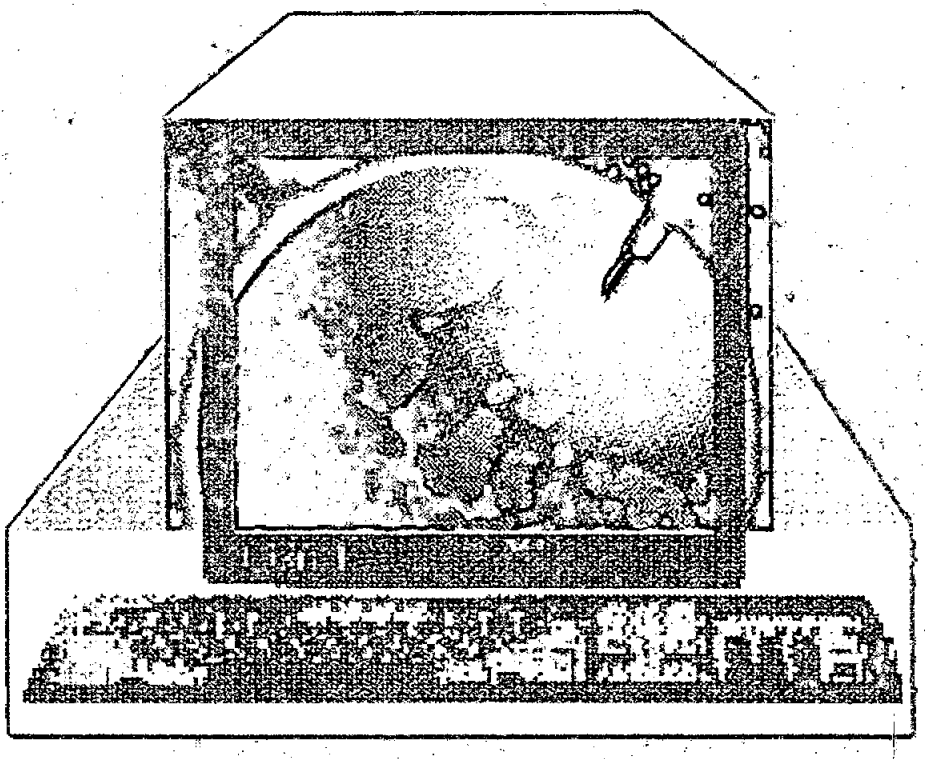
SUPERVISORY IMPACT OF TECHNOLOGY ON SOUTH EAST ASIAN BANKING



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The South East Asian Central Banks (SEACEN)
Research and Training Centre

The Supervisory Impact of Technology on South East Asian Banking

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PREFACE

Driven by competitive pressure, banks around the world have been rapidly embracing information technology (IT) to develop and deliver financial services. The consequent risks that can threaten the systemic financial stability makes it incumbent upon bank supervisors to better understand the underlying technology and its attendant risks. The SEACEN Collaborative Project on *Supervisory Impact of Technology on South East Asian Banking* was conducted in response to this concern.

This research project aims at reviewing the current state of information technology in the banking industry in the SEACEN region. It also provides an assessment of the region's supervisory response to the technology-related risks, and offers policy recommendations on the various aspects of bank supervision, including an effective supervision framework, training requirements and regional cooperation. The SEACEN Centre hopes that the findings of this research project would help to strengthen banking supervision as well as create greater awareness of the kind of training that bank supervisors need to keep up with the technology-driven environment.

The SEACEN Centre is indebted to the Federal Reserve Bank of Chicago for its technical assistance in making available Mr. William B. Barouski, Senior Vice President, and Mrs. Margaret M. Beutel, Director of the Emerging Technology Unit, to lead the project. We are also grateful to our member banks for assigning their highly qualified staff to participate in the project. The professionalism and dedication of the project team are indeed highly commendable. We would also like to thank Dr. Delano Villanueva, the Centre's previous Deputy Director (Research), for securing the technical assistance from the Federal Reserve Bank of Chicago, and for chairing both of the research workshops; Mrs. Kanaengnid T. Quah for coordinating the research project; and Ms. Karen How for reformatting the manuscript.

The views expressed in this research report are those of the authors and do not necessarily reflect the views of The SEACEN Centre, its member banks or the Federal Reserve Bank of Chicago.

Tan Wai Kuen
Officer-in-Charge

The SEACEN Centre
Kuala Lumpur
May 1999

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EXECUTIVE SUMMARY

As technology becomes an increasingly appealing vehicle for developing and delivering financial services, it has also created strong competitive pressure in this arena around the world. The financial services industry's desire to adopt technology-based solutions makes it incumbent upon bank supervisors to better understand the underlying technology and its attendant risks.

The deployment of technology within each of the SEACEN countries and throughout the region is closely linked to the state of the economy, political atmosphere, demographic factors and communications infrastructure. While the effects of the Asian economic crisis and specific responses by the member countries have varied widely, the growth and deployment of technology was adversely affected by events of 1997. The decline in currency values had a significant impact on the cost of all imports, including the technology needed to fuel infrastructure development. With this higher cost structure, national deployment agendas have been delayed and local industries, including the banking sector, have not enjoyed the full benefits of the declining cost of technology occurring elsewhere in the world. With consumer demand and adoption rate of technology linked to educational levels, each of the SEACEN countries face a natural state of equilibrium which may, however, be positively shifted by foreign workers initially, and formal technical training initiatives in the longer term. As factors contributing to the crisis are addressed and currency values return to more stable levels, pent-up IT spending has the potential to attract providers of technology services and knowledge workers to the region.

The face of banking in the region, and the financial services industry overall, has changed dramatically as a result of the economic crisis. Financial reform and deterioration of asset values have resulted in numerous bank closures, mergers and consolidations. The funding requirements needed to recapitalize the banking industry have provided an incentive for many countries to relax or eliminate foreign ownership restrictions on the financial services industry. With greater opportunity for global competitors to enter the region, technological competitiveness will influence the strategic direction of domestic banks in those locales. Government-backed technology initiatives and greater access to the Internet will ultimately influence consumer use and demand for electronic retail banking products. With this, banks will face increasing challenges in balancing their IT risk management process

and use of technology solutions – whether applications are adopted from a turnkey provider or developed locally.

The ability of financial institutions, regardless of size, to reduce their cost structure via electronic delivery systems has wide appeal in a region where banks have traditionally built physical structures to serve their clientele. The Internet, as an evolving banking technology, has received attention throughout the region for opportunities to provide both cost savings and revenue growth. With certain supervisory restrictions and limited access to personal computers in some countries, growth of Internet banking will remain tempered in parts of the region. Conversely, PC banking allays certain open-network concerns of the Internet by affording banks the opportunity to provide customer-driven transaction processing in a closed network delivery system. Notwithstanding banks' efforts to incent customers to shift to these less-costly delivery systems, growth in the use of certain of these channels will likely result from government-sponsored initiatives, as in the case of integrated chip cards. Widespread use of telephone call centers throughout the region has resulted in back-office operating efficiencies and improved customer service. As bank consolidation continues to occur, migration to more integrated database systems, or warehouses, will present opportunities for interoperability between applications, product cross-selling and enhanced risk-management systems.

The supervisory environment within the region faces a state of potentially rapid change and transition, brought about by the region's economic crisis, as well as by the fast pace of technological change in the global marketplace. While technology investment and deployment decisions in the region effectively slowed in response to strained financial conditions, supervisory resources will be challenged to keep pace with the projected rate of change as economic conditions normalize. Not only will attention need to be directed to the control environment for evolving technologies, supervisors will also need to focus on the implementation of effective risk management systems which address comprehensive risk profiles of technology-adopting organizations.

As globalization continues to transform the financial services industry, banking supervisors throughout the world are collectively developing and applying common methodologies to assess risk exposure of supervised institutions. Adoption of such practices not only provides a more seamless supervisory approach to the consolidated organization, it also fosters cooperation among cross-border supervisors – thereby

enabling an enterprise-wide assessment of risk-management processes. To take full advantage of such guidance products, banking supervisors must understand the IT risk profiles of the institutions under their authority. Once the range of exposures is identified, resource requirements and staff development needs may be determined to more effectively conduct risk-focused supervisory programs. Through this risk identification, technically-trained supervisory personnel would be allocated to assess those institutions with greater IT risk exposure. Through the SEACEN relationship, banking supervisors should identify common IT staff-development objectives and collaborate in their pursuit of technical staff training.

I. PROJECT SCOPE AND REPORT METHODOLOGY

A. INTRODUCTION[1]

"The rapidity of technological change, the globalization of finance, and the institutional expansion of financial competition are changing the banking environment so dramatically that regulators, of necessity, must continually re-evaluate their strategy and procedures."

Alan Greenspan, Chairman
Board of Governors of the Federal Reserve System
May 2, 1996

There is little debate over the influence of technology in banking – reaching into every corner of the industry, accelerating development and creating opportunities in one instant, facilitating risk and economic transfer in another. Information technology is providing banks specifically, and all companies broadly, the means to create new efficiencies and build products and services to compete in markets previously dominated by physical dimensions of scale and scope. Leveraged by technology, various innovative processes and/or practices have been implemented to improve customer service in a broad range of bank products and delivery systems. As the banking environment changes through the application of technology, this speed of transition can seem overwhelming. This technological transformation presents unique challenges to banking supervisors worldwide.

The list of major risks associated with the application of technology to the banking industry is long and familiar. Banking supervisors are well versed in traditional risks (e.g., credit, market, legal and operational), and risk management strategies are evolving toward cross-categorization of enterprise risk. Yet there is a less understood challenge – the transformation of banking services through technological innovation – that may actually do more to reshape the future of banking risks than any of the above.

The purpose of this paper is to show how technology is changing the South East Asian banking industry and particularly, the supervision

1. By William A. Barouski and Margaret M. Beutel. The views expressed are those of the authors and do not necessarily reflect the views of the Federal Reserve Bank of Chicago or the Board of Governors of the Federal Reserve System. The authors would like to thank Pamela Riger and Mitchell Doepke of the Federal Reserve Bank of Chicago for their excellent research assistance.

of banking in the region. To view these changes, this paper will highlight the range of economic and infrastructure issues in supporting emerging technologies within the region as well as the current and evolving supervisory risk management practices to oversee the changing risks.

While the risks inherent to banking remain basically unchanged with the "application" of technology, the introduction of electronic commerce and the speed of technological evolution challenge banking supervisors and the need to reevaluate their methods of supervision. This challenge is especially pronounced for SEACEN countries in the Asia-Pacific region of the world today. In a region contending with economic contraction, banking supervisors face institutions struggling with economic viability, market consolidation and Year 2000 compliance, as well as the rapid evolution toward electronic commerce and technology adaptations throughout the existing corporate enterprise.

At the intersection of global markets, and financial innovation, technology is driving the region and the industry toward a major transformation at an accelerated pace. As technology has enabled global economic payments transfers, risk and volatility have accompanied this light-speed movement of money. By its very design – based on connectivity, mobility and speed – the global financial system remains volatile. The currency crisis that precipitated economic upheaval in Asia serves as a reminder of the risk and volatility in global economic transfers when risk is not optimally allocated.[2] As risk managers and banking supervisors alike attempt to leverage technology for increasingly sophisticated risk management systems, the concept of a 'single system' for enterprise risk management remains elusive.

But if technology is part cause, it is also viewed throughout the region as part cure. For SEACEN countries struggling with the recent economic downturn, the return to prosperity depends heavily on their investment in information technology. This is especially true for the banking industry as a whole. Yet while technology is viewed as an equalizer and an enabler toward economic prosperity, the region is under constant pressure to evaluate IT spending as a whole. The same is true for banking supervision departments throughout the region.

2. Saskia Sassen, "Globalization & Its Discontents", New Press, 1998.

How the region's supervisors confront issues resulting from evolving technology will have significant resource consequences. As opportunities arise for banks to better leverage technology and compete globally, additional challenges surface for banking supervisors in a growing virtual marketplace. The challenge will be how to negotiate critical issues that range from supervisory program design, information collection and access, staff educational programs, and regional cooperation and resource sharing. These decisions will greatly influence how the region's supervisors manage, and can afford to manage, other major challenges that will face the region in the future.

B. SCOPE OF THE PROJECT

The SEACEN collaborative project to study the *Supervisory Impact of Technology on South East Asian Banking* was conducted to review the current state of information technology in the banking industry and to assess the region's supervisory response to its technology-related risks. Participants on the project included designated researchers from nine of the SEACEN member countries[3] and representatives from the Federal Reserve Bank of Chicago. Recent developments in the region, combined with participation of select central bank researchers, further provided a unique opportunity to observe, first-hand, the impact of market events on technology investment and deployment decisions in response to the Asian financial crisis.

The project commenced with a two-day workshop in Kuala Lumpur, Malaysia in June 1998 with presentations by each of the country researchers on technology conditions in their respective countries. Originally approved as a year-long initiative, the study was compressed to six months at SEACEN's request during the workshop. Due to the shortened time frame, the project focus shifted to the retail banking sector to ensure greater participation by all researchers. Since international supervisory bodies (such as the Bank for International Settlements) have issued guidance on select IT risk management practices, this project leveraged those efforts to present a framework to conduct analysis of regional supervisory conditions and recommendations to manage associated IT risks.

3. Research participants were from the central banks of Indonesia, Korea, Malaysia, Nepal, the Philippines, Singapore, Sri Lanka, Taiwan and Thailand.

In-country visitations were conducted during the last half of October 1998 to discuss researchers' findings first-hand in four of the participating countries: Korea, Malaysia, Singapore and Taiwan. Where possible, discussions with financial institutions were arranged to determine bankers' perspectives on emerging technologies in local markets and the region, the impact of nationalization and bank consolidations on technology development and/or deployment, risk management and control considerations, and the impact of the financial crisis on near-term technology spending.

Researchers returned to Kuala Lumpur in January 1999 to review and critique the draft report's conclusions and recommendations. Subsequent to the second workshop, the researchers reviewed findings with those individuals responsible for bank supervision. Input from these discussions was incorporated in the final report of findings issued in March 1999.

C. METHODOLOGY

As with some of the more recent products published by central bank supervisors on the subject of applied technology in banking, the discussion throughout this paper is general in nature because the use of technology is ever-changing and varies considerably throughout the region. With these changes in mind, the project focused on establishing a baseline understanding of those key elements that influence the financial services and technology environments for the countries studied. From that baseline of information, supervisory frameworks and IT risk assessment methodologies were identified to provide recommendations for enhanced supervisory processes to address the dynamic IT environment.

A significant portion of information collected for this study was obtained from Internet sites maintained throughout the region. Country summaries for the SEACEN participants, as well as comparative infrastructure data, are provided in Appendix sections A and B, respectively.

Between July and October 1998, the Federal Reserve Bank of Chicago, in conjunction with the in-country researchers, conducted a three-part survey to determine the extent of technology deployed by the financial services industry, financial institutions specifically, and supervisory responses by central banks to address the evolving tech-

nologies. Actual responses, by reporting countries, are provided in Appendix C. A discussion of the objectives of the separate surveys follows.

Part I: *Central Bank Questionnaire – Financial Industry Overview*
Researchers conducted a macro analysis of local financial markets to: a) provide SEACEN with a consistent, sound understanding of each country's technological environment and b) gather information necessary to identify all financial institutions offering banking products and services – not only those under the authority of the central bank.

Part II: *Central Bank Questionnaire – Supervisory Efforts*
This questionnaire dealt with the current and planned IT supervisory practices and specifically focused on staff experience and training efforts. This information aided in discussing and structuring future examiner training initiatives and enhancing overall supervisory processes. Questions presented in this survey were grouped to enable separate functional areas (e.g., IT supervision, research, etc.) to respond according to areas of responsibility over supervisory functions.

Part III: *Institution Survey – Electronic Banking*
Information on both the strategic direction and the current deployment of electronic banking services was requested of individual financial institutions to gain a better understanding of the use of electronic delivery channels by the financial services industry in the region. Specific information was requested on electronic products and services offered, with questions designed to minimize reporting burden for bankers.

The sample size for this survey was left to the researchers' discretion, depending on such factors as: 1) available central bank resources, 2) number of institutions under central bank supervision, 3) central banks' current knowledge of available electronic banking services, and 4) complexity of applied technology in the banking industry.

In a banking environment increasingly dominated by information technology, the global financial services industry and audit profession have turned their attention toward operational risk and associated risk-

management systems. Recent guidance issued by banking supervisors and industry practitioners provides a core of information for SEACEN supervisors to begin a review of their supervisory frameworks for evaluating IT risk-management systems. Descriptions of some of the more recent guidance are provided in Appendix D

For clarification of the use of terms and phrases attributed to the dynamic technology environment at the core of this study, a Glossary of Terms Used is provided in Appendix E. These definitions are provided as a reference tool for readers and their use are intended only in the context of this report.

II. FACTORS AFFECTING THE USE OF TECHNOLOGY

A. INTRODUCTION

This section provides an overview of national attributes that affect the financial services industry in South East Asia. The state of the economy and impact of the political atmosphere have certain known implications for technological deployment in the banking industry. Social demographics, and the availability of basic telecommunications services and a more advanced communications infrastructure, help to explain the extent to which emerging technologies have been deployed and to determine whether the industry has the capacity or desire to move to a more electronic infrastructure.

Each of the following elements impacts the overall risk environment of the region when deploying technologies. This risk environment ultimately affects the banking industry and alters the profile of risks overseen by bank supervisors. In the aggregate, risks overseen by the central banks continue to expand due to their government's ever-increasing emphasis on emerging technology to achieve economic goals. On a micro level, the risks faced by banking supervisors depend on the characteristics of the individual financial institutions. Banking organizations operating within traditional product/delivery channels pose risks that should be evaluated within existing risk management methodologies. Banks at the forefront of evolving technologies, such as the Internet, however, present additional exposure to bank supervisors; not the least of which involves acquiring the technical competency to assess these activities.

This regional profile contains information derived from the individual country summaries provided in Appendix A. A table of country-specific economic and communications infrastructure data is presented in Appendix B.

B. ECONOMIC FACTORS

There are several ways in which a sound economic environment creates the opportunity for industry and government to allocate funds toward the development of technology. Steady economic performers are often those countries whose industries are more mature and diversified. Through the deployment of emerging technology, opportunities exist to lower operating costs and develop new products or services that can compete more effectively in the global marketplace. As an economy diversifies and matures, the real wages of the population increases. As disposable income increases, so does the demand for technology-based consumer products, such as computers, mobile telephones and the Internet. In addition, with the general increase in disposable income, banking institutions incur higher staffing costs. In most Asian countries, where banks are one of the more prominent employers of professional labor, there is a desire to automate manual processes and deliver electronic banking products to reduce overall operating costs. This move toward cost containment serves to advance the use of technology ahead of consumer demand.

Review of the economic environment for the SEACEN countries indicates a close association between macroeconomic performance and the deployment of technology within each country and throughout the region. The deployment of technology is more advanced in countries that have a strong, diversified economic base and higher per capita gross domestic product (GDP).[4] The following graphs show the relationship of the more diversified, non-agrarian economies and computer deployment.

4. To ensure consistency across all SEACEN countries, economic data from the Central Intelligence Agency Factbook (1996) was used. Per capita GDP figures used in this report are in terms of purchasing power parity and differs from GDP figures often reported by individual countries.

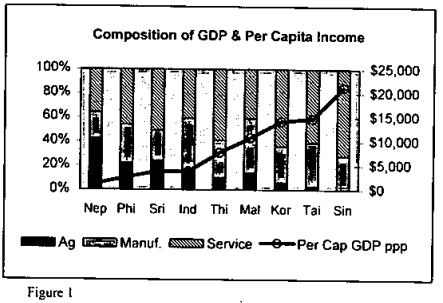

Figure 1

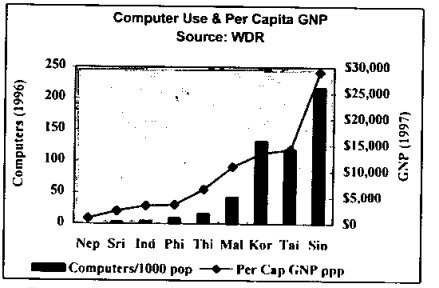

Figure 2

The degree to which the Asian economic crisis has affected individual countries is quite varied. A review of macroeconomic data suggests that there are two groups of countries that have suffered the least from this situation. The first of these two groups consists of countries with the highest per capita income and a diversified GDP that includes a high concentration in both services and industry. These countries have exhibited a longer-term economic growth and a somewhat diversified trade base due to a more open foreign trade and investment stance. While these countries felt the pains of the recent currency crisis, their economies remained competitive. Predictably, these countries also lead the region in technology deployment.

Another group of countries that has not experienced a severe impact from the currency crisis is at the lower end of economic performance. These countries report the lowest per capita income of the SEACEN countries and exhibit a significant dependence on agriculture as a component of GDP. This group of countries, while migrating toward a manufacturing and service-based economy, did not experience the rapid transition or significant gains in collateral values that often result from inflows of foreign capital. These countries also share characteristics such as inadequate or emerging physical and communications infrastructures, below-average educational statistics and high levels of the population below international poverty lines. In general, these countries have some of the lowest levels of technology deployment.

The SEACEN countries most adversely affected by the crisis were those economies that experienced the most rapid GDP growth. These countries often possessed one or more of these characteristics: rapid change from agricultural to manufacturing dominated economies, rapid increase in collateral values, high government subsidies, market share vs. profit share driven industries and highly leveraged corporate structures. These countries exhibited a variety of technology environments, although most were moving toward an economy newly focused on technology initiatives.

Despite the variances in economic performance, the region shares several common goals. One is the immediate challenge of moving past the economic crisis and creating more diversified, open economies that can compete effectively in an increasingly global environment. To this end, many countries have specifically identified technology development as an economic growth sector that will aid the region's recovery. Much of the region has implemented political and economic reforms to hasten the economic turnaround, some countries with assistance from international organizations and others independently. While these economic goals and reforms are long-term initiatives, international financial interest in South East Asia remains high and will contribute to the region's return to economic stability. However, the time it takes for each country to realize economic recovery will vary.

There is no question that the economic crisis of 1997 negatively impacted the growth and deployment of technology in the SEACEN countries. Domestic and international technology companies suffered financial setbacks, international companies scaled back operations, and progress on government projects slowed as a result.

Specifically, the decline in currency values had a significant impact on the cost of all imports, including technology needed to fuel electronic network development. In the case of Internet communication alone, costs for SEACEN countries were affected dramatically because access providers pay for the cost of international links in U.S. dollars.[5] This higher cost structure carried with it several adverse consequences. One is that the region has not enjoyed the full benefits of the declining

5. "Financial Crisis Hobbles Asian Net Growth", *Computerworld,* December 12, 1998.

cost of technology occurring elsewhere in the world. Another is that the higher cost structure caused or quickened the decline of local network providers' financial performance.

Through concerted efforts across the region, it appears that factors contributing to the crisis are being systematically addressed and currency values are returning to more normal, stabilized levels. Despite the cost disadvantage mentioned earlier, the region has seen some investments in IT, and the financial strain on local firms gave foreign companies an opportunity to enter the market. The entry of these international firms heightens the technology challenge to local companies and will help bring human resources and funding needed to fuel the spread of new technology in the region.

While consolidation and globalization are not new phenomena, the rate of these activities has changed dramatically throughout the region as a result of the economic crisis. Financial reform and deterioration of asset values have resulted in numerous mergers and bank consolidations. Also, the funding requirements needed to recapitalize the banking industry have provided the incentive for many countries to relax or eliminate foreign ownership restrictions on the financial services industry. As a result, the migration to a more global banking system is one-sided; global competitors are entering the region rather than local banks expanding outside their country or regional borders. With increased foreign ownership and larger financial institutions, the rate of technology deployment is expected to accelerate as economic conditions stabilize.

Cost effectiveness and product innovation, necessary to compete in the global marketplace, provide another impetus for structural change in the financial services industry. Megamergers, such as those most recently occurring in North America and Europe, are creating organizations with unprecedented global influence. Alternatively, costs associated with successful deployment of emerging technologies have led banks to enter alliances, third-party contracts, or entirely outsource IT support for their new products, services or delivery channels.

As these trends continue, SEACEN supervisory authorities will be faced with regulating a banking industry where the technology risk is greater and increasingly concentrated in fewer and larger banks. At a recent ASEAN summit, Vietnam's Prime Minister, Phan Van Khai, sum-

marized the risk of globalization this way, "Rapid economic globalization is bringing about greater market access and new partners for development, but also putting the weaker economies in a more vulnerable and disadvantageous position, and in an uneven competition."[6] The risk management tools needed by these organizations and the supervisory techniques needed to address these institutions, while fundamentally the same, require a more sophisticated and integrated approach. As witnessed in the recent Asian crisis, both investors and the recipients of capital investments suffer when risk management tools are inadequate.

C. POLITICAL ENVIRONMENT

The political environment plays a significant role in the development of a country's communications infrastructure. Policies that create a market-oriented economy in turn attract financial and technological expertise. Governments can promote technology through direct investment in their own systems or through sponsorship of projects headed by private industry. Governments can also support technological development indirectly through tax and trade policies. The political environment also includes the legal system. A legal framework that includes the protection and enforcement of intellectual property rights encourages foreign investment. Furthermore, the development of payment laws which are supportive of electronic transactions creates a framework for the emerging Internet technology.

The political environment in Asia is undergoing significant change, certainly prompted by the recent economic crisis. Within the last year, most countries have experienced a change in leadership at the highest level of government. With these changes in leadership often came a move toward a more open, market-oriented business environment that is more conducive to global competition. Governments within most of the region have prioritized technology initiatives to develop their economies. These efforts will require capital to build technology investment within the government sector and support its growth in the private sector.

6. "ASEAN Leaders Warn of Dangers of Globalization", *CNN Interactive,* December 14, 1998.

The opening of the South East Asian economies to foreign competition and ownership has been a gradual process. In many countries, tariffs and other barriers still play a large role in managing economic activity. While the region continues to open its markets to private competition and foreign investment, the influential industries of finance and telecommunications often have remained protected. In general, those countries with the least restrictions on private and foreign investment have demonstrated more stable economic performance.

To support a technology-based economy, the corporate environment must be supported by a comprehensive legal structure. Issues such as acceptable forms of identification and authentication, legally defined electronic data terminology and certainty regarding the composition of legal documents need to be addressed within the legal framework. The development of laws that foster electronic commerce has been gradual and varies widely among the countries. While several countries have enacted legislation that creates a better-defined legal environment in which to conduct business electronically, many others have yet to fully address these legal issues, which can inhibit the advancement of electronic commerce in the region. Likewise, the protection of intellectual property rights is gradually evolving, although in many instances still providing insufficient protection and enforcement.

D. DEMOGRAPHIC FACTORS

Social demographics are another contributing factor to the advancement of technology, specifically in terms of literacy rate, education and financial capacity of the population. The more literate and educated the population, the higher the demand for sophisticated, electronic consumer products. Further, development of a more technically adept workforce provides companies with human resources that are proficient in the newest applied technologies. Government programs and educational efforts can increase the technical knowledge of the general population and thus increase the demand for state-of-the-art technology and the supply of knowledge workers. However, in a growing economy, educational programs often do not keep pace with the demand for knowledge workers and the supply of more advanced consumers products.

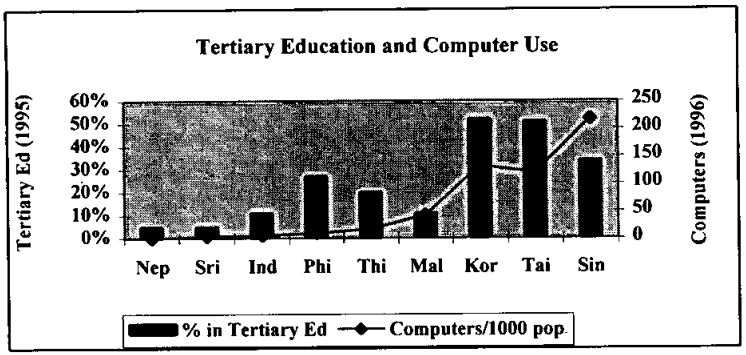

Figure 3

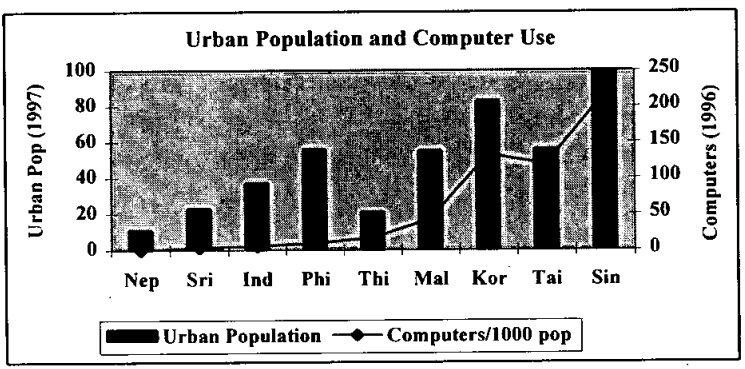

Figure 4

For many countries in this region, the benefits of education have lagged economic growth. It often takes years to develop an effective educational system which commensurates with the needs of fast-growing economies. Once the educational system is established, it takes several more years for students to complete the formal programs. For several of the countries, this lag has impacted the acceptance and use of technology, as the demand for emerging technologies would ultimately be limited by the technical competency or adoption rate of its users.

Figures 3 and 4 compare computer use in 1996 to higher levels of education and urban population. While urban population cannot be used as a predictor of technology deployment, it may present the case for increased demand or ease of implementing technology in an economy. Specifically, computer usage may reflect the impact of government initiatives on the use of technology. While Singapore has actively supported computer use, by contrast the Philippines has not

made technology a national priority.

Generally, the SEACEN countries with more urban population, stronger literacy rates, greater participation in higher education and lower poverty levels exhibited greater acceptance of applied technology. The higher acceptance, or adoption rate, was evidenced by variables such as computers per capita, number of Internet service providers, and the availability of electronic banking products. Alternatively, countries with the highest rural populations often experienced the lowest literacy rates and the lowest participation in higher education. Predictably, adoption of technology in these countries lagged the rest of the region.

Another similarity across the region is the overall shortage of knowledge workers. While a pool of information technology talent exists in the region, it is uncertain whether the level of talent is sufficient to manage and implement many of the technology projects that are underway or planned. Where the economic crisis may have directed attention toward economic survival and industry restructuring, some IT projects may have been postponed, thus reducing the immediate need for IT expertise. Regardless, IT workers are in high demand throughout the world, including Europe and the United States. Thus, the ability of the SEACEN countries to attract and retain the necessary talent remains a challenge to the financial services industry, as well as to bank supervisors. While educational programs are included in economic development plans to address this talent shortage, that process can take ten to 15 years. This need for knowledge workers was recently noted by the Malaysian Education Minister, who reported that "about 25,000 knowledge workers will be required over the next five years by the 124 companies that have received Multimedia Super Corridor (MSC) status".[7]

The shortage of qualified technical staff raises concerns for the region from two perspectives. First, the talent shortage challenges the banking industry to attract and retain sufficient technical talent to accomplish their strategic IT directives. Furthermore, it is uncertain whether banks have the appropriate management talent to establish realistic and profitable goals and to implement risk management techniques in the new environment.

7. "Lack of IT Skills Threatens Asian Growth", *PC World Online Singapore,* December 8, 1998.

The second concern extends the impact from the "talent shortage" to the effectiveness of supervision over the use of evolving technologies. This not only raises questions as to whether internal and external audit can conduct appropriate assessments of controls in this dynamic environment, but also whether bank supervisors can attract, train, and retain knowledge workers to effectively evaluate the ability of bank management and the adequacy of banks' risk management processes.

E. COMMUNICATIONS INFRASTRUCTURE

As depicted in Figure 5, the telecommunications infrastructure is another critical element supporting technological development. Overall, a reliable infrastructure must exist to introduce high-tech consumer products to the marketplace. Each government in the region recognizes the importance of this to foster the growth of domestic business, enhance educational opportunities and attract foreign investment. Those countries considered more technologically advanced, are also those with well-developed telecommunications and network systems distributed throughout the country.

The communications infrastructure in place among the SEACEN countries is quite varied. Some countries with well-developed telecommunications systems are focused on network and Internet communications, but the majority must still concentrate on building an effective, basic communications system. For example, the ratio of telephones per 100 people ranges from approximately one telephone for every two people at the highest level to just one telephone for 100 people at the lowest level. Generally, the higher the percentage of urban population, the higher the ratio of telephones in this census, reflecting more accessibility and affordability within the urban environment. Infrastructure development and improvement has been more completely and effectively accomplished in a compact urban environment versus a rural environment where higher poverty levels and varied physical geographies make building the infrastructure difficult. Also fueling infrastructure development was the transition by some countries from an agricultural to a manufacturing economy. This economic shift created job opportunities in cities and expanded urban populations. The resultant migration increased the demand for telecommunication facilities within the urban environment and the rural areas to link newly separated family units.

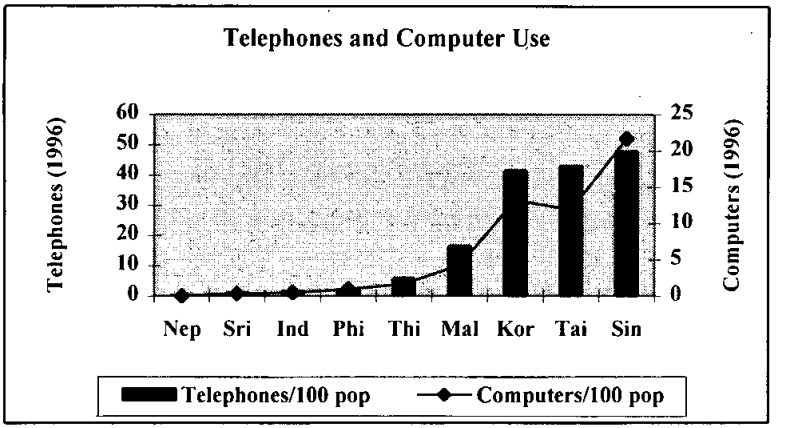

Figure 5

Dependability of the supporting utility infrastructure is also a key element in implementing an effective telecommunications infrastructure. The lowest levels of losses in electricity transmission and distribution (as a percentage of output) were realized in those countries with the greatest per capita telephone ownership. Use of mobile phones is increasing throughout the SEACEN group, although statistics show a close correlation between the highest per capita use of mobile phones and the per capita use of traditional telephones. Many SEACEN countries have telecommunications initiatives underway, and significant development of this sector is expected as funding occurs. Objectives for these development initiatives will be dependability, accessibility and affordability of services by the general population.

Computer and Internet usage are also on the rise within the region. All SEACEN participants have recognized the growing importance of the Internet within the global environment, although the stages of development vary by country. The countries with the highest statistics for computers and Internet service providers (ISPs) per capita are those with a well-developed communications infrastructure and an economic focus on high-tech products and services. Often within these countries, the primary telecom provider was also a primary ISP. While other Internet service providers are beginning to appear throughout the region, significant expansion has not yet occurred.

Despite numerous ISP entrants and efforts to address weaknesses in the communications infrastructure, the Internet as the foundation of electronic commerce is still in the early stages of development. The

technology to support a robust electronic commerce environment is constantly changing to keep pace with the need for more bandwidth as products and services expand. Thus, the standards for this environment are still being developed. Only recently, the United States computer industry designed a system to systematically evaluate ISPs and measure their ability to support mission-critical applications such as electronic commerce.[8] The requirements that were established for corporate-class ISPs are stringent and not all of the biggest United States ISPs measured up. A survey of Asia-Pacific ISPs also found that the quality of service providers varied greatly. Of the 17 ISPs surveyed, only one was considered to be capable of high-quality service for corporate clients.[9] For bank supervisors, reliability and security of the communications infrastructure should not be presumed. Regardless of whether institutions directly conduct or outsource these activities, an understanding of network disciplines is required for IT examination staff to assess the adequacy of banks' due diligence over network communications.

In most countries, state-controlled companies dominate the telecommunications industry. Many of these countries are now in the process of divesting some government ownership, as benefits of privatization are being recognized. Some benefits include increased cash flow as government ownership is sold, greater access to foreign technical expertise, and greater competition and innovation. Several governments are also allowing more entrants into the telecommunications industry, thereby increasing competition, speeding infrastructure growth and lowering consumer costs.

F. PAYMENTS SYSTEMS

Payments systems used within each country generally mirror its particular state of communications infrastructure development and the implementation of electronic banking. Several of the SEACEN countries have (or plan to) adopt more sophisticated payments systems that will facilitate an open economy and international commerce.

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8. "Corporate-Class Internet? Don't Count On It!", *Data Communications,* November 1998.

9. "ISPs: The Other Crisis?", *Data Communications,* November 1998.

Those countries with the most basic telecommunications infrastructure also have a banking industry with minimal electronic banking products and basic payments systems. Countries with banks using a number of electronic delivery channels typically provide numerous payments systems options, including traditional check clearing mechanisms, electronic funds transfer systems and Real Time Gross Settlement (RTGS). These countries also have a more comprehensive telecommunications infrastructure in place.

Several countries are moving toward more sophisticated electronic payments systems, such as check imaging systems and RTGS. Korea, Thailand and Singapore currently operate RTGS systems, while Malaysia and Taiwan have plans to implement the same in 1999 and after 2000, respectively. These countries enjoy the benefits of a smaller geographic area and a smaller universe of institutions that create an environment where new systems can be implemented relatively quickly. However, obstacles to universal acceptance remain for these more sophisticated systems, including proven and accepted traditional check clearing systems, and the tendency of some domestic economies to be largely cash-based.

III. BANKING INDUSTRY IN THE SEACEN COUNTRIES

A. BANKING INDUSTRY OVERVIEW

The banking industry plays a key role in the regional economy and is also often a leading indicator of the use of technology within a country. The extent to which banks in the SEACEN countries have deployed technology to improve operating efficiencies and offer new products and services varies greatly. For most of the region, banks had been evolving toward greater use of technology, but in some instances these plans were delayed due to the economic crisis. For those countries hardest hit by the crisis, restructuring of the banking industry is underway. Once restructuring has occurred and the financial concerns have dissipated, it is likely that the banking sector will return its attention to the use of technology-based solutions. According to survey results, banks will the focus their attention on electronic banking products, back office operations and internal risk management systems.

Across the SEACEN countries, the banking industry shares many common characteristics. To some degree, all countries have been impacted by the Asian financial crisis, with the banking sector being one of the most affected. Most countries are experiencing an increase in nonperforming assets, either from direct exposure to the most severely affected countries or indirectly, as nearby domestic economies and significant trading partners become affected. Further, many countries are experiencing consolidation within the financial services industry, either to merge insolvent banks or create economies of scale.

For many of these countries, the banking system is dominated by a small number of large commercial banks that hold the majority of banking assets. The financial systems are also characterized by a large number of smaller entities, which might include development banks, finance companies, rural banks, trade cooperatives and postal savings banks. While all countries have a foreign banking presence of some kind, there is a large difference in the activities conducted by these multinationals within each country.

Among the SEACEN countries, the banking industry can be divided into three groups and parallels the discussion of the country groups in the economic section of this report. The first group, consisting of Singapore and Taiwan, represents those banking systems least affected by the banking crisis. Although dominated by a few large domestic banks, these countries also have a number of smaller "specialty" institutions and a relatively large foreign banking presence. While relatively sound, the banking industry in each of these countries is still experiencing higher levels of nonperforming loans and growing pressure for some consolidation. Banks within this first group generally offer the greatest number of electronic banking products and delivery channel alternatives.

The second group, including the Philippines, Nepal and Sri Lanka, was also less affected by the Asian crisis, although for different reasons. For the Philippines, an economic crisis in the mid 1980's helped soften the impact of events in 1997 in two ways. When the Asian crisis began, the Philippine economy was still experiencing an economic recovery that helped offset the regional downturn. Comprehensive reforms resulted in a restructured banking industry that was well prepared to handle another economic downturn. Certain economic and

banking industry characteristics for Nepal and Sri Lanka contributed to a less severe impact from the crisis. These two countries have not experienced rapid economic growth and are in the early stages of building a more diversified economy. Other factors which limited the effects of the economic crisis on each of these countries included such factors as: a banking industry dominated by a few large domestic commercial banks, a banking sector considered small in terms of total assets, and a smaller foreign banking presence than the first group. For each of these three countries, the use of technology and delivery channel alternatives is just beginning to emerge.

The third group was the most directly affected by the Asian crisis. This group includes Indonesia, Korea, Malaysia and Thailand. For these countries, the banking industry experienced rapid growth prior to 1997 and often had greater leverage than the other groups. Foreign banks were rapidly expanding their presence in these countries, although certain restrictions still exist. Technology development in electronic delivery channels was being actively pursued. However, since the economic downturn, the focus for many of these banks has been on survival. Bank closures and mergers have been necessary to deal with insufficient capital funding, poor asset quality and ineffective bank management.

B. STRATEGIC DIRECTION

Because of the varying economic and political environments, the key challenges facing the banking industry differs among the SEACEN countries, but similarities exist throughout the region. Predictably, funding and liquidity were identified as the primary challenges for those institutions within the region most affected by the Asian crisis. Alternatively, banks operating in those countries less affected by the economic downturn cited technological competitiveness as one of the key elements influencing their strategic direction.

When asked to specify which factors influenced their deployment of technology, banks consistently reported that retail customers and domestic competition were the two driving forces. To a lesser extent, wholesale customers were cited for their impact on technology efforts. Not surprisingly, banks reported their technology budgets were dedicated to retail and back office efforts. In some parts of the region, funds dedicated to electronic commerce made up the greatest portion

of the technology budgets for a significant number of the respondent banks.

As banking technologies evolve, banks throughout the region are looking for revenue generating opportunities in specialized or niche markets, in addition to expansion of traditional banking products, services, and delivery channels. In addition to such efforts aimed at an expanded customer service focus, attention to back office efficiencies, such as cost containment initiatives and consolidation of legacy systems, provide further incentives for these banks to pursue newer technology solutions.

C. TECHNOLOGY TAKERS

First and foremost, the SEACEN countries have historically been technology-takers, not innovators. This philosophy has worked well as companies have imported applied technology to refine manufacturing processes and services to become cost-effective in the global "high-tech" hardware market. Risk exposures associated with this philosophy can generally be identified and managed, since operations and technologies have already been proven elsewhere. With respect to banking, risk exposures associated with providing proven delivery channels such as ATMs, for example, have been moderate since software limitations and operational difficulties were identified and addressed during the device's initial stages of implementation in other parts of the world. Typically, larger and more technically progressive global institutions have been at the forefront of implementing emerging products where the costs of refining new technologies can be identified and more readily absorbed.

However, there is evidence that this "adoptive" philosophy is changing in South East Asia. With this change comes a fundamental shift in the risks faced by the banking industry and thus the respective supervisory authorities. As governments in much of the region have identified technology as an economic development sector, the financial services industry is included in those deployment plans. With financial institutions' ever-increasing focus on opportunities presented by evolving technology, they are exploring electronic methods to remain competitive, improve customer service, and reduce operating costs overall. Consequently, banking supervisors face a dynamic environment in which to assess their institutions' deployment of technology.

D. IT SPENDING

When looking at the impact of technology on this market, information on the level of IT investment can be helpful. A survey completed by the *Asian Banker Journal*[10] provides specific insight to the current and expected information technology spending in the Asian banking industry. Conclusions drawn from the survey suggest that, in general, banks in this region have not spent as much on IT as European banks and thus may have difficulty competing in an open, more competitive environment. The variance in IT spending was significant both among countries and among banks within each country; large regional banks and Singapore banks are the IT spending leaders and are focusing on new electronic banking products and backroom infrastructure. And while certain banks saw a reduced level of IT spending, the majority expect increased spending over the next three years.

While survey results only provide a sample of actual activity, they help indicate particular direction for regional dynamics. The SEACEN countries have a wide variety of IT expertise and management strategies within the banking industry. Given recent economic conditions and attention by the industry to the Year 2000 issue, signs of pent-up IT spending are apparent. The supervisory strategy for this type of environment needs to be flexible and the IT technical expertise needed to supervise these organizations will vary greatly depending on the type of institution being examined. As the financial institutions focus on recovery efforts, banking supervisors should use this time to review existing IT supervisory strategies before the region becomes fully engaged in electronic banking.

E. RISK MANAGEMENT SYSTEMS

Weaknesses in traditional financial risk-management processes (e.g., asset review and classification), and management information systems brought to light by the economic crisis, underscore the need for a integrated supervisory approach to ensure that risk management systems are comprehensive and inclusive of IT considerations.

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10. "The Impact of the Currency Crisis on Bank Strategy and Technology in Asia", Key Findings Report of Regional Survey, *Asian Banker Journal,* September 1998.

While exceptions exist, recent studies suggest that the region's financial services industry has not historically placed a heavy reliance on formal risk-management systems. A regional survey completed by the *Asian Banker Journal*[11] indicated that while 40 percent of banks have risk management systems in place, a large percentage of these systems do not assess risk and profit information at the customer level. A significant percentage of surveyed banks (35 percent) indicated that risk management systems were currently being implemented. While many of the local banks reported satisfaction with their information systems, regional banks, presumed to deploy technology more actively, reported general dissatisfaction with current risk management systems. Similarly, the Asian Wall Street Journal recently noted that Asian banks trail U.S. and European banks by three to five years in using technology to implement risk-management systems.[12]

This historical lack of reliance on technology has produced fragmented and incompatible information sources that result in, at best, a functional review of the various risks of the banking organization. Aggregating and analyzing the various data sources and risk exposures on a consolidated basis has proven difficult if not impossible. To take full-advantage of contemporary automated risk management tools, integrated databases or feeder systems are needed to provide historical and current data for the entire organization's operations. Equally critical, risk managers must develop the expertise to analyze and assess the integrated results.

IV. STATE OF EMERGING TECHNOLOGY

A. INTRODUCTION

Despite the macro similarities of the region, it appears from information provided by the *Financial Institution Survey* that banks within the SEACEN countries vary to the extent that they have access to and have subsequently deployed emerging technologies. The *Financial Institution Survey,* conducted as part of this research project, obtained

11. ibid.

12. "Antiquated Systems: Asian Banks Trail Western Rivals in Use of Technology", *The Asian Wall Street Journal,* October 13, 1998.

information on the strategic direction of banks' technology efforts as well as the current and future deployment of alternative delivery channels. While survey responses were obtained from only a portion of the SEACEN countries,[13] they provide insight into the attention currently being given to retail banking channels and overall technology conditions for the region's banking industry. A discussion of the more frequently cited retail channels, along with comparative information on the deployment of similar technologies outside the region follows.

B. RETAIL DELIVERY CHANNELS

1. Internet / Electronic Commerce

While the degree of Internet banking penetration varies throughout the region, each country is offering basic Internet access. Specifically, information-only sites, those that provide information and limited e-mail capabilities, are provided by many of the regions' respondents. Transactional services, such as bill payment and funds transfers, are available on a much more limited basis and appear to be offered almost entirely by larger banks at present. Although transactional capabilities are not widespread, many of the reporting banks, regardless of size, plan to have similar capabilities within two to five years. Other examples of transactional services offered include account balance and activity inquiries, funds transfers, mortgage and credit card bill payment, loan applications, cashier's checks/orders and travelers checks.

The Internet, as an evolving banking technology, has received attention throughout the region for opportunities to provide both cost savings and revenue growth. The ability of banks, regardless of size, to lower transaction costs via electronic delivery systems has wide appeal in a region where banks have traditionally built physical structures to serve their clientele. In addition, the reputed ability of the Internet to be the "great equalizer" may provide comparable access to the market for banks of all sizes. Whether the Internet becomes the "great equalizer" remains to be seen, particularly for the South East Asian market. For the majority of banks in this region, the retail elec-

13. Indonesia, Korea, Malaysia, Nepal, Singapore and Taiwan completed the Financial Institution Survey. Country-specific data compiled from participants are provided in Appendix C-3.

tronic banking market consists of a small number of affluent, technically-sophisticated customers. Since a broad customer base is needed for Internet profitability, it is possible that only a few, large banks will have the capacity to build that retail customer base.

Even though the acceptance and growth rate of Internet banking in this region has not met some banks' projections,[14] growth of this delivery channel continues to gain momentum. As consulting firms and industry experts debate the pace at which electronic commerce will grow, there is widespread agreement that it will claim a major portion of the Asian and global commercial and financial services markets. The region's Internet use and acceptance will receive greater attention from the technology emphasis placed within political and economic agendas, consolidation of the banking industry, and increased competition from globalization.

Some recent examples of corporate activity provide evidence that South East Asia will experience a strong move to Internet commerce. Two virtual communities on the Internet have made a recent commitment to serve the growing number of on-line Asian consumers.[15] These companies have signed agreements with Singapore-based On-line Technologies Consortium, and virtual communities are planned for Singapore, Japan, China, Malaysia, Indonesia and the Philippines. Netlife, a German company that specializes in facilitating payments over the Internet, has also established a strategy to penetrate Asia within the next year.[16] An international consortium of global financial institutions has also created a joint venture to speed the growth of electronic commerce.[17] This for-profit consortium, known as Global Trust, plans to establish a network of global financial institutions that will operate as certificate authorities. Citigroup, which has actively targeted United States banking customers via the Internet, estimates that business and consumer transactions over the Internet in the Asia Pacific region will

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14. "Special Report on the Internet in Banking in Asia", *Asian Banker Journal,* Issue 14.

15. "U.S. Virtual Communities Expand into Asia", *Computerworld Hong Kong,* December 10, 1998.

16. "Netlife nurtures Net Payments in Asia", *Computerworld Hong Kong,* December 8, 1998.

17. "News Bulletin: Bank Group Forms to Boost E-commerce", *Bank Technology News Online,* December 1, 1998.

reach $1.4 billion in the year 2000.[18] While its Citibank subsidiary has been slower to roll out an Internet program in Asia because of the legal and economic environment, growth estimates support the view that the Internet will become a major strategic force for retail product delivery throughout this region.

The growth of Internet banking services may still remain tempered in several countries, notably Nepal, Indonesia, Malaysia, Philippines and Sri Lanka, where the cost of personal computers is high relative to personal income. So long as customers demand human interaction for critical banking services, the acceptance of electronic banking is expected to be limited. While the Internet is adding a new dimension to the retail banking industry, it will not likely render bank offices and the human element obsolete.

2. Integrated Chip (IC) Cards

Survey results indicated that although a few banks in most reporting countries are offering this product, banks' deployment of integrated chip (IC) or "smart" cards, is not widespread within the region. However, deeper penetration is expected within two years. In addition to the survey results, other factors are expected to contribute to a significant increase in the deployment of IC cards over the next several years.

One important factor supporting migration of this technology into the region is the aggressive government projects that promote or require the use of IC cards. An example is Malaysia's commitment to a multi-purpose card that will put one or two smart cards into the hands of every adult in the country.[19] Another factor enabling the use of this technology is the lack of dependence throughout the region upon on-line payments, such as credit cards. Indeed, the primary obstacle to the adoption of this technology in the United States is the reliable and affordable on-line debit and credit card system. Finally, smaller geographic areas throughout this region make it less costly to implement and upgrade the infrastructure for these systems.

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18. "Internet in Banking: Developing the Art of the Long View", Supplement, *Asian Banker Journal,* Issue 14.

19. "Malaysia Remains Committed to Smart Cards", *Card Technology,* November 1998.

On the other hand, there are circumstances that have prevented rapid deployment of stored-value programs in the region, including a decreased level of resources available due to the economic crisis, Year 2000 preparation, as well as a lack of programming standards. While it is natural for the development of standards to lag technological breakthroughs, both of these must coexist to create products that will gain widespread acceptance. The IC card technology is still being developed, and it will be some time before programming standards are determined. Industry leaders, such as MasterCard, Visa, Microsoft and Proton, along with the market, will eventually determine programming languages and necessary standards. Expediting this process are regional efforts by organizations such as APEC and ASEAN to encourage the creation and acceptance of such standards. Hesitance by banks to invest in this technology will continue until the arrival of standards that contribute to a more structured, stable environment.

3. Proprietary PC Banking

Survey results indicate that proprietary PC banking is generally well accepted in those countries where it is deployed. A significant percentage of respondents in each country indicated that deployment of this banking delivery channel continues to stay ahead of the pace of Internet delivery for several reasons.

As a proprietary system, PC banking uses a closed, more secure network (compared to open systems like the Internet) that is suitable for information-sensitive applications like banking and financial planning. The security controls for closed systems have been in place longer, and controls have been developed from experience. Further, banks implementing proprietary systems historically have had control over the user interface and product updates. With more widespread deployment comes the likelihood that banks will work to further distinguish themselves by customizing products and services for large corporate clients and/or specific segments of the retail market.

In addition to security features inherent in this channel, another factor influencing the use of PC banking is the lack of widespread approval for Internet banking by many of the region's central banks. Until transactional capabilities become fully available, convenience-motivated customers will continue to conduct their banking activities via proprietary schemes.

The penetration of proprietary banking products brings both increased opportunities for income growth and increased risk. To ensure a large, profitable customer base, banks must undertake more aggressive marketing tactics to anticipate customer needs and to convince them of the benefits of PC banking. Maintaining a secure system with accurate, integrated information sources presents another challenge to financial institutions. Version control over software applications in use by customers further adds to this challenge. Risks increase, since even closed networks can be infiltrated and customization of these systems raises the cost of doing business. Besides operational issues from the organization's perspective, exposure from reputational risk can be significant when products are delivered through a channel which the bank does not completely control.

4. Telephone Call Centers and Data Warehouses

Replacing outdated and segmented databases, updating paper processing, and automating customer-service processes have been customary methods used throughout the industry to create more efficient back-office operations. Whereas the back office was historically considered to be a "cost center", newer technologies are enabling the industry to move to an integrated "profit center" approach to back office operations. Telephone call centers and data warehousing are two ways in which banks in the region are migrating to the back-office "profit center."

Survey responses indicate wide deployment of telephone call centers in the region, with significant levels of penetration cited by all countries. Singapore and Korea reported the highest level of deployment, with more than 75 percent of respondents offering this service. Conversely, the region's current deployment of imaging and data warehousing was significantly less than telephone call centers. Most of the region reported deployment levels well below 50 percent. However, Singapore reported high levels of both imaging and data warehousing, and Malaysia reported approximately 50-percent deployment of imaging technology. These results suggest that the region has successfully implemented telephone call centers as low-cost customer service centers. However, the move to a more integrated, profit-oriented operation has yet to occur.

The primary goal of telephone call centers has traditionally been to lower the cost of customer service. Due to banking consolidation and competition, however, there is an increasing need not only to achieve even greater cost efficiencies but also to increase the quality of the customer service provided. For example, voice response units (VRU) or computerized telephone answering systems are increasingly being used to handle routine customer-service calls, such as balance and statement inquiries, so that the call center agents can be available for more complex issues. With such technology enhancements as VRUs, call center effectiveness becomes measured by the ease with which telephone systems and databases interface to support administrative efforts.

Specialized training on banking products and cross-selling techniques for call center personnel are critical to move staff beyond traditional roles as customer service representatives. This development is an important driver of change in the call center environment as staff specialization, along with more sophisticated call routing techniques, helps to create a back office that can serve fast-growing and often variable call volumes.

Development of integrated information sources with imaging and data warehousing allows banks to leverage the customer-service opportunity to anticipate individual client's needs and cross-sell services based on the existing customer profile. Simple storage of data is the passive component of data warehouse management. To be effective, the warehouse operations must also include accurate forecasting of data storage needs, integration of multiple databases, networking between multiple locations, and implementing and maintaining necessary operating hardware and software components.

The push to integrate disparate sets of customer data through warehousing provides an added benefit to banks in the region. With consolidation likely to continue, bank mergers and integration of legacy systems present complex challenges to technology resources. Migration to an integrated database, such as a warehouse, provides the framework to make information timely, consistent and accurate – once systems have been scrubbed of outdated information and redundancies. As data is centralized, banks may accrue further benefits through cost reductions in such areas as software licenses, hardware redundancies, storage and space lease overages, personnel, and even real estate.

Developing these integrated systems takes time and resources; the processes of integrating existing data sources and transferring data to new databases are often expensive and time consuming. Furthermore, these back-office enhancements often render existing contingency plans and procedures obsolete, thus requiring procedures to be comprehensively reviewed and possibly, reengineered. Banks that have invested in data warehousing, however, recognize that integration and effective analysis of customer data, leading to a better understanding of their customers overall, are critical factors for their success.

5. Electronic Trading

While several banks in the region indicated that they offer electronic trading, this service is at the beginning of the growth cycle in the region. Although detail was not requested to determine whether this activity was conducted for corporate or retail clients, respondents indicated that this service would see a more substantial rollout within the next few years. Recent activity in the United States provides insight on the possible developments and the risks involved in this product.

Recent events suggest that on-line trading is a significant and growing portion of the United States market largely due to reduced trading costs. Predictably, the bulk of on-line trading growth is attributed to individuals who are computer-literate and familiar with the high-technology environment. It was reported that on-line trading by individuals grew by 30 percent since September 1998 and was fueled by trading for Internet-related stocks.[20] Another estimate indicated that 25 percent of the individual trades on the New York Stock Exchange and Nasdaq system are over the Internet. Although this is a significant percentage of individuals' activity, volumes traded by individuals are lower than institutional traders, so on-line brokers account for only a small portion of the total dollar value. Seeing potential for this activity, U.S. on-line brokerage firms are not limiting their focus to stock trading or even the domestic market. Recently, it was reported that two major American on-line brokers have plans to launch on-line trading in Europe in 1999[21] and a group led by E*Trade Group, Inc. is expected

20. "Individuals' Thirst for Internet Stocks Boosts Online Brokers", *Los Angeles Times,* December 22, 1998.

21. "U.S. Firms Lead Way In On-Line Investing", *The Wall Street Journal Europe,* December 23, 1998.

to unveil plans for an electronic options exchange.[22] However, despite the growing success of on-line brokers in the U.S., profits are slim, as high capital spending is required to establish the system and attract a profitable client base. While profitability of this activity has yet to materialize, the prospects for long-term success appear positive.

Risks unique to electronic trading have limited the ability to extend this service to a wider client audience. Since the immediacy of electronic trading can produce undesirable results if network communications are not in perfect working condition, the need for reliable and readily available communication links cannot be overstated. To minimize its exposure from systems problems, Merrill Lynch delayed its plans to offer on-line stock trading to its wealthiest customers, in part due to recent volatility and heavy trading volume in some Nasdaq stocks.[23] This company also experienced difficulty when trading Nasdaq stocks due to a "communications glitch"; some trades were not timely and some were executed at the wrong price. Another major trading company is no longer accepting trades over the Internet for stocks of some companies on the first day they are available for public trading due to market volatility.[24] Other on-line trading houses have chosen not to institute these types of restrictions.

While it seems that electronic trading is beginning to prosper in the U.S. and will also move into global markets, there are several characteristics among the South East Asian countries that may delay their acceptance of on-line trading. The small geographic size of many SEACEN countries favors the adoption of other emerging technologies; however, this small size may hinder the feasibility of widespread electronic trading by individual investors. Given a low-cost, high-volume pricing structure, a large customer base is needed to

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22. "A New Option: Electronic Trading Set for Unveiling", *The Wall Street Journal,* November 10, 1998.

23. "Merrill On-Line Trading –2: Company Hit by System Problems Monday", *Dow Jones Intl. News Service, DowVision,* December 22, 1998.

24. "Compressed Data: Schwab Backs Away From Some Internet Trades", *The New York Times,* - December 21, 1998.

be profitable – suggesting a regional solution that introduces cross-border legal, communication and currency issues. Another challenge is that the universe of South East Asian customers that are knowledgeable about computers and active users of the Internet is currently smaller than in the U.S. market, making the profitability of electronic trading harder to achieve. And as mentioned above, a reliable communications network is critical to any on-line service, but particularly in trading. A less mature network infrastructure would be more susceptible to outages and delays.

Despite these obstacles, certain banks in the region will be motivated in the long-term to offer electronic trading capabilities. On-line brokerage is becoming more accepted in the global market, and the region's client base is becoming more financially and technically sophisticated. Further, as economic conditions improve and on-line transaction costs continue to decline, the potential customer base will likely increase over time. With the increase in investment by foreign banks comes a greater likelihood that international brokers will continue to bring their expertise to new markets, and take advantage of lower-cost delivery channels to do so. Global competition, coupled with strong domestic competition, suggests that on-line trading will eventually be part of the South East Asian banking industry.

6. Electronic Bill Presentment / Bill Payment

As in other parts of the world, presenting and paying bills electronically is a technological function that has, until quite recently, not gained much support from consumers. Businesses in the region, often with government support, have pressed the use of this cost-effective method of invoice presentation and funds transfer.

As intermediaries in the presentment and payment scheme, banks retain a percentage of the transaction fees and, through electronic processing, can realize a significant reduction in associated processing costs. While cost savings provide the business case for banks to begin clearing electronic checks, another driver for this activity is the opportunity to maintain or expand their existing client base through enhanced customer service.

V. CURRENT SUPERVISORY ENVIRONMENT

A. INTRODUCTION

This section provides a summary of information derived from the Central Bank Questionnaire on Supervisory Efforts, which requested that research participants discuss their current and future plans for IT supervision. Questions placed particular focus on supervisors' use of formal workprograms, review of IT risk management processes and integration of examination efforts. In addition to current staff experience and development efforts, supervisors were asked to comment on their plans to identify, assess and monitor the impact of risks posed by the changing environment on staffing levels overall. Finally, comments were requested on the availability and usage of information from other sources, namely cross-border supervisors and audit professionals, to enhance the overall supervisory process. While all of the SEACEN countries did not participate in this survey, reporting countries[25] provided a representative sample of the range of functional oversight conducted by the members.

The emerging risks identified by the respondents reflect a quickly changing IT environment within the region.[26] While some SEACEN countries have experienced slower adoption of technology, the expectation is that this pace will quicken and therefore present additional challenges for these countries and their banking supervisors. These countries are being challenged to create an infrastructure sufficient to support the rapid change, including the creation of laws and regulations to encourage and protect users of the newer technologies. As a parallel effort, bank supervisory authorities must initiate steps to effectively identify and supervise risks associated with these technologies.

The following discussion summarizes the six individual country submissions. Actual responses, grouped by question, are available in Appendix C1.

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25. Indonesia, Korea, Malaysia, Nepal, Singapore and Sri Lanka reported.

26. Specific emerging risks identified by respondents included globalization of technological systems, security, contingency planning, insufficient staffing levels, training, high tech criminal activities, and ability of management to understand and control risks.

B. SUPERVISORY AUTHORITY

For many of the SEACEN countries, the central bank serves as the primary regulator responsible for supervision of most financial institutions, including commercial banks, finance companies and specialty banks. While the majority of banking assets is often concentrated within a few large commercial banks, the scope of supervisory responsibilities extends in Taiwan and the Philippines to hundreds of additional, smaller institutions. These numerous smaller institutions can add significant burden to supervisory staff that monitor the overall condition of these organizations.

Generally two exceptions to central bank supervision of the financial services industry were noted. In some instances, other agencies exist in addition to the central bank to supervise providers of financial services. These agencies were formed to oversee specific types of banks, or were created as the financial system evolved. The second exception is the relatively recent trend of carving bank supervision out of the central bank function through the creation of a new independent agency. Most recently, Korea's Financial Supervisory Commission (FSC) was established in April 1998 to become the supervisory authority over all financial institutions there. Indonesia is considering similar action to separate the supervision of its financial institutions from the central bank function.

C. IT STAFFING AND DEVELOPMENT

Although the countries' IT supervisory staffing has migrated toward functional specialization, adoption of this methodology varies widely among the countries; for several, review and assessment of their banks' IT environments remains part of the commercial examination responsibilities. In those countries where IT has been treated as a specialty examination function,[27] staff levels are comparatively small, with experience averaging around five years; this reflects industry trends and the developing use of technology in the region. The training of designated IT staff within the region is also quite varied, although some degree of internal and external IT training is pursued for most staff by all of the

27. Korea, Malaysia and Singapore.

SEACEN countries. With the rapid changes in technology and ever-increasing emphasis on technology deployment within the region, bank supervisors acknowledge the need to focus greater attention and commitment to IT training to further develop and maintain an experienced workforce with appropriate expertise to evaluate this dynamic environment.

D. RISK MANAGEMENT CONSIDERATIONS

The overriding themes presented by existing guidance on this subject[28] are that the current banking environment is dynamic and fast-changing and that banking institutions need to establish and maintain strong internal control processes. Bank management is increasingly challenged to identify, monitor, and evaluate information systems that can provide timely information critical to effective decision making and risk management. This increasing role of information technology necessitates a broader and deeper understanding of technology on the part of bank management and its directors.

Clearly, banking supervisors play an important role in evaluating institutions' risks in the use of information technology. Regardless of the technology deployed, the rapid pace of change in the electronic networked environment places added burden on banking supervisors to evaluate institutions' ability to create a safe, sound, and secure infrastructure that is adequate to evaluate and mitigate risks associated with these activities. Regardless of the level of sophistication, risks are inherent in all electronic applications. The use of an electronic channel to deliver products and services introduces unique risks due to the increased speed at which systems operate and the expanded access to the institution. As the underlying activities are generally not new to the bank, examiners must also continue to evaluate the effectiveness of risk-management practices just as if traditional activities were conducted. For example, if a financial institution conducts lending activities over an electronic channel, credit risks must be considered in the context of the high-speed, wide-access electronic environment. Therefore, the supervisory process needs to integrate both credit and IT elements to fully capture the risk posed by the banking activity.

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28. Appendix D presents a summary of recent guidance products on the subject of IT risk management.

Naturally, the risks resulting from this environment make it increasingly important for bank supervisors to review their current supervisory framework to ensure that it provides a comprehensive risk-management review process that incorporates IT risk elements.

E. RISK ASSESSMENT METHODOLOGY

As a starting point to review an organization's IT operating environment, supervisors commonly referred to use of the workprograms contained in the Federal Financial Institutions Examination Council (FFIEC) Information Systems Handbook. These workprograms are often supplemented by checklists and questionnaires developed by the respective supervisory authority.

Although the FFIEC handbook sets forth a process for reviewing the information processing environment, it is unclear from the responses whether supervisors consider the risks associated with information technology as they evaluate and assess the overall effectiveness of organizations' risk management processes. Recognizing that financial institutions are becoming more dependent on technology and its deployment becoming more widespread in the region, supervisors should incorporate recent guidance on IT risk management in this assessment process. The Basle Committee on Banking Supervision has issued guidance on the identification and management of IT-related risks.[29] Separately, the Federal Reserve System defined five risk elements for evaluating the effectiveness of IT risk management and include, management processes, architecture, integrity, security and availability.[30] Any of these products could serve as a basis for discussing the integration of IT risk assessments in the supervisory process.

Further, several characteristics somewhat unique to this region suggest that this is a critical and opportune time for banking supervi-

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29. See e.g., "Risk Management for Electronic Banking and Electronic Money Activities", Basle Committee on Banking Supervision (March 1998), and "Core Principles for Effective Banking Supervision", Basle Committee on Banking Supervision (September 1997) for general discussions of risk management elements.

30. Board of Governors of the Federal Reserve System, SR 98-9 (SUP), April 20, 1998, "Assessment of Information Technology in the Risk-Focused Frameworks for the Supervision of Community Banks and Large Complex Banking Organizations." Definitions for these elements are provided in Appendix D

sors to evaluate the risk-management practices of banks and revisit the way in which they oversee IT risk management. One characteristic that greatly impacts back-office operations and thus increases IT risk is the consolidation and restructuring of financial services organizations throughout the region. Another is the economic and political focus on technology as a means to economic recovery. Perhaps most importantly, weaknesses in traditional financial risk-management processes (e.g., asset review and classification) and management information systems brought to light by the economic crisis underscore the need for an integrated supervisory approach to ensure that risk management systems are comprehensive and inclusive of IT considerations.

While these surveys and publications offer only a partial view of the region's overall risk-management environment, they serve to provide a starting point for the discussion of supervisory steps needed to move toward a more effective and dynamic risk-management environment. This information further suggests that an increased emphasis on technology is needed to drive quality risk management systems in the region's financial institutions. In adopting contemporary risk-management programs and techniques, these organizations have an opportunity to optimize their control environment over deployed technology.

F. INFORMATION ACCESS

For IT activities that are outsourced or conducted on a regional basis outside the national boundaries of the supervisory authority, methodologies to assess those activities also varied widely. For activities conducted offshore, such as regionalized data processing services, supervisors appear to place a heavy reliance on the supervisory effectiveness of the host-country authority to evaluate the adequacy of local operations' controls. Similarly, regulatory reporting requirements vary widely and formal agreements between countries generally do not exist – conditions that further impede the sharing of effective supervisory information and the ability of home country supervisors to assess the consolidated performance and risk profile of these financial institutions. As technology evolves and its deployment throughout the region expands, the likelihood of outsourcing and regionalization of services increases. The necessity of sharing supervisory information in this environment not only sets the stage for regional cooperation, but also creates a framework for a supervisory process that is transparent to the

industry and consistent in evaluating the overall condition of such organizations.

G. CONCLUSION

The supervisory environment within the region faces a state of potentially rapid change and transition, brought about by the region's economic crisis, as well as by the fast pace of technological change in the global marketplace. While technology investment and deployment decisions in the region effectively slowed in response to strained financial conditions, supervisory resources will be challenged to keep pace with the projected rate of change as economic conditions normalize. Not only will attention need to be directed to the control environment for evolving technologies, supervisors will also need to focus on the implementation of effective risk management systems which address comprehensive risk profiles of technology-adopting organizations.

VI. RECOMMENDATIONS FOR SUPERVISORY PROGRAMS

A. INTRODUCTION

The following recommendations are intended to set in motion a regional discussion on a series of enhancements to the current SEACEN supervisory environment. General and wide-ranging in scope, these recommendations will likely necessitate a thorough self-assessment of current bank supervision practices before specific supervisory responses are developed. While there are challenges and administrative costs associated with moving toward a coordinated, regional approach to banking supervision, the long-term benefits can greatly outweigh these costs. As globalization continues to transform our corporate and social environments, bank supervisors throughout the world are collectively developing and applying common "standards" for financial services industry reporting and oversight. Inherent in these efforts to develop an accepted supervisory framework would be the flexibility to account for national differences and the varying capacity of each country to adopt such standards.

An effective IT supervisory program starts with a strong support foundation. This foundation includes a well-trained examination staff with an understanding of the technology environment, a clear grasp of

supervisory principles and an effective communication network with supervised institutions. Fundamental to this process is strong cooperation among cross-border regulators, collaboration with banking and technology-industry experts and access to reliable information from independent risk-management resources, such as external auditors.

While many of these individual elements are evident from supervisory efforts reported by the SEACEN countries, overall effectiveness of the programs depends upon a framework that links these elements together. Even if the same developmental process is used, supervisory programs within each country will uniquely reflect the nature of the technological environment and subsequent risk profiles of the supervised institutions. Wherever possible, collaboration on supervisory improvement efforts within the region and use of global resources is encouraged.

B. INITIATE AN IT EXAMINATION FOUNDATION

1. Develop Institution Risk Profiles and an IT Database

The baseline for an effective supervisory program includes developing an awareness of the technology industry in general, identifying the technologies deployed by financial institutions in particular and using this information to create risk profiles for the supervised institutions. An inventory of IT deployment could serve as a starting point in creating institutional profiles for use in identifying supervisory resource requirements and determining the appropriate allocation of scarce examination resources. From these profiles, an IT database should be developed to catalogue information about these institutions by select risk categories. An ongoing tracking methodology to monitor those institutions considered high-risk would facilitate dialogue with the supervised institutions and thus enable banking supervisors to identify and respond to changing risk profiles in a timely manner.

2. Review Staff Levels and Develop Appropriate IT Knowledge

In conjunction with the industry baseline study, an examination staffing review should be conducted to determine whether current staff levels and IT expertise allow for an appropriate oversight of the IT environment. Attrition levels should be reviewed along with development of retention strategies for key IT staff members. To allocate

resources most effectively, opportunities to monitor lowest-risk activities by non-IT staff should be pursued. Further, supervisors must also develop contingency plans that allow flexibility to redirect examination resources as needed in a changing environment.

3. Heighten IT Communication with Supervised Institutions

To establish and maintain a current IT "inventory", a dynamic communication system should be established between bank supervisors and the financial institutions they monitor. Establishing ongoing communication between these parties helps ensure that banking supervisors are informed of a possible change in an institution's risk profile. While on-site examinations provide a reliable method to determine IT deployment and risk, IT risk profiles at financial institutions can change quickly. Obtaining this information in a more frequent or timely manner allows supervisors to remain current on institution's IT activity, ensure that institution's risk-management programs are up-to-date and more effectively prioritize the allocation of examination resources according to risk.

There are several methods to routinely identify significant IT deployment. This process can take the form of an informal notification completed by institutions as certain products or operational enhancements are considered (e.g., Internet, back office system conversion, etc.). Alternatively, supervisors could conduct periodic visitations or telephone interviews with institution management to update information on the current IT environment. Regardless of the method selected, the results of this ongoing communication process will be beneficial if the program's objectives are clearly understood by the financial institutions and consistently conducted by supervisory staff.

4. Create Base Line Expectations for Audit Programs

With the widely-held practice of risk-focused examinations, supervisors have sought methods to more effectively and efficiently allocate scarce examination resources to the review of high-risk areas. Thus, the supervisory examination process can be supplemented by leveraging certain control mechanisms that provide the most objective and corporate-wide perspective. Internal and external audit functions are two such control mechanisms that can be instrumental in maintaining an effective operational environment. However, due to concerns over the

credibility of audit findings, information obtained from internal and external audit programs is used in varying degrees by supervised institutions and banking supervisors. To optimize the use of audit findings, common supervisory expectations for these independent reviews should be developed, thereby enabling examiners to more readily use this information to enhance the supervisory process.

One strategy is the establishment of minimum requirements for internal and external audit activities, specifically related to IT. An expectation should be developed that internal and external audit will conduct periodic reviews of IT deployment and the associated risk management processes. It must be the responsibility of the institution to ensure the independence and accuracy of the audit processes.

The second strategy builds upon the existence of high-quality, independent reports conducted by audit professionals. Examination staff should ensure the effectiveness of the internal audit process by evaluating the audit scope and findings. Bank supervisors can then rely on subsequent audit reports to assist in establishing priorities for risk-focused examinations.

C. EXTEND SEACEN'S COLLABORATIVE BASE

1. Collectively Address IT Policy and Regional Support Initiatives

The SEACEN governors and directors of supervision have the potential to serve as a vehicle to promote greater cooperation among bank supervisors within and outside the region. Identification of specific collaborative efforts would facilitate dialogue on supervisory policy issues and promote the development of enhanced supervisory programs.

Initially, guidelines should be established that identify the types of supervisory discussions that will be coordinated by a central administrative site. Functional cooperation may be adopted, wherein individual countries take the lead in managing projects related to a particular subject matter. Immediate consideration could be directed to the following topics:

- Review jurisdictional issues to share supervisory authority as it relates to cross-border processors and electronic commerce.

- Establish a forum for discussion of supervisory practices to develop formal guidance on electronic banking topics. To raise attention to emerging issues, offer participation in these forums to non-SEACEN countries in the region that are technology leaders, for example, Australia, Hong Kong and Japan.

- Expand SEACEN's training role beyond that of a conduit for training programs to include central administration of regional IT training initiatives. Identification, development and sponsorship of new training programs would be within these broader responsibilities.

2. Expand Cooperative Efforts for IT Implementation Issues

The benefits of cooperation can extend beyond policy issues to aid the implementation of new supervisory programs and to fully engage the expertise of regional IT supervision professionals. Establishing a collaborative working group of IT practitioners through SEACEN can serve to empower these select professionals to more proactively identify and formulate IT supervisory initiatives. A few examples of such cooperative efforts follow:

- Designate country IT representatives, or regional IT experts, to participate and lead regional training initiatives. Initiatives would include development of training programs and participation in global training initiatives.

- Establish periodic discussion forums that bring together technology experts and IT professionals throughout the region to contribute to identification of emerging risks and training initiatives.

- Identify opportunities for cooperative examination efforts or regional technical assistance programs.

D. ENSURE EFFECTIVE STAFF DEVELOPMENT AND TRAINING

1. Establish or Enhance Continuing IT Education Programs

The technical expertise of all examination staff should be enhanced to effectively evaluate the increasingly complex management information systems in use. While training efforts for supervisory staff have increased in recent years, SEACEN bank supervisors would benefit from an enhanced, formal training approach.

The initial steps in developing an effective IT examination training program are to establish IT knowledge requirements and to choose a framework for their implementation. Very likely, a review of current training opportunities and identification of critical training needs serve as the first step in the process. The overriding objective is to raise overall IT awareness so examiners can evaluate the controls and assess the adequacy of deployed technology and resultant information systems - or know when to request the assistance of specialists to make those evaluations. In addition, the IT training program should enable examination staff to properly evaluate risk management systems of supervised institutions. The knowledge requirements for IT training can encompass a wide spectrum of subjects, including applied technical training (such as for security solutions and network communications), due diligence reviews for outsourcing arrangements, external audit standards and specific product training (e.g., on-line brokerage).

Different institution and the environment in which they operate require varying degrees of IT expertise. However, the need to understand and evaluate information systems and their associated risks is critical in assessing the effectiveness of bank operations, regardless of the complexity of the institution. A tiered training implementation framework would provide flexibility to address differences in institutions' IT risk profiles and supervisory staff expertise by defining and establishing training for different levels of desired technical expertise. The first level would include a core curriculum that provides training for IT fundamentals. Additional training levels would be defined to deliver increasingly complex and detailed IT material, thus creating IT specialists. Banking supervisors would then have a spectrum of IT expertise to drawn upon within the ranks of their supervisory staff.

2. Develop a Regional IT Training Program

An IT training program should be developed and shared among the SEACEN countries to foster long-term cooperation among banking supervisors, to attract the best regional and global expertise and to reduce administrative costs associated with program development and delivery.

While there are many outside resources available to assist with program development, the start-up costs to deliver IT training are still significant. Despite differences in IT expertise and deployment, each member country faces similar training needs. The applied technologies in the banking industry, while deployed in varying stages, are consistent across this region and are therefore uniquely suited to a regional training approach.

E. ENHANCE THE SUPERVISORY PROCESSES

1. Conduct an IT Supervisory Process Review

While the SEACEN members combine many IT operational risk elements into their supervisory programs, it is unclear to what extent examinations integrate an assessment of IT risks into each organization's overall evaluation. Moreover, the functional role of IT specialists appears to occur as an adjunct to the commercial examination process, rather than through an ongoing, integrated supervisory approach.

A supervisory process review should be conducted to ensure that examinations take an integrated approach to the assessment of IT risk management processes. Bank supervisors are encouraged to share guidance outlining effective risk management methodologies with the institutions they oversee. Moreover, supervisors should also formalize expectations of bank management for this process to ensure the adequacy of controls when newer technologies are implemented.

2. Introduce a Tiered, Risk-Focused IT Supervisory Program

To take full advantage of the supervisory enhancements described above, SEACEN supervisors should consider establishing a tiered approach to the risk-focused supervisory process.

The legal structure of the banking industry ensures that every institution with the same charter shares a common liability for managing associated risks for common products or services it offers. Where similar risk characteristics exist for activities in common, supervisors may categorize banks according to those risk elements. Differences in corporate structure, size, and product differentiation, however, result in unique risk profiles for each bank. In conjunction with this risk identification, banking supervisors are charged with developing and implementing a supervisory approach that not only creates a degree of consistency throughout the banking industry but also allows for special consideration of these unique risk profiles.

To further advance a flexible, responsive supervisory assessment of risk management systems, a tiered examination process is encouraged. Despite the unique risk profiles for all financial institutions, it is feasible to group organizations by predetermined characteristics and to create a common supervisory approach for each similar group of institutions. Corporate structure, asset size, technology environment, trading operations, deployment of emerging technology, and back office infrastructure are examples of such characteristics.

An example of such an approach places institutions into one of several categories and develops an examination team best suited to evaluate the risk factors and assess the adequacy of management processes by category. The tiered approach would begin with an examination team for non-complex or lower risk organizations consisting exclusively of commercial examiners trained in a core IT curriculum. Subsequent phases would establish examination teams dealing with progressively more complex institutions (e.g., based on structure, size and technology infrastructure) and thus would engage an increasing level of IT expertise. The final phase would represent a dual examination effort consisting of both commercial and IT examination teams to coordinate and conduct the risk management review. This phase would be reserved for the most complex institutions, typically, banks leading the industry in the deployment of technology.

In the above scenario, expertise could range from 1) commercial examination staff with elevated or application-specific training to 2) IT designated specialists to review IT risks and technology at complex organizations to 3) IT specialization and high expertise in specific technology applications, processes, or products. Regardless of staff

discipline, IT skills would be elevated through training initiatives so examiners have the fundamental capability to assess controls and adequacy of management information systems, recognizing the need for and requesting assistance of an IT specialist where warranted.

Several advantages exist for this type of examination approach. One advantage is that all staff, regardless of discipline, are held to a common base of IT knowledge. Another is that higher level technical expertise is developed within the IT specialty group and is assigned only to the highest risk institutions. Regardless of the institution, this approach would ensure that the evaluation of risk management processes would always include an IT perspective.

APPENDICES

APPENDIX A

COUNTRY SUMMARIES

This appendix provides a summary of the national characteristics that contribute to each SEACEN country's financial and technological environments. The impact of the political atmosphere and the state of the economy have obvious implications for technological deployment in the banking industry. Social demographics, availability of basic telecommunications services and communications infrastructure can also prove insightful when exploring the extent emerging technologies have been deployed and determining whether a market has the capacity or desire to move to a more electronic infrastructure. A discussion of the economic and political environment is provided followed by a review of the social, telecommunications and payments systems. The section closes with a brief overview of the banking environment.

Unless otherwise noted, the quantitative economic and telecommunications data discussed in these summaries are found in Appendix B.

COUNTRY SUMMARY — INDONESIA

A. OVERVIEW

Indonesia is a country that is undergoing significant political, economic and social change. The last 30 years have brought significant economic and social advancement and because of that advancement, the country is considered newly industrialized. However, the economic crisis and persistent political turmoil has reversed economic growth and slowed efforts to create a more sophisticated communications infrastructure. Further, the economic downturn has required restructuring of the financial industry. Efforts to create a more global economy are underway and the telecommunications infrastructure and legislative structure needed to support that economy are just beginning to emerge.

B. INFRASTRUCTURE — ECONOMIC AND POLITICAL

1. Economic[1]

The average income in 1967 was $70. By 1997 it rose to $1,091 and in 1998 it fell to $467 due to the economic crisis. The population remains one of the poorest of the SEACEN countries with a per capita GDP in terms of purchase power parity of $3,310 in 1996 and 39% of the population below the poverty line. The 1996 GDP is made up of four primary segments, industrial at 26%, agricultural at 19%, trading at 15% and the remaining 40% is mining and other services. Significant industries include petroleum and manufacturing of garment, footwear and electronic goods. Textiles and garments, wood products and electronics are the major export commodities and the major trading partners are Japan, United States, Singapore and South Korea.

Although just 19% of GDP is derived from agriculture, the largest portion (40.5%) of the workforce is engaged in agricultural production and represents the poorest population segment. The remaining work-

1. Economic and demographic data was provided by Bank Indonesia.

ers are concentrated in three occupational segments that include trade/ restaurants at 19.7%, public services at 20% and manufacturing at 19.8%.

Two measurements of the openness of the economy, trade and foreign investment as a percentage of GDP, indicate a relatively closed economy. However, since 1967 Indonesia has forged a contemporary foreign policy that involves Association of Southeast Asian Nations (ASEAN) membership and supports the Asia-Pacific Economic Cooperation forum (APEC). In 1997, foreign ownership limitations on most firms publicly traded on Indonesian stock markets were eliminated and in late 1998, 100% foreign ownership of banks was allowed.

The Indonesian government also implemented several deregulation packages that intended to lower investment barriers and tariffs in stages. Original goals were to reduce tariffs in varying degrees by the years 2000 and 2003. However, the recent economic crisis accelerated these plans. The November 1997 and January 1998 International Monetary Fund (IMF) packages announced the end of most import and distribution monopolies on food and exports and pledged gradual opening of the country's distribution system. Foreign investment has increased within the last several years with the expansion of plantation crops, textiles and plywood.

The impact of the Asian crisis has been severe and it appears that economic restructuring will be a lengthy process. While the worst of the liquidity and currency crisis has passed, interest rates and inflation have not yet normalized. A planned sale of hundreds of companies representing about 25% of GDP was delayed at the IMF's insistence because of a fear that full value would not be received[2]. However, the IMF approved the first installment of its loan package of SDR 8.3 billion ($11.9 billion) in November after it was determined that banking and corporate debt restructuring was underway. Further economic stabilization is expected once confidence of the global community returns.

2. Political

The current leadership of Indonesia has a variety of critical issues to resolve in order to stabilize the economy and banking system. While political and legislative actions to create a more competitive and

2. "Indonesia Pact on Debt Averts IMF Impasse", *The Wall Street Journal*, November 10, 1998.

open economy have been planned for some time, terms of the IMF loan package have encouraged and in some cases accelerated these plans. The World Trade Organization (WTO) world telecommunications pact was recently signed to prevent anti-competitive practices. As a result, new patent, trademark and copyright laws were enacted in 1997 to bring the country's laws into compliance. While these revisions addressed many inadequate penalties, the judicial system does not have the experience to deal with intellectual property issues.

C. INFRASTRUCTURE — DEMOGRAPHIC AND COMMUNICATIONS

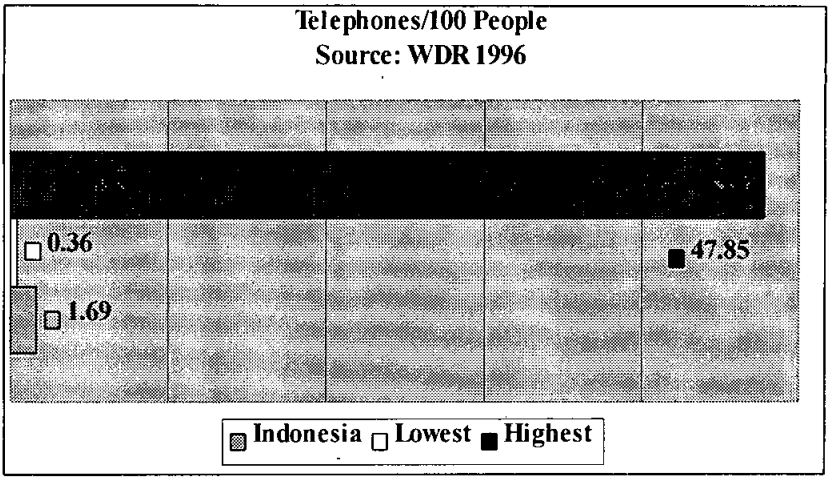
1. Demographic

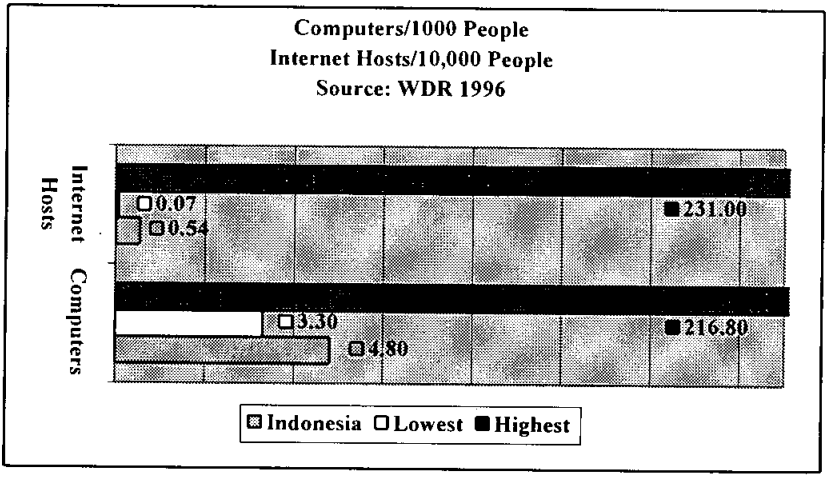
Indonesia consists of 13,667 islands and about 30.5% of the land is cultivated farmland. It is the world's fourth-most populous nation with a varied population distribution. On the one hand, just 957 or 7% of these islands are inhabited and the urban population is relatively low at 34.4%. On the other hand, Java is one of the most densely populated areas in the world.

Indonesia's literacy, while not as high as more advanced nations, is a respectable 87.4%. However, enrollment of the population in secondary and tertiary education is relatively low at 60.4% and 9.7% respectively. Moreover, Indonesia's growth in tertiary education over the past 15 to 20 years has been modest while other SEACEN countries have experienced strong increases.

2. Communications

Given the low per capita income, diverse geography and low urban population, it is not surprising that telecommunications and computer usage is lower than other industrialized SEACEN countries. In addition, the telecommunications industry is state-controlled with minimal competition, limited services and high prices. Telephones, mobile phones, fax machines and computers per capita are low and consistent with other developing SEACEN countries. There are less than two telephones per 100 people, five computers per 1000 people and one-Internet host per 20,000 people and the following graphs provide a comparison of these statistics to the highest and lowest performers in SEACEN.


Telephones/100 People
Source: WDR 1996
0.36
1.69
47.85
Indonesia
Lowest
Highest


Computers/1000 People
Internet Hosts/10,000 People
Source: WDR 1996
Internet Hosts
Computers
0.07
0.54
231.00
3.30
4.80
216.80
Indonesia
Lowest
Highest

The Directorate General of Posts and Telecommunications implements policies and strategies in the telecommunications industry and those services are split into domestic and international sectors.[3] PT Telkom and five regional operators are the only providers of domestic services and the Indonesia Satellite Company (Indosat) and Satelindo operate international services. The government has maintained the right to provide long distance direct line phone services and additional domestic and international licenses will not be reviewed until the years 2011 and 2006, respectively.

PT Telkom is the only public switched telecommunications network and offers all aspects of telecommunications services. It is partially state-owned and employs 37,600 people. The five regional operators are private companies that have a 15-year concession to build and operate fixed line networks for PT Telkom in five geographic zones (West Java, Central Java, Sumatra, Kalimantan, and East Indonesia). Recent plans to privatize PT Telkom have been postponed until the national economy has recovered.[4]

PT Indosat is also partially state-owned and provides a wide range of international services due to its diversified interests in several companies. There are four international gateway exchanges in Jakarta, Medan, Bantam and Surabaya. Jakarta handles 85% of international traffic. Satelindo began operations in 1994 and has one international gateway at Jakarta. They have plans to introduce a digital cellular network to compete with Indosat for the business call market. Indonesia ISDN & IN User Forum was established in 1995 and the network installed in Jakarta the first quarter of 1996.

There are several major projects planned to improve the telecommunications infrastructure. The Nusantara-21 Superhighway and the Archipelagic Super-Lane are expected to link the entire country together for multimedia access. However, it was reported that the Nusantara-21 project has been delayed due to funding problems[5]. Another project, the sixth in a series of five-year telecommunications plans, will expand telephones lines by 6.5 million.

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3. Paul Budde Communication Pty. Ltd., "Telecommunications and Information Highways", 1998.

4. "Indonesia Postpones the Privatisation of Pt Telkom", *Skali,* October 14, 1998.

5. "The Currency Crisis and Asia's On-Line Services Boom", *Telecommunications Online,* July 1998

Internet services began as a national research network and commercial services were introduced in 1995. The government has placed a ceiling on service providers at 24 and service is restricted to central Jakarta. One report indicated that there were ten Internet service providers available in 1996. Internet hosts have not penetrated the market as hosts per 10,000 were reported at .54 in 1997, which is significantly below most SEACEN countries.

3. Payment Systems

Wholesale or large value payments include interbank and large-value customer transfers and are processed in two ways. One is a paper-based RTGS and the other a netting process using clearing houses that are generally run by Bank Indonesia. All retail payments are based on netting arrangements and include both paper-based and electronic payments systems. There are more than 100 paper-based clearing houses, 43 of which are run by Bank Indonesia and membership in these clearing houses is mandatory for all banks. Securities clearing is handled by private companies and Financial EDI is provided by the Indonesia EDI Company, Ltd.

The retail electronic payments systems include ATM networks, EFT/POS, credit cards and electronic money such as Mondex and Visa Proton. Membership in these payments systems is voluntary and Bank Indonesia has not yet assumed a formal role in the development and oversight of these systems. However, the central bank is considering plans to integrate all electronic payments systems in order to avoid excess, optimize banks' returns and encourage membership and cooperation among banks.

D. Banking Industry Overview

As of December 1998, there were 208 Indonesian banks consisting of state, regional government, private national, foreign and joint banks. Rural credit banks are smaller in size but number 9,383. However, because of the seriousness of bank insolvencies, current restructuring efforts will greatly change the makeup of the banking industry. Bank Indonesia reports nonperforming loans at 36% as of September 1998. Another report indicates that 60% of loans of Indonesian banks are nonperforming and perhaps ten banks would survive after the economic crisis.[6]

6. "Indonesia's Troubles Swamp Even Well-Run Banks", *The New York Times,* September 23, 1998.

The Indonesia Bank Restructuring Agency (IBRA) was formed in January 1998 and is working closely with Bank Indonesia on the resolution of troubled banks. Thus far, more than 38 banks have been liquidated. Additional measures that have or will be taken to restructure the industry includes 1) the merger of four state banks (Bank Exim, Bank BNI, Bapindo and Bank Bumi Daya) into the new Bank Mandiri; 2) suspension of operations of banks expected to not achieve capital ratios of 8% by 2001; and 3) recapitalization of banks expected to achieve capital ratios of 8% by 2001. The recapitalization will be achieved through capital injections from existing owners, new investors and/or the government.

Efforts to deal with more troubled state banks have been slow due to political resistance. As independent oversight of banking is new to Indonesia, the transfer of power to IBRA will likely be slow. However, in early November, President B.J. Habibie promised the IBRA that measures will be taken that will enhance its autonomy.[7] The government is also considering legislation that would remove bank supervision from Bank Indonesia in an attempt to establish a separate, more independent supervisor.

In addition, new laws and regulations are expected to create a more transparent reporting system and provide deposit insurance and other safeguards in line with international standards. Proposed regulations will cover a wide spectrum of issues including loan classification, loss provisions, liquidity management and director liability. While requirements being implemented in this restructuring effort are not new to many countries, these reforms, when implemented, will result in a drastic change in Indonesia's banking industry.

Responses from the Financial Industry Survey conducted for this research project indicate that the key challenges facing the banking industry are funding and liquidity, revenue growth and economic conditions. The participants driving technology efforts are the retail customer, domestic competition and internal bank management. Thus, the major efforts are primarily in retail banking and then payments systems and back office operations.

7. "No Miracle Cure: Indonesian Agency for Sick Banks Gets a Shot in the Arm", *Far Eastern Economic Review*, November 16, 1998.

COUNTRY SUMMARY — KOREA

A. OVERVIEW

As one of the Four Dragons of East Asia, South Korea had enjoyed 30 years of strong economic growth and achieved a solid standing in the world's manufacturing and services economic sectors. Prior to 1997, Korea was ranked as the 11th largest economy in the world. However, the economic crisis of 1997 abruptly ended economic growth and brought to the surface several weaknesses in the country's corporate and financial structures. And while the hardship of this downturn cannot be overstated, the economic and political reforms that are being implemented will strengthen the country's long-term competitive position. Further, the solid telecommunications infrastructure and social demographics suggest that Korea is a country poised to take advantage of emerging technology once the economic crisis is resolved.

B. INFRASTRUCTURE — ECONOMIC AND POLITICAL

1. Economic

Economic measures of per capita income and composition of GDP are among the strongest of the SEACEN countries. The country has a population of 46 million people, with 83 percent living in urban environments and approximately 24 percent living in the capital city of Seoul.

Korea's per capita GNP for 1997 in terms of purchase power parity has risen to $13,500 behind the strength of its services and industrial economic sectors. The most significant services sector claims 65 percent of the work force and contributes 64 percent to GDP. Manufacturing and industry represents 23 percent of the workers and 30 percent of the GDP. Agriculture is the smallest contributor to the economy with 12 percent of the workforce and 6 percent of GDP. The country's main industries are organized into seven sectors under the five top chaebols or conglomerates. These industries include aerospace, rolling stock, power generation, ship engines, oil refining, semiconductors and petrochemicals. Other prominent industries are textiles and footwear.

Given Korea's economic strength of manufacturing, it follows that there are strong trading relationships with the United States, Japan and Europe. Trade as a percent of GDP place Korea above the least developed countries in SEACEN but lag most other countries. While it is unclear if trade barriers and foreign investment laws are excessive, recent economic reforms include lowering existing restrictions and lifting barriers.

The last year has been challenging as Korea's 30 years of continued growth came to an end in late 1997. Over lending by banks to the chaebols resulted in highly leveraged businesses with excess capacity. This lending environment was accompanied by a decline in Korean export competitiveness and an opaque corporate governance structure. However, a change in leadership and an International Monetary Fund rescue package of $58 billion has brought a renewed focus on financial and corporate reform and has moved the country past the liquidity crisis. In fact, revised IMF economic forecasts include positive growth for 1999[8] and beyond.

This economic crisis has served as a catalyst to change the way business is conducted in Korea. Chaebols are being required to reduce nonviable subsidiaries, streamline core businesses and increase capital levels. Pressure to expedite this process continues to mount as the Fair Trade Commission recently fined five leading conglomerates for financially supporting nonviable subsidiaries.[9] Tariffs on telecommunication and information-related equipment are to be eliminated by 1999; other tariffs are to be phased out by 2004.

2. Political

While the economic crisis has resulted in significant financial hardship, it has also provided incentives to move quickly to a more open economy. A change in the country's leadership and guidance from the IMF has placed political and economic reform as top priorities. Barriers to foreign investments have been lifted and the process of separating business interests from political agendas is underway. Further, the government has identified the long-term goal of creating a more com-

8. "IMF Predicts Positive Economic Growth for Korea Next Year", *Korea Herald Business News,* October 30, 1998.

9. "S. Korea Slaps Penalty of KRW20.9B on Five Conglomerates", *Dow Jones International News Service,* November 12, 1998.

petitive economy by distributing the economic power beyond the chaebols.

The laws and enforcement procedures that are necessary in a more competitive economy are still in transition in Korea. Intellectual property right laws are adequate; however, enforcement, while improved upon in recent years, is not fully supported. Patent law is comprehensive, but international ownership of patents is not always recognized. Protection of trademarks has also improved, but only to domestically registered trademarks. In 1998, software copyright laws are to be revised to improve enforcement against piracy and a Basic Law for Electronic Commerce was proposed.

C. INFRASTRUCTURE — DEMOGRAPHIC, COMMUNICATIONS AND PAYMENTS SYSTEMS

1. Demographic

Korea is strongly positioned in the SEACEN group when comparing social demographics and telecommunication infrastructure. Its population is the most educated of the SEACEN countries and has a 98 percent literacy rate. Tertiary education participation grew from just 15 percent in 1980 to 52 percent in 1995. Interestingly, Korea spends less on education as a percentage of GNP than several countries with lower participation rates. These demographics suggest that education is more highly valued in Korean society and/or that the educational system is more efficient.

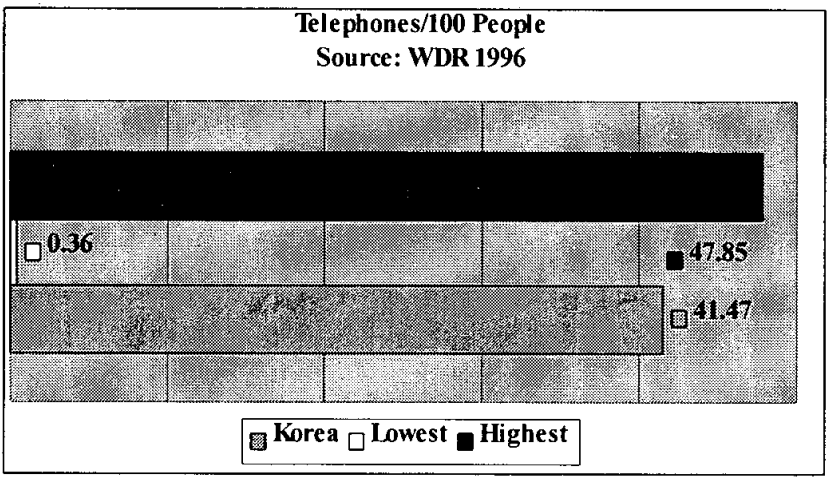
2. Communications

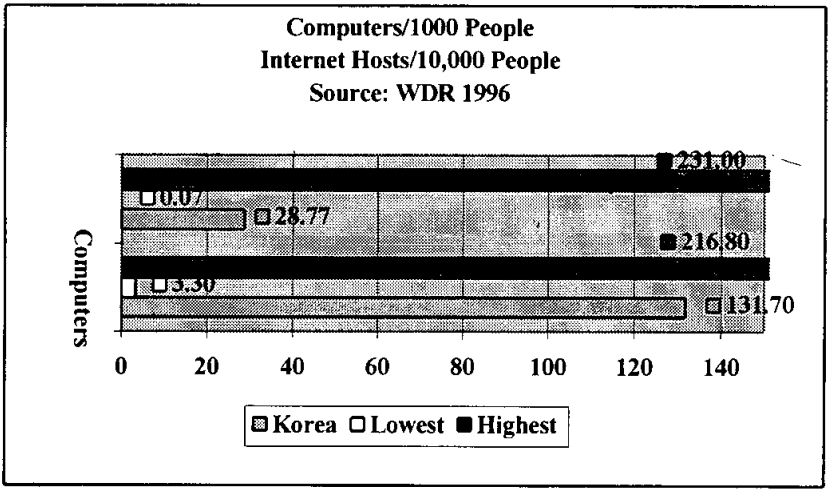
Basic telecommunication infrastructure is sound and multiple government and private projects are underway that will significantly upgrade the IT infrastructure. However, several factors such as lower Internet usage and a services industry only recently opened to competition and private ownership, suggest a telecommunications market still in transition.

Basic communications measurements such as electricity transmission, telephone faults per 100 main lines, waiting time for phone lines and telephones per person place Korea near the top of SEACEN countries. The following graphs compare these statistics to the highest and lowest performers in SEACEN. The deployment of

mobile phones and fax machines is not as prevalent as the leading country of Singapore. However, recent reports indicate fast growth of mobile phone subscribers (60 percent increase in sales for the first six months of 1998). Also, KT Telecom (KT) recently developed their first satellite mobile phone (IMT-2000) that allows the transmission of video images and voice data.

In 1981, the telecommunications network became a priority and KT was separated from the Ministry of Communications. Recently, the long-standing monopoly of KT came to an end when two new licenses





(Onse Telecom and Dacom) were issued for the long-distance market.[10] KT is still the major data communications service provider and offers voice mail, fax, video conferencing, data gateways, virtual private network, and an international ISDN. Plans to privatize KT began in 1998 and are scheduled in stages through 2002. Value Added Network (VAN) services have been gradually deregulated since 1985 and can now be foreign-owned.

Efforts to enhance the IT infrastructure include both private and government efforts. The Sondo Media Valley is under construction in Inchon City and plans include a software park, a media academy, a multimedia information center and an assistance complex. Commercial activity is planned to begin in 2001. The Ministry of Information and Communication has committed to provide funds to certain communications companies for further investment in information superhighways.

Korea has a high level of computer deployment while it is lagging more progressive countries in Internet access. There are 132 computers per 1,000 people, significantly above all SEACEN countries except Singapore. Internet service is still emerging. There are multiple service providers and several recent entrants. However, the number of Internet hosts per 1,000 people is relatively low at 29 and the quality of service varies. Pricing structures are controlled with the government announcing price reductions up to 10 percent starting in November 1998.

3. Payments Systems

There are seven interbank funds transfer systems in operation. The Korea Financial Telecommunications and Clearings Institution (KFTC) operates six retail payments and multilateral net settlement systems. The oldest clearing mechanism is the Cheque Clearing System of 1910. Alternatively, five of the six electronic systems have been installed in the last ten years. The newest electronic payments project is Check Truncation that is currently being developed to reduce processing costs and time associated with Giro payments. By the end of 1996, 36 percent of the volume and 52 percent of the value of cashless payment systems were handled electronically.

10. Paul Budde Communication Pty. Ltd., "Telecommunications and Information Highways", 1998.

EDI is fully operational and provides for the exchange of trade documents and payment-related information between companies.

D. BANKING INDUSTRY OVERVIEW

At the end of June 1998, there were 16 nationwide commercial banks, ten local banks and 52 foreign bank branches. Nationwide banks have a widely distributed branching structure and hold 79 percent of total commercial bank assets. The foreign banks generally focus on wholesale activities. In addition to the commercial banks, specialized banks were established to provide funds to particular sectors and are directed and supervised by the government.

Non-bank financial institutions were introduced in the 1970's to further diversify the market. From 1980 to 1996, non-bank institutions' market share of won deposits increased from 29 percent to 68 percent while the commercial banking market share declined from 71 percent to 32 percent. A similar transfer of market share also occurred with loans.

With guidance from the IMF, the banking industry is undergoing substantial restructuring to eliminate insolvent institutions and to create a market-driven banking system and an effective supervision mechanism. In April 1998, responsibility for bank supervision was granted to the Financial Supervisory Commission (FSC), thus separating oversight of the banking industry from the Central Bank. In addition, all financial supervisors were merged into the Financial Supervisory Service (FSS) on January 1, 1999. The Korea Asset Management Corporation (KAMCO) was formed to purchase and manage the sale of the financial industry's distressed assets. Also, financial reporting requirements were revised in accordance with international standards to increase transparency and consistency.

The restructuring process is still underway. In the last half of 1998, five smaller banks were forced to merge with healthier institutions, two more banks were scheduled for sale and multiple mergers were announced. The FSS reported that more than 1,000 foreign and domestic branches were closed and some workforce reductions made. One report indicated that staff cuts of up to 50 percent for troubled banks and 10 percent to 20 percent for healthy banks would be needed to reach a reasonable cost structure.[11]

11. "Account Update Korea", *The Asian Banker Journal*, Issue 14.

Responses from the Financial Industry Survey conducted for this research project provide information on the key challenges and forces driving the technology efforts of the banking industry. Given the overall economic environment, it is not surprising that the key challenges are economic and political conditions, expense reduction and funding or liquidity concerns. Domestic competition, retail customers and internal management are driving the technology efforts that include retail banking, back office operations and payments systems.

COUNTRY SUMMARY — MALAYSIA

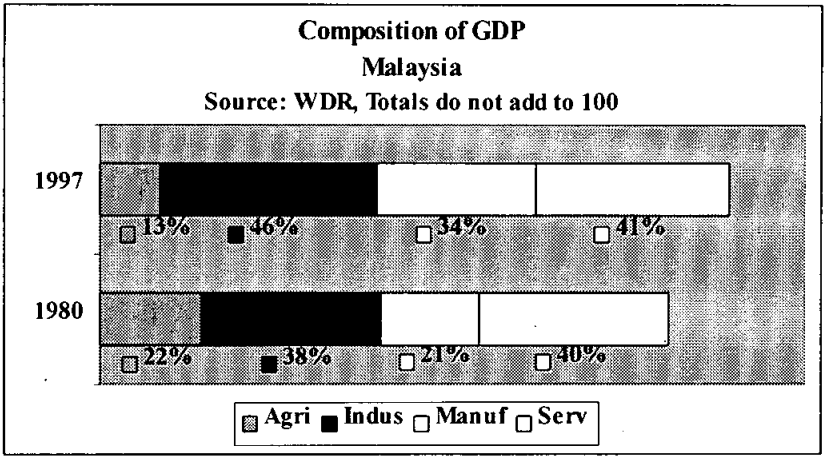
A. OVERVIEW

When comparing economic, social and infrastructure characteristics, Malaysia falls solidly into the middle of the SEACEN countries as a result of significant economic growth and social improvements over the past ten years. This growth has resulted in a well-diversified economy that is not overly dependent on one trading partner. Current leaders have aggressive goals to transform the economy to one built around high technology. The Malaysian Multimedia Super Corridor (MSC) is the major project that represents this economic future. While the effect of the Asian crisis has not been as severe as for some SEACEN countries, it has resulted in the first economic recession in over ten years. However, the government has implemented a series of measures to support economic recovery and recent statistics indicate that the economy is entering a recovery phase. While delayed, achievement of long-term economic goals appears likely.

B. INFRASTRUCTURE — ECONOMIC AND POLITICAL

1. Economic

The economic system is based essentially on private enterprise with the Government playing an active role in development planning. Since independence in 1957, Malaysia consistently enjoyed a high rate of economic growth, particularly in the industrial and manufacturing sectors, and from 1987 to 1997 economic growth accelerated with real GDP growth averaging 8.4%. In 1997, the manufacturing sector accounted for 36% of overall real GDP, while the services and agriculture sectors accounted for 45% and 12% respectively. The following chart shows the change in GDP from 1980 to 1997 based on data from the World Development Report and illustrates the growing importance of industry and manufacturing in this economy. Major industries in the manufacturing sector are electronic and electrical products, chemical products, textiles and wearing apparel as well as wood and wood-based products.



Malaysia's 1997 per capita GNP in terms of purchase power parity of $10,920 is the fourth highest among the SEACEN countries. Employment has remained tight for the last six years with shortages in the professional sectors. In 1997, the services sector accounted for the largest share of total employment (46%), followed by the manufacturing (27%) and agriculture (17%) sectors.

Trade and foreign investment measurements for Malaysia are substantially above all other SEACEN countries with the exception of Singapore. The economy is open and foreign trade is supported. There is no dominant trading partner as exports and imports are evenly distributed among the participants. The major export markets include Singapore, United States, European Union and Japan. Major importers are Japan, United States, European Union and Singapore.

The Asian crisis hit Malaysia in July 1997 when the equity markets declined and currency depreciated. However, the economic downturn has not been as severe as in other SEACEN countries and the IMF is predicting positive growth for 1999.[12] This is likely due to the diver-

12. "Malaysia and Neighbors Set to Recover Next Year, says IMF", *Star Publications*, October 29, 1998.

sified economy and stronger supervisory oversight of the banking system.[13] Regardless, unemployment figures and nonperforming loans increased and government action was taken to stabilize the economy and improve banking oversight. While the crisis has slowed achievement of economic goals, recent government efforts to strengthen the economy and banking system will likely enhance the country's long-term competitiveness.

2. Political

The country is an active participant in the World Trade Organization (WTO) and Asia-Pacific Economic Cooperation (APEC) and has worked to reduce tariff levels over time. Trade barriers in most sectors are considered low and tariffs and import licensing are used. Recently, the government has undertaken efforts to de-nationalize the economy including liberalizing foreign investment guidelines for selected sectors. The share of foreign equity investment has been raised to 49% in the telecommunication sector (61% for a period of 5 years on a case-by-case basis); 51% in the insurance sector and 49% in the stock brokerage industry. On the manufacturing sector, 100% foreign ownership is allowed for enterprises that export more than 80% of their output. Recently, this ruling has been further liberalized to allow 100% foreign ownership for all applications received between 31 July 1998 and 31 December 2000.

Despite recent efforts to de-nationalize the economy, the government still maintains equity stakes in several industries, including telecommunications, and hold monopoly or near-monopoly positions in their sectors. The service sector, particularly financial services, remains protected and the recent crisis is prompting Malaysia to consider increasing the caps on foreign ownership. Nonetheless, foreign participation in the banking sector accounted for 24.3% of the banking system's total assets at the end of December 1997.

To support the country's technological goals, progress has been made on the e-commerce legislative front. The Digital Signature Act 1997 was implemented on October 1 and paves the

13. "Singapore, Malaysia Rated Top Regulatory Agencies", *Asian Banker Journal*, Issue 03.

way for the use of digital certificates in various e-commerce applications. The law declares the digital signature as legally binding and requires certification for holding and offering signatures. The Computer Crime Act 1997 was also enacted that defines offenses and penalties.

While the Constitution of Malaysia does not specifically recognize the right to privacy, the Personal Data Protection law is currently being formulated to provide a safeguard to individuals' right to privacy.

C. INFRASTRUCTURE — DEMOGRAPHIC, COMMUNICATIONS AND PAYMENTS SYSTEMS

1. Demographic

Social characteristics place Malaysia in the middle of the SEACEN counties, being more advanced than developing countries, but still lagging the economic leaders of the region. The population is almost evenly split between urban and rural (55% urban). Literacy is 83.5% with 61% of relevant population in tertiary education and just 11% in secondary education. These figures will likely continue to increase since government spending for education as a percent of GDP is the highest in SEACEN at 5.3%.

The labor market has been tight for the last several years with shortages in the professional sectors. It appears likely that, although unemployment is on the rise, knowledge workers for management and high technology jobs will continue to be imported.

2. Communications

When looking at basic telecommunication infrastructure and computer usage, Malaysia again falls again into the middle of the SEACEN countries. In 1996, there was 17 telephones per 100 people, five fax machines and 74 mobile phones for every 1,000 persons. There is limited competition in the telecommunications industry with the majority of infrastructure provided by government-owned enterprises. The following two graphs provide information on selected communications statistics and compares them to the highest and lowest SEACEN countries.

Telekom Malaysia is the dominant voice service provider although there are five other fixed-line licenses.[14] However, equal-access by these five providers is not expected until 1999.

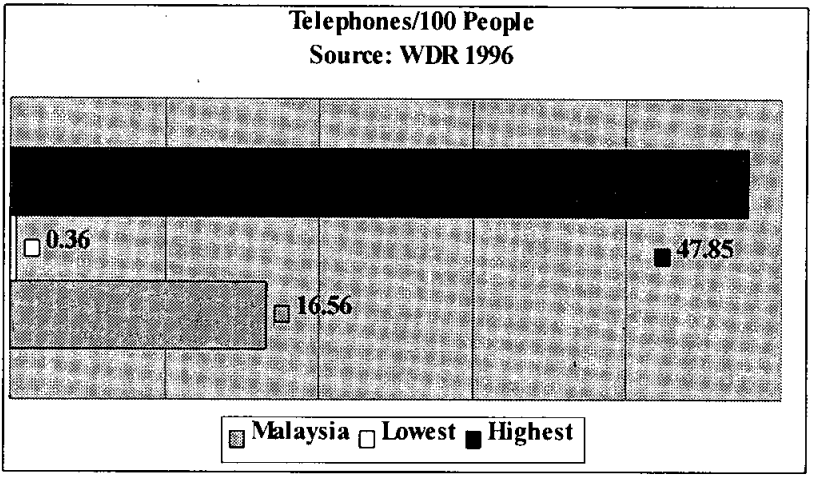
Telekom Malaysia Bhd. holds exclusive rights to provide basic telecommunication facilities with an estimated cost of $1.32 billion with a completion date of December 2020. Telekom Malaysia and Celcom are currently providing international gateway licenses while three other companies have been granted licenses and are waiting for equal access. Telekom Malaysia is also providing ISDN services. Two companies offer value added network services.

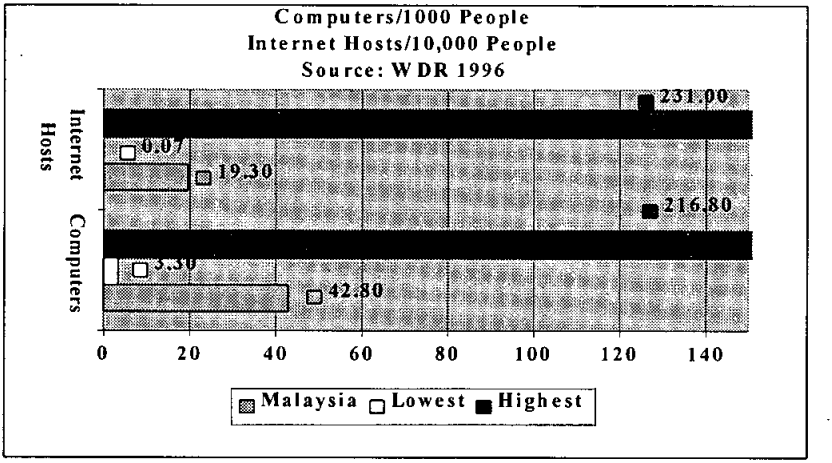
Recent government efforts are pushing for rapid improvement of the communications infrastructure and those efforts are centered on the MSC. The MSC is a 750 square kilometer zone south of Kuala Lumpur that is designated for the development and delivery of various multimedia products and services such as electronic government, smart cards, telemedicine, distance learning, remote manufacturing and electronic commerce. The federal government administrative center of Putrajaya will support 250,000 residents and will have 76,000 government staff. The Multimedia University (MMU) is expected to open in 1999. There are special economic concessions for MSC companies such as exemption from capital controls, multi-year tax exemptions and unlimited imports of foreign knowledge workers.

3. Payments Systems

The existing payments systems include an imaging system for check clearing, an electronic network of ATMs, a bond trading system and an interbank funds transfer system. Consistent with the country's macroeconomic goals and to reduce risks associated with the large value payments, Bank Negara Malaysia (BNM) is in the process of introducing the Real Time Gross Settlement System (RTGS). Expected implementation is mid-1999. At the same time, Malaysian Electronic Payment System Sdn. Bhd. (MEPS), a payment consortium owned by banking institutions in Malaysia, is undertaking various projects to enhance the existing retail electronic payment systems of the country.

14. Paul Budde Communication Pty Ltd, "Telecommunications and Information Highways", 1998





These will include the implementation of the SET Payment Gateway to support payments for business transactions conducted through the Internet, the introduction of the national electronic money scheme by second half of 1999 and payment multipurpose card by early 2000.

D. BANKING INDUSTRY OVERVIEW

The Malaysian financial system consists of the banking system and non-bank financial intermediaries. The banking system dominates the financial system, accounting for approximately 73% of the total assets of the financial system at the end of 1997. Within the banking system, five categories of institutions are supervised by BNM, the central bank.

These are the commercial banks, finance companies, merchant banks, discount houses and an Islamic bank. Commercial banks target both the retail consumer and corporate markets; finance companies focus on the consumer market; merchant banks and discount houses offer wholesale services; and the Islamic bank offers banking services based on Islamic principles. Non-bank financial intermediaries (NBFIs), include the provident, pension and insurance funds, and other financial intermediaries.

Prior to the Asian crisis, the banking system was in a position of strength. As the crisis persisted, however, worsening economic conditions resulted in the deterioration of the asset quality and erosion of the capital base of the banking institutions. In response to the crisis, the Government implemented a series of measures in 1998 to restructure the banking sector. The restructuring plan included the establishment of Danaharta, an asset management company, Danamodal, special purpose vehicle, and the Corporate Debt Restructuring Committee to address the issues of rising non-performing loans, erosion of capital of the banking institutions and deterioration of the corporate sector respectively. In addition, Loan Rehabilitation Units in all banking institutions were established to manage non-performing loans. A merger program launched for the finance companies is expected to reduce the number of finance companies by more than half of 39 in 1999, thus consolidating and rationalizing the industry.

Responses from the Financial Industry Survey conducted for this research project provide information on the key challenges and forces driving the technology efforts of the banking industry. The key challenges are revenue growth, funding/liquidity and expense reduction. Domestic competition, retail customers and internal management are viewed as the technology drivers with efforts focused on back office operations, retail banking and payments.

COUNTRY SUMMARY — NEPAL

A. OVERVIEW

Nepal is the least developed country in SEACEN when comparing economic, socio-political and demographic statistics. The government's immediate commitment involves reducing poverty and upgrading the country's physical and telecommunications infrastructure. Once basic economic and social goals are achieved, Nepal will likely begin a slow move toward a more integrated telecommunications infrastructure and financial system.

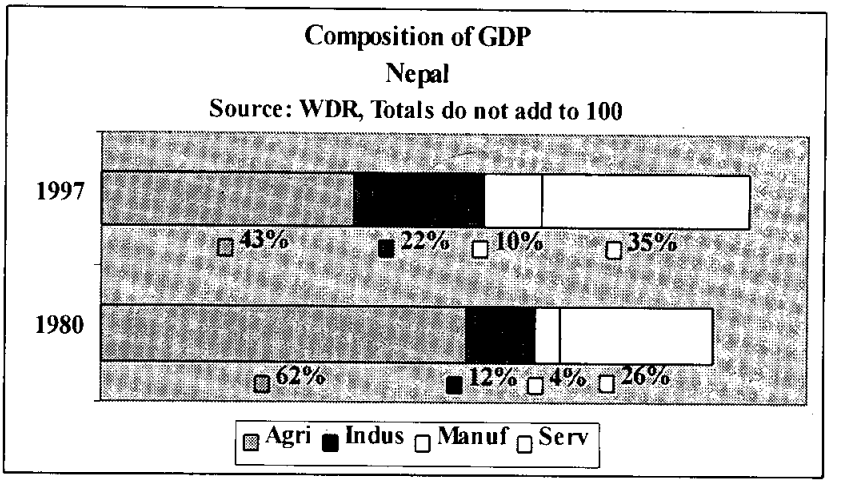
B. INFRASTRUCTURE — ECONOMIC AND POLITICAL

1. Economic

While Nepal's natural resources provide for a unique tourist destination, they have not been fully utilized to provide economic success for most Nepalese. Nepal's population of 23 million is economically among the poorest in the world.

The country's 1997 per capita GNP in terms of purchase power parity of $1,090 is less than 50 percent of the next lowest GDP among the SEACEN countries. Poverty levels are significant with 42 percent of the population living below the national poverty line and 87 percent below the international poverty line of $2 a day. The vast majority of the population (89 percent) lives in rural areas and engages in subsistence agriculture. This segment of the population is the poorest as their income contributes 40 percent to GDP. Alternatively, the service sector represents just 16 percent of the workforce, makes up 39 percent of GDP and the industrial sector comprises 3 percent of the workforce and contributes 21 percent to GDP.

Given this makeup of the economy, it is not surprising that there is a substantial trade imbalance with imports greatly outpacing exports. Major exports are carpets and garments while imports are petroleum products, fertilizer and machinery. Historically, Germany and the United States were the major export partners; however, trade with India has increased within the last several years.



The Nepalese government has identified tourism, transport, telecommunications and hydropower as the major economic growth sectors[15] and the change in composition of GDP since 1980 reflect this economic shift. The above graph with GDP composition as reported in the World Development Report illustrates this fact.

There are multiple projects planned for 1998 and beyond that if completed will increase hydropower exports and greatly enhance the country's basic telecommunications infrastructure. The hydropower growth potential is great since less than one-half of one percent of the country's hydroelectric power has been tapped. A five-year telecommunications project (1992 to 1997) provided 600 remote villages with telephones. The follow-up project that began in 1998 is expected to install telephone lines to 3,995 more villages.

2. Political

The country is still adapting to the democratic government that was restored in 1990 and has experienced frequent government turnover. Efforts at economic and political reform have been ongoing but slow. The economy is stable and the country is in the process of implementing tax reform, privatizing public enterprises and liberalizing

15. American Embassy, "FY 1998 Country Commercial Guide: Nepal", August 1997.

markets. Recently, business relations with India have improved and provide economic hope for the future. In 1996 and 1997, three agreements that defined business terms, duty-free access and power trade issues between the two countries were signed.

While the country officially welcomes foreign direct investment, government-operating procedures often delay this process[16]. Licensing and regulations have been simplified and in some cases 100 percent foreign ownership is allowed. The legal system is not yet mature since private contracts are not regularly enforced and there is no protection for intellectual property.

C. INFRASTRUCTURE—DEMOGRAPHIC, COMMUNICATIONS AND PAYMENTS SYSTEMS

1. Demographic

Given the isolated geography and economic structure, it is predictable that the social characteristics of Nepal would differ from other SEACEN countries. The literacy rate of 39.6 percent falls far below the average rate of the SEACEN countries. Similarly, the percent of population in secondary and tertiary schools is very low at 38 percent and 5 percent respectively.

2. Communications

The geography is not conducive to traditional modes of transportation or communication. Many areas are accessible only by foot and the country is landlocked. Roads are limited and air travel into Kathmandu does not meet current demand. Given these geographical challenges, electricity is often not available and/or reliable in many rural areas.

Nepal is at the beginning of the telecommunication development cycle as evidenced by data on electricity consumption per capita, telephone per person, years wait for telephone service and computer use. The usage in each category is the lowest of the SEACEN countries.

16. Ibid.

While Kathmandu offers high services of international fax and telephone, deployment of computers, fax machines and mobile phones for the country as a whole are negligible. The waiting list for phone lines in Nepal is greater than 10 years.

Competition is not currently a driving force in the telecommunications industry. The government-owned Nepal Telecommunications Corporation (NTC) is the sole operator of domestic and international services in the country. The current network is 99 percent automated and 89 percent is digital with a goal to become 100 percent digital in the year 2000. However, competition will be introduced as three licenses are to be awarded for the operation of local networks in order to triple fixed lines and improve service.

An Australian company maintains Nepal's first top level Internet domain and their access is via Singapore using a leased line. SLIP/PPP access and X.25 and X.75 are not yet available. While Internet services are available, they have not penetrated the market as Internet hosts per 10,000 people is .07, the lowest of the SEACEN countries.

3. Payments Systems

Five banks are providing payments systems services through the Society for Worldwide Interbank Financial Telecommunication (SWIFT). These services are lines of credit, funds transfers and exchange of financial information. Nepal Grindlays Bank was the first bank to provide this service in September 1996. The remaining four banks, Nepal Arab Bank Ltd., Himalayan Bank, Nepal Bangladesh Bank and Everest Bank, joined the organization in September 1998. Efforts are still underway to provide an electronic network for bank branches.

D. BANKING INDUSTRY OVERVIEW

Prior to 1980, two commercial banks made up Nepal's financial industry; however, adoption of a free liberalized economic policy in the late 1980's resulted in expansion. Today there are 13 commercial banks, seven development banks, 44 finance companies, 29 cooperative societies and 30 non-governmental organizations performing limited banking transactions. The banking system assets total approximately $1.9 billion with the two largest banks being Nepal Bank Ltd. and Rastriya Banijya Bank.

The two original banks have 419 or 91 percent of the 461 branches in the country and hold 60 percent of total commercial bank deposits. The location of the banks' branches is similar to the population distribution with 72 percent rural branches and 28 percent city branches. However, this branch distribution is changing. Newer banks are opening branches in urban areas as the profits of rural branches have been and continue to be small.

While traditional banking competition has increased over the last ten years, global and nonbank competitors are not a major threat. Because of economic and physical infrastructure limitations, the move to electronic banking has not occurred.

Responses from the Financial Industry Survey conducted for this research project provide information on the key challenges and forces driving the technology efforts of Nepal's banking industry. The top three key challenges are revenue growth, expense reduction and economic/political conditions. The groups that drive technological advancements are domestic competition, internal management and the more sophisticated retail customers. Given these factors, it is not surprising that current technological efforts are focused on back office operations and traditional retail banking.

COUNTRY REVIEW — PHILIPPINES

A. OVERVIEW

The Philippines' economic and social characteristics place it behind the leaders for most categories within the SEACEN group. The Philippines had undertaken a number of economic reforms during the 1990's and experienced reasonable growth during the years prior to the Asian economic crisis, although at a slower pace than others in the region. This slower growth pattern protected the country, to a degree, from the initial steep decline experienced by high growth economies. The Philippines also attempted to limit the downside from the financial crisis through preemptive measures to limit currency speculation, maintain banking liquidity and invoke more discipline within the banking system.[17] Given economic and social issues, coupled with an underdeveloped communications infrastructure, this country is in an early phase of technological development.

B. INFRASTRUCTURE — ECONOMIC AND POLITICAL

1. Economic

The country's 1997 GNP in terms of purchase power parity was $269 billion, which on a per capita basis of $3,670 is one of the lowest in the region. The percentage of the population below the national poverty line is well above average and the percent of the population earning less than two dollars per day is at 64.5%. Over one half of the population resides in urban areas, and roughly 9% of the population is reported as unemployed.

The Philippine economy is primarily a mixture of agriculture and light industry. The service sector is the most significant contributor to the country's GDP at 46% with industry (32%) and agriculture (22%) also important. However, over 43% of the work force are employed in agriculture, with 23% in services and government and industry employment making up the remainder of the work force. Agricultural

17. "Slow Take-off for Financial Reforms", *Asian Business,* June 1998.

products include rice, coconuts, corn, sugarcane, bananas and pineapples. Industries represented include textiles, pharmaceuticals, chemicals, wood products, food processing, electronics assembly and petroleum refining. Despite the focus on agriculture, roughly 70% of the general population owns no land. Large landowners exercise significant economic and political power and the lack of meaningful land reform has caused many to move to urban areas, where jobs are scarce.

International trade is less significant than many other countries in the group. Imports in 1997 totaled $34.7 billion, the second lowest among the SEACEN countries. Although a certain level of self-sufficiency may partially account for low trade, the inability of the population to afford imports is also a factor. The Philippines is primarily an exporter of raw materials and an importer of manufactured goods. Imports include crude petroleum (for refinement), telecommunications equipment, electronics, plastics, cars and textiles. Exports, which totaled $20.3 billion, included electronics and telecommunications equipment, machinery and textiles. Major trading partners include the United States, Japan, Europe and ASEAN.

The Philippines has undergone nearly a decade of structural reform including trade liberalization and monetary management, which has led to higher levels of investment and exports.[18] The country is also aided by its large trade relationship with the U.S. and Japan, which has had a stabilizing impact on the country. However, recently the reliance on the Japanese economy has had a negative effect on the Philippine economy.

In addition, investor concerns from Thailand and Indonesia spread to other countries within the region, causing the Philippine stock market and currency to decline. Poverty concerns will require significant increases in public investment for health, education and agriculture. And with public resources scarce, funding available for public infrastructure is very limited.

2. Political

It is premature to measure the progress of new administration as the new president was elected in 1998. The two previous governments implemented a strategy of economic growth and liberalization that was

18. World Bank, "Country Brief: Philippines", 1998.

generally successful. Regardless, the Asian economic crisis and the uncertainty about the country's economic health led to a drop in capital inflows and a higher fiscal deficit.

The Philippines has some trade barriers that inhibit market entry. There are quantitative restrictions on more than 100 agricultural and industrial items. Tariff rates are still relatively high, although reductions are planned. There are also restrictions on company and land ownership which have discouraged investment. Some movement toward liberalization of foreign investment is underway.[19]

Intellectual property rights have historically not been well-protected due to inadequate laws and regulations and insufficient enforcement resources. In recent years there has been progress made to strengthen protection of intellectual property rights, but effective, full protection has not yet been realized.

C. INFRASTRUCTURE — DEMOGRAPHIC, COMMUNICATIONS AND PAYMENTS SYSTEMS

1. Demographic

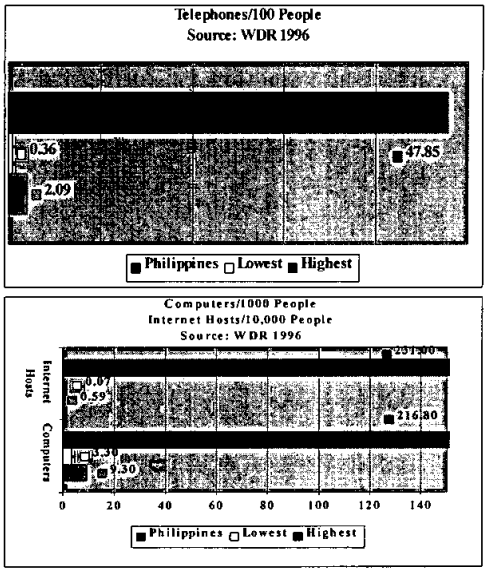
The population is 77.7 million with approximately 30 million in the workforce. Diminished prospects in rural areas have caused many of the poor to move to urban areas in search of limited employment opportunities. Many of the jobs available to the general population are lower-skilled and lower-paying positions.

The Philippines reports a literacy rate of 94.6% which is the second highest in the SEACEN group. Enrollment in tertiary level education was 27%, which is in the mid-range for the region, but well below that of the U.S. However, the trend toward higher levels of education is a positive factor that will likely improve the population's living standards over the long term.

2. Communications

Development of technology trails many countries within the region. The telecommunications network is not sufficient to support the

19. U.S. Department of State, "Philippines: Economic Policy and Trade Practices Report", 1997.



needs of the population, partly due to the mountainous and forested terrain that characterizes much of the country. Telephones per 100 people are 2.1, one of the lowest ratios among the SEACEN group. Mobile phone usage is also low, at 13 per every 1000 in population, as is fax machine distribution. These two graphs compare selected communication statistics with the highest and lowest performers in the SEACEN countries.

Philippines Long Distance Telephone Company (PLDTC), a private company, has dominated the telecommunications industry. This long-standing dominance ended in 1979 when the National Telecommunications Commission was created to better rationalize the telecommunications industry. However, significant penetration by new companies and competitive pressures on PLDTC did not occur until the 1990's.

There are now several efforts underway to bring improvement to the Philippines, but they are relatively recent and face many challenges. There are presently six major companies that offer data communications and value-added networks in the Philippines, and numerous others that offer VAS and VAN services. The Philippines has been slow to incorporate Internet technology, and is one of the only SEACEN countries that does not have an Internet policy. There are approximately 150,000 Internet subscribers in the Philippines, with another estimated 50,000 users registered as students and employees. There are approxi-

mately 130 Internet service providers, although most are a network of resellers without actual connections between ISP networks[20].

2. Payment Systems

There are several payments systems within the Philippines, including the Philippine Clearing House Corporation (PCHC), Bangko Sentral ng Pilipinas (BSP), Bureau of Treasury, Philippine Dealing System and Philippine Central Depository. Systems used by a majority of the banks are the PCHC and the BSP. The PCHC provides electronic check clearing, domestic dollar transfer, and multibank inter-bank payment systems to metro-Manila based member banks and those serviced by regional clearing offices near Manila. All other banks under regional clearing are serviced by BSP that also provides Electronic Funds Transfer to all banks authorized to collect taxes, customs duties, and other fees on behalf of the government. Peso settlements are conducted through an account at the BSP, while foreign currency settlements are conducted through accounts maintained at Citibank. An RTGS for Peso clearing is under consideration by the BSP and banking organizations, as the Citibank dollar clearing is already on an RTGS.

D. BANKING INDUSTRY OVERVIEW

The Philippines has 1004 financial institutions, categorized as commercial, thrift or rural banks. Commercial banks represent only 55 of the 1004 banks, but constitute over 90% of total banking assets. On the other hand, rural banks total 882, but comprise only 2% of total banking assets. There are only 13 branches of foreign banks within the country. In addition to banks, there is a multitude of other financial companies, ranging from investment houses and financing companies to pawnshops. Many of the structural reforms undertaken over the past decade were targeted at improving the financial strength of the banking sector. These reforms were a higher priority than technological development and thus the level of technology employed by the banking sector is behind the leaders in the region. Infrastructure to advance retail technology throughout the country is in the developing stage and not yet sufficient to keep pace with the development within wholesale and government sectors.

20. Paul Budde Communication Pty Ltd, "Telecommunications and Information Highways", 1998.

The banking sector has not experienced the severity of problems that others have in the region primarily because the banks entered the crisis with among the highest capital levels and earnings in the region. However, there are a number of challenges facing the banking industry including a weak currency, higher interest rates, growing problem loans and likely industry consolidation. Nonperforming loans have tripled since 1997 and now represent 9% of total loans as of June 1998.

As the Asian financial crisis unfolded, the central bank instituted a number of regulatory changes in an attempt to minimize the vulnerability of the banking sector. Banking reform was also a stipulation in the IMF stand-by agreement. Many of the commercial banks are relatively small, and may find mergers a desirable alternative to dealing with tightening regulation and a limited lending base. High capital requirements and certain benefits provided to newly consolidated institutions will also likely encourage more merger activity.

Responses from the Financial Industry Survey conducted for this research project provide information on the key challenges and forces driving the technology efforts of the Philippines banking industry. The top challenges include economic and political conditions, liquidity, capital management and a recently declining credit environment. Technology is largely being driven on the wholesale side, with larger, urban banks being the most significant force. Retail efforts are increasing, particularly within the urban areas.

COUNTRY REVIEW — SINGAPORE

A. OVERVIEW

Singapore is a leader within the region in most capacities and is supported by a government whose objective is to establish the country as a financial center and a technological leader. Despite its small size and limited natural resources, Singapore has become a strategic business center for the region. Furthermore, its small size has allowed infrastructure and economic improvements to be quickly and completely implemented. Therefore, the technological environment in Singapore is considered well developed.

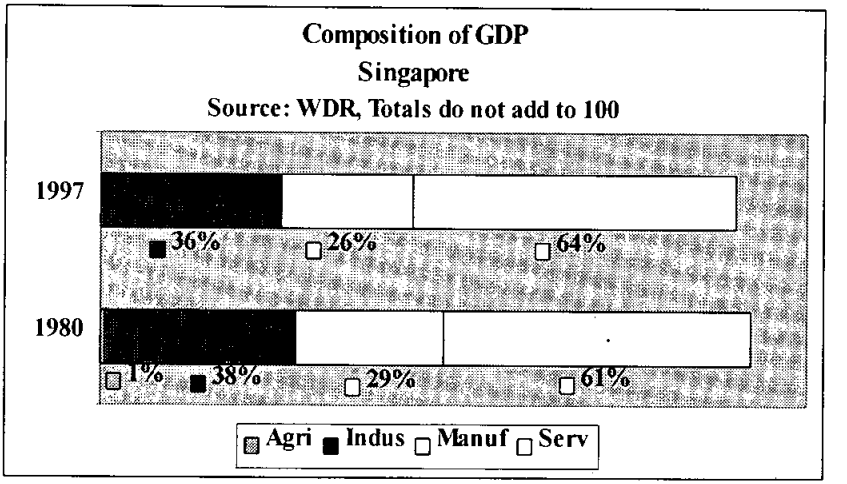
B. INFRASTRUCTURE — ECONOMIC AND POLITICAL

1. Economic

Singapore is an economic leader within the region. The 1997 per capita GNP in terms of purchase power parity is the highest in the region, at $29,000. Services represent 72% of GDP, industry represents 28% and agriculture is negligible. The largest sector of the workforce is services (33%), with manufacturing (26%) and commerce (23%) also major components. Some of the major industries include petroleum refining, electronics, construction, financial services and biotechnology.

Singapore's real GDP growth for the first three-quarters of 1998 was 2.3%, compared to 7.8% growth for the year in 1997. The GDP growth range for 1999 is projected to be –1% to 1%. The deterioration in growth was reflected across all sectors of the economy, particularly in the manufacturing, commerce and financial services sectors. The manufacturing decline was led by the electronics sector and the financial services sector was affected by a decline in the currency markets and more cautious bank lending.

The significance of the services sector has steadily increased over time while the manufacturing sector has declined. These trends are shown in the accompanying graph that compares GDP makeup from 1980 to 1997. Manufacturing employment has decreased due to higher productivity levels from automation and higher labor costs. The ser-



vices sector, with higher technology and high value-added activities, has dominated Singapore's recent economic evolution. Financial and business services account for 40% of total services output while commerce, transport and communications and social and personal services round out the services sector.

International trade plays an important role in Singapore and was more than three times its GDP in 1996 with a trade imbalance for the year of $6 billion. Japan is the largest import source, followed by Malaysia and the United States. Major imports include aircraft, petroleum, chemicals, and foodstuffs. Singapore reexports a significant portion of its imports after refinements (such as petroleum products, finished electronics and chemicals), accounting for 37% of its exports in 1996. Major export partners include Malaysia, the United States and Hong Kong.

In recent years, Singapore has concentrated more on regional economic relationships to diversify its external dependency. Thus, the economic difficulties experienced by the region have an increasing impact on the country's economy. The financial services and commerce sectors have been particularly vulnerable to the regional slowdown and have impacted loan volumes, stock market activities and the foreign exchange markets. Real estate prices are a concern, as emerging oversupply was an issue being addressed by the Monetary Authority of Singapore (MAS) in 1996. Despite this apparent exposure, Singa-

pore is still in a position of relative stability compared to many others in the region.

Several challenge for this country will be to achieve further efficiencies within its manufacturing sector, expand its export destination base, and maintain its regional leadership in the financial markets. The technological base that Singapore has established should provide a sound basis by which to achieve these objectives.

2. Political

The political environment of Singapore targets economic growth with generally effective regulatory oversight. Singapore imposes very few tariffs, with 98% of imports entering duty free. In 1994, Singapore implemented a value-added tax, which was three percent on goods and services to all businesses with at least $1 million in sales of goods and services within Singapore.[21]

Singapore has a relatively open investment policy. The Singapore Economic Development Board serves as a "business architect" by identifying sectors with high potential to contribute to the economy and drafting incentives to encourage foreign investment in those areas. Government policies encourage local firms to form strategic partnerships with multinational corporations, and there are no restrictions on foreign ownership of businesses. The Economic Development Board also provides incentives for firms to invest in technology, automation, training and product development. High technology is actively encouraged and pursued by the Economic Development Board.

Intellectual property rights are generally protected, and violators are subject to prosecution. Singapore strengthened its patent law in 1995, and toughened its trademark law in 1991. Singapore is a member of the World Intellectual Property Organization.

21. U.S. Department of State, "Singapore: Economic Policy and Trade Practices Report", 1997.

C. INFRASTRUCTURE — DEMOGRAPHICS, COMMUNICATIONS AND PAYMENTS SYSTEMS

1. Demographics

Singapore's demographic environment is conducive to technological development and utilization. Singapore reports a population of 3.5 million, with approximately 2 million in the workforce. The country reports nearly full employment, with the unemployment rate typically less than 3%. In fact, there have been labor shortages in the service sector and in many low-skilled positions in the construction and electronics industries. These shortfalls have been addressed through the enlistment of foreign workers, which represent 22% of the total work force. The government has also implemented programs to increase productivity and encourage women and older people to enter the workforce.

Singapore reports a literacy rate of 91% and, although not the highest of the SEACEN countries, is a relatively high rate. Enrollment in tertiary levels of education is above average and increasing.

2. Communications

Singapore is a regional leader in terms of telecommunications infrastructure. The small physical size of the country, combined with the high urbanization and strong government support, creates an environment where technology can more easily be updated and disseminated.

Development of technology, including telecommunications, has been a priority of the Singapore government and there is a documented objective to become an "intelligent island" by 2005. In the early 1990's Singapore spent $1.5 billion to build an advanced telecommunications system and another $2.4 billion was spent in the mid 1990's for additional upgrades. There are plans to build a telecommunications network equipped with intelligent networks, broadband ISDN (Integrated Services Digital Network) and fiber optic links to all homes and offices.

Currently, SingTel is the only operator allowed to provide domestic and international telephone services. After the year 2000 however, the telecommunications sector will be liberalized and another operator, M1, will join the market. SingTel's domestic network is considered one of

the best and a large number of the companies that offer value added services tied to the telephone system are subsidiaries of SingTel. Advances include value-added networks, enhanced E-mail for businesses, an international ISDN, and an intelligent network system called Global Advanced Telecommunications Services which allows connection to advanced freephone service, tele-charge cards, WorldSource virtual network and a global private network.

As of December 1997, there were an estimated 180,000 Internet users, with five service providers and 44 service resellers. Revenue from e-commerce is expected to reach U.S. $800 million by 2001. As of 1996, Singapore reported 217 computers per 1000 people, the highest of any SEACEN country. This country also has the highest ratio of telephones, mobile phones and fax machines in use.

3. Payments Systems

Interbank payment services in Singapore are provided under the auspices of the Singapore Clearing House Association (SCHA). The SCHA provides its members, which are banks in Singapore, with services to facilitate check clearing, Singapore Dollar interbank electronic funds transfers, the transfer of Singapore Government Securities (SGS) and inter bank GIRO.

The Automated Clearing House (ACH) for check clearing commenced operations in August 1982 and is operated by Banking Computer Services (BCS). With the establishment of the ACH and the use of Magnetic Ink Character Recognition (MICR) technology, the sorting of checks and the computation of clearing figures for settlement between banks' MAS accounts were automated. In 1993, the Electronic Clearing System (ECS) for checks clearing was implemented. ECS uses MASNET, the electronic network established by MAS for communication among financial institutions, for the on-line transmission of check information from banks and their branches to the Clearing House for earlier processing. Access to the checks clearing system is limited to banks that enter an agreement with the SCHA, and those not participating in the system must maintain accounts with participating banks.

22. Paul Budde Communication Pty. Ltd., "Telecommunications and Information Highways", 1998.

Interbank GIRO (IBG) is a cashless, paperless payment system which enables pre-authorized deductions to be made from one party's account in favor of another party who initiated the deduction. Credits, such as salary payments, can also be effected through IBG.

The MAS Electronic Payment System (MEPS), a Real-Time Gross Settlement (RTGS) system, was implemented in July 1998. With MEPS, individual payment instructions are settled on a gross and real-time basis if there are sufficient funds in the paying bank's current account with MAS. Upon settlement the payment is final and irrevocable and the receiving bank is able to use the funds immediately. MEPS is linked to the SGS Book-Entry System to provide delivery-versus-payment capability for SGS transactions.

D. BANKING SYSTEM OVERVIEW

The banking system is designed to promote the country as an international financial center[23] and the use of technology has enabled Singapore to meet this goal. There are three types of banking licenses issued; full, restricted and offshore. The banking environment is characterized by foreign influence, with ten local banks and 140 foreign bank offices. Additionally, there are 79 merchant banks, 67 representative offices, 19 finance companies and 151 insurance companies.

Domestically, the banking industry is dominated by four institutions, that collectively hold approximately 90% of domestic banking assets, and is considered one of the safest banking systems in Asia due to strict supervision by MAS, generally conservative management practices and high capital levels. However, the Asian crisis has resulted in increased nonperforming loans, slower loan growth, declines in financial services and vulnerability to declining real estate values. The high capitalization, general conservatism and active MAS oversight contribute to local banks' ability to withstand the worst of the regional crisis.

Responses from the Financial Industry Survey conducted for this research project provide information on the key challenges and forces driving the technology efforts of the banking industry in Singapore. The primary challenges include revenue growth, economic and political conditions and technological competitiveness. Development of tech-

23. "Payment Systems in Singapore", *TMA Journal,* March 1998.

nology is being driven by global as well as domestic competition. Initial technological advancement resulted from investment in domestic and foreign wholesale markets followed by retail development. The Singapore government is also a significant factor in the advancement of technology.

COUNTRY REVIEW — SRI LANKA

A. Overview

Sri Lanka is working to transform itself from an agrarian nation toward an economy dominated by fast-paced industrial growth. This country has been insulated, to a degree, from the economic hardship that has negatively impacted the region. Sri Lanka avoided some of the decline due to slower growth in the preceding years and the fact that its major export partners are not located within the region. The country has had its share of economic and political issues including a recent drought, slow economic reform and a civil war. These issues, coupled with the generally low standard of living, have resulted in Sri Lanka lagging behind the regional leaders in technological infrastructure development.

B. INFRASTRUCTURE — ECONOMIC AND POLITICAL

1. Economic

Economic statistics are reflective of a traditionally agrarian country with higher unemployment and an emerging industrial base using low-skilled workers. A primary goal of the government is to build a solid manufacturing economic base. The population of 18.9 million is second to Singapore as the smallest within SEACEN. The labor force totals 6.8 million, with unemployment at 10.4 percent. Approximately 23 percent of the population live in an urbanized area.

Two primary challenges for Sri Lanka, beyond building a manufacturing base, are the reduction of poverty and the increase of productivity within its agricultural sector. GNP has been growing at a steady pace; however, the per capita GNP in terms of purchase power parity in 1997 was second lowest at $2,460. The population below the national poverty line was 35 percent in 1990 and is one of the highest of the SEACEN countries. The services sector dominates the use of labor and represented 46 percent of the labor force in 1997. The agriculture and industry sectors made up 37 percent and 17 percent of the workforce, respectively. Industries include rubber processing, agricultural commodities, clothing, cement, textiles and petroleum refining. Sri Lanka is the largest tea exporter in the world.

In 1997, Sri Lanka reported a trade imbalance of almost $1 billion. The primary import partners are India and Japan and imports include textiles, machinery and equipment, transport equipment, petroleum, building materials and sugar. The largest export partner is the U.S. with 34 percent; other export partners include the United Kingdom, Germany and Belgium-Luxembourg. Exports include textiles and apparel, tea, petroleum products, diamonds, other gems and rubber products.

While recovery from the 1996 draught is expected in the agricultural sector, this sector would need productivity improvement to bring rural farmers above subsistence levels. Furthermore, internal conflict and political unrest in Sri Lanka have slowed foreign capital investments and high real interest rates and stalled progress on privatization have slowed manufacturing sector growth.[24] Resolution of these issues will help create a solid economic foundation on which to build its technological infrastructure.

2. Political

The political environment of Sri Lanka has stabilized over the past two years; however, continued unrest creates investor caution and hesitancy. With many emerging economies looking to attract foreign investment, internal stability and safety is a key factor in attracting foreign capital. The government has officially welcomed investment in capital and technology intensive industries and incentives are available for various products and activities.

C. INFRASTRUCTURE — DEMOGRAPHIC, COMMUNICATIONS AND PAYMENTS SYSTEMS

1. Demographic

The demographic factors are not consistent with countries that are effective technology users. The workforce is predominantly employed in agriculture and the services industry with wages often near subsistence levels. This, coupled with a high percentage of the population living below the national poverty line, create significant social chal-

24. Central Intelligence Agency, "CIA Factbook, Sri Lanka".

lenges for the Sri Lanka government. To combat this situation, the government has encouraged growth in the manufacturing sector and experienced growth in its apparel production.

Sri Lanka reports a literacy rate of 90 percent, which is characteristic of many countries within the region. However, while the country has increased the literacy rate (90 percent) and enrollment of secondary education (75 percent), its level of tertiary education enrollment of 5 percent is the lowest within the SEACEN group.

2. Communications

Sri Lanka's telecommunications infrastructure does not yet meet the needs of the population. The country suffers from irregular electricity supplies, inefficient ports, poor quality roads and insufficient communications capabilities. The agricultural sector of the population remains underserved, while the systems within the urban environments are more developed. Sri Lanka reports just over one telephone per 100 population which is next to the lowest within the SEACEN group. In 1991, Sri Lanka Telecom (SLT) was established out of the existing telecom department of the government, and in 1997 the government sold a 35 percent stake in the company to NTT of Japan. SLT has the largest customer base in the country since other providers were recently established. There are presently 325,000 subscriber lines in use, with a waiting list of 500,000.[25]

The market is presently under-served and there are plans to expand the telecommunications infrastructure. In 1994, a National Telecommunications policy was introduced which provided greater financial autonomy to the telecom oversight agency and created greater competitive access for licenses and access lines. Additionally, 1998 was designated as the "Year of Information Technology" with plans to formulate long-term policies and plans, with a number of companies looking to invest in infrastructure development. Funding these projects may be difficult in lieu of the current regional economic environments. Private infrastructure projects already in operation or in process include radio paging services, cellular telephones, data communication services and a trunk telecommunication network.

25. Paul Budde Communication Pty. Ltd., "Telecommunications Voice, Data and Broadcasting Services", 1998.

Internet use is low. At the end of 1996, Internet subscribers were estimated to be 2,500. With PC ownership low, high growth in Internet subscribership is not anticipated. There are six Internet service providers in the country, with SLT being one of the two largest providers.

3. Payments Systems

The Central Bank of Sri Lanka provides the basic payments facilities among commercial banks. Check clearing is operated by the Automated Clearing House (ACH) and uses magnetic ink character recognition. An off-line settlement system for member banks, the Sri Lanka Inter Bank Payment System (SLIPS), was developed in 1993 and eliminated the need for paper transactions among banks. In addition, the Society for Worldwide Interbank Financial Telecommunication (SWIFT) was introduced in 1994 and 18 commercial banks use this system to facilitate international trade.

Efforts are underway to upgrade and enhance the current, more traditional payments mechanisms. Currently, the Central Bank is studying the impact of a Real Time Gross Settlement (RTGS) and plans to introduce this system in the near future. In addition, a networked securities trading system is being designed to automate the government securities trading.

D. BANKING INDUSTRY OVERVIEW

The banking system in Sri Lanka consists of several types of institutions. There are eight domestic commercial banks, with another 18 foreign commercial banks represented. In addition, the country has special savings institutions, financial companies, long-term lending institutions (development banks), merchant banks and regional rural development banks. Despite the variety of institutions described above, two state commercial banks account for 55 percent of total commercial banking assets in the country. The banking industry is characterized by a more traditional technological environment. Much smaller than several other SEACEN members, it is relatively stable and has not experienced the full effect of the Asian crisis. Loan portfolios of commercial banks are generally diversified and business confidence is slowly improving which should enhance the lending environment.

Responses from the Financial Industry Survey conducted for this research project provide information on the key challenges and forces

driving the technology efforts of the banking industry. Key challenges include the building of technological competitiveness, funding and liquidity issues as well as revenue growth. The development of technology is largely being driven in the wholesale sector, both by domestic competition and by companies outside of the country via servicing arrangements and direct investment. Retail demand is also a growing influence, although challenges described elsewhere in this document represent issues that must be addressed to allow the retail sector to fully develop.

COUNTRY REVIEW — TAIWAN

A. OVERVIEW

Taiwan has not experienced as severe a downturn as other SEACEN countries, due to long-term, systematic economic development and management. Taiwan has transformed itself from an agrarian, underdeveloped island into an economic power that is a leading producer of high-technology goods. This transformation has also made Taiwan a leader in technology infrastructure within the region, taking benefits achieved within the financial and employment sectors and creating a wider spectrum of technological benefit.[26]

B. INFRASTRUCTURE — ECONOMIC AND POLITICAL

1. Economic

Taiwan is one of the stronger economic performers within the SEACEN group. It has achieved these results through a steady build-up of its economic base to ensure self-sufficiency. The country reports a population of 21.9 million, 56 percent of which live in an urban environment. The increased urbanization of Taiwan has evolved in conjunction with the country's transition from agrarian toward an industrialized export nation.

The 1997 per capita GNP in terms of purchase power parity was $14,200, which is the second highest within the SEACEN countries. In 1997, GDP grew by over 6 percent, with projected 1998 GDP growth at 5 percent, both healthy relative to many countries within the regi-on.[27] With over half of its exports concentrated in Asia, a certain level of trade decline is anticipated, but Taiwan is still projected to run an overall trade surplus for the year. Over one half of the workforce is employed in the services sector, with industry at 38 percent and agriculture at 10 percent. The composition of GDP is reflected in the accompanying graph. Industries include electronics, textiles, chemicals, clothing, food processing, sugar milling, shipbuilding and petroleum refining.

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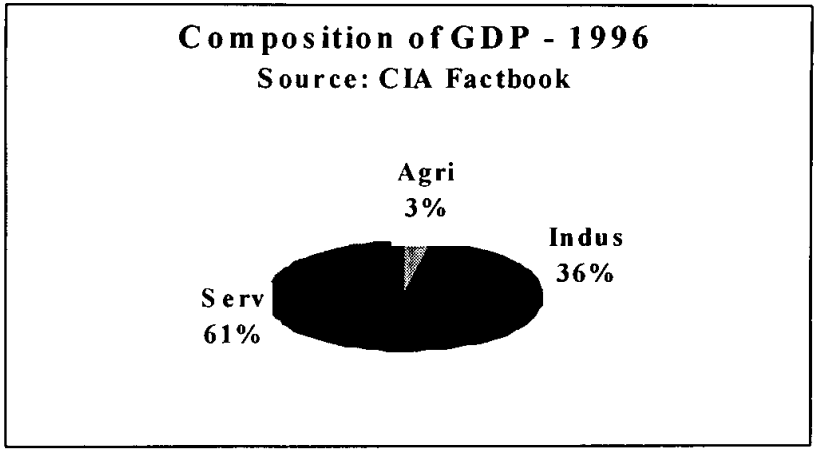
26. "Technology in Asia", *Far Eastern Economic Review,* May 14, 1998.

27. "In Praise of Paranoia", *The Economist,* November 7, 1998.



With government guidance, an entrepreneurial atmosphere has resulted in an economy dominated by small- to medium-sized businesses. These businesses constitute over 98 percent of Taiwan's companies, over 75 percent of all employment and 47 percent of the total economy. These smaller businesses have made the business environment more flexible and better able to adapt to economic changes.[28]

International trade is important to the country's continued economic success. In 1996, trade represented over 69 percent of GDP, one of the three highest within SEACEN. Primary export partners include the U.S., Hong Kong, European Union countries and Japan. Taiwan has diversified its trading partners, reducing the dominance once held by the U.S. Exports include machinery and electrical equipment, electronic products, information/communications and textiles. Major import partners include Japan, the United States and the European Union. Imports consist of machinery and electrical equipment, electronic products, chemicals, and precision instruments.

In addition to the regional financial problems, Taiwan now faces some of the same economic issues experienced by more developed economies. Labor intensive industries have begun to move out of Taiwan to countries with cheaper labor costs. Thus, there is a government goal to transform the economy toward a high technology and service oriented economy.

28. "An Army of Ants", *The Economist,* November 7, 1998.

2. Political

Liberalization has been in process for two decades with human rights and a democratic political process taking on more importance. Taiwan has also worked to develop ties with a number of countries to reduce political isolation and build economic relations. While political tensions exist between Taiwan and Mainland China, contact between them has increased over time with hopes for an eventual peaceful resolution to the differences.[29]

There are still numerous barriers and/or impediments to foreign competition. In 1997, tariff reductions were initiated on 289 high technology goods as part of its commitment to a multilateral Information Technology Agreement. It is expected that additional lowering of tariffs will occur. However, high tariffs and pricing structures and import restrictions remain on other goods such as agricultural. Restrictions and/or barriers also exist in the areas of banking, financial sector, legal, insurance, telecommunications, pharmaceuticals and investments.

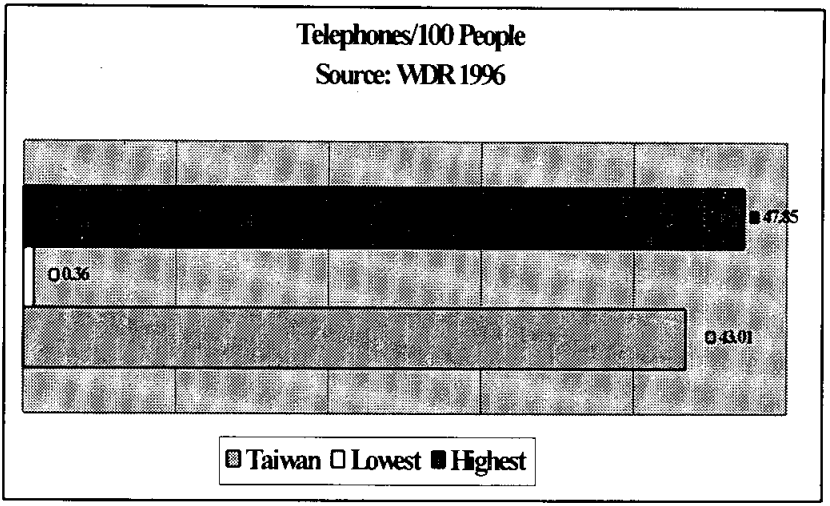
Protection of intellectual property rights is improving, although unauthorized copying of computer software and video games remains a problem. Enforcement and regulations over CDs, videos and patents has improved with the enactment of recent laws and regulations.[30]

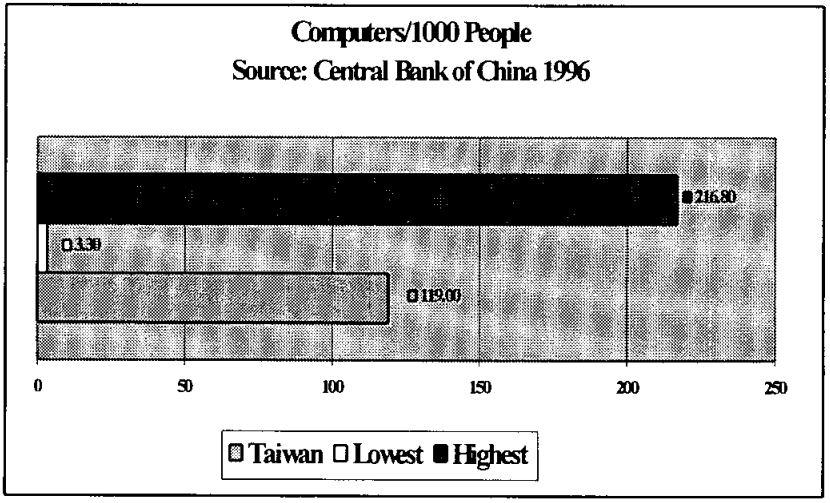
B. INFRASTRUCTURE — DEMOGRAPHIC AND COMMUNICATIONS

1. Demographic

The demographic environment establishes a sound base for continued development of technology infrastructure. Taiwan reports a high literacy rate of 93 percent. The country has a compulsory nine-year education system for all children, with about 90 percent of junior high graduates continuing on to senior high school or vocational school. The tertiary enrollment ratio of 51 percent is one of the highest within the SEACEN group. Taiwan has over 100 institutions of higher learning, with opportunities for graduate school education expanding. Despite this, many look abroad for advanced education, including approximately 13,000 who study each year in the U.S. The need for highly

29. U.S. Department of State, "Taiwan: Background Notes", October 1998.
30. U.S. Department of State, "Taiwan: Economic Policy and Trade Practices Report", 1997.


Telephones/100 People
Source: WDR 1996
47.85
0.36
43.01
Taiwan
Lowest
Highest


Computers/1000 People
Source: Central Bank of China 1996
216.80
3.30
119.00
0
50
100
150
200
250
Taiwan
Lowest
Highest

skilled workers continues to grow as Taiwan experiences growth in capital and technology intensive industries such as computers, electronic components and petrochemicals.

2. Communications

The communication infrastructure is relatively well developed and is positioned to take advantage of changing technology. Telecommunication statistics place Taiwan closely behind Singapore as a leader within the region, while Taiwan's relatively larger size (compared to Singapore) makes countrywide infrastructure implementation more difficult to accomplish. For example, there are 43 telephones per 100 people with steady growth being experienced in the traditional and mobile phone market.

The government has been an active supporter of infrastructure development. In 1994, the government launched the National Information Infrastructure Project and in 1996, designated the Internet as the core of the project's implementation. The project intends to promote increased use of the Internet through accessibility to the public and the schools and to develop the country into a regional Internet hub. The National Telecommunication Infrastructure Project was started in 1998 to create business opportunities for local wireless telecommunications and wide-bandwidth Internet service. Initial objectives include construction of a wide-bandwidth Internet infrastructure, development of service-oriented network technology, IMT 2000 telecommunications technology and a 10 mbps high-speed wireless network.

As with most countries, Taiwan is experiencing an increased use of computers and the Internet. Statistics reflect 119 computers per 1000 people, with projections of 232 computers per 1000 people by 2000. Internet hosts per 10,000 [people are reported at 231, placing it at the top of the SEACEN countries. Increased use of the Internet has occurred as government-supported programs have been implemented.

D. BANKING INDUSTRY OVERVIEW

The banking environment is positioned to take advantage of new technology due to the relatively sound financial condition, prudent regulation and accessible infrastructure. There are 39 domestic banks, with 1,760 branches and 45 foreign bank branches represented in the country. The large domestic banks and the foreign banks are the

primary contributors to market activities. In addition, there are eight medium business banks, 60 credit corporations, 287 credit departments of farmer's associations and 27 credit departments of fishermen's associations. There are also postal savings banks, life insurance companies and investment and trust companies. The variety and number of financial institutions is generous and consolidation of the industry is expected.

The banking environment remains relatively sound in Taiwan although recent press reports indicate a deterioration in asset quality. Several factors have enabled the Taiwanese banks to maintain stable financial conditions. Direct lending exposure to Southeast Asia is less than one percent of total assets, partially the result of prudential lending regulations. Other conditions include low leverage and relative conservatism practiced by both bankers and bank supervisors. Regardless, the Asian downturn has impacted the exporting and trading industry and has indirectly impacted the banks. This decline in bank performance will likely contribute to further industry consolidation.

Responses from the Financial Industry Survey conducted for this research project provide information on the key challenges and forces driving the technology efforts of the banking industry. Political and economic conditions, technological competitiveness and revenue growth are the most pressing issues facing the Taiwan banking industry. Domestic competition is a primary factor in technological advancement although foreign banks have had a lesser impact. In addition to back office development, technology efforts are relatively evenly divided between retail and wholesale initiatives.

COUNTRY REVIEW — THAILAND

A. OVERVIEW

Thailand was characterized as one of the fastest growing economies in the world over the past decade before becoming the focal point of the regional crisis. Through a combination of an International Monetary Fund (IMF) assistance package and financial reform, Thailand has worked to overcome the difficult economic circumstances. However, the road to recovery is proving to be a lengthy process. Predictably, investment in technology has been reduced due to the economic crisis and the technological infrastructure lags behind most of the SEACEN countries.

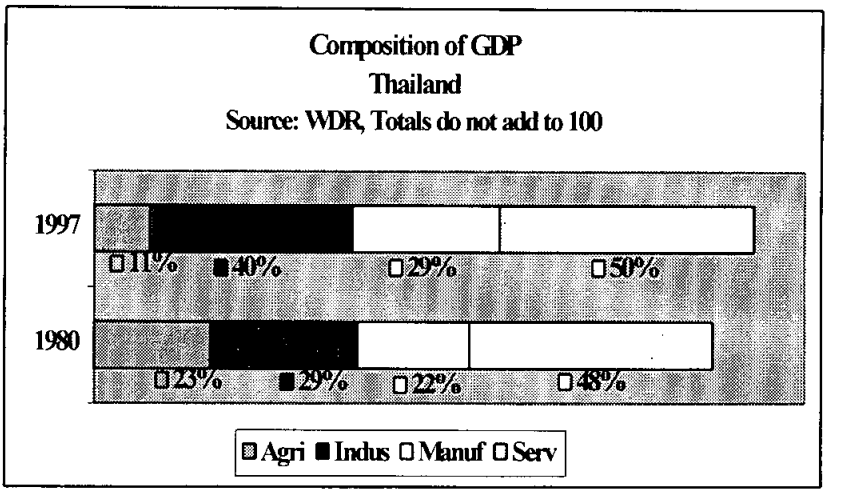
B. INFRASTRUCTURE — ECONOMIC AND POLITICAL

1. Economic

Thailand falls in the middle of the SEACEN members in terms of economic performance and increased urbanization has taken place as the country is moving from an agrarian to an industrialized export nation. The 1997 per capita GNP in terms of purchasing power parity was $6,590, roughly one-fourth that of the highest SEACEN country. Approximately 54 percent of the workforce is employed in the agricultural sector, followed by service and government (31 percent) and industry (15 percent). However, despite the large percentage of workers involved in agriculture, services and industry are the largest contributors to the GDP. Some of the major industries include tourism, textiles and garments, agricultural processing, beverages, tobacco and light industry.[31]

The importance of international trade has grown as Thailand emphasized industrial and manufacturing growth in both labor-intensive and higher-skilled technology manufacturing. The accompanying graph shows the trend of GDP from 1980 to 1997. Prior to the financial crisis, generally inexpensive labor, abundant natural resources and improved foreign investment policies created an environment

31. U.S. Department of State, "Background Notes: Thailand", October 1998.



in which manufacturing flourished. Japan is the largest import partner, followed by the U.S., Singapore, Taiwan, Germany and Malaysia. Imports include machinery and parts, automotives, petroleum, iron and steel, chemicals and electronics and jewelry. Major export partners include the U.S., Japan, Singapore, Hong Kong, Malaysia and the United Kingdom. Commodities exported include textiles and footwear, fish products, computers and parts, rice, tapioca products and rubber.

An ailing banking system, capital shortages, a severely depressed stock market and devalued currency present immediate problems that will potentially take a lengthy period of time to effectively address.[32] Once immediate financial concerns are under control, long-term issues such as poverty, the environment and the communications infrastructure will need to be addressed. And while Thailand can take steps to address its internal issues, the trade dependence with Japan leaves this country vulnerable to the Japanese economy.

2. Political

The political environment has been in a state of transition. Over the past two years, turnover has occurred in the positions of finance minister, central governor, stock exchange president and secretary general

32. "Cleaning up Thailand's Mess: The Long Struggle Ahead", *Business Week*, October 12, 1998.

at the Securities and Exchange Commission. The ruling party elected in 1997 has indicated its willingness to adhere to IMF guidelines and restructure corporate and regulatory structures as necessary.

There are a number of trade barriers, including high import duties, arbitrary customs valuation and lax property rights protection.[33] Some duty rates for U.S. products could range from 30 to 50 percent. However, in recent years tariffs have been lifted or reduced on many import items.

Intellectual property rights are still inadequately protected, but enforcement has improved in recent years. In 1995, Thailand adopted revised copyright law that complemented other enhancements to protect intellectual property rights. Intensified enforcement actions have also increased resulting in a higher number of arrests and seizures. However, piracy remains a problem and particularly affects U.S. pharmaceutical, film and software industries.[34]

C. INFRASTRUCTURE — DEMOGRAPHIC, COMMUNICATIONS AND PAYMENTS SYSTEMS

1. Demographic

Immediate concerns of the rural poor are basic needs and improved education. In response, the government is increasing its efforts to expand and improve the quality and access to primary, secondary and higher education. The gross enrollment ratio for tertiary education in 1995 was 20 percent, lower than that of Korea, Philippines, Singapore and Taiwan and less than one quarter that of the U.S. However, the literacy rate of 93.8 percent places Thailand at the upper level of the SEACEN group, suggesting a sound basis for education enhancement.

Of a population of 60 million, just 21 percent live in an urban environment and thus about 80 percent live in a rural setting. The work force totals approximately 35 million and the country faces a shortage of skilled labor in high-tech industry due to insufficient secondary education.[35]

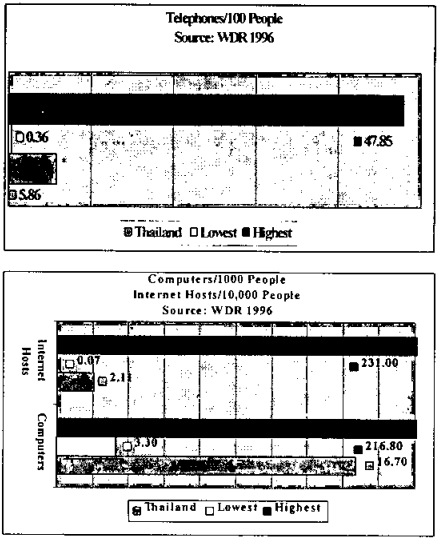
33. U.S. Department of State, "Thailand: Economic Policy and Trade Practices Report", 1997.

34. U.S. Department of State, "Thailand FAQ", 1998.

35. The World Bank, "Country Brief: Thailand", 1998.

2. Communications

The telecommunications infrastructure would benefit from additional investment. The agrarian sector of the population remains largely under-served and the systems within the urban environments are developing but not yet sufficient. The country reports approximately six telephones for 100 people, well behind Korea, Malaysia, Singapore, and Taiwan. Forecasts for telephone infrastructure predict 18 telephones per 100 people by 2001. However, plans to meet these predictions have been placed on hold due to the economic problems.[36] The two major telecommunications companies have more lines than they can readily market due to lack of affordability by the masses, lack of infrastructure beyond the urbanized areas and increasing competition



from the cellular telephone market. There are approximately 2.8 mobile phones per 100 persons which places it in the middle of the SEACEN group. There are several efforts in process to enhance the telecommunication environment, including satellite-based services, e-mail, ISDN and value-added services.

Thailand, like most other countries, has experienced increasing use of computers and the Internet. However, it still trails the progress experienced in Malaysia, Korea and Singapore. The number of compu-

36. Paul Budde Communication Pty. Ltd., "Thailand – Voice and Data Services", 1998.

ters per 1000 people stands at just under 17. In 1996, there were ten Internet service providers, with nearly 100,000 subscribers at the end of 1997. Internet use is expected to more than double by the year 2000.

Government leaders indicated a desire to become a sub-regional Internet hub for countries such as Myanmar, Laos and Cambodia and several projects are underway to achieve this goal. Within the past two years, a company called Samart introduced online services including telemedicine, teleshopping and video conferencing. A new ISP has plans to provide Internet access via satellite in order to allow users in the provincial areas to gain access for approximately the same price as users in Bangkok.

While not a leader within the region, efforts to advance e-commerce are ongoing and include addressing the lack of related laws and regulations. The government established "SchoolNet" a project launched in 1996 to encourage secondary schools to access information through the World Wide Web and to transfer information electronically to secondary schools throughout the country.[37] While initial usage has been less than expected, efforts continue to achieve the project's initial objectives.

3. Payment Systems

In the early 1990's, the Bank of Thailand (BOT) formulated medium- and long-term plans for the development of the financial structure. These plans included the payment systems and resulted in the formation of the Payment System Development Committee. Through necessity and the guidance of this committee, two primary payments systems have evolved. BAHTNET is an RTGS system that began in 1995, with user institutions including 35 commercial banks, five specialized banks, 18 finance companies, two government departments, five BOT offices and the Thailand Securities Depository Company. BAHTNET is primarily designed for large-value funds transfer among financial institutions and government entities and provides interbank funds transfer, third party funds transfer, current account inquiry, bilateral communication and general broadcast services.

The second most significant payment system mechanism is the Electronic Cheque Clearing System (ECS), in which check information

37. "An Attempt at Cooperation", *National Multimedia News,* July 3, 1998.

is sent via electronic communication during banking hours. The ECS is still the system of choice for many, due to the high use of checks in Thailand, increased liquidity management requirements associated with RTGS and the limits of the legal environment to support non-traditional means of payment.

D. BANKING INDUSTRY OVERVIEW

The banking system has undergone significant change, as the economic crisis has led to the closure or merger of several commercial banks. There are presently 13 domestic commercial banks in Thailand and they are the primary providers of capital. Additionally, as of October 1998 there are finance companies and credit fonciers as well as 21 foreign bank branches and 36 IBFs.

The financial crisis resulted in the government entering into an IMF Assistance Program and a primary component of this program is the restructuring of the financial sector. Measures have been taken to address the structural weaknesses within the financial system. These measures include higher capital standards, timely intervention of distressed institutions, tighter loan classification standards, liberalized limits on foreign equity investment in banks and the creation of an institution to deal with disposition of the assets of closed institutions. Some consolidation and elimination of failing banks has occurred in conformance with the IMF program. Many of the initiatives, such as a deposit insurance framework and comprehensive reform of financial supervision represent longer-term undertakings and may not have an immediate effect on the weak financial system. In the meantime, capital and loan loss reserves will be tested by rising levels of nonperforming loans.

Responses from the Financial Industry Survey conducted for this research project provide information on the key challenges and forces driving the technology efforts of the banking industry. The immediate challenges include the economic and political environment, liquidity and funding. Domestic competition is the primary force behind technological advancement followed by foreign banks. Efforts have been in both retail and wholesale initiatives, but slightly more focused toward wholesale banking. The infrastructure needed to support electronic retail banking is developing and will ultimately lead to a more robust electronic banking environment.

APPENDIX B

INFRASTRUCTURE DATA

This appendix provides quantitative and objective measurements of each country's economic performance, demographic characteristics and the physical telecommunications infrastructure. While more current data was available for certain data elements and certain individual countries, the data used for analysis reflect the most current and consistent data available for all SEACEN countries. There are two sets of charts, the first presents the data for all SEACEN countries. The second set provides data for the United States and Japan.

INFRASTRUCTURE INFORMATION BY COUNTRY

Factors	Indonesia	Korea	Malaysia	Nepal	Philippines	Singapore	Sri Lanka	Taiwan	Thailand
SOCIAL DEMOGRAPHICS									
Population[1] (7/98 est)	212,941,810	46,416,796	20,932,901	23,698,421	77,725,862	3,490,356	18,933,558	21,908,135	60,037,366
Life Expectancy[1] (1998 est)	62.5	74.0	70.4	57.9	66.4	78.5	72.06	76.8	69
Population Density[2] (1997)	107	456	61	150	236	4896	280	NA	116
% of Urban Population[2] (1980/1997)	22% / 37%	57% / 83%	42% / 55%	7% / 11%	38% / 56%	100%	22% / 23%	56%	17% / 21%
Literacy Rate[1] (1995 est)	83.8%	98%	83.5%	27.5%[3]	94.6%	91.1%	90.2%	92.7% (1997)	93.8%
Gross Enrollment % of Relevant Age Group: Secondary[4]	29% (1980) 48% (1995)	78% (1980) 101% (1995)	48% (1980) 61% (1995)	22% (1980) 38% (1995)	64% (1980) 79% (1995)	58% (1980) 62% (1995)	55% (1980) 75% (1995)	96% (1995) 97% (1997)	29% (1980) 55% (1995)
Gross Enrollment % of Relevant Age Group: Tertiary[4]	4% (1980) 11% (1995)	15% (1980) 52% (1995)	4% (1980) 11% (1995)	3% (1980) 5% (1995)	24% (1980) 27% (1995)	8% (1980) 34% (1995)	3% (1980) 5% (1995)	46% (1995) 51% (1997)	15% (1980) 20% (1995)
% of GNP for Education[2] (1980/1995)	1.7% / NA	3.7% / 3.7%	6.0% / 5.3%	1.8% / 2.9%	1.7% / 2.2%	2.8% / 3.0%	2.7% /3.1%	4.6% (1983) 6.0% (1995)	3.4% / 4.2%
INFRASTRUCTURE									
Electricity Consumption per Capita[2] (1995 est)	263 kWh	3,606 kWh	1,983 kWh	39 kWh	337 kWh	6,018 kWh	208 kWh	5,270 kWh	1,199 kWh
Main Telephone Lines in Operation[5]	3,290,854	18,600,204	3,332,447	77,317	1,409,639	1,429,000	204,350	9,174,813	3,481,997

INFRASTRUCTURE INFORMATION BY COUNTRY

Factors	Indonesia	Korea	Malaysia	Nepal	Philippines	Singapore	Sri Lanka	Taiwan	Thailand
Telephone/100 People [5]	1.69	41.47	16.56	0.36	2.09	47.85	1.11	43.01	5.86
People per Telephone[6]	262.3	4.7	7.9	NA	48.2	3.3	NA	5.4	26.7
Urban Teledensity[7] (1995)	7.7	52.9	14.3	NA	8.6	47.3	NA	62.1	25.5
Rural Teledensity[7] (1995)	0.7	33.1	14.7	NA	0.6	NA	NA	36.8	1.6
Telephone Faults per 100 Main Lines[5]	32 (1993) 71.04 (1990)	12.48 (1992) 15.36 (1990)	60 (1994) 76 (1990)	156 (1993) 192 (1990)	131.57 (1995)	5.5 (1994) 10.3 (1991)	192 (1995) 300 (1994)	11.5 (1995) 26.64 (1992)	45 (1993) 32.16 (1991)
Electricity Trans. And Dist. Losses [2,8] (1980/1995)	19% / 12%	6% / 5%	9% / 10%	29% / 26%	2% / 16%	5% / 4%	15% / 18%	NA	10% / 8%
Telephone Mainlines/1000 People[2,9] (1996)	21	430	183	5	25	513	14	NA	70
Phone Mainlines in Largest City/1000 people[10] (1996)	77	466	143	69	96	513	219	NA	339
Waiting List 1000's[10] (1996)	117.5	NA	160.0	136.2	900.2	0.2	237.8	0.0	821.6
Waiting time in years[10] (1996)	0.2	0.0	0.4	>10	2.9	0.0	7.4	NA	1.2
Mobile Phones / 1000 People[2] (1996)	3	70	74	NA	13	141	4	185.6[11] (9/98)	28
People per Mobile Phones[6]	38.2	4.5	4.9	NA	26.7	1.9	NA	1.9	8.6

INFRASTRUCTURE INFORMATION BY COUNTRY

Factors	Indonesia	Korea	Malaysia	Nepal	Philippines	Singapore	Sri Lanka	Taiwan	Thailand
Fax Machines / 1000 People[10] (1995)	0.4	8.9	5.0	NA	0.7	25.1	0.6	343 [11] (12/97)	1.7
Computers in Use[12] (1995/2000)	0.98M 3.4M	3.5M 10.6M	0.81M 2.5M	NA	0.66M 1.7M	0.55M 1.25M	NA	2.1M 5.2M	1.1M 3.3M
Computers/1000 People[12] (1995/2000)	4.8 15.5	77.9 222.1	41.1 113.9	NA	9.01 21.11	188.8 412.0	NA	95.9 232.1	17.6 51.7
Computers per 1000 people[2] (1996)	4.8	131.7	42.8	NA	9.3	216.8	3.3	119[11]	16.7
Computers per Population[6]	.66%	14.3%	6.24%	NA	.93%	32.0%	NA	8.8%	2.0%
% Population with Internet Access[6]	.12%	22.9%	1.0%	NA	.34%	11.4%	NA	11.1%	.55%
Internet Hosts per 10,000 people[2,13] (July 1997)	0.54	28.77	19.3	0.07	0.59	196.30	0.33	231[11] (10/98)	2.11
ISDN Subscribers[5] (1995)	NA	5,788	324	NA	NA	2,400	NA	636	327

INFRASTRUCTURE INFORMATION BY COUNTRY

Factors	Indonesia	Korea	Malaysia	Nepal	Philippines	Singapore	Sri Lanka	Taiwan	Thailand
ECONOMY									
Labor Force (millions) (1997)[2]	94	22	8	11	30	2	8	9.4	35
Labor Force Growth Rate (1990 to 1997)[2]	2.5%	1.9%	2.7%	2.5%	2.7%	1.7%	1.8%	NA	1.5%
GNP in Purchasing Power Parity[2] (Billions / 1997)	690.7	621.1	229.3	24.7	269.2	89.6	45.5	308[14]	399.3
Per Capita GNP in Purchasing Power Parity[2] (1997)	$3,450	$13,500	$10,920	$1,090	$3,670	$29,000	$2,460	$14,200[14]	$6,590
World Rank	67	24	29	103	63	1	75	NA	41
Per Capita GNP[2] (1997)	$1,110	$10,550	$4,680 Central Bank reported $4,518	$210	$1,220	$32,940	$800	NA	$2,800
Population Below the National Poverty Line[2]	15.1% (1990)	NA	15.5% (1989)	42% (1995)	54% (1991)	NA	35.3% (1990)	NA	13.1% (1992)
Population < $2/Day (Intl Poverty Line)[2]	58.7% (1995)	NA	26.6% (1989)	86.7% (1995)	64.5% (1991)	NA	41.2% (1990)	NA	23.5% (1992)

INFRASTRUCTURE INFORMATION BY COUNTRY

Factors	Indonesia	Korea	Malaysia	Nepal	Philippines	Singapore	Sri Lanka	Taiwan	Thailand
% of Work Force by Occupation[1]	Agriculture: 40% Public Service: 20% Manufacturing: 20% Trade and Restr: 20% (1996) Source: Bank Indonesia	Services: 65% Industry and Manufacturing: 23% Agriculture: 12% Source: Bank of Korea	Manufacturing: 27% Agriculture: 17% Services 46% (1997) Source: Central Bank	Agriculture: 81% Services: 16% Industry: 3% (1996)	Agriculture: 43% Services: 23% Government: 18% Industry and Commerce: 16% (1995)	Services: 33% Commerce: 23% Manufacture 26% Construction 7% Other 11% (1997)	Agriculture37 % Services: 46% Industry: 17% (1997)	Services: 52% Industry: 38% Agriculture: 10% (1996)	Agriculture: 54% Industry: 15% Service and Government: 31% (1996)
Composition of GDP[1]	Agriculture: 19% Industry: 41% Services: 40% (1996) Source: Bank Indonesia	Agriculture: 6% Industry: 40% Services: 64% Source: Bank of Korea	Agriculture: 12% Industry: 36% Services: 45% (1997) Source: Central Bank	Agriculture: 40% Industry: 21% Services: 39% (1997)	Agriculture: 22% Industry: 32% Services: 46% (1996)	Agriculture: NGL% Industry: 28% Services : 72% (1997)	Agriculture 18% Industry: 18% Services : 64% (1996)	Agriculture : 3% Industry: 36% Services: 61% (1996)	Agriculture: 10% Industry: 29% Services: 61% (1997)
Composition of GDP(1980/1997) **Agriculture** **Industry** **Manufacturing** **Services[2]**	 24% / 16% 42% / 42% 13% / 25% 34% / 41%	 15% / 6% 40% / 43% 28% / 26% 45% / 51%	 22% / 13% 38% / 46% 21% / 34% 40% / 41%	 62% / 43% 12% / 22% 4% / 10% 26% / 35%	 25% / 20% 39% / 32% 26% / 22% 36% / 48%	 1% / 0% 38% / 36% 29% / 26% 61% / 64%	 28% / 22% 30% / 26% 18% / 17% 43% / 52%	 NA	 23% / 11% 29% / 40% 22% / 29% 48% / 50%
Imports[2] (1996)	42.9 B	144.7 B	76.1 B	664 M	34.7 B	131.1 B	5 B	122.1 B[14]	73.3 B
Exports[2] (1996)	49.7 B	124.4 B	78.1 B	358 M	20.3 B	124.8 B	4.1 B	114.4 B[14] (1997)	55.8 B
Trade: % of PPP GDP[2,15] (1996)	51%	69%	183%	60%	94%	356%	79%	NA	83%
Mean Tariff[10]	13.2%	11.3%	9.1%	NA	21.6%	NA	20%	NA	NA
Recipient of Economic Aid[2,16]	$42B IMF (1998)	NA	$45M ODA (1993)	$41M ODA (1997/98)	$3B ODA (1998)	NA	$620M ODA (1996)	NA	$624 M ODA (1993)

[1] Source: CIA Factbook 1998, Country Listing (http://www.cia.gov/cia/publications/factbook/id.html).
[2] Source: World Development Report 1998/99 (http://www.worldbank.org/wdr/wdr98/contents.htm). Categories for Composition of GDP overlap and totals do not add to 100.
[3] 1991 Literacy Rate of 39.6% was reported by Nepal Rastra Bank in the Economic Survey, 1997/98.
[4] Source: 1997 UNESCO Statistical Yearbook. Gross enrollment ration is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown.
[5] Source: World Telecommunications Indicators, 4th Edition.
[6] Source: The Asian Banker Journal, Issue 17 (http://www.asianbanker.com.sg/abj/home.nsf/index).
[7] Source: Pacific Rim Review (http://pacificrim.bx.com).
[8] Electricity Transmission and Distribution Losses as percentage of output.
[9] Telephone mainlines are telephone lines connecting a customer's equipment to the public switched telephone network.
[10] Source: World Development Report, 1998.
[11] Figures provided by the Central Bank of China.
[12] Source: 8th Edition Computer Industry Almanac (Nepal and Sri Lanka not included).
[13] Internet hosts are the number of computers directly connected to the worldwide network of interconnected computer systems.
[14] Source: CIA Factbook 1998, Country Listing.
[15] Trade as a share of GDP is the sum of exports and imports as recorded in the national accounts, divided by DGP at market prices.
[16] ODA is defined as financial assistance, which is concessional in character, has the main objective to promote economic development and welfare.
[17] The following economic data was provided by the researcher from the Bank of Thailand.

Statistic	1997	1998	Statistic	1996	1997
Population	60.8 mil	61.4 mil	Per Capita GDP	3,024	2,539
Workforce	32.8 mil	32.8 mil	Trade Balance	-16.1 bil	-4.6 bil
			Unemployment	1.54%	1.90%

INFRASTRUCTURE INFORMATION BY COUNTRY

Factors	Japan	US
SOCIAL DEMOGRAPHICS		
Population[1] (7/98 est)	125,931,533	270,311,756
Life Expectancy[1] (1998 est)	80	76.13
Population Density[2] (1997)	333	29
% of Urban Population[2] (1980/1997)	76% / 78%	74% / 77%
Literacy Rate[1] (1995 est)	99%	97%
Gross Enrollment % of Relevant Age Group: Secondary[3]	93% (1980) 99% (1995)	91% (1980) 97% (1995)
Gross Enrollment % of Relevant Age Group: Tertiary[4]	31% (1980) 40% (1995)	56% (1980) 81% (1995)
% of GNP for Education[1] (1980/1995)	5.8% (1980) 3.8% (1995)	6.7% (1980) 5.3% (1995)
INFRASTRUCTURE		
Electricity Consumption per Capita[2] (1995 est)	6,937 kWh	11,571 kWh
Main Telephone Lines in Operation[4]	61,105,840	164,624,368

INFRASTRUCTURE INFORMATION BY COUNTRY

Factors	Japan	US
Telephone/100 People [5]	48.80	62.57
People per Telephone[5]	3.4	NA
Urban Teledensity[6] **(1995)**	NA	NA
Rural Teledensity[7] **(1995)**	NA	NA
Telephone Faults per 100 Main Lines[5]	2.16 (1992)	NA
Electricity Trans. and Dist. Losses [2,7] **(1980/1995)**	4% / 4%	9% / 7%
Telephone Mainlines/1000 People[2,8] **(1996)**	489	640
Phone Mainlines in Largest City/1000 people[10] **(1996)**	NA	NA
Waiting List 1000's[9] **(1996)**	NA	NA
Waiting time in years[10] **(1996)**	0	0
Mobile Phones / 1000 People[2] **(1996)**	214	165
People per Mobile Phones[6]	2.1	NA

INFRASTRUCTURE INFORMATION BY COUNTRY

Factors	Japan	US
Fax Machines / 1000 People[10] (1995)	102.2	64.6
Computers in Use[10] (1995/2000)	18.3M 46.8M	96.2M 160.5M
Computers/1000 People[12] (1995/2000)	145.6 367.0	364.7 580
Computers per 1000 people[2] (1996)	128.0	362.4
Computers per Population[6]	18.9%	NA
% Population with Internet Access[6]	8.2%	NA
Internet Hosts per 10,000 people[2,11] (July 1997)	75.80	442.11
ISDN Subscribers[5] (1995)	510,000	507,312

INFRASTRUCTURE INFORMATION BY COUNTRY

Factors	Japan	US
ECONOMY		
Labor Force (millions) (1997)[2]	67	136
Labor Force Growth Rate (1990 to 1997)[2]	.6	1.1
GNP in Purchasing Power Parity[2] (Billions / 1997)	2,950.7	7,690.1
Per Capita GNP in Purchasing Power Parity[2] (1997)	$23,400	$28,740.2
World Rank	6	2
Per Capita GNP[2] (1997)	$37,850	$28,740
Population Below the National Poverty Line[2]	NA	NA
Population < $2/Day (Intl Poverty Line)[2]	NA	NA

INFRASTRUCTURE INFORMATION BY COUNTRY

Factors	Japan	US
% of Work Force by Occupation[1]	Trade and Services: 50% Manufacturing: 33% Utilities and Communication: 7% Agriculture: 6% Government: 3% (1994)	Managerial and Professional: 29% Technical, Sales and Admin. 30% Services: 13% Manufacturing: 25% Agriculture: 3% (1997)
Composition of GDP[1]	Agriculture: 2% Industry: 42% Services: 56% (1995)	Agriculture: 2% Industry: 23% Services: 75% (1997)
Composition of GDP(1980/1997) **Agriculture** **Industry** **Manufacturing** **Services**[2]	 4% / 2% 42% / 38% 29% / 25% 54% / 60%	 3% / NA 33% / NA 22% / NA 64% / NA
Imports[2] **(1996)**	347,496	575,477
Exports[2] **(1996)**	410,481	814,888
Trade: % of PPP GDP[2,12] **(1996)**	17%	24%
Mean Tariff[10]	6%	6%
Recipient of Economic Aid[2,13]	8.3B Donor: ODA (1998est)	9.72B Donor: ODA (1993)

[1] Source: CIA Factbook 1998, Country Listing (http://www.cia.gov/cia/publications/factbook/id.html).
[2] Source: World Development Report 1998/99 (http://www.worldbank.org/wdr/wdr98/contents.htm).
[3] Source: 1997 UNESCO Statistical Yearbook. Gross enrollment ration is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown.
[4] Source: World Telecommunications Indicators, 4th Edition.
[5] Source: The Asian Banker Journal, Issue 17 (http://www.asianbanker.com.sg/abj/home.nsf/index).
[6] Source: Pacific Rim Review (http://pacificrim.bx.com).
[7] Electricity Transmission and Distribution Losses as percentage of output.
[8] Telephone mainlines are telephone lines connecting a customer's equipment to the public switched telephone network.
[9] Source: World Development Report, 1998.
[10] Source: 8th Edition Computer Industry Almanac (Nepal and Sri Lanka not included).
[11] Internet hosts are the number of computers directly connected to the worldwide network of interconnected computer systems.
[12] Trade as a share of GDP is the sum of exports and imports as recorded in the national accounts, divided by DGP at market prices.
[13] ODA is defined as financial assistance, which is concessional in character, has the main objective to promote economic development and welfare.

APPENDIX C

SURVEY RESULTS

Central bank Questionnaire - Supervisory Oversight

This questionnaire was completed by the Central banks and dealt with the current and expected IT supervisory practices, staff competency and training and the country's political and technological environment. Country responses are presented in one consolidated document.

Central bank Questionnaire - Financial Industry Overview

This questionnaire was completed by the Central Banks to provide an overview of the technological environment of the entire financial market, including technology development outside the traditional banking industry and outside the individual country borders. The individual country questionnaires are included.

Institution Survey - Electronic Banking

The Central banks distributed this survey to selected financial institutions under their supervision. The respondents provided information both on their strategic direction of technology and current deployment of specific electronic banking services. The individual country questionnaires are included.

APPENDIX C-1

SURVEY RESULTS

CENTRAL BANK
SUPERVISORY OVERSIGHT

CENTRAL BANK SUPERVISORY OVERSIGHT - COMBINED FINDINGS

SUPERVISORY OVERSIGHT

1. List the types of institutions your central bank supervises. Identify institution types involved in electronic banking that are not supervised by the central bank and indicate the organization with supervisory authority.

A. Korea

Since April 1998, under the Act Concerning the Establishment of Financial Supervisory Organisations supervisory authority over all the financial institutions in Korea has been concentrated in the Financial Supervisory Commission (FSC). In January 1999, three agencies were established under a united organization, the Financial Supervisory Service (FSS). The FSS is now the only supervisory authority over all financial institutions in Korea and the FSS is its executive organization. The Bank of Korea is only able to request that the FSS examine institutions or allow it join the FSS's examinations where this is necessary for the conduct of monetary policy.

B. Malaysia

With the exception of a few co-operative banks, the National Savings Bank, Industrial Bank (Government), Agricultural Bank (Government) and the Export Import Bank, Bank Negara Malaysia (BNM) supervises all other types of institutions. The Ministry of Finance, the Ministry of Agriculture and the Ministry of Trade and Industry would have supervisory powers over the other institutions.

The above mentioned institutions do not provide much in terms of electronic banking other than ATMs (National Savings Bank and a co-operative called Bank Rakyat).

Institutions supervised by BNM can be divided into four categories:

1. Commercial banks (35 institutions) which provide the most sophisticated form of electronic banking products. They cater for retail consumer markets as well as corporate and international markets.

2. Finance companies (currently 39, but merger exercises could reduce this to around 10 larger institutions) which cater mainly for hire purchase and leasing business. They are also offering electronic banking products for retail and corporate customers.
3. Merchant banks (12 institutions) which cater for wholesale banking, syndicated loans and public equity or debt security markets. Far less involvement in electronic banking, but new products are emerging since deregulation has caused the demarcation between retail and wholesale to be blurred.
4. Discount houses (6 institutions) which cater for government securities and wholesale funds. No electronic banking products, and these institutions will soon be phased out by merging with merchant banks.

C. Nepal

Nepal Rastra Bank (Central Bank) supervises the following institutions:

1. Commercial Banks (13)
2. Development Banks (2)
3. Rural Development Banks (5)
4. Finance Companies (44)
5. Co-operatives (29)
6. Non-government Organizations (30)

Among the above mentioned financial institutions, only some of the commercial banks are involved in electronic banking in a limited manner in the areas such as deposit taking, lending, account management, ATM, Credit Card, EFTPOS and SWIFT, etc. Besides this activity, no other financial institutions have introduced any electronic banking to date. The above mentioned banks and non-bank financial institutions, whether they are involved in electronic banking or not, are supervised by Nepal Rastra Bank as empowered by section 23 (a) of the Nepal Rastra Bank Act 2012 BS (1955 AD). Therefore, there is no other supervisory authority except Nepal Rastra Bank in the context of Nepal.

D. Singapore

Institutions under MAS supervision include: full bank, merchant bank, offshore bank, finance company, insurance company, securities

firms, and money changers. No other non-MAS supervised institutions are involved in electronic banking.

E. Sri Lanka

The following banking and non-banking financial institutions are supervised by the Central Bank:

1. Commercial Banks (26)
2. Regional Rural Development Banks (5)
3. Specialized Banks (11)
4. Finance Companies (25)

The Central Bank of Sri Lanka was established under the Monetary Law Act (MLA) No. 58 of 1949 as the authority for the administration and regulation of the Monetary System of Sri Lanka. In addition to the powers vested under the MLA, the Banking Act No. 30 of 1988 and the Finance Companies Act No. 78 of 1988 with subsequent amendments, further extended the powers of the Central Bank in maintaining an effective supervisory and regulatory system for both banking and non-banking financial institutions all over the country.

At present, commercial banks and specialized banks are the only institutions engaged in electronic banking operations. Therefore, banking business activities (electronic or otherwise) are supervised by the Central Bank.

2. *Provide a description of IT examination responsibilities and IT risks that are reviewed, formal workprograms in use and frequency of reviews conducted.*

A. Korea

The FSS uses a checklist, which represents a modified version of the Information Systems Examination Handbook of the Federal Institutions Examination Council. Examinations usually cover IT audit, IT management, systems and programming, and computer operations. On the basis of its examination findings, the FSS conducts an integrated

evaluation. IT examinations can be conducted at any time according to the situations, but the average number of examination has been once a year so far.

B. Malaysia

Responsibilities

Ultimate responsibility is to ensure that the IT environment as a whole contributes to a safe and sound financial system. At the institution level, main risks can be categorized by examination portfolios:

- Management
- Computer Operations
- Computer Security
- Systems Development and Programming
- Telecommunications
- Electronic Funds Transfer Systems

Formal Workprograms

- Main workprogram is the FFIEC workprogram
- Various ICQs have been developed to cater for local systems to check internal controls
- Systems specific ICQs that are used include those provided by the vendors, e.g. OS/400 security manuals, MVS audit program, etc.

Frequency of Reviews

- On average one examination every three years
- Available manpower and the prior ratings given by examiners influence frequency of examinations.

C. Nepal

No IT supervision is conducted by Nepal Rastra Bank except on-going on-site and off-site examinations.

D. Singapore

IT examination responsibilities include ensuring the soundness of financial institutions' EDP operations and their compliance with appli-

cable laws and regulations, as well as reviewing financial institutions' internal control systems to detect existence of imprudent practices, management problems or other deficiencies.

Formal workprograms used range from platform specific audit programs (eg. AS400), customizable business application audit programs, to Y2000 assessment programs.

IT examination usually follows the regular financial inspection which covers both scheduled and surprise visits.

E. Sri Lanka

Primary concern of the supervision function is to safeguard the public depositors. When new products, including IT initiated ones, are introduced to the market, the banks obtain covering approval from the Central Bank. In such instances, features of the new products and related risk in the products are evaluated before approving the new products. Internal control procedures of the products are also evaluated by the examiners when they conduct examinations. Documentation, test system before implementation audit trail, staff training, development of back-up facilities and contingency plans are also reviewed. In addition to traditional banking risks such as credit, liquidity, and interest rate risk, specific risks related to Information Technology; like operational risk, reputational risk, and legal risk, etc., are also reviewed.

3. How are IT management controls reviewed at financial organizations? How are IT examination findings communicated to the organization and are these integrated with other examination findings?

A. Korea

In principle, IT management controls are reviewed by: internal audit, the supervisory authority, and external consulting. The FSS had regarded IT examination as a part of the management section in the CAMEL check until the end of 1996, but changed this to a stand-alone check. On the basis of the checklist, the FSS scores the four sections described above. The examination results are rated in five grades after

the FSS talks to the institution to determine if there is anything particular to be considered. The FSS draws on these results in its usual examinations. For example, when the program handling credit services is found wanting, the evaluation result is forwarded to the credit service examination section of the FSS.

B. Malaysia

- Review of management controls is done by interviewing management and by reviewing the minutes of management meetings.
- Team leaders perform the overall management review by perusing Steering Committee minutes and Board of Directors' minutes.
- Team members contribute by assessing how functional heads perform their tasks and how they report to senior management of the financial institution.
- IT examination findings are communicated to the organization at two levels:
  a. The first is the 'Exit Meeting' conducted on-site at the end of the examination, with or without the presence of the supervising examiner.
  b. The second is the 'Management Meeting' which is held either at BNM or at the institution's site, depending on the seriousness of the findings. The supervising examiner, Head of Supervision and possibly the Assistant Governor may participate.
- IT findings are not, at the present time, integrated with other non-IT findings.

C. Nepal

Management controls are reviewed through on-site inspection at financial organizations where the following systems are verified. IT risks and management controls are not reviewed separately.

1. Internal Audit System
2. Credit Policy System
3. Branch Authority and Control System
4. Computer Back-up System
5. Cross Checking System
6. Human Resource Management System

D. Singapore

IT management controls are reviewed through EDP policies and procedures, minutes of IT department meetings, and interview with IT management and selected users. IT examination findings are raised as inspection comments and submitted to the organization for reply, just like general financial inspection. The final report sent to the organization also incorporates findings from the IT examination.

E. Sri Lanka

It is the responsibility of the management of the respective financial institutions to develop risk management procedures to control the inherent risk of the IT products. In our review, we ensure Internal Control Systems are in place including: segregation of duties, internal audit, external auditing of employee performance (password management, encryption techniques, proper authorization of end-users), and back-up plans established with service providers and contingency plan.

IT risks and management controls are reviewed during the on-site examination. Such review findings are integrated with normal examination findings. However, weaknesses and shortcomings related to IT controls in electronic banking activities are listed separately.

4. How do you supervise and/or evaluate the IT activities that are 1) outsourced and/or 2) conducted outside your national borders by financial institutions you regulate? Describe the extent of your reliance on external audit findings and/or foreign bank supervisors and existence of formal agreements for the particular activities to be reviewed.

A. Korea

The FSS examinations do not cover outsourced IT activities because there is no such case yet in Korea, nor do they include those IT activities conducted abroad. The FSS, in principle, does not make use of external audit findings. So far, the FSS has not made international agreements for cooperative review. Recently the Hong Kong Monetary Authority and the Bank of England have requested discussions on the responsibility for the surveillance of Y2K issues. They suggested that they be responsible for Korean offices in the U.K. and Hong Kong and the FSS oversee their offices in Korea.

B. Malaysia

Financial institutions under BNM's supervision must get permission prior to outsourcing their IT activities. Permission is granted subject to BNM's right to examine the service provider, and such examination will consider the usual issues for a data centre audit. Outsourcing activities include credit card manufacturing and data processing, but only a small number of institutions have undertaken such activities.

Reliance on external audit findings is limited since it is still rare for external auditors to conduct detailed IS audits. Certain smaller institutions do depend on their external auditors to provide IS audit functions, and such reports are forwarded to BNM for our information.

Reliance on foreign bank supervisors is limited since Malaysian institutions with extensive foreign commercial operations (aside from money market dealings) are practically non-existent. The safety and soundness of foreign institutions operating in Malaysia is implicitly left to foreign supervisors, but BNM supervisors cover local operations.

C. Nepal

So far no IT activities are supervised or evaluated by Nepal Rastra Bank. Therefore, Nepal Rastra Bank has to rely on external audit findings in this regard.

D. Singapore

For IT activities that are outsourced, we rely on the relevant documents and interviews with the financial institution for assessment. We have not gone overseas for IT examinations yet. External auditor's findings provide us with an additional means to decide which institutions to visit. In addition, during IT examinations, we also follow up with the auditor's findings. As for foreign supervisory bodies, there is cooperation in Y2000 assessment.

E. Sri Lanka

IT activity as well as supervision conducted outside national borders are minimal at present. International payments are subject to Exchange Control Regulation. In general, those regulations are permitted on non-capital transactions. However, outside national border transactions are reported to the Exchange Control Department.

Examination of financial institutions has three tools: internal audit, external audit, and bank examination. Therefore, examiners rely upon properly functioning internal control systems and external audit activities in place.

Existing foreign bank branches operating in Sri Lanka and engaged IT activities outside the country are supervised by home country supervisors of such banks. Therefore, we rely on their monitoring/evaluation report. However, there is no formal agreement with other countries to obtain information in relation to cross-border activities. As supervisors, we rely on external audit review and foreign bank supervisors reporting.

5. What IT risks or supervisory efforts do you see changing in the future? Describe the ways in which your agency plans to address these changes. Does the current supervisory staff have the capacity/skills to adapt to the new environment?

A. Korea

The more electronic banking develops, the greater the importance of security and contingency plans. Therefore, supervisory efforts should be focused on these two aspects. It would be desirable to train the supervisory staff to acquire adequate knowledge of IT. The FSS has not mounted any initiatives to tackle its current development to date.

B. Malaysia

Emerging Risks and Supervisory Efforts

- Borderless transactions in a 'virtual banking system'
- High tech criminal activities
- Malicious hacking or 'cyber-terrorism' – "If we can get away with it, why not!"
- Reconciling an outdated 'regulatory regime' with a 'rapidly evolving banking system'
- Designing a supervisory regime that compels 'self-regulation'
- Educating the public about 'caveat emptor' which is essentially part of self-regulation
- Pace of development in electronic banking continues to exceed the development of management and technical talent

- The creation of 'super-banks' within the local banking industry (due to an innate ability to capitalise on deregulation and EB) threatens the weaker banks, and increases short-term systemic risk.

Plans to Address these Changes

- Increasing training efforts in both scope and depth
- Increasing internal research activities to understand the new environment
- Increasing off-site supervision in order to have better interaction with the system
- Collaborating more closely with the regulators, domestic and foreign
- Collaborating more closely with the institutions, domestic and foreign
- Integrating IS supervision and risk management with conventional supervision and risk management

Staff Skills

The current supervisory staff lacks the technical skills necessary for detailed examinations or extensive dialogue with the institutions. Recruitment and training will have to bridge the gap using whatever means deemed feasible. Such means include:

- Formal training programs (scholarships for further study);
- Internal training courses (Bank supervision courses, SEACEN programs, Central Bank Course – CBC);
- Secondment (e.g., attachment with Federal Reserve USA); and
- Research activities (collaboration with Malaysian Institute of Economic Research, Smart card project, Internet with MIMOS, discussing Y2K with the industry and government).

C. Nepal

Electronic banking is in the initial stage in Nepal. However, the development of electronic banking is gradually increasing. Some banks are providing few services of electronic banking whereas some others are going to introduce some IT products within two to five years. With the introduction of IT products, the following IT risks may arise in future:

1. Credit risk,
2. Liquidity risk,

3. Interest rate risk, and
4. Market risk.

The current supervisory staffs do not seem to be in the position to demonstrate their capacity/ skills to adapt to the new environment, as they are not trained in this field. Even so, NRB is seriously thinking to mitigate the above risks as far as possible. The NRB has advised all concerned banks and non-bank financial institutions to make them aware of IT related risks. Similarly, NRB is also planning to train its staff by sending them abroad as needs arise. At present, a high level team is planning to visit and study IT related supervision system adopted by some SEACEN member countries. This study will certainly help the department to identify training possibilities in this field.

D. Singapore

The current trend is toward globalization. As such, the institution's IT systems are all linked up globally. There may be a need to evaluate the IT management and support within the institution's group. To prepare ourselves for this trend, our staff are sent to attend the relevant seminars and training to keep themselves updated.

E. Sri Lanka

At present, electronic banking activities are in the early stages. However, IT activities will increase in the future due to market development. Therefore, most of the IT risks are not existing now but may appear in the future.

Some of the risks, such as unauthorized access, negative public image due to non-maintenance of bank customer relationship, and money laundering activities may develop with widespread electronic banking activities. Necessary initial steps have been already taken to address these challenges. For example, unauthorized access of computer data base activities are discussed in the proposed Computer Crime Act to be presented in Parliament. To maintain bank customer relationships and confidence, code of ethics are being circulated among banks. To counteract money laundering activities, a draft Parliamentary Act is under preparation.

The existing number of supervisory staff members is inadequate, therefore plans to increase staff strength of the IT examination activities

have been made. On the other hand, there are ongoing job training facilities for the supervisory staff members to improve their skills and capabilities.

6. Describe initiatives to conduct research and identify developments in the area of electronic banking and deployment by the financial services industry. What, if any, ongoing monitoring programs exist? Are the research results folded into the examination process? If so, how?

A. Korea

Once a year, the Bank of Korea surveys the planning and development of the financial institutions' IT activities. We have published and distributed the results so that institutions may be able to ascertain their status in the IT area of the financial industry. However, the survey results have not been used directly in examination activities.

B. Malaysia

There has been very little done in terms of research programs in this area so far.

The Multi-Purpose Card (MPC) project led by BNM to introduce a smart card into the retail payment system by the year 2000 has conducted limited market research into this area. Results are inconclusive largely due to lack of data.

BNM obtained the services of Mr. Nigel Ogilvie from the San Francisco Federal Reserve to discuss regulatory issues on electronic commerce. The 10-day session was completed in August 1998.

The data on electronic banking that exists within Bank Negara Malaysia is largely to cater for requests to launch new products and services. They are not folded into the examination process, but there is a growing awareness of the need to understand the wider implications of electronic banking. Even further, there is a need to understand E-Commerce in relation to its sub-set industry of E-Banking and the industry of conventional banking.

C. Nepal

Electronic banking refers to the provision of retail and small value banking products and services through electronic channels. Such products and services can include deposit taking, lending, account management, the provision of financial advice, electronic bill payment and the provision of the other electronic payment products and services such as electronic money. The system of electronic banking was first introduced by the Nepal Arab Bank Ltd., a joint venture bank, by providing limited electronic banking services in the areas of deposit taking, lending and account management of their customers. All the joint venture banks are now providing the above mentioned electronic banking services to their customers.

Currently, widely used access devices through which electronic banking products and services can be provided to customers include point of sale terminals, automatic teller machines, telephones, personal computers, smart cards etc. In this context, all the above services are available in Nepal except for personal computers. For example, till date there is only one ATM.

Another bank is also going to install an ATM very shortly. Previously SWIFT service was available at the Nepal Grindlays Bank only. Recently four more joint venture banks are also providing SWIFT service. Likewise, the Himalayan Bank Ltd. was the first to issue credit cards to their customers whereas at present the Nepal Arab Bank and the Nepal Grindlays Bank also issue credit cards, both domestic and international, to their customers. At the same time, the Himalayan Bank Ltd. provides Tele Banking service with limited options, i.e. balance inquiry and furnishing account statement. The Nepal Arab Bank Ltd. has inducted EFTPOS service in their credit card department as an added service. The above example reveals that the development of electronic banking is gradually increasing in Nepal.

Due to the above reason, IT examination has now become a very important factor for Nepal Rastra Bank. There is a need for Nepal Rastra Bank to think seriously about information technology especially for inspection and supervision purposes.

Nepal Rastra Bank has not yet started to conduct IT examination due to non-availability of trained manpower in the ISD. Therefore, it is expected that this research study will help NRB to understand the importance of IT and thereby formulate proper policy with regard to IT examination.

D. Singapore

Within MAS, the Financial sector Promotion Department has initiated a project to study the IT infrastructure support within the financial industry. The project includes study of electronic banking. Within the National Computer Board, there is also a group known as the Electronic Commerce Hotbed that looks into EC concerns. So far, the results are not yet folded into the examination process.

E. Sri Lanka

The Government of Sri Lanka declared 1998 as the year of Information Technology on the recommendation of the Council of Information Technology (CINTEC). During the year (1998), CINTEC, as the responsible state agency, hopes to act as a catalyst and promoter of IT. CINTEC established in 1984 has always been concerned with the need to provide awareness to the general public. CINTEC was a major player in the initiatives taken to provide Internet Services. On an initiative of this Committee, plans are underway to establish a local internet exchange.

With the recent economic development, life styles are also changing. However, available statistics show that there are only 200 ATMs and less than 500,000 card users in the country. In other words, only less that 3% of the country's population uses plastic cards. Most developed nations have already progressed rapidly toward a "cashless society." Consumer perceptions, however, are bound to change for the better since electronic money will be the way forward for many developing countries, including Sri Lanka. Smart card-based electronic money was introduced by a bank in August 1998.

Furthermore, CINTEC, the central body of all the information technology in the country, appointed a "Special Task Force on Year 2000 Compliance" in February 1998.

STAFF AND DEVELOPMENT

7. ***Describe staffing for the Information Technology examination function. Include primary responsibility and secondary roles (if any), numbers of examiners, years of IT examining experience and range of titles. Are any significant staffing changes planned for the IT examination function?***

A. Korea

Before September 1996, the examiners who had knowledge of IT conducted the review of IT activities along with other banking business. At present, the FSS has 12 examiners who take exclusive charge of IT examinations. Their average years of IT examining experience are more than three years. The titles of staffs are head examiner, senior examiner, and examiner. However, there are no significant staffing changes for the IT examination function.

B. Malaysia

Title	No. of Staff	Experience in Years		Tech.
	Average	Range	Background	
Head of Dept.	1	20	-	Arts & Languages
Senior Manager IT	1	12	-	Mathematics/
Manager	3			Note A
Senior Executive	26		1 – 12	Note B

Background Detail	Note A	Note B
Accounting	1	7
Business/Finance	1	9
Economics/Arts	1	2
Computer Science	2	5I
Information Technology	na	3

Primary Responsibilities

A. Management Staff

- Plan, co-ordinate and review IS examination programmes of financial institutions and insurance companies to meet the performance objectives of the department.
- Supervise IS examination of institutions to ensure minimum standards and deadlines are adhered to by team members.
- Discuss and confirm examination results with team leader and members before officiating at the exit meetings.
- Vet and finalise examination reports/memos.
- Assist senior management of the central bank in formulation of policies and procedures on IS matters concerning the banking and insurance industries.
- Keep abreast of IT developments in the local banking and insurance industries, as well as global market place, particularly if there are any supervisory issues.

B. Examiners

- Assist the managers to plan for IS examinations.
- Conduct on-site examination work.
- Review and research material that can contribute to the examination process.
- Prepare draft examination report for discussion with the financial institutions' management.
- Participate in internal projects as and when required.
- Keep abreast of IT developments in the local banking and insurance industries, as well as global market place, particularly if there are any supervisory issues.

C. Significant Changes Planned for Staffing

- Progressively increase the number of staff who specialise in IT and computer science.
- Merge the non-IS examination and IS examination function and create multi-skilled examiners (This is seen as part of the longer-term strategy, rather than an immediate objective).

C. Nepal

Nepal Rastra Bank basically conducts on-site and off-site inspection of all banks and financial institutions especially to protect the interest of the depositors. Besides this, the main objectives of bank supervision

1. To determine the bank's financial positions in the light of its solvency position and the quality of its operations.
2. To assess the efficiency of the bank's management and staff.
3. To ascertain whether the bank is complying with current applicable laws, regulations and monetary measures issued by Nepal Rastra Bank.
4. To test the accuracy of its books of account and records and to evaluate the adequacy of its accounting system, records and internal control.

To attain the above objectives of supervision, ISD conducts mainly the following types of inspection:

1. Off-site inspection
2. On-site inspection

Offsite Inspection

This inspection is a desk-related task of ISD. All the commercial banks and financial institutions have to submit their statistical returns on a regular basis regarding the capital adequacy, statutory reserves, bank's credit exposure to a single customer, provisioning against bad and doubtful loans, and deprived sector lending etc. The staff of the off-site division carry out in-depth examination upon the statistical returns. In the process, they analyze the balance sheet, profit and loss account, and other information using the CAMEL test approach.

On-site Inspection

While off-site surveillance plays an important role in detecting potential problems faced by the banks and financial institutions, simple monitoring on an off-site basis may not be enough. There might be a lack of transparency because of cosmetic management and accounting practices in the banks. The only way to find out the realities is by direct, regular and surprise on-site examinations of banks and financial institutions. On-site examination of banks and financial institutions is perhaps the most popular means of determining the quality of loan portfolio, quality of management, and the overall performance of a Bank. On-site examinations also facilitate the detection of frauds, abuse of power by management and staff and concentration of loans and deposits in a sector or a group. Nepal Rastra Bank deputes its staff at the offices of banks and financial institutions as per its annual plan

and programme. The inspection team carries out its job as outlined in the "Inspection Manual".

There are altogether 68 examiners in the Inspection and Supervision Department with 1 to 6 years of operational experience. The range of titles of the examiners in the Department is as follows:

1. Chief Manager (1)
2. Deputy Chief Manager (4)
3. Deputy Chief Officers (15)
4. Assistant Officers (21)
5. Senior Assistants (22)
6. Assistants (5)

D. Singapore

- Number of examiners: 9 with experience ranging from 1 to 6 years
- Range of titles: examiner, senior examiner, inspection manager, and director
- Inspection manager takes care of scheduling and reviewing examiners' work.
- Examiners carry out on-site IS examination.
- There are no significant staffing changes planned for the IT examination area.

E. Sri Lanka

The staff or team for the conduct of an on-site examination would depend on the size of the bank, its branches and extent of its assets/ liabilities.

Off-site Surveillance System involves analysing key bank financial ratios and other financial data generated from the periodic financial returns submitted to the supervisors. Analytical report on each bank is prepared by an Examiner.

An examiner and one Assistant Examiner would be assigned to conduct small bank (a bank with only one branch) on-site examination while large bank (a bank with more than 50 branches) on-site examination would be led by a Senior Examiner and assisted by at least ten Examiners and Assistant Examiners.

Responsibilities of the Examiner-in-Charge are as follows:

1. Planning the examination procedures and work steps.
2. Organising the examination work with available staff and other resources.
3. Assign duties to the examination staff.
4. Supervision management.
5. Discussion with the management where necessary.
6. Preparation and submission of the examination report to the Director of Bank Supervision.

The examination team members' responsibilities are as follows:

1. Carry out duties assigned by the Examiner-in-Charge.
2. Preparation and submission of report based on findings to the Examiner-in-Charge.

At present, the examination staff include 6 Senior Examiners (>10 years experience), 30 Examiners (5-10 years experience) and 10 Assistant Examiners (<5 years experience). It is proposed to expand the examination staff up to 125 gradually by the end of the year 2000.

It is also expected that separate units will be built within the supervisory staff to handle specific areas of examination such as foreign exchange, IT activities, etc. and the number of IT supervisors is expected to increase with a pool of expertise to be developed in each area.

8. Describe the current training program for developing examination staff expertise. What training is provided to develop IT competencies within your staff? Describe current and planned initiatives to raise competencies of all staff to evaluate technology initiatives by your financial institutions.

A. Korea

The FSS lets its examiners participate in the various training programs given by domestic and foreign organisations. Apart from that, no special initiatives have been taken or are planned to raise the competencies of staff in IT supervision.

B. Malaysia

- In-house training program conducted by senior examiners and/or external resource persons for junior examiners. Areas covered are IS examination of management, operations, telecommunications, security, EFTS and systems development.
- External training programmes conducted by vendors and training centres on areas such as telecommunications, computer security, firewall technology, Internet and E-Commerce.
- Collaboration with other central banks via SEACEN.

C. Nepal

Nepal Rastra Bank has established its own training Center called Bankers Training Center (BTC). BTC conducts various types of training throughout the year. In this connection, the center conducts two courses on Inspection and Supervision, one for the officer and another for the non-officer level employees. Similarly, the SEACEN Centre (Malaysia) also conducts "Examination and Supervision" courses twice a year. The department sends its staff regularly to participate in the above mentioned training programs for developing the expertise of the examination staff. Besides this, ISD sends its staff to attend the training seminar workshops conducted by the Federal Reserve Bank, USA, Bank for International Settlements, Basle, and other foreign institutions.

Currently, no IT examination is being conducted by ISD. However, ISD has planned initiatives towards manpower training so as to be able to conduct IT examinations. In this context, ISD has incorporated Computer Audit as the "Mission of the Year" for 1998/99. This will certainly help ISD to start IT examination by the year 2000.

D. Singapore

Current training program consists of pairing experienced examiner with new staff for on-site inspection for hands-on experience, external audit training and other relevant technology seminars. Within the IS group, we are setting up an R&D resource library to supplement the training program. We are also encouraging the examiners to each focus on one technology area and use the department bulletin board as a forum for discussion.

E. Sri Lanka

In-house training facilities and seminars are arranged for development of staff expertise and arrangements are also made to attend international seminars, workshops, training programmes to improve capabilities of the supervisory staff.

Basic knowledge or awareness of IT environment has been given to all examination staff members while special facilities have been provided to a few members to specialise in IT examination work.

Further plans are afoot to provide on-the-job training facilities to improve their ability to understand new products and examination techniques relating to technology initiatives.

POLITICAL AND TECHNOLOGICAL ENVIRONMENT

9. Provide an overview of current and proposed legislation and regulatory reform that addresses banking technology developments and payments systems. Also, describe any legislation or regulation that limits co-operation and/or information disclosure by bank supervisors across national borders.

A. Korea

We have the Fundamental Laws in Data Communications Network Enhancement, which is to enhance data communications in each section of society and arrange policies among the government agencies if necessary. Bank supervisors do not have any legislation or regulation to limit the cooperation or information disclosure across national boards.

B. Malaysia

The current banking law was designed to also cater for some anticipated changes in the mode of delivering banking services. This includes the increased usage of technology in banking services. The provisions in the Banking and Financial Institutions Act 1989 (BAFIA) are mostly general in nature, i.e., they are applicable in conventional as well as electronic banking. Similarly, the prohibitions in the BAFIA would be applicable whether it is conducted through conventional or electronic means.

With reference to payment systems, the BAFIA specifically provides for electronic fund transfer systems. The BAFIA provides that any operator for electronic fund transfer requires written authorization from Bank Negara Malaysia. Furthermore, the BAFIA also empowers Bank Negara Malaysia to make regulations, among others, to provide for:

- the setting up, operation, administration of, or any other matter relating to, electronic fund transfer system; and
- the imposition of duties, liabilities, limitations and prohibitions, sanctions, or the conferment of rights, benefits or indemnities on parties to any electronic fund transfer system in Malaysia.

At present, the payment rules for the interbank fund transfer system and scripless securities transfer systems are provided under the SPEEDS Participation Rules. These are club rules that govern the participation and operation of both the interbank fund transfer system and scripless securities transfer system.

To cater for developments in the banking industry, which relate to new technology, Bank Negara Malaysia has issued two new rules in 1997:

Bond Information and Dissemination System (BIDS) Rules

These rules govern financial institutions that participate in BIDS. BIDS provides transparency on information relating to bonds and bond trading activities. It also allows the participants to advertise for trading of bonds. The rules set out the duties and responsibilities of participants of BIDS and procedures for BIDS.

The Imaging System for Cheque Clearing (SPICK) Rules

These rules govern the participants of SPICK system to ensure the smooth running of the newly introduced SPICK system.

Other Legal Infrastructure

- The *Digital Signature Act 1997* has been passed by the Parliament to provide for the legality of digital signatures. This Act is expected to come into force on 1 October 1998. It is based extensively on the Utah legislation from the U.S.A. It gives legal recognition of digital signature, addresses the verification and non-

repudiation of contracts and agreements executed via the network..

- The *Computer Crime Act 1997* has also been enacted in an attempt to provide a secure environment for transacting via electronic means. The Act defines four offences:
  - Unauthorized access;
  - Unauthorized access with intention to commit further offence;
  - Unauthorized modification; and
  - Wrongful communication.
- For the purpose of proving a case in the court relating to electronic banking, the amendments to the *Evidence Act 1950* would be very useful. The 1993 amendments provide for the admissibility of computer generated documents. Such evidence is primary evidence. To put the matter beyond doubt, the amendments further state that it shall prevail notwithstanding any other provisions of the Evidence Act 1950, the Bankers Books Evidence Act 1949 or any other written law relating to certification, production or extraction of documents in any rule of law or practice relating to production, or admission of proof, of evidence in any criminal or civil proceedings.

Proposed Legislation or Regulations

To address the privacy issue, the Government is in the process of formulating the *Personal Data Protection* law. This confidence building law will provide a safeguard to individuals' right to privacy and prevent manipulation of personal data. For the banking sector, this law would complement the existing secrecy provisions in the BAFIA to protect personal data of bank's customers.

With the proposed introduction of *Real Time Gross Settlement System* (RTGS), a new set of RTGS rules will be issued before the introduction of this system to govern this new activity.

Legislation and Regulations on Disclosure of Information among Bank Supervisors

Part XIII of the BAFIA covers the issues of information and banking secrecy. It provides two modes of accessing a bank's books, accounts and transactions to other bank supervisors:

- examination by other bank supervisors; or
- disclosure by Bank Negara Malaysia of such information.

However, such access by other bank supervisors must be with the approval of Bank Negara Malaysia which will then determine the request and assess it based on the overall policies at that time and other relevant restrictions.

C. Nepal

There is no current legislatory framework that addresses banking technology developments and payment systems. The current Nepal Rastra Bank Act is being used as a framework to oversee the banks and financial institutions. Till date, all the banks and financial institutions are free to induct any banking technology in their service. However, in doing so, they should have prior approval from Nepal Rastra Bank (NRB). While giving permission for any kind of new services to be inducted, whether it be technology or non-technology, NRB can give specific directives in this regard and the banks and financial institutions are required to follow the directives of Nepal Rastra Bank.

There is therefore a pressing need for regulatory reform in this area. As NRB is planning to strengthen its regulatory and supervising function, this would be the best time for considering these issues. The Bank, is also considering improvement in various legal aspects governing the banking system.

Nepal Rastra Bank Act, 2012(1955) Section 33 Sub-section (1) and Commercial Bank Act 2031 (1974) Section 48 Sub-section (3) prohibit the disclosure of information regarding the relationship between banks and the customers and the ledger, records and the statement of bank accounts to an unauthorized person by bank supervisors. Currently, as no foreign bank is operating branches or subsidiaries in Nepal and none of the domestic banks has opened branches or subsidiaries outside Nepal, there is no such legislation or regulation that limits cooperation and/or information disclosure by bank supervisors across national borders. However, NRB is planning to review and amend the current banking legislation in view of the possibilities of the opening of foreign bank branches in Nepal and the domestic banks opening branches outside Nepal in the future.

D. Singapore

The electronic transaction bill has just been enacted which puts in place the legal framework for conducting business over the net. With

the launch of the RTGS, the interbank settlement polices and procedures are also updated accordingly.

The original Banking Secrecy Act requires that all banks keep customer information confidential. However, a recent amendment to the Act has allowed foreign supervisory body to inspect a branch of a bank incorporated outside Singapore for the sole purpose of supervision. The foreign supervisor should be the one responsible for regulating the head office of the bank, and is required to observe the confidentiality of the information received.

E. Sri Lanka

With regard to current legislation, it may be stated that the Law of Evidence was amended to permit any statement produced by computer to be admissible evidence in a Court of Law. This was extended to evidence reproduced from micro-films.

Rapid development of electronic data processing and anticipating a rise in white collar crimes, a Computer Crimes Act drafted on the Singaporean model is to be introduced shortly in Sri Lanka. Having regard to the serious nature of offences under the "Computer Crime Act," the jurisdiction for such offence is given to the High Court with indictment to be by Attorney General and it is a non-bailable offence. A code of conduct to issuers and holders of credit cards is also being drafted.

At the moment, the Monetary Law Act contains a provision that precludes disclosing of any information except under specific conditions. Section 45 of the Monetary Law Act imposes duty to maintain secrecy to Central Bank employees. However, with the Governor's permission, information may be given. This type of information is usually shared between bank supervisors in a limited way such as obtaining status report, unlike in the other countries. (e.g. Malaysia, where BAFIA contains specific provision for exchange of information). However, proposals have been made to incorporate specific provisions to permit exchange of information between supervisors.

10. Describe any infrastructure issues or population demographics that particularly inhibit or encourage the development of electronic banking in your country.

A. Korea

Banks in Korea have already developed centralised electronic payment networks, which may be relatively advantageous for the development of electronic banking.

B. Malaysia

In the absence of formal research data, an informal survey was conducted amongst certain senior management staff in the commercial banking sector involved in electronic banking. Information contained in the Asian Banker Journal, Issue 14, June-July 1998 which had done a research based write-up on Internet / Electronic Banking in selected Asian countries was also utilized. The following issues are considered pertinent to issues of infrastructure and population demographics:

1. The Malaysian telecommunications infrastructure can be described as above average with respect to the rest of Asia-Pacific. The penetration of telephones within the Malaysian society is 5.5 people per telephone (USA – 1.3:1; Singapore – 2:1; Taiwan – 2.1:1; Thailand – 13.5 : 1; Nepal – 174:1; Philippines – 38.1:1; Indonesia – 47.7:1; Sri Lanka – 65.1:1)[1]. The introduction of ISDN and fibre-optics is increasing line capacity.
2. Availability of PCs at home is increasing but the use is primarily for computer games or word processor/spreadsheet purposes. The recent devaluation of the ringgit has also halted the decline in PC prices. The more rigorous implementation of software piracy laws has further dampened a once burgeoning market for PCs for the small business segment of the entire PC market. The cost of a PC and software is still considered high for many homes.
3. Malaysia has not yet achieved critical mass in terms of Internet subscribers. Currently there are some 350,000 subscribers, and E-Banking managers suggest at least one million subscribers as adequate critical mass. However, the presence of a large and youthful market of new professionals promises to overcome this hurdle

1. AsiaWeek, September 4, 1998, page 54.

once E-Commerce proves to be a value-adding service. This is a classic chicken and egg situation. The E-Banking market can be broken into four main segments:

a. Corporate customers interested in business-to-business links;
b. Students who have to PCs on campus;
c. Working people who can piggy-back on PCs at the work-place; and,
d. Expatriates who are keen on Internet services (extremely small market).

4. Lack of leadership from key players in the telecommunications industry, retail business sector and banking industry to collaborate in the setting of standards, procedures and regulations for E-Commerce.
5. E-Banking is seen as an alternate delivery channel, and the main benefit is reduction in the costs of operating large physical branches. However, in order to ensure a quality delivery channel, a sophisticated supporting infrastructure comprising 24-hour help desk, call centre, backup systems and technical assistance personnel must be established. This significant investment in capital equipment and overheads skews the profit equation in favour of large volume business. Hence, banks with a smaller customer-base are reluctant to venture into EB. Even larger domestic institutions are hampered by a customer profile that prefers conventional banking. The foreign banks in Malaysia have always targeted the up-market professional segment, and are thus more willing to offer EB.
6. Many of the domestic banks in Malaysia confront a steep learning curve in the implementation of EB since they have traditionally depended on an extensive physical branch network, and lack the requisite management and technical skills to operate an EB environment. Foreign banks, which can draw extensively upon their parent institutions in Europe or the United States of America, have less fear of confronting the learning curve.
7. The lack of significant value-add for customers outside the commercial or economic hubs of Malaysia (Kuala Lumpur, Johor Baru and Penang) inhibits EB. Within the commercial hubs, the heavy traffic, high cost of parking, lack of parking space, difficulty in finding time to do banking and the sheer pace of city life has created a demand for 'convenience products'. Convenience in itself can sell but does not make EB commercially viable. However, when lack of EB results in the loss of savvy, high-income customers, the banks have little choice but to offer EB to maintain a competitive edge, and remain commercially viable.

8. Business-to-business E-Commerce offers better growth opportunities, and is leading to Intranet and Extranet products, with the banks as both channel provider and payment intermediary. But lack of standards and an inadequate legal infrastructure is putting the brakes on this type of ventures. Private networks are too costly; hence Intranet/Extranet options are restricted to high value-add propositions. Internet would be attractive, but Bank Negara Malaysia has yet to approve Internet-based transactions for reasons of security and control.

Recapitulation:

It is important to note that the above issues are both inter-related in the sense that each contributes to the viability of E-Commerce, and thus E-Banking, and independent in that they can encourage or discourage EB depending on the specific attributes of the financial institution. Hence, every aspect must be addressed. This can be done either by a public regulatory body (not the preferred option from a business perspective) or a non-profit industry committee (inhibited by lack of leadership and collaboration). Generally the respondents were of the opinion that EB will take off, and become a norm in Malaysian banking. The pace at which this will occur varied from two years to ten years, with respondents generally citing that the current economic uncertainty has seriously slowed the process of adopting E-Commerce. The key issues pertaining to the economic crisis are shown below in Diagram 1. It must be recognised that the recent drastic initiatives undertaken by Malaysia, such as capital controls, fixed exchange rate and a move to lower interest rates have all contributed to an 'uncertain state of mind'. The issues listed could be short-term or long-term depending on this 'state of mind'.

Diagram 1: Impact of the Economic Crisis on Electronic Banking in Malaysia

Strategy, Systems, People and Integration

Before the Economic Crisis	After the Economic Crisis
Strategy • Growth of loans and deposits • Shift from local to regional • Create strategic alliances with E-Commerce partners	**Strategy** • Containment of loan losses • managing 'fixed currency' and 'closed economy' • Chasing after elusive 'foreign partners'
Systems • Invest heavily in new On-line Internet compatible systems • Recruit consultants and IT staff to design and create applications	**Systems** • Cost control, deferment of experimental technology • Repatriate the expatriates except for Y2K issues
People • Expand staff size, especially IT/ Telco divisions • Shift from counter service to sales & marketing personnel • Switch from physical branch network to call centre/virtual model	**People** • Voluntary separation schemes • Expand risk management division • Old is gold, hold on to the depositors
Integration • Stand-alone to fully integrated databased • Experimenting with data warehouse & data mining technologies • Promote IT-oriented manager to create 'techno-culture'	**Integration** • Stand-alone to fully integrated databased • Historical data has less value in a dynamic environment • Back to staid and stable for the moment

C. Nepal

It would be more convenient for the banks to have direct linkage among the branches for the transmission of data as well as to operate branch banking system. The branches are connected to the central processor through a telecommunications link that can be either a dial-up or a leased line or a microwave or a VSAT. Among these, VSAT is the most popular and reliable link that can transfer data reliably. However, only the dial-up and leased line systems are available in Nepal. Both of the systems are provided only by the Nepal Telecommunications Corporation (NTC), a government undertaking. The NTC concentrates on distributing telephone lines to the general public and therefore it has been giving less attention to the leased line system. Because of this, NTC has no specialized group in their office which looks after the leased line only. This is one of the hindrances for electronic banking in terms of infrastructure issues.

For a country like Nepal, with all its legacy of problems, introducing high technology in the banking system is fraught with many difficulties, e.g. infrastructural, economic and social. Seventy four percent of the people are illiterate and almost fifty percent are under the poverty line. In such a situation, the available services of electronic banking is out of reach of most people. The present scenario of electronic banking is not encouraging for the banks to introduce new services. However, in a fast changing society, the banks have to think about initiating the latest means of electronic banking in their services both for the reputation of the banks and also to attract more customers despite the above mentioned hindrances.

D. Singapore

Given the smallness of Singapore, both in terms of population and physical area, it is relatively easier to implement infrastructure conducive for electronic banking. In addition, the people are generally well educated and have been receptive to the introduction of technologies so far. This is evident by the high percentage of PC ownership at home and the increased number of Internet subscribers.

E. Sri Lanka

Electricity and telecommunication facilities are not available in most of the rural areas. More than 70 percent of the population live in the rural areas. Further, it is noted that electronic banking facilities are available chiefly in the main cities. We have less than 200 standard ATM machines out of which more than 70 percent are located in the capital city of the country. Plastic card holders amounts to less than 500,000 which accounts for less than 3 percent of the population of the country and less than 0.4 percent of the population use credit cards. These low numbers are due to sociological factors and organizational restrictions such as attitude of people towards credit and its utilization, heavy costs of ATMs, lack of infrastructure facilities, complexities in assessing the credit risks, and credit worthiness of customers, among others.

11. What electronic infrastructure or payments systems projects are currently underway and how are these funded (government or private backing)? Identify whether these projects are unique to your country/central bank or encompass a regional effort through a supranational group or consortium.

A. Korea

In Korea, two major IT projects are underway: the introduction of check truncation and the development of electronic money. These projects are joint activities of the domestic banks so their funding is being shared among them.

B. Malaysia

There are only three such projects underway at the moment:

1. Enhancements to the Malaysian Electronic Payment System (MEPS) which currently allows ATMs of different banking institutions to be connected. The project involves linking the shared ATM network with private network via SET payment gateways. Eventually the additional functions will include E-Purse, EDI payment, virtual wallet, virtual POS and virtual banking. The project involves the MEPS entity, all relevant banks and Bank Negara Malaysia. In addition,

MEPS will be introducing a retail payment system early next year designed for small-value high-volume business. And finally, the retail payment system will allow local transactions to be routed within the national borders rather than through the VISA/MasterCard system. This will expedite processing as well as reduce telecommunication costs for acquirers and issuers.

2. Enhancements to the inter-bank payment system, RTGS, to allow real-time settlement. This is expected to be rolled-out in May 1999.
3. The Multi-Purpose Smart Card project initiated by Bank Negara Malaysia to introduce an electronic retail payment system in the year 2000. It involves Bank Negara Malaysia, MIMOS, various banks, hardware and software vendors and other companies investing in Malaysia's Multi-media Super Corridor project. This Smart card platform will support three types of card structures:
   - The Government Multipurpose Card which will combine the national ID, driving licence, medical & immigration applications and optional e-cash.
   - The Payment Multipurpose Card which will accommodate international credit, debit, ATM and e-cash applications.
   - The disposable E-cash card designed for small-value, high-volume transactions.

C. Nepal

There are no projects currently underway for the electronic infrastructure or payments system in Nepal. The whole telecommunication system of Nepal is run by the Nepal Telecommunication Corporation (NTC). Due to the low priority of the NTC for leased lines, there is hardly any improvement in the field of exchanging information electronically within the country. However, the banks are trying to link up among the branches for the transmission of information and transfer of money electronically through any branch banking system from the existing leased line. It is worthwhile mentioning that despite the above mentioned problems, Nepal's telecommunications system is far better than the Indian telecommunications system because it has been upgraded recently with the assistance of foreign countries especially Japan.

Regarding the exchange of information electronically, NRB has recently introduced the Data Base format and Data Preparation Software to which all the commercial banks have to send liquidity and

priority sector lending information daily. NRB is planning to link up its branches for exchange of information electronically by 1999. Similarly, NRB is also planning to link up all the commercial banks for the exchange of information on banking statistics electronically within the next year as well as the information of daily transactions of government revenue and expenses within the next 2 years. This shows that NRB is making a foray into the field of exchanging information electronically on a step-by-step basis.

D. Singapore

The government is active in promoting electronic commerce. The SingaporeOne initiative, broadband infrastructure for electronic commerce, aims to reach a majority of the population. The cabling up of the Singapore household by the Singapore Cable Vision is also another effort to lay the foundation for electronic infrastructure.

MAS has recently rolled out the RTGS enabling interbank settlements to be conducted in realtime.

Recently, Deputy Prime Minister Lee Hsien Loong unveiled an Electronic Commerce Master plan during the opening of the Comdex Asia information technology tradeshow. It will encourage the pervasive use of e-commerce in Singapore and strengthen Singapore's position as an international e-commerce hub.

One of the five main thrusts outlined in the master plan is to promote use of e-commerce by the public. This will enable individuals and businesses to enjoy the benefits of e-commerce, and at the same time create an e-commerce-savvy culture. Besides mass education, the government will set the pace to proliferate the use of e-commerce in Singapore through its electronic public service initiatives. Key public services will be delivered electronically by the year 2001.

E. Sri Lanka

Telecommunication facilities were under Government control. However, recently the facilities were privatised and international telecom companies have entered the industry. Due to these changes, telecommunication services are rapidly improving and have spread all over the country.

Stock Exchange and Central Depository System (CDS) transactions are carried out electronically. Screen based trading has been introduced and is available in main cities in selected provinces.

Similar to this system, a semi-scripless system to trade Government securities is to commence in another month's time. Under the new system, Government securities could be traded electronically. Initially, the semi-scripless system would be limited to transactions with primary dealers and Central Bank (Government security issuer). This system was designed and developed in house by the Central Bank. The fully scripless system will be introduced with technical assistance of the World Bank within a one and a half-year period.

APPENDIX C-2

SURVEY RESULTS

CENTRAL BANK
FINANCIAL INDUSTRY OVERVIEW

CENTRAL BANK QUESTIONNAIRE – FINANCIAL INDUSTRY OVERVIEW KOREA

1. Identify the key challenges and rank in order of their significance.

–	Margin Compression	3	Reduced Credit Extending Opportunities
–	Revenue Growth	5	Funding / Liability
4	Expense Reduction	7	Technological Competitiveness
6	Nonbank Competition	–	Geographic Expansion of Competitors
2	Capital Management	1	Economic / Political Conditions

2. Identify and rank the groups that are driving technology initiatives.

–	Retails Customers	5	Domestic Competition
–	Wholesale Customers	4	Global Competition
1	IT Vendors	3	Internal Management
2	Government Initiatives	–	No significant influence

3. Identify the areas where banking technological efforts are being focused (excluding Y2K)? Rank in order of significance.

a. back office operations		g. other	
b. electronic commerce			
c. retail banking			
d. trading operations			
e. payments			
f. wholesale banking			

3.1 Identify the prominent initiatives in each of the above categories.

a. back office operations	Full office automation
b. electronic commerce	Banks join the development project initiated by IT co.
c. retail banking	ATM card, EFT/POS card, call center(ARS), PC banking
d. trading operations	—
e. payments	CD/ATM Network, Central Bank RTGS system, EFTS
f. wholesale banking	Firm Banking(PC Banking)
g. other	—

4. Which of the following home banking channels are available?

Channel Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. bank proprietary (i.e., direct dial-in)	✓			
b. internet	✓			
c. telephone banking (voice response/call centre)	✓			
d. other: *(please indicate)*				
1.				
2.				

5. Which of the following service types are, or will be, available via the Internet?

Service Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. Information Access Sites	X			
b. Information Exchange Sites	X			
c. Transactional Sites			X	
1. Deposit				
2. Credit				
3. Other (insurance, brokerage, mutual funds, etc.)				

6. Which of the following retail delivery channels are available?

Channel Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. smart / screen telephones			X	
b. interactive television			X	
c. standard ATMs	X			
d. advanced function ATMs			X	
e. automated loan machines (ALMs)			X	
f. banking kiosks	X			
g. telephone call centers	X			
h. other: (please indicate)				
1.				
2.				

7. Which of the following technological initiatives are available?

Channel Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. electronic commerce			X	
b. smart or IC cards			X	
c. computer imaging			X	
d. data warehousing / datamining			X	
e. electronic trading			X	
f. other : *(please indicate)*				
1.				
2.				

CENTRAL BANK QUESTIONNAIRE – FINANCIAL INDUSTRY OVERVIEW
MALAYSIA

Highlights

- Bank Negara Malaysia has not conducted a survey on electronic banking prior to this project.

- Financial institutions that are not under Bank Negara Malaysia's jurisdiction are mainly co-operatives or State-owned enterprises, and by and large do not offer any significant electronic banking products. The information contained in this document refers to institutions under Bank Negara Malaysia's supervision.

- Malaysia, along with other Asian nations, is going through a major economic crisis, and the banking industry is facing the first downturn in profits in almost 10 years.

- The past 5 years has seen an extremely tight labour market, particularly in the professional sector, and consequently wages/salaries have been rising rapidly. This has accelerated the need to automate banking services.

- The Malaysian government launched the Multi-Media Supercorridor project three years ago, and as a result there has been a great deal of interest in electronic services, both within banking as well as retail commerce.

- The telecommunications sector has been facing increased deregulation. The quasi-public Telekom Malaysia lost part of its monopoly when several new entrants were granted licences to provide communications services. Telekom Malaysia is currently embarking on a massive project to provide fiber-optic lines throughout the nation. Both ISDN and ADSL facilities are available in major commercial sites of the country.

- Domestic competition for banking business is extremely strong, and is expected to intensify after the current spate of bank mergers is finalised since economies of scale issues will be more important

to the new larger banking entities. Automation (electronic banking) is expected to become more important.

- International competition is critical only at the regional level since Malaysian owned banks are not significant players in the international banking scene. At the regional level, there is intense competition amongst the governments of Singapore, Malaysia, Thailand, Phillipines, Indonesia, Korea, Taiwan and Hong Kong to attract international bankers and multi-nationals to their respective countries.

- Bank Negara Malaysia has not approved Internet banking as yet, but Singapore is about to launch it. E-commerce is considered of significant strategic importance, and it can be reasonably assumed that Bank Negara Malaysia will allow and foster Internet banking in the near future.

Background on Malaysia's Banking Sector

The analysis provided by the World Competitiveness Report, 1997, extracted from the 1997 Bank Negara Malaysia Annual Report, provides a useful starting point to understand Malaysia from an international perspective. The data is provided in Attachment I.

Statistical Data

	1995	1996	1997
Number of Commercial Banks/Branches	37 / 1433	37 / 1569	35 / 1671
Number of Finance Companies/Branches	40 / 988	40 / 1096	39 / 1144
Number of Merchant Banks/Branches	12 / 18	12 / 24	12 / 24
Number of Employees – Commercial Banks	64461	68068	73530
Number of Employees – Finance Companies	24593	26322	27937
Number of Employees – Merchant Banks	2334	2592	2802
Number of ATMs – Commercial Banks	2230	2326	2573
Number of ATMs – Finance Companies	402	525	627
Persons Served per Office – Comm. Bank	14024	13492	12986
Persons Served per Office – Finance Co.	20341	19314	18969
Pre-Tax Profit per Employee (RM)	76680	90100	97200
Staff Cost per Employee (RM)	32900	34400	40000
Overheads to Staff Cost Ratio	98.5%	106.7%	102.3%

Source: Bank Negara Malaysia Annual Report 1997.

1. Identify the key challenges and rank in order of their significance.

Based on the preliminary findings of the survey, the following results were obtained:

Rank	Key Challenges
4	Margin Compression
1	Revenue Growth
3	Expense Reduction
10	Non-bank Competition
8	Capital Management
6	Reduced Credit Extending Opportunities
2	Funding/Liquidity
5	Technological Competitiveness
9	Geographic Expansion of Competitors
7	Economic/Political Conditions

2. Identify and rank the groups that are driving technology initiatives.

Driver of Electronic Banking Initiatives	Ranking
1. Domestic Competition	1
2. Retail Customers	2
3. Internal Management	3
4. Wholesale Customers	4
5. Global Competition	5
6. Government Initiatives	6
7. IT Vendors	7
8. No Significant Influence	-

3. Identify the areas where banking technological efforts are being focused (excluding Y2K)? Rank in order of significance.

Area	Rank
Back Office Operations	1
Retail Banking	2
Payments	3
Trading Operations	4
Electronic Commerce	5
Wholesale Banking	6
Others:	-

3.1 Identify the prominent initiatives in each of the above categories.

a. Back office operations

- ❑ Reducing back office intervention by adopting client-server architecture.
- ❑ Moving towards integrated database environments to reduce duplication of work.

b. Electronic commerce

- ❑ Only a handful of institutions have progressed to E-Comm, and initiatives include a Cybermall and Travel shop. Both deploy an Intranet architecture.

c. Retail banking

- ❑ Increased automation by having more ATMs, autocash receivers, telebanking, PC-banking and call centers.

d. Trading operations

- ❑ Increased level of integration between trading system and central database.
- ❑ Increased emphasis on risk management software, including the anticipated use of data warehouse and data mining technologies.
- ❑ Bank Negara Malaysia is providing from this year the Bond Information Dissemination System (BIDS), a

centralised database for all government and private debt securities.

e. Payments

- ❑ Bank Negara Malaysia initiatives :
  - ❑ Implementation of the Real Time Gross Settlement system, due to go live in May 1999.
  - ❑ Cheque imaging system to expedite the process of clearing cheques.
  - ❑ Multi-Purpose Card (Smart Card) projects to introduce a card-based retail payment system in the year 2000.
- ❑ Retail payment systems include advanced ATM machines to permit intra and inter account fund transfers, as well as payments to designated third party accounts.
- ❑ Intranet architecture to facilitate fund transfers using proprietary systems.
- ❑ Telebanking to facilitate retail funds transfer.

f. Wholesale banking

- ❑ As in 'Trading operations' above.

4. Which of the following banking channels are available?

Channel Description	Now Offer	Planned		
		Later in 1998	Within 2 Years	Within 5 Years
a. Bank proprietary (i.e., direct dial-in)	Y	Y	Y	Y
b. Internet connection via an on-line network	Y	0	Y	Y
c. Telephone banking (voice response/call centre)	Y	Y	Y	Y
d. PC Banking	Y	0	0	0
e. Handheld Terminals	Y	0	0	0
f. TV Banking	0	0	Y	0
g. Virtual Interactive Kiosks	Y	0	0	0
h. Visa Plan	Y	0	0	0

N.B.: Several of the above products have 'Y' indicated across each column. This is to indicate that these products are not yet widely used, and institutions will continue to introduce these products in the years ahead. The above information is based on the preliminary findings of the survey being carried out.

5. Which of the following service types are, or will be, available via the Internet?

Service Description	Now	Expected		
		Later in 1998	Within 2 Years	Within 5 Years
a. Information Access Sites	Y			
b. Information Exchange Sites		Y		
c. Funds transfer between accounts			Y	
d. Bill presentment			Y	
e. Bill payment			Y	
f. Accepting deposits			Y	
g. Online credit card applications			Y	
j. Conducting other online activities			Y	
❑ Brokerage				
❑ Insurance				
❑ Mutual				
❑ Virtual				
❑ Unit Trust				

6. Which of the following retail delivery channels are available?

Channel Description	Now	Expected		
		Later in 1998	Within 2 Years	Within 5 Years
a. Smart / screen telephones	-	-	Y	
b. Standard ATMs	Y			
c. Advanced function ATMs	Y			
d. Automated Loan Machines			Y	
e. Telephone call centres	Y			
f. Electronic trading	Y			
g. Corporate Terminal	Y			
h. Cash Deposit	Y			
i. Passbook Updating	Y			
j. Infokiosk			Y	
k. Cash Recycling ATM		Y		
l. Interactive Voice Response	Y			

N.B.: Some of the more advanced delivery channels listed above are only offered by a few institutions. Hence the potential growth in each category is still very significant.

7. Which of the following technological initiatives are available?

Description	Now Offer	Planned		
		Later in 1998	Within 2 Years	Within 5 Years
a. Electronic commerce (digital cash/checks)	Y			
b. Integrated chip stored value cards (smart/IC cards)			Y	
c. Computer imaging	Y			
d. Data warehousing / data mining			Y	
e. Corporate Intranet & E-mail	Y			
f. EIS	Y			

CENTRAL BANK QUESTIONNAIRE - FINANCIAL INDUSTRY OVERVIEW
NEPAL

1. Identify the key challenges and rank in order of their significance.

4	Margin Compression	5	Reduced Credit Extending Opportunities
1	Revenue Growth	8	Funding / Liquidity
2	Expense Reduction	6	Technological Competitiveness
10	Nonbank Competition	9	Geographic Expansion of Competitors
7	Capital Management	3	Economic / Political Conditions

2. Identify and rank the groups that are driving technology initiatives.

3	Retail Customers	1	Domestic Competition
5	Wholesale Customers	8	Global Competition
6	IT Vendors	2	Internal Management
7	Government Initiatives	4	No significant influence

3. Identify the areas where banking technological efforts are being focused (excluding Y2K)? Rank in order of significance.

a. back office operations	1	f. other (please indicate):		
b. electronic commerce				
c. retail banking	2			
d. trading operations				
e. payments				
f. wholesale banking				

3.1 Identify the prominent initiatives in each of the above categories.

a. back office operations	
b. electronic commerce	-
c. retail banking	ATM, SWIFT, EFTPOS
d. trading operations	-
e. payments	-
f. wholesale banking	-
g. other	-

4. Which of the following home banking channels are available?

Channel Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. bank proprietary (i.e., direct dial-in)	X			
b. internet			X	
c. telephone banking (voice response/call center)		X	X	
d. other: *(please indicate)*				
1.				
2.				

5. Which of the following service types are, or will be, available via the Internet?

Service Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. Information Access Sites			X	
b. Information Exchange Sites			X	
c. Transactional Sites				X
1. Deposit				
2. Credit				
3. Other (insurance, brokerage, mutual funds, etc.)				

6. Which of the following retail delivery channels are available?

Channel Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. smart / screen telephones				X
b. interactive television				
c. standard ATMs	X			
d. advanced function automated teller machines (ATMs)			X	
e. automated loan machines (ALMs)				X
f. banking kiosks				
g. telephone call centers		X	X	
h. other: *(please indicate)*				
1.				
2.				

7. Which of the following technological initiatives are available?

Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. electronic commerce (digital cash/checks)				X
b. integrated chip stored value cards (smart or IC cards)				-
c. computer imaging			X	
d. data warehousing / data mining			X	-
e. electronic trading				
f. other: *(please indicate)*				
1.				
2.				

Financial Industry Overview of Nepal

In Nepal, there are 13 commercial banks, 7 development banks, 44 finance companies, 29 co-operatives and 30 non-governmental organizations as at August 1998. These co-operatives and NGOs are conducting limited banking transactions. All these financial institutions emerged after Nepal adopted liberalization policy in the late 1980's. Till early 1980's there were only two commercial banks and not a single finance company existed at that time.

Out of 13 commercial banks, the Nepal Bank Ltd., (NBL) is the first commercial bank to be established (1937). After 29 years of its operation, Rastriya Banijya Bank (RBB), a fully government-owned commercial bank was established in 1966. After an interval of 18 years, the Nepal Arab bank Ltd., (NABIL), the first joint venture bank was established in 1984. This is the first commercial bank that introduced computer services to their customers, Similarly, the Nepal Indosuez Bank Ltd., (NIBL) came into operation in 1986, the Nepal Grindlays Bank Ltd., (NGBL) in 1987, the Himalayan Bank Ltd., (HBL) in 1990, the Nepal SBI Bank Ltd., (NSBL) in 1993, the Nepal Bangladesh Bank (NB Bank) and the Everest Bank Ltd., (EBL) in 1994, the Bank of Kathmandu (BOK) in 1995, the Nepal Bank of Ceylon Ltd., (NBCL) in 1996 (all joint venture banks), the Nepal Industrial and Commercial Bank Ltd., (NICBL) and the Lumbini Bank Ltd., (both private banks) in 1998.

The total branches of all commercial banks are 461 at mid-July 1997. Among the 461 branches, NBL and RBB have 419

branches all over the country, out of which 303 branches are in rural areas and 116 in urban areas as at mid-July 1997, During this period, the total deposit of the commercial banks was Rs. 7305.5 million, out of which NBL and RBB hold Rs. 4355.8 million while rest is held by joint venture banks or 60% of the total deposits.

Regarding the opening of rural branches, the joint venture banks are reluctant to go to the rural areas where the opportunity to make profit is less. NBL and RBB have been operating rural branches because of social obligations rather than profit motive. There are so many remote areas where electricity as well as transportation facility is not available. Due to this problem, the two banks are unable to provide computerised services at all of the branches. Therefore, NBL and RBB have been trying to provide computerised services in the area of deposit taking and lending activities especially in the main branches located in the big cities.

Nepal being a developing country, the overall growth in economic activities is not steady. Due to this problem, the banks find it difficult to generate enough business. The market is very competitive in the banking sector in terms of the volume of the business. However, there is no such competition in the introduction of electronic banking services.

Two banks provide general introductory information of the banks in the Internet. The services via the Internet like Information Access Sites, Information Exchange Sites, Transactional Sites are expected to be available within 2 and 5 years in two more banks.

Regarding the retail delivery channels, the following services are available:

1) ATM
2) SWIFT
3) EFTPOS

Automatic Teller Machine (ATM)

The only ATM was introduced by the Himalayan Bank Ltd., just two years back and it is confined to cash disbursement only. Presently, the number of ATM cardholders are around 1500 only. Apart from this,

six banks (NABIL, NGBL, NSBL, EBL, BOK, NBCL) are planning to introduce standard ATM within 2 years, three banks are planning to induct advanced function Automated Teller Machines (ATM) and both EBL and BOK are planning to induct Automated Loan Machines (ALM) within 5 years.

SWIFT

The Nepal Grindlays Bank has been providing this service since September 1996 for the following purposes:

1) Opening of the L/C
2) Fund Transfer
3) Financial Information

The other four banks (NABIL, HBL, NBBank and EBL) have also inducted SWIFT services from September 1998.

EFTPOS

Only two banks (NABIL, NGBL) have been providing this service. HBL is going to introduce this service within 2 years. This system has made it easier for banks to maintain accounts related to international credit cards transactions. It has also helped the bank to detect the genuineness of cards as well as the balance of the cardholder.

Apart from the above prevailing retail delivery channels, some banks are planning to induct telephone call centers later in 1998 and some within 2 years respectively, Similarly, one bank is going to induct smarts/screen telephones within 5 years.

None of the following technological initiatives are available presently:

1) Electronic Commerce (digital cash/checks)
2) Integrated Chip Stored Value Cards (smart or IC cards)
3) Computer Imaging
4) Data Warehousing/Data Mining
5) Electronic Trading

However, two banks are planning to induct computer imaging and data warehousing/data mining within 2 years as well as electronic commerce (digital cash/checks) within 5 years.

CENTRAL BANK QUESTIONNAIRE - FINANCIAL INDUSTRY OVERVIEW SINGAPORE

1. Identify the key challenges and rank in order of their significance.

3	Margin Compression	6	Reduced Credit Extending Opportunities
3	Revenue Growth	4	Funding / Liquidity
8	Expense Reduction	7	Technological Competitiveness
9	Nonbank Competition	5	Geographic Expansion of Competitors
2	Capital Management	1	Economic / Political Conditions

2. Identify and rank the groups that are driving technology initiatives.

	Retail Customers	3	Domestic Competition
	Wholesale Customers	2	Global Competition
5	IT Vendors	4	Internal Management
1	Government Initiatives		No significant influence

3. Identify the areas where banking technological efforts are being focused (excluding Y2K)? Rank in order of significance.

a. back office operations	3	g. other: (please indicate)	
b. electronic commerce	1	MIS	6
c. retail banking	4		
d. trading operations	2		
e. payments	5		
f. wholesale banking			

3.1 Identify the prominent initiatives in each of the above categories.

a. back office operations	Tampines Finance Park
b. electronic commerce	SingaporeOne, NetTrust, EC Horbed, Electronic Transaction Bill, CommerceNet Singapore
c. retail banking	
d. trading operations	SES internet trading, TF (TradeNet +), IBEX, Bills Presentment
e. payments	RTGS, C-ONE, SET, GIRO, NETS, Cashcard
f. wholesale banking	
g. other	Initial Public Offering, Kiosk

4. Which of the following home banking channels are available?

Channel Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. bank proprietary (i.e., direct dial-in)	X			
b. internet	X			
c. telephone banking (voice response/call center)	X			
d. other: *(please indicate)*				

5. Which of the following service types are, or will be, available via the Internet?

Service Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. Information Access Sites	X			
b. Information Exchange Sites				
c. Transactional Sites				
1. Deposit				X
2. Credit				
3. Other (insurance, brokerage, mutual funds, etc.)			X	

6. Which of the following retail delivery channels are available?

Channel Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. smart / screen telephones	X			
b. interactive television	X			
c. standard ATMs	X			
d. advanced function automated teller machines (ATMs)	X			
e. automated loan machines (ALMs)				
f. banking kiosks	X			
g. telephone call centers	X			
h. other: *(please indicate)*				
1.				
2.				

7. Which of the following technological initiatives are available?

Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. electronic commerce (digital cash/checks)			X	
b. integrated chip stored value cards (smart or IC cards)	X			
c. computer imaging	X			
d. data warehousing / data mining	X			
e. electronic trading	X			
f. other: *(please indicate)*				
1.				
2.				

Explanatory Notes on Initiatives in Singapore

SingaporeOne – This is the broadband infrastructure set up by the government and industry to pave the way for future electronic commerce. Currently, there are a hundred over applications available to pilot subscribers including banking, shopping, learning, etc.

NetTrust – The first national certificate authority for electronic commerce. It is used in banking and government applications.

Electronic Commerce Hotbed – This initiative was launched in August 1996 by the National Computer Board to look into creating a conducive environment for EC. The EC policy committee is chaired by MAS.

Tampines Finance Park - The Tampines Finance Park was set up in 1992 to provide financial institutions with low cost office space for their backroom and IT operations.

NETS – Network for Electronic Transfer Systems Pte. Ltd., a company set up by the local banks to provide services for electronic transfer. The company has rolled out many electronic banking services such as the joint ATM network, EFTPOS, FEDI, etc.

Internet Business Exchange (IBEX) - DBS announced in June 1998 that it was partnering with Lyrehc Corp to set up a Business-to-Business electronic commerce hub. The joint venture, IBEX Co. Pte. Ltd., would

enable the full inter-business commerce cycle of sourcing, marketing, sales, order fulfilment and payment to be conducted entirely over the Internet, and DBS would provide multi-currency clearing facilities for the transactions.

Online Payment System (Bills Presentment) - NETS signed a MOU with Asia Manufacturing Online on 4 August 1998 to build a secure system for bill presentation, consolidation of billing statements and payment authorization over the Internet. The system provides user companies with a secure and integrated supply chain management, and offers payment and settlement facilities.

Cashcard for Open Network Electronic commerce (C-ONE) - NETS has introduced the C-ONE service to facilitate the use of the cashcard to make payments for purchases on the Internet. C-ONE opens up a new arena of Internet commerce opportunities for online merchants and service providers who can now offer online cash sales, time based access charges and low value payment.

TradeNet Plus - The key objective of TradeNet Plus is to support Singapore's vision to become an international trading hub. The areas covered include business sourcing to business matching, procurement, trade finance, insurance, government interface, logistics, warehousing and payment. The complete implementation of all modules will be done by 2001.

CommerceNet – This is a worldwide partnership program recently launched in Singapore. It is set up to look into EC concerns for subscribing members.

CENTRAL BANK QUESTIONNAIRE - FINANCIAL INDUSTRY OVERVIEW
SRI LANKA

1. Identify the key challenges and rank in order of their significance.

____	Margin Compression	____	Reduced Credit Extending Opportunities
4	Revenue Growth	2	Funding / Liquidity
____	Expense Reduction	1	Technological Competitiveness
5	Nonbank Competition	____	Geographic Expansion of Competitors
3	Capital Management	____	Economic / Political Conditions

2. Identify and rank the groups that are driving technology initiatives.

2	Retail Customers	3	Domestic Competition
1	Wholesale Customers	7	Global Competition
4	IT Vendors	6	Internal Management
5	Government Initiatives	8	No significant influence

3. Identify the areas where banking technological efforts are being focused (excluding Y2K)? Rank in order of significance.

a. back office operations	5	f. other (please indicate)	
b. electronic commerce	7	Management Info. System	6
c. retail banking	1	_____	_____
d. trading operations	4	_____	_____
e. payments	3	_____	_____
f. wholesale banking	2	_____	_____

3.1 Identify the prominent initiatives in each of the above categories.

a. back office operations	Respective bank management
b. electronic commerce	Not yet in place
c. retail banking	Customers demand and competition among banks
d. trading operations	Trading partners (Inter-banks and Central Bank)
e. payments	Interbank settlement by Central Bank
f. wholesale banking	Corporate customers
g. other	Respective bank management

4. Which of the following home banking channels are available?

Channel Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. bank proprietary (i.e., direct dial-in)			X	
b. internet			X	
c. telephone banking (voice response/call center)	X			
d. other: *(please indicate)*				
1.				
2.				

5. Which of the following service types are, or will be, available via the Internet?

Service Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. Information Access Sites				X
b. Information Exchange Sites				X
c. Transactional Sites			X	
1. Deposit				
2. Credit				
3. Other (insurance, brokerage, mutual funds, etc.)				

6. Which of the following retail delivery channels are available?

Channel Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. smart / screen telephones			X	
b. interactive television			X	
c. standard ATMs	X			
d. advanced function automated teller machines (ATMs)			X	
e. automated loan machines (ALMs)			X	
f. banking kiosks				X
g. telephone call centers		X		
h. other: *(please indicate)*				
1.				
2.				

7. Which of the following technological initiatives are available?

Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. electronic commerce (digital cash/checks)		X		
b. integrated chip stored value cards (smart or IC cards)		X		
c. computer imaging			X	
d. data warehousing / data mining			X	
e. electronic trading			X	
f. other: (please indicate)				
1.				
2.				

APPENDIX C-3

SURVEY RESULTS

CENTRAL BANK
INSTITUTION SURVEY

SUMMARY RESULTS OF INSTITUTION SURVEY

Central Bank	**Bank Indonesia**
Total Number of Institutions Surveyed	**19**
Total Number By Institution Type:	
Retail	**9**
Agriculture	
Merchant	
Finance	**1**
Other	**9**

Survey Method: ❑ Face-to-face interview ❑ Telephone interview ☒ Mail

Part I: Strategic Plan Elements

1. For each category, calculate the percentage of respondents that identified that category as a key challenge to their organization:

____	Margin Compression	____	Reduced Credit Extending Opportunities
31.58	Revenue Growth	36.84	Funding / Liquidity
____	Expense Reduction	____	Technological Competitiveness
____	Nonbank Competition	____	Geographic Expansion of Competitors
5.26	Capital Management	26.32	Economic / Political Conditions

1.1 Of these, identify the three challenges that were sited most frequently as the institutions' top concern:

1. Funding/Liquidity
2. Revenue Growth
3. Economic/Political Conditions

2. For each category, calculate the percentage of respondents that identified that category as a driving force in determining electronic banking initiatives:

78.95	Retail Customers	68.42	Domestic Competition
31.58	Wholesale Customers	31.58	Global Competition
5.26	IT Vendors	31.58	Internal Management
____	Government Initiatives	____	No significant influence

3. For each category, calculate the percentage of respondents that identified that category as the greatest portion of their technology budget:

a. back office operations	10.53	g. other: *(please indicate)*	
b. electronic commerce	5.26	_____	_____
c. retail banking	68.92	_____	_____
d. trading operations	____	_____	_____
e. payments	10.53	_____	_____
f. wholesale banking	5.26	_____	_____

Part II: Retail Banking via the Internet

1. Calculate the number and percentage of respondents that:

2 or 10.53%	do not have an Internet site
_____	plan an Internet site for 1998
7 or 36.84%	plan an Internet site for 1999 or later
10 or 52.63%	currently have an Internet Site

2. Calculate the percentage of respondents that:

10%	developed their Internet site in-house
40%	used an outside vendor to develop their Internet site
50%	used both internal staff and an outside vendor to develop their Internet site

3a. Indicate the number of respondents that are offering the following services via the Internet:

Service Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. general information on bank products & services	10	1	6	
b. contacting your bank via e-mail	11	1	4	1
c. balance inquiry	2	2	11	1
d. funds transfer between accounts	2	2	10	2
e. bill presentment	1	2	10	3
f. bill payment	2	2	9	4
g. accepting deposits	1	1	6	6
h. online credit card applications	1	1	6	4
i. other online credit applications *(indicate types)*				
1. Consumer Loan		1	2	
2. Small Business Loan		1		
j. conducting other online activities (e.g., insurance, brokerage, mutual fund sales etc.)				
1. Securities		1		
2. Other			1	1

3b. Calculate the <u>percentage</u> of respondents that are offering the following services via the Internet:

Service Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. general information on bank products & services	52.63	5.26	31.58	
b. contacting your bank via e-mail	57.89	5.26	21.05	5.26
c. balance inquiry	10.53	10.53	57.89	5.26
d. funds transfer between accounts	10.53	10.53	52.63	1053
e. bill presentment	5.26	10.53	52.63	15.79
f. bill payment	10.53	10.53	47.37	21.05
g. accepting deposits	5.26	5.26	31.58	3158
h. online credit card applications	5.26	5.26	31.58	21.05
i. other online credit applications *(indicate types)*				
1. Consumer Loans		5.26	10.53	
2. Small Business Loans		5.26		
j. conducting other online activities (e.g., insurance, brokerage, mutual fund sales etc.)				
1. Securities			5.26	
2. Other			5.26	5.26

4. Calculate the percentage of respondents that use an outside vendor to provide an Internet service. <u>5.26 %</u>

Indicate the services that are provided by an outside vendor:

Home page design
Web site

5. Calculate the percentage of respondents that differentiate/ segregate its customer base in offering electronic products or services. <u>21.05 %</u>

Part III: Home Banking via Proprietary Systems

1. Calculate the number and percentage of respondents that:

9 or 47.3%	offer home banking services through a proprietary system
NA	plan a home banking service for 1998
3 or 15.79%	plan a home banking service for 1999 or later
NA	currently offer home banking services

2a. Indicate the number of respondents that are using the following home banking channels to interface with customers:

Channel Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. bank proprietary (i.e., direct dial-in)	9	1	3	2
b. internet connection via an on-line network	1	1	11	1
c. telephone banking (voice response/call center)	9	1	3	2
d. other: *(please indicate)*				
1.				
2.				

2b. Calculate the percentage of respondents that are using the following home banking channels to interface with customers:

Channel Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. bank proprietary (i.e., direct dial-in)	47.37	5.26	15.79	10.53
b. internet connection via an on-line network	5.26	5.26	57.89	5.26
c. telephone banking (voice response/call center)	47.87	5.26	15.79	10.53
d. other: *(please indicate)*				
1.				
2.				

Part IV: Other Technology Initiatives

1a. Indicate the number of respondents that are currently or planning to offer the following channels to deliver its products or services to customers:

Channel Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. smart / screen telephones		1	5	7
b. standard ATMs	15	1	2	1
c. advanced function automated teller machines (ATMs)	5		9	2
d. automated loan machines (ALMs)		1	1	9
e. telephone call centres	7	1	4	4
f. electronic trading	1	1	3	8
g. other: *(please indicate)*				
1. Fax on demand	2			
2. Small office and home office				

1b. Calculate the percentage of respondents that are currently or planning to offer the following channels to deliver its products or services to customers:

Channel Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. smart / screen telephones		5.26	26.32	36.84
b. standard ATMs	78.95	5.26	10.53	5.26
c. advanced function automated teller machines (ATMs)	26.32		47.37	10.53
d. automated loan machines (ALMs)		5.26	5.26	47.37
e. telephone call centres	36.84	5.26	21.05	26.05
f. electronic trading	5.26	5.26	15.79	42.11
g. other: *(please indicate)*				
1. Fax on demand	10.53			
2. Small office and home office				5.26

2a. Indicate the number of respondents that are currently planning to undertake the following technology initiatives:

Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. electronic commerce (digital cash/checks)		1	6	6
b. integrated chip stored values cards (smart or IC cards)	2	1	9	3
c. computer imaging	3	1	4	7
d. data warehousing / data mining	5		7	3
e. other: *(please indicate)*				
1.				
2.				

2b. Calculate the percentage of respondents that are currently planning to undertake the following technology initiatives:

Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. electronic commerce (digital cash/checks)		5.26	31.58	31.58
b. integrated chip stored values cards (smart or IC cards)	10.53	5.26	47.37	15.79
c. computer imaging	15.79	5.26	21.05	36.84
d. data warehousing / data mining	26.32		36.84	15.79
e. other: *(please indicate)*				
1.				
2.				

Part V: Controls / Risk Management Measures

1a. Indicate the number of respondents that are taking the following measures to secure their electronic banking delivery channels:

Channel Description	Symmetric (private key cryptography)	Asymmetric (public key cryptography)	Virtual Private Networks	Digital Certificates	Digital Signatures	PIN	Other *(please indicate)*
a. bank proprietary (i.e., direct dial-in)	8	2	4	1	1	12	Smart card
b. internet connection via an on-line network	2	4	1			4	SSL
c. telephone banking (call center)	3	1	1			10	
d. other: *(please indicate)*							
1. ATM		1				2	
2. IRV	1	1				1	

1b. Calculate the percentage of respondents that are taking the following measures to secure their electronic banking delivery channels:

Channel Description	Symmetric (private key cryptography)	Asymmetric (public key cryptography)	Virtual Private Networks	Digital Certificates	Digital Signatures	PIN	Other *(please indicate)*
a. bank proprietary (i.e., direct dial-in)	42.11	10.53	21.05	5.26	5.26	63.16	Smart card
b. internet connection via an on-line network	10.53	21.05	5.26			21.05	SSL
c. telephone banking (call center)	15.79	5.26	5.26			52.63	
d. other: *(please indicate)*							
1. ATM		5.26				10.53	
2. IRV	5.26	5.26				5.26	

2a. List the percentage of respondents that have maintenance and development staff dedicated to electronic banking and delivery systems as well as audit personnel monitoring controls over these activities.

Function	Maintenance and Development Staff	Audit Staff
a. Internet banking	47.37	21.11
b. Proprietary banking	68.42	63.16
c. Other initiatives: *(please indicate)*		
1. Phone banking	5.26	
2. L/C Issuance	5.26	
3. ATM	5.26	

2b. Calculate the average number of staff for those respondents that have maintenance and development staff dedicated to electronic banking delivery systems as well as audit personnel monitoring controls over these activities.

Function	Maintenance and Development Staff	Audit Staff
a. Internet banking	3	1
b. Proprietary banking	11	2
c. Other initiatives: *(please indicate)*		
1. Phone banking	2	
2. L/C Issuance	5	
3. ATM	4	1

SUMMARY RESULTS OF INSTITUTION SURVEY

Central Bank	**The Bank of Korea**
Total Number of Institutions Surveyed	26
Total Number By Institution Type:	
Retail	26
Agriculture	
Merchant	
Finance	
Other	

Survey Method: ❑ **Face-to-face interview** ❑ **Telephone interview** ☒ **Mail**

Part I: Strategic Plan Elements

1. For each category, calculate the percentage of respondents that identified that category as a key challenge to their organization:

7.7	Margin Compression	3.8	Reduced Credit Extending Opportunities
3.8	Revenue Growth	11.6	Funding / Liquidity
15.4	Expense Reduction		Technological Competitiveness
	Nonbank Competition	3.8	Geographic Expansion of Competitors
11.6	Capital Management	42.3	Economic / Political Conditions

1.1 Of these, identify the three challenges that were sited most frequently as the institutions' top concern.

1. Economic / Political Conditions
2. Expense Reduction
3. Funding / Liquidity

2. For each category, calculate the percentage of respondents that identified that category as a driving force in determining electronic banking initiatives.

26.9	Retail Customers	34.6	Domestic Competition
11.6	Wholesale Customers		Global Competition
3.8	IT Vendors	15.4	Internal Management
7.7	Government		No significant influence

3. For each category, calculate the percentage of respondents that identified that category as the greatest portion of their technology budget:

a. back office operations	15.4
b. electronic commerce	
c. retail banking	73.1
d. trading operations	
e. payments	7.7
f. wholesale banking	3.8

Part II: Retail Banking via the Internet

1. Calculate the number and percentage of respondents that:

2 / 7.7%	do not have an Internet site
	plan an Internet site for 1998
4 / 15.4%	plan an Internet site for 1999 or later
20 / 76.9%	currently have an Internet site

2. Calculate the percentage of respondents that:

40.0%	developed their Internet site in-house
15.0%	used an outside vendor to develop their Internet site
45.0%	used both internal staff and an outside vendor to develop their Internet site

3a. Indicate the number of respondents that are offering the following services via the Internet:

Service Description	Now Offer	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. general information on bank products & serivces	20		2	
b. contacting your bank via e-mail	20		2	
c. balance inquiry		3	15	2
d. funds transfer between accounts		3	13	4
e. bill presentment		1	10	3
f. bill payment			8	4
g. accepting deposits			8	4
h. online credit card applicaitons	1		12	5

3b. Calculate the percentage of respondents that are offering the following services via the Internet:

Service Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. general information on bank products & serivces	90.9		9.1	
b. contacting your bank via e-mail	90.9		9.1	
c. balance inquiry		15.0	75.0	10.0
d. funds transfer between accounts		15.0	65.0	20.0
e. bill presentment		7.1	71.4	21.4
f. bill payment			66.7	33.3
g. accepting deposits			66.7	33.3
h. online credit card applicaitons	5.6		66.7	27.8

4. Calculate the percentage of respondents that use an outside vendor to provide an Internet service. 10.0 %

4.1 Indicate the services that are provided by an outside vendor:

Tax affairs counsel, real estate data

5. Calculate the percentage of respondents that differentiate/ segregate its customer base in offering electronic products or services. 30.8 %

Part III: Home Banking via Proprietary Systems

1. Calculate the number and percentage of respondents that:

2 / 7.7% offer home banking services through a proprietary system
_____ plan a home banking service for 1998
24 / 92.3% plan a home banking service for 1999 or later
_____ current offer home banking services

2a. Indicate the number of respondents that are using the following home banking channels to interface with customers:

Channel Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. bank proprietary (i.e., direct dial-in)	23	3		
b. internet connection via an on-line network		2	17	3
c. telephone banking (voice response/call center)	23	2	1	
d. other				

2b. Calculate the percentage of respondents that are using the following home banking channels to interface with customers:

Channel Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. bank proprietary (i.e., direct dial-in)	88.5	11.5		
b. internet connection via an on-line network		9.1	77.3	13.6
c. telephone banking (voice response/call center)	88.5	7.7	3.8	
d. other				

Part IV: Other Technology Initiatives

1a. Indicate the number of respondents that are currently or planning to offer the following channels to deliver its products or services to customers:

Channel Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. smart/screen telephones	3		5	4
b. standard ATMs	25	1		
c. advanced function automated teller machines (ATMs)			9	4
d. automated loan machines (ALMs)	2		3	3
e. telephone call centers	22	2	1	1
f. electronic trading			11	4
g. other:				
1.				
2.				

1b. Calculate the percentage of respondents that are currently or planning to offer the following channels to deliver its products or services to customers:

Channel Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. smart/screen telephones	25.0		41.7	33.3
b. standard ATMs	96.2	3.8		
c. advanced function automated teller machines (ATMs)			69.2	30.8
d. automated loan machines (ALMs)	25.0		37.5	37.5
e. telephone call centers	84.6	7.7	3.8	3.8
f. electronic trading			73.3	26.7
g. other:				
1.				
2.				

2a. Indicate the number of respondents that are currently planning to undertake the following technology initiatives:

Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. electronic commerce (digital cash / checks)			14	8
b. integrated chip stored value cards (smart or IC cards)	1		14	5
c. computer imaging			13	4
d. data warehousing / data mining	3		12	4
e. other:				
1.				
2.				

2b. Calculate the percentage of respondents that are currently planning to undertake the following technology initiatives:

Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. electronic commerce (digital cash / checks)			63.6	36.4
b. integrated chip stored value cards (smart or IC cards)	5.0		70.0	25.0
c. computer imaging			76.5	23.5
d. data warehousing / data mining	15.8		63.2	21.1

Part V: Controls / Risk Management Measures

1a. Indicate the number of respondents that are taking the following measures to secure their electronic banking delivery channels:

Channel Description	Private Key	Public Key	Virtual Private Networks	Digital Certificates	Digital Signatures	PIN	Other (secret card)
a. bank proprietary (i.e., direct dial-in)	1						16
b. internet connection via an on-line network)							
c. telephone banking (call center)							19
d. other:							
1.							
2.							

1b. Indicate the percentage of respondents that are taking the following measures to secure their electronic banking delivery channels:

Channel Description	Private Key	Public Key	Virtual Private Networks	Digital Certificates	Digital Signatures	PIN	Other (secret card)
a. bank proprietary (i.e., direct dial-in)	5.9						94.1
b. internet connection via an on-line network)							
c. telephone banking (call center)							100.0
d. other:							
1.							
2.							

2a. List the percentage of respondents that have maintenance and development staff dedicated to electronic banking and delivery systems as well as audit personnel monitoring controls over these activities.

Fuction	Maintenance and Development Staff	Audit Staff
a. Internet banking	23.1	7.7
b. Proprietary banking	100.0	96.2
c. Other Initiatives		
1.		
2.		
3.		

2b. Calculate the average number of staff for those respondents that have maintenance and development staff dedicated to electronic banking and delivery systems as well as audit personnel monitoring controls over these activities.

Fuction	Maintenance and Development Staff	Audit Staff
a. Internet banking	3.2	1.5
b. Proprietary banking	11.7	2.2
c. Other Initiatives		
1.		
2.		
3.		

APPENDIX C-3c

SUMMARY RESULTS OF INSTITUTION SURVEY [38 RESPONDENTS] MALAYSIA

Part I: Strategic Plan Elements

1. Number of respondents who rated the following key challenges:

Challenges (Descending Order) \ Ratings	1	2	3	4	5	6	7	8	9	10
Revenue Growth	12	6	6	2	5	2	1	0	0	0
Funding/Liquidity	4	7	7	4	1	0	5	2	1	0
Margin Compression	3	5	4	4	2	8	4	2	0	1
Economic/Political Conditions	5	2	3	2	4	1	2	3	2	7
Expense Reduction	2	6	3	6	3	4	2	6	0	1
Technological Competitiveness	5	1	4	5	6	5	4	4	2	0
Capital Management	2	4	3	4	3	4	3	4	3	2
Reduced Credit Extending Opportunities	2	3	3	1	3	6	5	6	2	2
Geographic Expansion of Competitors	0	1	2	4	4	1	3	0	12	5
Non-bank Competition	0	0	0	3	3	0	2	5	7	11

2. What group(s) is driving your organisation's electronic banking initiatives?

Driver of Electronic Banking Initiatives	Number of Respondents
1. Domestic Competition	30
2. Retail Customers	28
3. Internal Management	24
4. Wholesale Customers	19
5. Global Competition	19
6. Government Initiatives	16
7. IT Vendors	3
8. No Significant Influence	0

3. For the technology budget (excluding Y2K), what portion is allocated toward:

	Number of Respondents				
	0 to 20 %	*21 to 40 %*	*41 to 60 %*	*61 to 80 %*	*81 to 100 %*
Back Office Operations	15	9	7	0	1
Electronic Commerce	16	1	1	0	0
Retail Banking	4	13	6	5	1
Trading Operations	20	1	0	0	0
Payments	22	3	0	0	0
Wholesale Banking	18	0	0	0	0
Others: ❑					

Part II: Retail Banking via the Internet

1. **Does your institution have an Internet site?**

	Number of Respondents
No	9
No, but planned later in 1998	2
No, but planned for 1999 or later	8
Yes	19

2. **Who developed your organisation's Internet site?** ***(Number of respondents)***

	Number of Respondents
In house	3
Outside vendor	11
In house and Outside vendor	9

3. **Number of respondents who indicated the following services are, or will be, available via the Internet.**

Service Description	Number of Respondents			
	Now	Expected		
		Later in 1998	Within 2 Years	Within 5 Years
a. General information on banking products & services	17	3	8	2
b. Contacting your bank via e-mail	17	2	8	2
c. Balance inquiry	1	1	15	8
d. Funds transfer between accounts	1	1	14	9
e. Bill presentment	0	1	13	8
f. Bill payment	1	1	12	10
g. Accepting deposits	1	1	6	14
h. Online credit card applications	0	2	4	13
i. Other online credit applications				
❑ Payment	0	0	3	0
❑ Treasury	1	0	0	0
❑ Loan	0	1	3	3
❑ Overdraft	0	0	1	1
j. Conducting other online activities				
❑ Brokerage	1	1	3	3
❑ Insurance	2	1	3	2
❑ Mutual	0	1	0	0
❑ Virtual	0	1	0	0
❑ Unit Trust	1	0	2	1

4. **Are any of the services (i.e., data or transaction processing) offered through your Internet site provided by an outside vendor?**

Since Bank Negara Malaysia has not approved Internet based transactions as yet, none of the local institutions provide Internet based services.

5. **Does the bank differentiate/segregate its customer base in offering electronic products or services?**

No : ALL respondents
Yes : NO respondents

If yes, how:

- Primary distinction is Corporate versus Individual

6a. How many customers currently subscribe to Internet-based services? NONE

6b. What are your projections for later in 1998, within 2 years and within 5 years?

1998	< 1,000
Within 2 Years	< 25,000
Within 5 years	< 100,000

Only 5 institutions out of the 38 respondents gave projections.

Part III: Home Banking via Proprietary Systems

1. Does your institution offer home banking services through a proprietary system?

	Number of Respondents
No	17
No, but planned later in 1998	3
No, but planned for 1999 or later	6
Yes	12

2. Which of the following home banking channels are used to interface with customers?

Channel Description	Number of Respondents			
		Planned		
	Now Offer	Later in 1998	Within 2 Years	Within 5 Years
a. Bank proprietary (i.e., direct dial-in)	10	1	3	4
b. Internet connection via an on-line network	1	0	10	9
c. Telephone banking (voice response/call centre)	10	5	9	5
d. PC Banking	5	0	0	0
e. Handheld Terminals	1	0	0	0
f. TV Banking	0	0	1	0
g. Virtual Interactive Kiosks	1	0	0	0
h. Visa Plan	1	0	0	0

Part IV: Other Technology Initiatives

1. **Does your institution currently or plan to offer any of the following channels to deliver its products or services to customers?**

Channel Description	Number of Respondents			
		Planned		
	Now Offer	Later in 1998	Within 2 Years	Within 5 Years
a. Smart / screen telephones	-	-	9	12
b. Standard ATMs	26	1	2	1
c. Advanced function ATMs	9	2	10	7
d. Automated Loan Machines	1	0	6	7
e. Telephone call centres	7	3	15	4
f. Electronic trading	3	-	8	7
g. Corporate Terminal	1	-	-	-
h. Cash Deposit	1	-	-	-
i. Passbook Updating	1	-	-	-
j. Infokiosk	-	-	1	-
k. Cash Recycling ATM	-	-	1	-
l. Interactive Voice Response	1	-	-	-

2. **Is your institution currently involved or planning to undertake any of the following technology initiatives?**

Description	Number of Respondents			
		Planned		
	Now Offer	Later in 1998	Within 2 Years	Within 5 Years
a. Electronic commerce (digital cash/checks)	2	3	15	11
b. Integrated chip stored value cards (smart/IC cards)	-	3	19	5
c. Computer imaging	13	5	9	9
d. Data warehousing / data mining	5	6	10	7
e. Corporate Intranet & E-mail	1	-	1	-
f. EIS	1	-	-	-
g. CRMS		1	-	-

Part V: Controls / Risk Management Measures

Channel Description	Sym-metric (Private Key Crypto-graphy)	Asym-metric (Public Key Crypto-graphy)	Virtual Private Net-works	Digital Certifi-cates	Digital Signa-tures	PIN
a. Bank proprietary (direct dial-in)	9	3	6	4	7	13
b. Internet connection via an on-line network	-	3	1	4	1	3
c. Telephone banking	2	-	2	-	1	11
d. E – Commerce	-	1	-	1	1	-
e. Corporate Terminal	-	-	-	-	-	1
f. ATM	1	-	1	-	3	-

3. **Where noted, indicate the number of staff dedicated to develop/maintain electronic banking and delivery systems, as well as audit personnel charged with monitoring controls over these activities. Please identify whether these functions are filled by internal, external or a combination of staff.**

Function	Maintenance and Development Staff				Audit Staff			
	0 – 5	*5 – 10*	*10 – 20*	*> 20*	*0 – 5*	*5 – 10*	*10 – 20*	*> 20*
a. Internet banking	5	2	2	-	4			
b. Proprietary banking	2	7	7	4	2		1	
c. Other initiatives:								
❑ ATM	2							
❑ Corp. Terminal	1							
❑ Telebanking				1				
❑ Share Margin		1						
❑ Branch Delivery			1					
❑ Treasury	1							

Malaysian Analysis of the Institution Survey on Electronic Banking

Important points to keep in mind:

- Survey forms were sent to 42 financial institutions (out of a total 92 institutions).
- The 42 institutions are estimated to represent more than 90% of electronic banking business.
- 38 financial institutions responded to the survey (90% response rate). Of the four which did not respond, one institution has merged with another bank.
- The responses were mostly dated around the 15th of August 1998, and do not reflect sentiments prevailing since the 1st of September when the Malaysian ringgit was fixed to 3:80 to the US dollar.

Part I: Strategic Plan Elements

- Since the Asian crisis began in July 1997, banks have faced a rise in non-performing loans, a contraction in new business opportunities and a sharp rise in interest rates (until September 1998).
- The three main challenges identified are revenue growth, liquidity management and profitability margins. Capital management is becoming another problem for several smaller institutions.
- The increased level of uncertainty concerning government policy and business opportunity has compelled management of many FIs to focus on short term problems and solutions. In addition, the Y2K issue also is forcing the FIs to concentrate resources on short-term issues, as well as spending more time on contingency planning rather than strategic expansion.
- Drivers of electronic banking initiatives are almost wholly domestic/retail.
- Budget allocation for technology is skewed heavily in favour of retail banking and back office operations. E-Commerce as an independent product platform has favor only with the larger institutions.

Conclusion

Only a small handful of large and well managed institutions have the financial and human resources as well as time to focus on new

electronic banking platforms. Strategically speaking, E-Banking will develop at a slower pace than anticipated a year ago. Nonetheless, its advent into the Malaysian banking scene is inevitable. A major issue for regulators will be protection of domestic institutions from falling prey to more powerful international players. How do we level the playing field? A major issue for the bankers is tackling the underlying EB business paradigm rather than the overlying IT paradigm. Many are pushing the technology, but show little appreciation for the business processes and changes that must accompany the EB initiative.

Part II: Retail Banking via the Internet

- Bank Negara Malaysia has not allowed it on the grounds that:
  - The regulatory framework is not well established, including cyberlaws and risk management.
  - The local financial institutions will face intense competition and may require central bank support if profitability is eroded.
- The wider commercial and economic implications have yet to be understood.
- The nature, degree and viability of collaboration between the different players in EB is still unclear. Several bankers have suggested there is a need for coordination between providers of telecommunication line capacity, E-Commerce content, financial settlement and uniformity in standards.

The survey results suggest that the majority of the respondents agree Internet banking in Malaysia will be a reality within five years with almost half the respondents believing Internet banking will be a reality within two years. The services to be provided include conventional over-the-counter banking services, but with a far higher level of integration between banking services. Hence, inter-account transactions will become much more transparent to users. However, when it comes to users, there is no research data available to form concrete opinions about possible market segmentation.

Part III: Home Banking via Proprietary Systems

About half the respondents either already offer such services, or plan to within two years. The most popular modes were telebanking followed by PC-Banking. Evidence suggests that the latter choice is targeted to corporate and small business segments of the market. However, about 40% of the respondents indicated that they were not

planning to offer home banking services via a proprietary channel. Ten respondents also indicated that the service would be offered via an Internet connection, thus confusing proprietary systems with open systems. When contrasted with the 75% of respondents who said yes to Internet sites (indicating the popularity of remote banking), the relatively high number of institutions not interested in remote banking via proprietary systems suggests the channel configuration is pertinent.

Not only will telecommunication costs be higher via proprietary systems, accessibility to the market will also be a problem. Institutions with systems that are perceived to be problematic could suffer a quick and costly death. The remaining institutions will be curtailed in forming strategic alliances across different E-Commerce sectors if their systems cannot communicate in a seamless manner. Further, adherence to internationally accepted security standards will also pose complications if the proprietary system does not support a wide array of digital signatures and cryptograms.

Part IV: Other Technology Initiatives

Apart from standard ATMs and advanced ATMs, very few of the other channels were being exploited. However, the majority of institutions indicated that they expected to deploy such delivery systems within two years. The most popular channels were the advanced ATMs and telephone call centres, followed by EDI and smart screens. Smart card technology is widely expected to be deployed following the launch of the Multi-Purpose Card by the government and Bank Negara Malaysia in 2000/2001. It is expected that once digital technology is widely embraced and made practical by acceptable levels of telecommunication line costs and transmission speed, other technologies such as computer imaging and data warehousing will become more attractive. The inter-dependency of these technologies requires many components to be simultaneously in place before any practical application can be taken to market. Another major drawback to actual implementation is the dearth of qualified professionals who can bridge the business-technology gap. It may yet be a few years before senior management is comfortable using full-fledged EIS for on-line decision-making.

Part V: Controls / Risk Management Measures

The full range of security methods listed is being utilised by different institutions. However, in terms of audit capabilities very few

institutions have the requisite level of manpower, skills and resources to ensure effective deployment of the security systems. Similarly, as indicated in Part II, many of the institutions depend on outside assistance to build web-sites and other sophisticated applications. The current economic climate has increased pressure to cut costs. It is highly unlikely that the internal controls and risk management measures will be able to keep up with developments in electronic banking/commerce. As a result of these weaknesses, the long-term repercussions for the banking system as a whole cannot be reliably determined since the likelihood of 'errors, omissions and malpractice' could be high. A predictable off-shoot of this dilemma is the mooting of 'technology risk management' as a specialised career within the financial institutions until such time that the marriage of business and technology is on a stable and harmonious footing.

SUMMARY RESULTS OF INSTITUTION SURVEY

Central Bank	**Nepal Rastra Bank**
Total Number of Institutions Surveyed	11
Total Number by Institution Type:	
Retail	11
Agriculture	
Merchant	
Finance	
Other	

Survey Method: ☐ **Face-to-face interview** ☐ **Telephone interview** ☒ **Mail**

Part I: Strategic Plan Elements

1. For each category, calculate the percentage of respondents that identified that category as a key challenge to their organization:

54%	Margin Compression	53%	Reduced Credit Extending Opportunities
84%	Revenue Growth	47%	Funding / Liquidity
71%	Expense Reduction	44%	Technological Competitiveness
23%	Nonbank Competition	32%	Geographic Expansion of Competitors
50%	Capital Management	55%	Economic / Political Conditions

1.1 Of these, identify the three challenges that were sited most frequently as the institutions' top concern.

1. Revenue Growth
2. Expense Reduction
3. Economic/Political Conditions

2. For each category, calculate the percentage of respondents that identified that category as a driving force in determining electronic banking initiatives:

36%	Retail Customers	64%	Domestic Competition
18%	Wholesale Customers	18%	Global Competition
9%	IT Vendors	46%	Internal Management
9%	Government Initiatives	9%	No significant influence

3. For each category, calculate the percentage of respondents that identified that category as the greatest portion of their technology budget:

a.	back office operations	18%	g. other: *(please indicate)*	
b.	electronic commerce		computerization	9%
c.	retail banking	18%	hardware/software	9%
d.	trading operations			
e.	payments			
f.	wholesale banking			

Part II: Retail Banking via the Internet

1. Calculate the number and percentage of respondents that:

9 / 82 %	do not have an Internet site
0 / 0 %	plan an Internet site for 1998
4 / 36 %	plan an Internet site for 1999 or later
2 / 18 %	currently have an Internet site

2. Calculate the percentage of respondents that:

	developed their Internet site in-house
9 %	used an outside vendor to develop their Internet site
9 %	used both internal staff and an outside vendor to develop their Internet site

3a. Indicate the number of respondents that are offering the following services via the Internet:

Service Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. general information on bank products & services	2	1	3	
b. contacting your bank via e-mail	3	2		
c. balance inquiry		1	2	1
d. funds transfer between accounts			2	
e. bill presentment			2	
f. bill payment			2	
g. accepting deposits			2	
h. online credit card applications			1	2
i. other online credit applications *(indicate types)*				
1. Consumer Loan				
2. Small Business Loan				
j. conducting other online activities (e.g., insurance, brokerage, mutual fund sales etc.)				
1. Securities				
2.				

3b. Calculate the percentage of respondents that are offering the following services via Internet:

Service Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. general information on bank products & services	18%	9%	27%	
b. contacting your bank via e-mail	27%	18%		
c. balance inquiry		9%	18%	9%
d. funds transfer between accounts			18%	
e. bill presentment			18%	
f. bill payment			18%	
g. accepting deposits			18%	
h. online credit card applications			9%	18%
i. other online credit applications: *(indicate types)*				
1. Consumer Loans				
2. Small Business Loans				
j. conducting other online activities (e.g., insurance, brokerage, mutual fund sales etc.)				
1. Securities				
2.				

4. **Calculate the percentage of respondents that use an outside vendor to provide an Internet service.** 9 %

Indicate the services that are provided by an outside vendor:

Due to no direct access, the bank has to take the service of outside vendor to make information update.

5. **Calculate the percentage of respondents that differentiate/segregate its customer base in offering electronic products or services.** ___%

Part III: Home Banking via Proprietary Systems

1. **Calculate the number and percentage of respondents that:**

2 / 18 %	offer home banking services through a proprietary system
2 / 18 %	plan a home banking service for 1998
3 / 27 %	plan a home banking service for 1999 or later
2 / 18 %	currently offer home banking services

2a. Indicate the number of respondents that are using the following home banking channels to interface with customers:

Channel Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. bank proprietary (i.e., direct dial-in)	2		1	
b. internet connection via an on-line network			1	
c. telephone banking (voice response/call center)	2	2	3	
d. other: *(please indicate)*				
1.				
2.				

2b. Calculate the percentage of respondents that are using the following home banking channels to interface with customers:

Channel Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. bank proprietary (i.e., direct dial-in)	18%		9%	
b. internet connection via an on-line network			9%	
c. telephone banking (voice response/call center)	18%	18%	27%	
d. other: *(please indicate)*				
1.				
2.				

Part IV: Other Technology Initiatives

1a. Indicate the number of respondents that are currently or planning to offer the following channels to deliver its products or services to customers:

Channel Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. smart / screen telephones			1	1
b. standard ATMs	1		6	
c. advanced function automated teller machines (ATMs)			3	2
d. automated loan machines (ALMs)				2
e. telephone call centers			2	
f. electronic trading				
g. other: *(please indicate)*				
1. SWIFT	5			
2. Point of sales terminals	1	1	1	

1b. Calculate the percentage of respondents that are currently or planning to offer the following channels to deliver its products or services to customers:

Channel Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. smart / screen telephones			9%	9%
b. standard ATMs	9%		55%	
c. advanced function automated teller machines (ATMs)			27%	18%
d. automated loan machines (ALMs)				18%
e. telephone call centers			18%	
f. electronic trading				
g. other: *(please indicate)*				
1. SWIFT	45%			
2. Point of sales terminals	9%	9%	9%	

2a. Indicate the number of respondents that are currently planning to undertake the following technology initiatives:

Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. electronic commerce (digital cash/checks)				1
b. integrated chip stored value cards (smart or IC cards)				
c. computer imaging			2	
d. data warehousing / data mining			1	
e. other: *(please indicate)*				
1.				
2.				

2b. Calculate the <u>percentage</u> of respondents that are currently planning to undertake the following technology initiatives:

Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. electronic commerce (digital cash/checks)				9%
b. integrated chip stored value cards (smart or IC cards)				
c. computer imaging			18%	
d. data warehousing / data mining			9%	
e. other: *(please indicate)*				
1.				
2.				

Part V: Controls / Risk Management Measures

1a. Indicate the <u>number</u> of respondents that are taking the following measures to secure their electronic banking delivery channels:

Channel Description	Symmetric (private key cryptography)	Asymmetric (public key cryptography)	Virtual private networks	Digital certificates	Digital signatures	PIN	Other *(please indicate)*
a. bank proprietary (i.e., direct dial-in)			1		1	1	
b. internet connection via an on-line network							
c. telephone banking (call center)						1	Code
d. other: *(please indicate)*							
1. SWIFT						5	Code
2. Point of sales terminals						1	
3. ATM						1	

1b. Calculate the <u>percentage</u> of respondents that are taking the following measures to secure their electronic banking delivery channels:

Channel Description	Symmetric (private key cryptography)	Asymmetric (public key cryptography)	Virtual private networks	Digital certificates	Digital signatures	PIN	Other *(please indicate)*
a. bank proprietary (i.e., direct dial-in)			9%		9%	9%	
b. internet connection via an on-line network							
c. telephone banking (call center)						9%	
d. other: *(please indicate)*							
1. SWIFT						45%	
2. Points of sales terminals						9%	
3. ATM						9%	

2a. List the percentage of respondents that have maintenance and development staff dedicated to electronic banking and delivery systems as well as audit personnel monitoring controls over these activities.

Function	Maintenance and Development Staff	Audit Staff
a. Internet banking	9%	9%
b. Proprietary banking	36%	9%
c. Other initiatives: *(please indicate)*		
1. Telephone Banking (in–house)	9%	
2.		
3.		

2b. Calculate the average number of staff for those respondents that have maintenance and development staff dedicated to electronic banking delivery systems as well as audit personnel monitoring controls over these activities.

Function	Maintenance and Development Staff	Audit Staff
a. Internet banking	1	1
b. Proprietary banking	3	1
c. Other initiatives: *(please indicate)*		
1. Telephone Banking (in–house)	1	
2.		
3.		

SUMMARY RESULTS OF INSTITUTION SURVEY

Central Bank	**Monetary Authority of Singapore**
Total Number of Institutions Surveyed	**12**
Total Number by Institution Type:	
Retail	
Agriculture	
Merchant	
Finance	
Other: *(please describe)*	**11 full banks *** **1 restricted bank ***

Survey Method: ☐ **Face-to-face interview** ☐ **Telephone interview** ☐ **Mail**

* Full bank – all banking business
* Restricted bank – no branches, no saving accounts, time deposits > $¼ M

Part I: Strategic Plan Elements

1. For each category, calculate the percentage of respondents that identified that category as a key challenge to their organization:

42	Margin Compression	25	Reduced Credit Extending Opportunities
83	Revenue Growth	8	Funding / Liquidity
42	Expense Reduction	42	Technological Competitiveness
8	Nonbank Competition	33	Geographic Expansion of Competitors
17	Capital Management	50	Economic / Political Conditions

1.1 Of these, identify the three challenges that were sited most frequently as the institutions' top concern.

1. Revenue Growth
2. Economic/Political Conditions
3. Technological Competitiveness

2. For each category, calculate the percentage of respondents that identified that category as a driving force in determining electronic banking initiatives:

67	Retail Customers	75	Domestic Competition
67	Wholesale Customers	92	Global Competition
17	IT Vendors	67	Internal Management
58	Government Initiatives		No significant influence

3. For each category, calculate the percentage of respondents that identified that category as the greatest portion of their technology budget:

a. back office operations	8	g. other: *(please indicate)*	
b. electronic commerce	8		
c. retail banking	58		
d. trading operations	17		
e. payments			
f. wholesale banking			

Part II: Retail Banking via the Internet

1. Calculate the number and percentage of respondents that:

1 / 8 %	do not have an Internet site
	plan an Internet site for 1998
1 / 8 %	plan an Internet site for 1999 or later
10 / 83 %	currently have an Internet site

2. Calculate the percentage of respondents that:

17 %	developed their Internet site in-house
17 %	used an outside vendor to develop their Internet site
17 %	used both internal staff and an outside vendor to develop their Internet site

3a. Indicate the number of respondents that are offering the following services via the Internet:

Service Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. general information on bank products &	9		1	
b. contacting your bank via e-mail	9		1	
c. balance inquiry	4	3	2	1
d. funds transfer between accounts	3	4	2	1
e. bill presentment	1		6	3
f. bill payment	3	2	2	2
g. accepting deposits		1	3	2
h. online credit card applications	1		4	2
i. other online credit applications *(indicate types)*				
1. loan application	3	1	4	
2.				
j. conducting other online activities (e.g., insurance, brokerage, mutual fund sales, etc.)				
1. electronic share application	1	1	3	1
2. securities trading				1
3. unit trust			1	
4. e commerce/internet banking			2	
5. financial news analysis	1			
6. electronic payment for share	1		1	
7. LC application			1	
8. remittance		1		
9. insurance sales			1	
10. mutual fund sales			1	

3b. Calculate the <u>percentage</u> of respondents that are offering the following services via the Internet:

Service Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. general information on bank products & services	75		8	
b. contacting your bank via e-mail	75		8	
c. balance inquiry	33	25	17	8
d. funds transfer between accounts	25	33	17	8
e. bill presentment	8		50	25
f. bill payment	25	17	17	17
g. accepting deposits		8	25	17
h. online credit card applications	8		33	17
i. other online credit applications *(indicate types)*				
1. loan application	25	8	33	
2.				
j. conducting other online activities (e.g., insurance, brokerage, mutual fund sales, etc.)				
1. electronic share application	8	8	25	8
2. securities trading				8
3. unit trust			8	
4. e commerce/internet banking			17	
5. financial news analysis	8			
6. electronic payment for share	8		8	
7. LC application			8	
8. remittance		8		
9. insurance sales			8	
10. mutual fund sales			8	

4. Calculate the percentage of respondents that use an outside vendor to provide an Internet service. <u>0 %</u>

Indicate the services that are provided by an outside vendor:

Nil

5. Calculate the percentage of respondents that differentiate/segregate its customer base in offering electronic products or services. <u>58 %</u>

Part III: Home Banking via Proprietary Systems

1. Indicate the number and calculate the percentage of respondents that:

9 / 75 %	offer home banking services through a proprietary system
	plan a home banking service for 1998
	plan a home banking service for 1999 or later
	Currently offer home banking services
9 / 75 %	No / NA

2a. Indicate the number of respondents that are using the following home banking channels to interface with customers:

Channel Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. bank proprietary (i.e., direct dial-in)	4	1		
b. internet connection via an on-line network	3	1	4	
c. telephone banking (voice response/call center)	9		1	
d. other: *(please indicate)*				
1.				
2.				

2b. Calculate the percentage of respondents that are using the following home banking channels to interface with customers:

Channel Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. bank proprietary (i.e., direct dial-in)	33	8		
b. internet connection via an on-line network	25	8	33	
c. telephone banking (voice response/call center)	75		8	
d. other: *(please indicate)*				
1.				

Part IV: Other Technology Initiatives

1a. Indicate the number of respondents that are currently or planning to offer the following channels to deliver its products or services to customers:

Channel Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. smart / screen telephones		1	1	1
b. standard ATMs	8			1
c. advanced function automated teller machines	6	1	1	1
d. automated loan machines (ALMs)			2	
e. telephone call centers	8		1	
f. electronic trading	1	1	6	
g. other: *(please indicate)*				
1. multimedia kiosk	4		2	
2. cash dispensary machine	4	1	1	1
3. auto bank branches / center	3		2	
4. ATM with cash card capability	4			2
5. ATM accepting Cirrus / Maestro / Plus	7			1
6. internet banking			1	
7. mobile phone banking			1	
8. passbook update machine	1			
9. cash management services	1			
10. cash management services via internet			1	
11. check book dispensary	1	1	1	1

1b. Calculate the percentage of respondents that are currently or planning to offer the following channels to deliver its products or services to customers:

Channel Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. smart / screen telephones		8	8	8
b. standard ATMs	67			8
c. advanced function automated teller machines	50	8	8	8
d. automated loan machines (ALMs)			17	
e. telephone call centers	67		8	
f. electronic trading	8	8	50	
g. other: *(please indicate)*				
1. multimedia kiosk	33		17	
2. cash dispensary machine	33	8	8	8
3. auto bank branches / center	25		17	
4. ATM with cash card capability	33			17
5. ATM accepting Cirrus / Maestro / Plus	58			8
6. internet banking			8	
7. mobile phone banking			8	
8. passbook update machine	8			
9. cash management services	8			
10. cash management services via internet			8	
11. check book dispensary	8	8	8	8

2a. Indicate the number of respondents that are currently planning to undertake the following technology initiatives:

Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. electronic commerce (digital cash/checks)	2		7	
b. integrated chip stored value cards (smart or IC cards)	7			
c. computer imaging	7	1	1	1
d. data warehousing / data mining	7		2	1
e. other: *(please indicate)*				
1. Java / Internet	4	3	3	
2. EDI in transaction	8		1	2
3. remote authorization device	1			

2b. Calculate the percentage of respondents that are currently planning to undertake the following technology initiatives:

Description	Now Offer	Planned		
		Later in 1998	Within 2 years	Within 5 years
a. electronic commerce (digital cash/checks)	17		58	
b. integrated chip stored value cards (smart or IC cards)	58			
c. computer imaging	58	8	8	8
d. data warehousing / data mining	58		17	8
e. other: *(please indicate)*				
1. Java / internet	33	25	25	
2. EDI in transaction	67		8	17
3. remote authorization device	8			

Part V: Controls / Risk Management Measures

1a. Indicate the number of respondents that are taking the following measures to secure their electronic banking delivery channels:

Channel description	Sym-metric (private key crypto-graphy)	Asym-metric (public key crypto-graphy)	Virtual private net-works	Digital certifi-cates	Digital signa-tures	PIN	Other *(please indicate)*
a. bank proprietary (i.e., direct dial-in)	6	3	3	2	3	8	Smartcard, encryption, password
b. internet connection via an on-line network	3	8	2	7	7	4	Smartcard, SSL, password
c. telephone banking (call center)	1					8	smartcard
d. other: *(please indicate)*							
1. NETS FEDI		1				1	
2. E Commerce		1		1	1	1	

1b. Calculate the percentage of respondents that are taking the following measures to secure their electronic banking delivery channels:

Channel description	Sym-metric (private key crypto-graphy)	Asym-metric (public key crypto-graphy)	Virtual private net-works	Digital certifi-cates	Digital signa-tures	PIN	Other *(please indicate)*
a. bank proprietary (i.e., direct dial-in)	50	25	25	17	25	67	
b. internet connection via an on-line network	25	67	17	58	58	33	
c. telephone banking (call center)	8					67	
d. other: *(please indicate)*							
1. NETS FEDI		8				8	
2. E Commerce		8		8	8	8	

2a. Calculate the percentage of respondents that have maintenance and development staff dedicated to electronic banking and delivery systems as well as audit personnel monitoring controls over these activities.

Function	Maintenance and Development Staff	Audit Staff
a. Internet banking	67	75
b. Proprietary banking	92	92
c. Other initiatives: *(please indicate)*		
1. E trading	8	8
2. E commerce	17	8
3. ATM / Kiosk	8	8
4. Call center	8	8

2b. Calculate the average number of staff for those respondents that have maintenance and development staff dedicated to electronic banking delivery systems as well as audit personnel monitoring controls over these activities.

Function	Maintenance and Development Staff	Audit Staff
a. Internet banking	9.4	1.75
b. Proprietary banking	7.8	2.4
c. Other initiatives: *(please indicate)*		
1. E trading	2	1
2. E commerce	31	3
3. ATM / Kiosk	6	1
4. Call center	26	2

SUMMARY RESULTS OF INSTITUTION SURVEY TAIWAN, REPUBLIC OF CHINA

This report is based on the decision reached in the first Workshop of the SEACEN Project on Supervisory Impact of Technology held during 16-17 June 1998. The first report introduces the industry adoption of technology based on a survey on electronic banking. Then it briefly describes the current supervisory practices in Taiwan. It ends with a simple conclusion.

In early August, a questionnaire was mailed to every financial institution in Taiwan. Then a telephone interview followed if there is any doubt in the answers to the questionnaire. The response to the survey is summarized in the following table:

Institution Type	# F.I. Surveyed	# Responded	% Responded
Domestic Banks	46	46	100
Local Branches of Foreign Banks	46	35	76
Trust & Investment Companies	5	4	80
Credit Cooperative Associations	59	30	51
Credit Dept. of Farmers' Associations	287	161	56
Credit Dept. of Fishermen's Associations	27	18	67
Bills Finance Companies	15	13	87
Securities Finance Companies	4	4	100
Life Insurance Companies	33	18	55
Property & Casualty Insurance Companies	28	15	54
Total Number of Institutions Surveyed	550	344	63

Different financial institutions use technology differently. Almost every domestic bank has its own mainframe and terminal network throughout the country. Some foreign bank branches do not have information technology (IT) facility and personnel in Taiwan, but use the facilities in its Asian operation center. Many local financial institutions as credit department of Farmers/Fishermen and Credit Cooperative Associations do not set up its own data processing center, but use the facilities of a joint area operation center. Since domestic banks adopt technology more heavily than other financial institutions, the following analysis of the survey data includes the condition of domestic banks in addition to the financial institutions as a whole.

Part I: Strategic Plan Elements

Among the 282 financial institution who listed the key challenges to their institutions, increasing competitive advantage is the most important, followed by revenue growth and expense reduction. For each category, the percentage that respondents marked the most important three is listed below:

76.60	Revenue Growth	13.83	Reduced Credit Extending Opportunities
48.58	Expense Reduction	83.69	Increase Competitive Advantage
9.20	Capital Management	31.21	Geographic Expansion
23.76	Funding / Liquidity	4.61	Economic / Political Conditions

Among the 46 domestic banks, 45 answered this question. For domestic banks, how to increase the competitive advantage is even more important than other goals. The percentage that domestic banks list geographic expansion as one of the top three challenges is much higher than financial institutions as a whole.

68.89	Revenue Growth	4.44	Reduced Credit Extending Opportunities
60.00	Expense Reduction	95.56	Increase Competitive Advantage
4.44	Capital Management	60.00	Geographic Expansion
8.89	Funding / Liquidity	2.22	Economic / Political Conditions

As for the driving force in determining electronic banking initiatives, the percentage of each category marked by 271 financial institutions as the most important three to their institutions is as follows:

85.61	Retail Customers	19.19	Government Initiatives
72.69	Wholesale Customers	83.03	Domestic Competition
7.01	IT Vendors	11.81	Global Competition

For the 45 domestic banks responded to this question, the most important driving force, like financial institutions as a whole, is a retail customer, followed by domestic competition and wholesale customers.

95.56	Retail Customers	26.67	Government Initiatives
80.00	Wholesale Customers	93.33	Domestic Competition
2.22	IT Vendors	4.44	Global Competition

The percentage of respondents that identified the category of banking operations spending the greatest portion of their technology budget is summarized in the following table. From the data, tradition back office operations, retail and wholesale banking still cost big. However, it is noticeable that there has already been 14.71% of domestic banks and 6.12% of all financial institutions recognizing that electronic commerce takes the greatest portion of their IT budget.

Use of IT Budget	All F.I. (%)	Domestic Banks (%)
a. back office operations	25.51	26.47
b. electronic commerce	6.12	14.71
c. retail banking	19.39	32.35
d. trading operations	3.07	0
e. payments	9.18	8.83
f. wholesale banking	36.73	17.64

Part II: Retail Banking via the Internet

Among the 344 respondents:

91 / 26.45 %	currently have an Internet site
13 / 3.78 %	plan an Internet site for 1998
25 / 36.34 %	plan an Internet site for 1999 or later
115 / 33.43 %	do not have an Internet site and do not plan to

Among the 46 domestic banks:

37 / 80.43 %	currently have an Internet site
3 / 6.52 %	plan an Internet site for 1998
6 / 10.87 %	plan an Internet site for 1999 or later
1 / 2.18 %	do not have an Internet site and do not plan to

In the above statistics, an institution without answering this question is treated as it does not have an Internet site and does not plan to. From the data, more than 80% of the domestic banks have set up the website. Only one domestic bank did not answer the question and is treated as it does not intend to.

As for the developer of the Internet site, the financial institutions' response is summarized in the following table. Most financial institutions used both internal staff and outside vendor to develop their Internet site.

Developer of Internet Site	All F.I. (%)	Domestic Banks (%)
a. internal staff	16.58	18.18
b. outside vendor	13.90	6.82
c. internal staff & outside vendor	69.52	75.00

The number and percentage of respondents that offer the various services via the Internet are summarized in the following two tables, respectively. The numbers in the parentheses of the percentage table indicate the condition of domestic banks. From the data, most domestic banks have recognized the importance and the potential of Internet banking. However, the services provided concentrate in the general information and balance inquiry. Maybe this is because the security of Internet is not totally satisfactory in the current stage.

Service Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. information on bank products & services	72	16	69	25
b. contacting your bank via e-mail	50	16	60	16
c. balance inquiry	27	18	68	30
d. funds transfer between accounts	6	9	54	35
e. bill presentment	1	1	35	32
f. bill payment	1	3	36	31
g. accepting deposits	1	23	34	38
h. online credit card applications	5	9	35	24

Service Description	Now	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. information on bank products & services	21 (78)	4.7 (6.5)	20 (8.7)	7.3 (0)
b. contacting your bank via e-mail	15 (59)	4.7 (11)	17 (13)	4.7 (0)
c. balance inquiry	7.8 (46)	5.2 (22)	20 (28)	8.7 (0)
d. funds transfer between accounts	1.7 (8.7)	2.6 (13)	16 (52)	10 (4.4)
e. bill presentment	0.3 (2.2)	0.3 (0)	10 (35)	9.3 (11)
f. bill payment	0.3 (2.2)	0.9 (4.4)	10 (33)	9 (11)
g. accepting deposits	0.3 (2.2)	0.9 (4.4)	10 (22)	11 (20)
h. online credit card applications	1.5 (11)	2.6 (17)	10 (37)	7 (11)

22.67% of the financial institutions providing services via Internet expressed that their services are developed by outside vendors. Among domestic banks, the ratio is even higher - 45%. The services established with the help of outside vendor are mainly general information on bank products and services inquiry, contacting banks with e-mail, and balance inquiry.

19.76% of the 162 respondents providing services via Internet (34.15% of 41 domestic banks) segregate their customer base. The differentiation is mainly on enterprises/individual customer. Some differentiate the international enterprise and small business. Some credit departments of farmers/ fishermen treat its member customers differently from non-members. One institution segregates its customer of age above 40.

Part III: Home Banking via Proprietary Systems

Among 344 respondents:

110 / 31.98 %	offer home banking services through a proprietary system
1 / 0.29 %	plan a home banking service for 1998
18 / 5.23 %	plan a home banking service for 1999 or later
123 / 35.76 %	do not plan to offer home banking services through a proprietary system

Among 46 domestic banks:

43 / 93.48 %	offer home banking services through a proprietary system
1 / 2.17 %	expresses that it does not plan to offer home banking services through a proprietary system

The above data show that the domestic banks are much more aggressive in adopting IT than other financial institutions. One more thing noticeable is that currently home banking services provided are mostly general information and balance inquiry. More complicated applications like fund transfer between accounts, payments, etc., though discussed a lot in the field, are not common.

On the channels respondents use to interface with home banking customers, the following two tables show the number and the percentage of respondents who use the specified channel to provide the home banking services. The numbers in parentheses indicate the relative statistics on domestic banks.

Channel Description	Now Offer	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. bank proprietary (i.e., direct dial-in)	35 (26)	1 (1)	14 (5)	8 (1)
b. internet connection via an online network	19 (18)	7 (6)	28 (10)	7 (0)
c. telephone banking (voice resp./call center)	104 (42)	0	9 (0)	6 (0)

Service Description	Now Offer	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. bank proprietary (i.e., direct dial-in)	10 (56)	0.3 (2.2)	4.1 (11)	2.3 (2.2)
b. internet connection via an online network	5.5 (39)	2 (13)	8.1 (22)	2.0 (0)
c. telephone banking (voice resp./call center)	30 (91)	0	2.6 (0)	1.7 (0)

Part IV: Other Technology Initiatives

As for the channels that respondents are currently or planning to use to deliver financial products or services to customers, the following two tables show the number and percentage respectively. The numbers in the parentheses indicate the survey results of domestic banks. From the figures we can tell that ATMs are widely used in Taiwan, while the use of other channels to the customers is still not popular.

Channel Description	Now Offer	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. smart / screen telephones	5 (3)	1 (0)	11 (7)	27 (8)
b. standard ATMs	175 (41)	4 (1)	5 (1)	8 (1)
c. advanced function ATMs	22 (14)	11 (7)	28 (6)	23 (5)
d. automated loan machines (ALMs)	4 (3)	0	13 (6)	30 (12)
e. telephone call centers	38 (5)	4 (3)	38 (14)	33 (7)
f. electronic trading	11 (4)	6 (5)	48 (23)	32 (5)

Channel Description	Now Offer	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. smart / screen telephones	1.5 (6.5)	0.3 (0)	3.2 (15)	7.9 (17)
b. standard ATMs	56.9 (89)	1.2 (2.2)	1.5 (2.2)	2.3 (2.2)
c. advanced function ATMs	6.4 (30)	3.2 (15)	8.1 (13)	6.7 (11)
d. automated loan machines (ALMs)	1.2 (6.5)	0 (0)	3.8 (13)	8.7 (26)
e. telephone call centers	11.1 (11)	1.2 (6.5)	11.1 (30)	9.6 (15)
f. electronic trading	3.2 (8.7)	1.7 (11)	14 (50)	9.3 (11)

The following two tables indicate the number and percentage of respondents that are currently planning to undertake the following technology initiatives. In many fields of the first table, the number in parenthesis almost equals the neighboring number, indicating that domestic banks lead in adopting emerging technology. What is worth noting include:

46 %	of domestic banks have distributed IC cards
71.7 %	of domestic banks plan to apply electronic commerce within two years

Description	Now Offer	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. electronic commerce (digital cash/checks)	6 (4)	5 (5)	43 (24)	37 (3)
b. smart or IC cards	24 (21)	2 (1)	28 (10)	32 (3)
c. computer imaging	11 (6)	2 (1)	24 (13)	34 (9)
d. data warehousing / data mining	7 (6)	5 (3)	42 (19)	25 (4)

Description	Now Offer	Expected		
		Later in 1998	Within 2 years	Within 5 years
a. electronic commerce (digital cash/checks)	17 (8.7)	1.5 (11)	12.5 (52)	11 (6.5)
b. smart or IC cards	7 (46)	0.6 (2.2)	8.1 (22)	9.3 (6.5)
c. computer imaging	3.2 (13)	0.6 (2.2)	8 (28)	9.9 (20)
d. data warehousing / data mining	2 (13)	1.5 (6.5)	12 (41)	7.3 (8.7)

Part V: Controls / Risk Management Measures

The following two tables indicate the number and percentage of respondents that are taking the following measures to secure their electronic banking delivery channels. The most widely used method is traditional personal identification number. Public key cryptography has been widely discussed and is becoming more commonly applied.

Channel description	Symmetric (private key cryptography)	Asymmetric (public key cryptography)	Virtual private networks	Digital signatures	PIN	SSL
a. bank proprietary	7 (5)	8 (7)	5 (5)	7 (6)	30 (24)	6 (5)
b. via an online network	7 (6)	12 (12)	1 (1)	4 (4)	17 (16)	6 (6)
c. telephone banking	18 (10)	0	3 (3)	0	84 (39)	1 (1)

Channel description	Symmetric (private key cryptography)	Asymmetric (public key cryptography)	Virtual private networks	Digital signatures	PIN	SSL
c. bank proprietary	20 (19)	22.9 (26.9)	14.3 (19)	20 (23)	86 (92)	17 (19)
d. via an online network	36.8 (33.3)	63.2 (66.7)	5.3 (5.6)	21 (22)	89 (89)	32 (33)
c. telephone banking	17.3 (23.8)	0	2.9 (7.1)	0	81 (93)	1 (2.4)

In the above table, the percentage is calculated by dividing the number of respondents taking the measures to secure their electronic banking delivery channel with the number of respondents using the relevant channel to interface with customers. For case of reference, the number of respondents using the relevant channel to interface with customers is listed below.

Channel description	All F.I.	Domestic Banks
a. bank proprietary	35	26
b. via an online network	19	18
c. telephone banking	104	42

The following table indicates the percentage of respondents that have maintenance and development staff dedicated to electronic banking and delivery systems as well as audit personnel monitoring controls over these activities. The numbers in parentheses indicate the relative statistics of domestic banks. Most domestic banks assign dedicated personnel to develop and manage the communication systems.

Function	Maintenance and Development Staff (%)	Audit Staff (%)
a. internet banking	37.95 (90.91)	28.21 (72.73)
b. proprietary banking	54.55 (79.07)	45.46 (65.12)

As for the average number of staff that financial institutions assign to maintain/develop and audit electronic banking delivery systems, the following table shows that domestic banks invest, on average, 3.85 persons for internet banking and 5.02 persons for proprietary banking development, much more than other financial institutions.

Function	Maintenance and Development Staff (%)	Audit Staff (%)
a. internet banking	1.29 (3.85)	0.44 (1.28)
b. proprietary banking	2.56 (5.02)	0.84 (1.36)

In the calculation of the above tables, the number of financial institutions providing the relevant function is used as the denominator, which are summarized in the following table for ease of reference:

Function	All F.I.	Domestic Banks
a. internet banking	195	44
b. proprietary banking	110	43

APPENDIX D

SUPERVISORY RISK MANAGEMENT
GUIDANCE & CONSIDERATIONS

SUPERVISORY RISK MANAGEMENT GUIDANCE

A. INTRODUCTION

For many organizations, information and the technology that supports it represent the most valuable assets to the organization. As the operating and competitive environment of the banking industry changes, it becomes necessary for industry participants to review and update their risk-management systems for information technology. With the emergence of electronic banking, formal guidance from global supervisors and industry practitioners on IT risk management has been issued to the international banking community. Further, the global financial services industry and audit profession have turned their attention toward operational risk and associated risk-management systems and have begun to recognize their critical role in a banking environment increasingly dominated by information technology.

B. RISK MANAGEMENT GUIDANCE

While there are many sources of information on IT risks, risk management and supervisory processes, the following documents present core information that serve as the basis for a supervisory approach to evaluate IT risk-management systems. Contained in this information are basic principles underlying the establishment of sound risk-management processes and supervisory practices. These documents are:

- "Uniform Rating System for Information Technology (URSIT)," Federal Financial Institutions Examination Council (FFIEC), January 1999;
- "Framework for Internal Control Systems in Banking Organizations," Bank for International Settlements, Basle Committee on Banking Supervision, No. 40, September 1998;
- "Guidance on Electronic Financial Services and Consumer Compliance," Federal Financial Institutions Examination Council (FFIEC), July 15, 1998;
- "Assessment of Information Technology in the Risk-Focused Frameworks for the Supervision of Community Banks and Large Complex Banking Organizations", Board of Governors of the Federal Reserve System Supervisory Letter (SR 98-9), April 1998;

- "Risk Management for Electronic Banking and Electronic Money Activities," Bank for International Settlements, Basle Committee on Banking Supervision, No. 35, March 1998;
- "Technology Risk Management," Office of the Comptroller of the Currency Bulletin (OCC-98-3), February 4, 1998;
- "Core Principles for Effective Banking Supervision," Bank for International Settlements, Basle Committee on Banking Supervision, No. 30, September 1997;
- "Electronic Money," Bank for International Settlements, Group of Ten Report of the Working Party, April 1997, ISBN 92-9131-901-5;
- "Electronic Banking Safety and Soundness Examination Procedures" Federal Deposit Insurance Corporation (FDIC), Division of Supervision, January 1997;
- Information Systems Audit and Control Foundation (ISACF), "Control Objectives for Information and related Technology (COBIT)", 1996;
- Federal Financial Institutions Examination Council (FFIEC) IS Examination Handbook – 1996.

Although a comprehensive review of these documents was outside the scope of this project, a brief summary of key information is provided to establish a common framework for later discussion of risk management and report recommendations.

In January of 1999, the Federal Financial Institutions Examination Council (FFIEC) approved revisions to the Uniform Interagency Rating System for Data Processing Operations. The revision changes the name of the rating system to the "Uniform Rating System for Information Technology (URSIT)". The U.S. federal regulators comprising the FFIEC will begin to use this rating system after April 1, 1999 to uniformly assess financial institutions and service provider risks introduced by information technology.

The "Framework for Internal Control Systems in Banking Organisations" outlines 13 principles that should be used by supervisory authorities when evaluating banks' internal-control systems. The major elements of an adequate internal-control process are outlined and supervisory guidance for the evaluation of internal-control systems is provided. Also included in this document is a discussion of internal-control failures and the negative impact they often have on financial performance.

Industry guidance on consumer regulatory implications of emerging electronic banking technologies is provided in the FFIEC's "Guidance on Electronic Financial Services and Consumer Compliance." The guidance provides federally insured U.S. depository institutions with information on federal consumer protection laws and regulations, and their application to electronic financial service operations. The guidance contains two sections: "Compliance Regulatory Environment" and "The Role of Consumer Compliance in Developing and Implementing Electronic Services."

The Board of Governors of the Federal Reserve System issued SR 98-9, "Assessment of Information Technology in the Risk-Focused Frameworks" to provide U.S. financial institutions with guidance on including information technology elements within the risk-focused framework for the supervision of banking organizations. This supervisory reference identifies five risk elements to establish common terminology and a consistent approach for evaluating the adequacy of an organization's information technology environment. The five elements – management processes, architecture, integrity, security and availability may be used to identify and evaluate the risks associated with information technology.

The Basle Committee's "Risk Management for Electronic Banking and Electronic Money Activities" was issued to facilitate development of appropriate supervisory approaches to the management of risks in electronic banking and electronic money activities. The report discusses considerations for supervisory authorities and banking organizations as they develop methods for identifying, assessing, managing, and controlling risks. Also, a representative set of risks that should be identified, measured and controlled by banking institutions was introduced. The principal message of the report is the need for banks to develop and maintain a rigorous risk-management process.

The "Technology Risk Management" bulletin describes the Office of the Comptroller of the Currency's (OCC) supervision by risk framework with respect to the risks posed by technology, sets forth the OCC's concerns regarding technology-related risks, and describes the risk management process associated with banks' use of technology.

The guidance contained in "Core Principles for Effective Banking Supervision" is intended to serve as a basic reference and discussion

vehicle for all supervisory and other public authorities involved in the supervision of banking organizations. More specifically, it addresses 25 principles within five key segments (Preconditions, Licensing and Approval, Ongoing Supervision, Formal Powers and Cross-Border Obligations) to delineate and formalize responsibilities and objectives for each agency involved in the supervision of banking organizations.

"Electronic Money" states its objectives are "to develop a broader understanding of the policy issues facing governments as a result of electronic money and to identify any issues that could benefit from additional international cooperation." The report, which builds on the extensive body of previous analysis and work on this subject, concentrates on three broad policy areas related to the payments arena: consumer, law enforcement, and supervisory issues.

In its "Electronic Banking Examination Procedures", the Federal Deposit Insurance Corporation (FDIC) provides examination guidance for its supervisory staff to address the safety and soundness aspects of electronic banking. Designed to be broad-based to apply to a wide range of electronic banking activities, the procedures focus on such functions as planning, administration, internal controls, and policies and procedures. Because the procedures are designed for safety and soundness examiners, they focus on non-technical strategic and administrative areas.

Developed by the Information Systems Audit and Control Foundation (ISACF), the "Control Objectives for Information and related Technology (COBIT)," serves as a framework of generally applicable security and control practices for information technology control. This framework provides high-level control statements for particular IT processes as it identifies the business need satisfied by the control statement and the IT resources managed by the processes, states the enabling controls and lists the major applicable control objectives. COBIT addresses, in depth, several components of risk assessment in an information technology environment. These include a business risk assessment, the risk assessment approach, risk identification, risk measurement, risk action plan and risk acceptance. It deals directly with information technology types of risk such as technology, security, continuity and regulatory risks. Additionally, COBIT addresses risk from both a global and system-specific perspective and provides a vehicle to facilitate communication among management, users and auditors regarding information systems controls.

The FFIEC IS Examination Handbook provides detailed guidance to experienced IT examiners, as well as commercial/financial and other specialty examiners. In addition to supervisory tools and examination workprograms for IT examinations, the Handbook emphasizes the importance of effective internal controls and management processes that appropriately identify and control risks.

APPENDIX E

GLOSSARY OF TERMS

GLOSSARY OF TERMS CONTAINED IN THIS REPORT

APEC	Asia-Pacific Economic Cooperation forum
ASEAN	Association of Southeast Asian Nations
Architecture	One of five information technology elements which refers to the underlying design of an automated information system and its individual components. The underlying design encompasses both physical and logical architecture, including operating environments, as well as the organization of data. Effective architecture meets current and long-term organizational objectives, addresses capacity requirements, and provides satisfactory solutions to problems arising from separate information systems.
Availability	One of five information technology elements which refers to the delivery of information to end-users. Availability is considered effective when information is consistently delivered on a timely basis in support of business and decision-making processes
Balance Inquiry	A basic function usually provided by home banking programs by which consumers can use a phone, personal computer or other electronic device to determine their balance of funds in a bank account.
Basle Committee	Committee established in 1974 by the Governors' of G-10 under the auspices of the BIS. The primary responsibility of this committee is to enhance supervisory practices and help set minimum standards for supervision of financial institutions.
BIS	Bank for International Settlements
Certificate Authority	An organization, such as a financial institution or trusted third party, that issues and manages digital certificates for use in electronic commerce.

Chip Card	Also known as an integrated circuit (IC) card. A plastic card with an embedded chip or integrated circuits for identification, data storage or special-purpose processing used to validate personal identification numbers, authorize purchases, verify account balances and store personal records. See also stored-value card.
Closed Architecture System	A system environment composed of a single issuer and service provider usually addressing a single application; or, a system using a communications protocol specifically designed for a particular set of hardware and software, normally all sourced from the same vendor.
Closed Network	A telecommunications network that is used for a specific purpose, such as a payment system, and to which access is restricted (also referred to as a private network).
Contingency Plan	A plan for emergency response, backup procedures, and post-disaster recovery. Synonymous with disaster recovery plan, continuity plan, or emergency plan.
Contingency Planning	The process of identifying risks from disruption of operations and services. The objectives are to: • minimize disruptions of service to the institution and its customers, • minimize financial loss, and, • ensure a timely resumption of operations in the event of disaster.
Data mining	The process of identifying commercially useful patterns or relationships in large databases or other computer repositories (data warehouses) through the use of specialized software or advanced statistical tools. In financial services, data mining is typically applied to a data warehouse containing information on customers, for purposes such as targeted marketing, cross-selling, and customer acquisition.

Data warehouse	A database, frequently very large, that can access all of a company's information. While the warehouse can be distributed over several computers and may contain several databases and information from numerous sources in a variety of formats, it should be accessible through a server. Thus, access to the warehouse is transparent to the user, who can use simple commands to retrieve and analyze all of the information. Frequently used for decision support within an organization, the data warehouse also allows the organization to organize its data, coordinate updates, and see relationships between information gathered from different parts of the organization.
Digital Certificate	An encoded document that verifies the connection between a server's public key (known to anyone) and the server's identification. This verification process is similar to that provided by a driver's license, which verifies the connection between the photograph and the personal identification. Cryptographic checks, including a digital signature, ensure that the information within the certificate (message) has not been tampered with during transmission.
Digital Signature	The electronic equivalent of a person's unique writing of their own name, usually performed today using public key cryptography. To create a digital signature, a hash function is performed on a message to create a unique message digest. The message digest is then encrypted using the sender's private key; the recipient decrypts the digest using the sender's public key. The recipient uses the public key of the sender to verify the authenticity of the sender, who should be the only one possessing that private key.
Electronic Bill Payment	A program provided by banks and third-party service providers by which consumers can electronically pay their bills. Funds are sent either electronically or by check by the bank or third party to the biller.

Electronic Bill Presentment	A program by which billers can electronically present a bill to a consumer so that the consumer can then electronically pay the amount owed. Many experts believe electronic bill presentment is necessary in order for electronic bill payment programs to be successful.
Electronic Commerce ("e-commerce")	The ability to purchase goods and services, including final payment settlement, solely with electronic transfers of financial value. Business environment integrating electronic transfer and automated business systems (end-user computing and computer-to-computer capabilities. Often used to refer to business conducted over the Internet.
Electronic Cash ("e-cash")	A system by which consumers can transfer the digital equivalent of dollars and cents (also referred to as digital cash) over the Internet or other online connections to pay for goods or information. Typically, this is associated with low transaction values or is a method used between individuals when the seller does not accept credit cards. Also referred to as micropayments.
Electronic Check	A generic model for all electronic, digitally-signed and authenticated financial instruments. Functionally, an e-check consists of an ASCII text block, cryptographically signed by an electronic checkbook, representing an electronic mail counterpart to the existing system of paper checks and physical mail - a form of payment for electronic or network services where no previous relationship exists between buyer and seller.
Electronic Trading	The ability to purchase and sell stocks and other financial instruments using electronic communication media; payment instructions underlying trades may also be communicated electronically.
Encryption	A method of coding (scrambling) files, clear text, or programs by changing one character string to another, using a cipher or mathematical algorithm to protect it from unauthorized access.

Exposure	The extent to which an information resource, or asset, is available, accessible and vulnerable.
FFIEC	Federal Financial Institutions Examination Council – An interagency body of U.S. federal regulatory agencies that seeks to promote the use of consistent examination practices for the financial institutions under their authority. FFIEC member agencies include: the Board of Governors of the Federal Reserve System, Federal Deposit Insurance Corporation, National Credit Union Administration, Office of the Comptroller of the Currency and Office of Thrift Supervision.
GDP in Purchasing Power Parity	The measure of the size of the economy converted to international dollars using purchasing power parity conversion factors. For SEACEN countries, GDP in PPP is considerably higher than real GDP measurements.
IMF	International Monetary Fund
Integrity Risk	One of five information technology elements that refers to the reliability, accuracy, and completeness of information delivered to the end-user. An information technology system has an effective level of integrity when the resulting information flows are accurate and complete.
ISDN	Integrated Services Digital Network. ISDN is a technology that combines voice and digital network services in a single medium making it possible to offer customers digital data and video services and voice connections through a single wire.
ISP	Internet Service Provider. A company that provides access to the Internet
IT	Information Technology
IVR	Interactive Voice Response - see also VRU
Legacy System	A financial computing system from an earlier generation that can sometimes be interfaced only with difficulty to modern computing and networking systems.

Management Processes Risk	One of five information technology elements that encompasses planning, investment, development, execution, and staffing of information technology from a corporate-wide and business-specific perspective. Management processes are considered effective when they are adequately and appropriately aligned with, and supportive of, the organization's mission and business objectives. Also referred to as "organization" or "strategic" risk.
MICR	Magnetic-ink Character Recognition. A technique that enables special characters printed in magnetic ink to be read and rapidly input into a computer.
RTGS	Real Time Gross Settlement System. An interbank funds transfer system that can effect final settlement on each transaction on a continuous basis during the processing day.
Security Risk	One of five information technology elements that refers to safety afforded to information assets and their data processing environments, using both physical and logical controls to achieve a level of protection commensurate with the value of the assets. Security is effective when controls prevent unauthorized access, modification, destruction, or disclosure of assets during their creation, transmission, processing, maintenance, or storage.
SEACEN	South East Asian Central Bankers group – A supranational organization comprised of the following central bank members: Indonesia, Malaysia, Myanmar, Nepal, the Philippines, Singapore, South Korea, Sri Lanka, Taiwan and Thailand.
Service Provider	A company that offers access to the Internet. Dial-up users obtain an account on the service provider's system and use its computers to log on to the Internet.
Smart Card	See Stored Value Card.

Stored Value Card	Term often used interchangeably with chip card, magnetic stripe card, or smart card. "Stored value" refers to the information stored in the magnetic stripe or microprocessor chip. Also, a card that stores prepaid financial or "stored value" via magnetic stripe or computer chip.
SWIFT	Society for Worldwide Interbank Financial Telecommunication. An international financial payment cooperative that operates a network to facilitate the exchange of payments and financial information between financial institutions throughout the world.
Systemic Risk	The risk that the failure of one participant in a funds transfer system, or in financial markets generally, to meet its required obligations will cause other participants or financial institutions to be unable to meet their obligations as they come due.
Telecommunications	Data transmission between a computing system and remotely located devices via telephone lines, cable, or wireless technology.
Telephone Banking	The use of a touch-tone telephone as the customer's device from which banking transactions are initiated.
Telephone Call Center ("Call Center")	Centralized customer service and sales facility through which a majority (and sometimes all) of customer calls are routed. The idea is to equip call center staff with access to customer relationship information so they can answer the customers' question on the first phone call, significantly reducing the amount of research staff and overhead a bank must support. This can either be run by the bank itself or outsourced to a third-party service provider on behalf of the bank.
Trusted Third Party	A reputable entity that authenticates one or more parties to an electronic transaction. The authentication process generally involves the issuance and administration of digital certificates.
Trading Operations	The ability to trade stock and other financial instruments offered through the financial exchanges.

VAN	Value Added Network. A vendor provided networking service, such as e-mail or fax.
VRU	Voice Response Unit. Technology employed in telephone call centers that handle simple customer requests – such as balance inquiries and funds transfers – that do not require personal assistance. Typically, customers are given instructions and respond by pushing keys on a touch-tone telephone keypad to complete queries.
WTO	World Trade Organization
Y2K	Abbreviation for Year 2000. It refers to the potential inability of computers to correctly process dates occurring after the year 2000 due to the use of two digits to represent the year.

APPENDIX F

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APPENDIX E

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