
	IT risk is included in the risk-based management	Yes
	System development life cycle	Yes
	All layers of IT system	Yes
	Internal control system for IT Implementation	Yes
	Business Continuity Plan and Disaster Recovery Plan	Yes
	Periodical IT audit (internal/external)	Yes

5	Because it involves supervision procedure, is IT outsourcing especially regulated?	Yes
6	Because it involves consumer protection, is E-banking products especially regulated?	Yes
7	Are any IT-related laws (cyber law, e-commerce, m-commerce, digital signature) installed?	Yes

Source : Survey of this research project

### **5.3 References / orientation for the prevailing supervisory framework**

Prior to the establishment of the FSC, the original authority, the Ministry of Finance(MOF), in addition to its jurisdiction over national treasury, taxation and customs, was in charge of the supervision of Taiwan's financial market through its three major subordinate agencies, namely, the Bureau of Monetary Affairs(BOMA), the Securities and Futures Commission, and the Department of Insurance. Among the agencies, BOMA is responsible for the formulation and implementation of policies and regulations.

The authority of financial supervision had shifted from the Ministry of Finance(MOF) to the Financial Supervisory Commission (FSC) since 1 July 2004. Most of the IT supervisory framework remain unchanged.

### **5.4 IT supervisory and audit practices**

There are three major layers of IT audit that are conducted in banking institutions of Taiwan:

- Self-audit conducted by Information Department itself;
- Internal-audit conducted by Audit Department that subordinates to the Board of Directors; and
- External-audit conducted by supervisory authority.

#### **5.4.1 Self-audit**

Information Department in banking institutions was requested to conduct self-audits regularly. The Department has the responsibility to help the bank achieve security objectives in IT implementations. Self-audit is a management approach for the department to review if the policies and procedures were properly complied with.

The contents of self-audit should be well documented. The Department

should conduct 2 times full scope self-audits and 10 times targeted self-audit per year. The self-audit activities are monitored by audit department of the Board of Directors.

#### **5.4.2 Internal-audit**

Internal-audits are conducted by Audit Department that subordinates to the Board of Directors, the Department is requested to conduct full-scope on site internal audit at least once a year. It should be conducted by IT-specialized auditors, and audit reports should be submitted to supervisory authorities.

#### **5.4.3 External-audit**

IT examinations are included within regular full-scope on-site examination conducted by supervisory authority. The frequency of regular full-scope examination depends on the performance of the banks. Average frequency would be once per 12-18 months. IT examinations are conducted by specialized IT auditors, in accordance with the examination handbooks. Any finding in the examination would be recorded and followed up subsequently.

**Table 13. Regarding on-site IT audit**

<u>No.</u>	<u>Item</u>	<u>Yes/No</u>
1	Is it conducted regularly?	Yes
2	If not regularly, is it conducted case by case?	
3	If regularly, objects of audit:	
	Organization and Management	Yes
	System development process	Yes
	Operation	Yes
	Software and Application, including E-Banking	Yes
	Security (authentication, authorization and protection – including audit trails, encryption)	Yes
	BCP/DRP	Yes
	Communication Network	Yes
	Outsourcing process	Yes
	Internal Auditing	Yes

Source : Survey of this research project

#### **5.5 IT-specialized supervisors / auditors**

The Financial Supervisory Commission(FSC) is the sole statutory financial supervisor, the Commission have 17 specialized IT supervisors / auditors.

#### **5.6 Coordination amongst financial institution authorities**

Pursuant to the Financial Supervisory Commission Act, there is a coordination mechanism among financial authorities in place. The “Financial Supervision Coordination Group” which is composed of senior officers of the FSC, the CBC and other related financial authorities meets every month and when necessary to coordinate and cooperate on issues of financial supervision, management and examination.

## **6. Issues and Challenges**

### **6.1 Issues**

#### **“In internet banking, What appropriate measures the banks had taken to ensure adherence to customer privacy requirements ?”**

As internet banking provides low cost, convenient and efficient services to customers, banks continue to promote products and services via internet. At the same time, internet threats also growing rapidly, security consideration becomes the major obstacle in promoting internet banking.

Most of the Banks which provide internet banking services would emphasize that they have been:

- Adopting security measures in transaction level:  
Banks using strong encryption supports to ensure message confidentiality, integrity, authentication, non-duplication and non-repudiation.
- Establishing Security Policies and setting Operating Guidelines:  
Only authorized persons may access the systems, audit trails were reserved for any access attempts.  
To achieve security objectives, comprehensive Security Policies and Operating Guidelines are implemented, enforced and monitored by the management.
- Improving the reliability of the system:  
To improve the reliability of the computer system, computer systems should be made ready to provide high usability, and decrease the chances of non availability.
- Protecting bank’s internal systems from malicious attacks:  
Banks had taken measures to protect internal computer systems from malicious attacks, such as firewalls, virus detection software and intruder detection systems, etc.

In March 2004, four commercial banks in Taiwan reported that their customers were infected by Trojan Horse. The criminals using Trojan Horse to steal password that the customer used to access services provided by internet banking, and then, funds in customer’s account were transferred away. This event caused temporary stop service in non-previously-agreed fund transfer of all the banks. The supervisory authority requested banks to reassess the risks and the measures in mitigating risks, and that banks should reopen this service with at least 2-factor authentication



procedures. This event illustrated that the privacy of customers was intruded in customer's own computing environment.

Though the customers of internet banking have the responsibility to manage their own computing environment in a proper state, most of them lacked for knowledge and capability in technology. They may be infected while he/she is just browsing the web pages, or opening an e-mail. Especially, most customers of bank lacked knowledge in technologies to prevent against malevolent intruders. In many cases, they were intruded and may not have any awareness.

The internet had become an important channels for banking business. The supervisory authorities should concern with the coverage of the security measures that banks had taken to protect customer privacy.

## 6.2 Challenges

**“In internet banking, What appropriate measures the banks could take to assist it's customers to manage their own computing environments in a proper state? ”**

Banks that provide internet banking services recognized the weakness existing in customer's side. To mitigate the risks, most of banks take the following measures:

- Providing security relative information to it's customers.  
The security relative information is provided in booklets when customers open the internet banking service. Most of the information provided were basic and not up to date.
- Taking the agreement from customers that they recognized the risks existed and that they had the responsibilities to maintain their own computing environment in a proper state.

Consequently, the customer still hadn't the abilities to prevent against malicious intruders. Technically, the system architectures of internet banking consist of bank server systems, internet and customer computing environment. Customers play an important role in keeping a secure e-banking operating environment. The impacts to the supervisory authorities exists because their powers doesn't reach there directly.

Nowadays, the measures taken by banks were too passive to gain the

benefits from internet banking. Eventually, while internet gradually becomes the main stream of human life, banks should constructively face the obstacles in developing internet banking. To resolve the security issues that customers have to be faced with when using the internet services, that is the challenges.

## **7. Policy Recommendation**

The following were major IT implementation policies that are generally adopted by IT auditors of Financial Inspection Division, Central Bank of Republic of China (Taiwan), while IT examinations were conducted to Financial Institutions.

- Organic policy  
Proper segregation of duties are required, especially among Operating System engineering, Application System design and Data control.
- Employee security policy  
The employees should recognize and comply with security policies.
- Information Assets management policy  
Important information assets should be managed by specified employee; risks and protection measures should be assessed periodically.
- Software policy  
The implementation of software should be conducted by team which consists of members from IT, accounting, auditing and end user. Risks should be assessed in advance, and all security measures should be made ready before on production.
- Change policy  
Any change in computing environment should be conducted under approval. Detailed evidences should be kept and reviewed regularly.
- Data access security policy  
Each application system should be properly taken into account of various access requirements to define various access rights.
- Disaster Recovery Plan & Business Continuity Plan  
DRP & BCP should be properly planned for each application system, and periodically exercised.
- Physical and environmental security policy  
Information security requirements should be considered in office areas and restricted areas, and enforced practically.
- Network security policy  
Secure data Transmission in Internal and external networks should be also

properly planned and enforced.

- Outsourcing policy

In case of outsourcing, risks should be assessed in advance. Proper risk mitigation measures should be planned in advance and enforced.

- Legal compliance policy

Laws, regulations and any contracts that are applicable to IT related activities should be periodically reviewed to comply.

- Internal auditing policy

Periodical internal auditing should be conducted to ensure the soundness and compliance in IT relative operations.

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