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An Analysis of Vietnam's ICT and Software Services Sector

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ABSTRACT:
This paper presents an analysis of Vietnam's position in the global ICT and Software services industry. Vietnam entry in this increasingly competitive sector is built on a foundation of positive macroeconomic changes and investments from government and multi-lateral organizations. Using an analytical framework that includes nine significant factors for newly competitive countries, this paper suggests that Vietnam's competitive strengths include cost effective workforce, improving infrastructure, linkages with key markets and an ambitious national vision. The country has benefited by attracting investment and established local presence of industry leaders. However Vietnam is a late entrant to the market and has weaknesses in key areas such as finance and international benchmarking.

1. INTRODUCTION

The multinational firm Kodak sparked the ICT outsourcing trend in the early 1990s with its much publicized contracts with IBM, Digital Equipment Corp. and BusinessLand Inc worth $250 million. ICT outsourcing has grown steadily, if not dramatically, since then and is expected to exceed $150 billion in 2003[1]. The phenomenon is increasingly transnational with firms looking for high value services on a worldwide basis. As offshore production costs and transaction costs drop, firms (particularly in ICT intensive sectors like financial services) in developed economies increasingly tap global pools of talent for improving the effectiveness and efficiency of ICT products and services [Ang and Straub, 1998; Diromauldo & Gurbaxani, 1998]. In the year 2000 alone, the U.S. is estimated to have spent $5.5 billion in offshore services [InfoWorld, 2001]. In a study of US firms Carmel and Agarwal (2002) contend that a majority of them will evolve from being bystanders and experimenters of offshore outsourcing to proactive portfolio managers with well-tuned organizational and technological infrastructure of strategic global sourcing of talent and services.

Several developing economies (e.g., India, Philippines) have benefited from this trend, spurring others to follow. Vietnam, a socialist country with "China-like" aspirations is one of the newer entrants in the global ICT business. This paper presents data and analysis of the growth and challenges facing the Vietnamese ICT sector that is estimated to be $2.1 billion with software exports of a modest $9 million [WITSA, 2002]. The first section presents an overview of Vietnam's macroeconomic conditions with special emphasis on ICT and software production. The next section examines in some detail key facets of the Vietnamese ICT sector – historical antecedents to growth in this sector, long term ICT initiatives that are currently underway, the number of multinational enterprises that have contributed to the ICT sector and the emerging software technology parks that are playing an important role in this market. The third section presents an analysis of Vietnam's competitiveness as a software exporter by examining demand, human capital, wages, infrastructure, international linkages and national vision for this sector.

[1] As reported by International Data Corp.

2. THE MACROECONOMIC PICTURE

2.1 Top Line Growth

Socialist Vietnam's *Doi Moi* or economic reform movement began with the sixth Congress in 1986 and continued with the passage of new enterprise laws in 2000; it is currently in accession talks with the World Trade Organization (WTO). The results of these reforms have yielded simultaneous improvements on many fronts – ranging from GDP growth to reduction in the food poverty line. Despite the general economic global slow-down in 2001, the Vietnamese economy grew by 7% to $33 billion and was second only to China in terms of growth. Even post 9/11, Vietnam's GDP was expected to grow by 7.3% in 2002. The fast paced GDP growth is accompanied by a slow to modest population growth of 1.43% in 2002. GDP/Capita in 2001 stood at a respectable $2,100. In his remarks in Hanoi, the World Bank Country Director clearly indicated bullishness about the Vietnamese economy:

"In light of the global slowdown, Vietnam now has the opportunity to act quickly to gain competitiveness and position itself for the decade ahead. In addition to gaining a reputation for stability, one of Vietnam's key advantages is the energy, enthusiasm and industriousness of its people. Liberating that energy will be crucial to Vietnam's path to prosperity". [2]

Both foreign direct investment (FDI) and new small business enterprise formation indicators suggest a strengthening climate for ICT and have shown order-of-magnitude increases (see Figure 1). There is little available data on the survival rate of these newly formed SMEs. It is well known that even in well developed economies like the U.S., SMEs are subject to "infant mortality" with nearly 50% of newly formed businesses closing their doors within three years of inception[3].

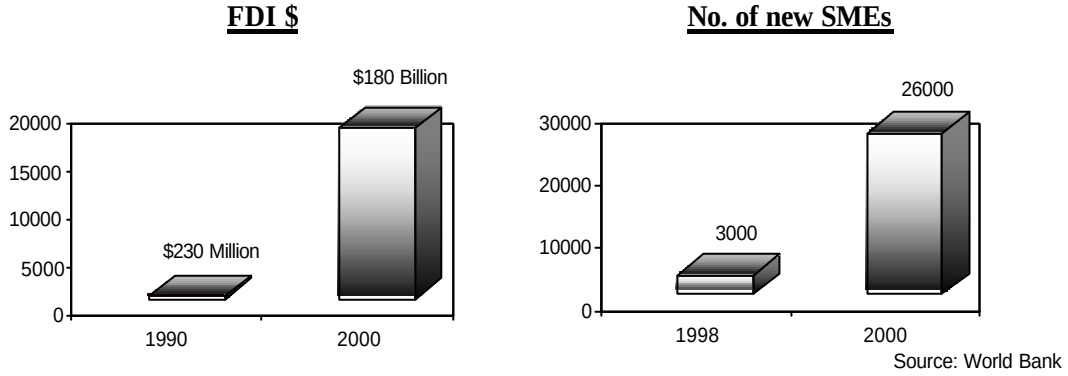

Figure 1: Strong growth

2.2 Benefiting from Global Outreach

The United Nations Development Program (UNDP) reports that disbursements of Official Development Assistance (ODA) in Vietnam reached US$1.75 billion in 2001, up from $1.6 billion in 2000 and $1.3 billion in 1999 [UNDP, 2001]. Since 1993, annual donor pledges of ODA have averaged around US$2.2 billion per year and the number of donors promoting and funding development projects has increased considerably from around a dozen to more than 45 today.

Over two-thirds of ODA disbursements in Vietnam are in the form of capital investment programs, 21% in the form of free standing technical assistance programs and

[2] Mr. Andrew Steer, World Bank Vietnam Country Director, Hanoi, December, 2001
[3] Source: The Small Business Association of America

17% in the form of quick disbursing program lending [UNDP, 2001]. Capital investment programs are predominately oriented towards major infrastructure projects, particularly in the energy and transport sectors. In 2001, 45% of ODA supported major infrastructure projects, 14% supported policy and institutional projects, 13% to human development (education and health), 12 % to rural development, 7% to the natural resources management and industry development sector.

During 2000, Japan was the largest single donor in Vietnam disbursing around US$870 million for infrastructure and energy projects. The Asian Development Bank (ADB), disbursing US$226 million was second and the World Bank was third with a US$139 million disbursement. Donors in Vietnam have supported projects at the macro level stimulating rapid economic growth, curbing inflation and promoting export and foreign investment. This has helped increase awareness in Vietnam about the potential to be derived from integrating more fully into the global economy and the promotion of development projects at the micro level.

3. THE VIETNAMESE ICT SECTOR

The $2.1 billion ICT sector in Vietnam is relatively small compared even to countries like the Philippines or Indonesia. Even so, this is impressive considering where Vietnam was just five years ago. To illustrate - in 1999 a Paris based group called "Reporters without Frontiers" awarded Vietnam the dubious distinction of being among the "Twenty Real Enemies of the Internet" because of its policy of restricting access to the Internet. Today the government actively makes Internet connections available to large sections of the population through public access facilities. ICT is quickly becoming a significant percentage of the Vietnamese economy growing from being less than 1% of the economy in 1993 to 7% in 2001.

Software[4] is a small but growing segment of the ICT sector totaling approximately $25 million in annual revenues. Vietnam exported $9 million worth of software services in 1999 but the government has the ambitious goal of increasing this to $300 million by 2005. Official statistics indicate that there are 95 companies that are registered software makers employing 1,500 workers. The actual number of programmers working in the industry is estimated to be 5,000 because many of them are employed in informally established software teams. Only the top three or four firms, all foreign owned, employ more than 100 programmers. The government actively encourages software production by granting a four-year income tax exemption and other favorable tax incentives. In addition to US, Japanese and European firms a number of Indian software firms are setting up operations in Vietnam to take advantage of lower costs and the attractive incentives.

3.1 Long Term Initiatives

There are several longer-term investments in Vietnam related to business education and technology currently underway that are financed by donors like Switzerland, the Denmark (DANIDA), the Finland (FINNIDA), the European Union and United Nations Agencies (UNIDO). Recently the German Government has been concerned with Information and Communications Technology (ICT) enabled SME-promotion in Vietnam. The SME Network Project (SMENET) is a bilingual Vietnamese business information "portal" for small and medium enterprises and offering a wide range of services. This is a business-oriented non-profit entity managed by the German Technical Cooperation (GTZ). SMENET serves enterprises as a platform for information access, inter-company communication, and as a channel for delivery of services (e.g., e-consulting, e-learning).

[4] Source: Vietnamese Government decree in June 1999

3.2 Presence of Technology Multi-National Enterprises (MNEs)

An impressive roster of US and Asian technology firms has recognized Vietnam's potential and established their local presence. Firms like Hewlett-Packard, Apple, Fujitsu, Intel, Siemens and Acer are significant players in the hardware sector. Software firms include Microsoft, Oracle and IBM. France Telecom, Novell and Cisco Systems are examples of networking and telecommunications firms that have established a presence in Vietnam. These MNEs have fostered a "high tech culture" particularly in urban areas like Ho Chi Minh (HCM) City with a mix of young, upwardly mobile Vietnamese and expatriates. Industry publications like *Computer Weekly* chronicling positive experiences of international managers reduce perceptions of risk and encourage other firms to follow in the footsteps of the early entrants.

3.3 Software Parks

Ho Chi Minh City is at the center of economic growth in Vietnam. This city contributes roughly 16% of the entire GDP, has attracted over $12 billion in FDI since 1988 and houses 8 fully developed industrial parks and 2 export processing zones. HCM City is actively promoting itself as an "IT Cluster" as evidenced by the following[5]:

- Two established software technology parks Saigon Software Park and Quang Trung Software Park) with a third in the building stage
- Online education facilities established in partnership with CISCO Systems
- A local ICT workforce of 6,000
- 24 companies have local software development operations
- 75% of Vietnamese personal computers are manufactured in HCM City
- Local universities and colleges graduate 2,500 to 3,000 qualified workers every year
- Tax incentives and land grants for software and related high technology businesses

Vietnam seems to be adopting salient features of the Chinese model of state planned selective growth as illustrated by the HCM software park with its high grade infrastructure and subsidized rent ($2/sq. meter) and low tax rates (0.4% $ per sq. meter) This is quite different from the more private entrepreneurial model that fueled ICT growth in Tier 1 countries like India and Israel.

4. ANALYSIS OF COMPETITIVE POSITIONING

Porter (1990) presents a useful framework (frequently referred to as Porter's Diamond) for analyzing the determinants of national competitiveness. Porter outlines four broad attributes of national competitive advantage – factor endowments, domestic demand conditions, related supporting industries and firm strategy and rivalry. Whilst this framework was developed through analysis of 10 different industries in over 100 countries its wider applicability has been questioned [Hill, 2003. pg 132]. The case of India's rise as a leader software exporter despite a significant domestic market and hampered by limited supporting industries is cited as evidence of the Porter Diamond's inapplicability to ICT and software. In light of this, a more specialized framework is called for to examine the competitiveness of the Vietnamese ICT sector with emphasis on the infant software export industry.

Heeks and Nicholson [2002] adapted the generic Porter model taking into account factors like overseas linkages and diaspora effects [Balasubramanyam and Balasubramanyam, 1997], geographic distribution of firms [Hung, 2000] suggested by ICT

[5] Source: Vietnam Network Information Center, HCM City Department of Science and Technology

oriented researchers. This adapted framework (referred to as "five factor model") suggests five key dimensions: demand, national vision and strategy, international linkages, industry characteristics and domestic inputs/infrastructure. Carmel [Carmel, 2002] further refines and specifies nine factors for Tier 4 nations i.e. nations that are currently in the early stages (less than $20 million annually) of their foray into software exports[6]. The nine factors deemed critical to competitiveness are:

- Demand – the nature and scope of domestic and international demand for software export services
- National Vision and Strategy – the degree of national commitment to setting the foundation for success in this sector
- Human Capital – the breadth and depth of the local talent pool
- Wages – local labor rates vis-à-vis international rates
- Global, regional, geographic, cultural and linguistic linkages – the level of interconnectedness of the local industry to important export markets
- Technological Infrastructure – the sophistication and reliability of communication technology
- Industry collaboration, vision and specialization – the extent of intra-industry collaboration
- Finance – Availability of capital for firm growth
- International Benchmarking – validation by external unbiased third parties

4.1 Demand Conditions

According to Porter [1990] local demand conditions affect the level of competitiveness of a nation internationally. As per this argument, Japan's international competitiveness in the automobile business rises in part due to the nature of demand in the local market. This would suggest that if Vietnamese demand for ICT is increasing and mirrors trends in the international market, local producers will become globally competitive. On this front, the picture is not entirely clear: demand has increased rapidly (from $740 million in 1995 to $2.1 billion in 2001) but is largely filled by foreign producers of ICT products and services. Table 1 below shows the breakdown of Vietnam's 2001 ICT consumption.

Category	Spending ($US Millions)
IT Hardware	$265
Software	$23
IT Services	$30
Internal	$73
Other Office Equipment	$24
Total IT	$415
Telecom	$1,709
Total ICT	$2,124

Table 1: ICT Sector Spending (2001)

USAID estimates that 35% of ICT demand is met by local suppliers and the remaining 65% of the market is met by international (mostly US) firms like Microsoft, IBM, CISCO and others [USAID, 2001]. There are signs that domestic producers are making strides. 70% of all new PC sales are locally manufactured by Vietnamese companies. USAID projects that local firms are likely to own 60% of the local market beyond 2005. Software

[6] Tier 1 nations are the "3 Is" – India, Israel and Ireland. Tier 2 nations are China, Russia and Philippines. Tier 3 nations those with annual software exports in the $20 million to $50 million range. The reader is referred to Heeks and Nicolson [2002] and Carmel [2002] for more detailed discussion of the four tiers.

spending is low and does not adequately reflect software usage due to high software piracy rates in Vietnam; copyright violations are estimated by the Business Software Alliance to be at 94% in 2002.

As researchers like Heeks & Nicholson and Carmel have noted local demand conditions may not be a primary driver of a country's international competitiveness in the ICT sector – the classic counter example being India whose ICT sector demand is not considered to have been a factor in driving India's emerging role as a leading software exporter. International demand for offshore services has steadily increased through the 1990s with growth in the US economy. Benefits accrued to all four tiers of software export nations and Vietnam was no exception. The current outlook for international demand is less robust than before. The investment firm Goldman Sachs expects firms to increase ICT expenses by a modest 1 to 2 % in 2003 on the heels of cutbacks in 2002. This overall reduction has had complex effects on offshore outsourcing. Cost containment has re-emphasized the need for looking for *reliable* offshore services. Consequently, tried and true offshore destinations like India have grown steadily at 20% rates in 2002 but Tier 4 countries have benefited less - Vietnam grew at a 20% rate in 2000, slowed down in 2001 and has stagnated in 2002 according to industry estimates [Tung, 2002].

4.2 National Vision

There is a shift underway in Vietnam with regard to ICT - national progress and poverty reduction are viewed to be dependent on ICT sector investment, education and business formation. The Vietnamese government views the ICT sector as a potential growth sector of the economy and multi-pronged efforts have been made to propel the ICT sector. Some of the targets set for this sector up to the year 2005 are:

- Training of 50,000 ICT experts
- Turnover of ICT sector to reach $500 million
- Yearly growth of 20% to 25%

To this end, a number of initiatives have begun. Examples include:

- Software technology parks (2 in Ho Chi Minh City alone)
- ICT training centers
- Subsidized internet phone service
- Tax "holidays" to software firms
- Online/distance educational private partnerships

4.3 Human Capital

Vietnam's demographics point towards a young, educated workforce. 32% of the population is under the age of 15 and less than 6% of the population is over 65. Unlike many other developing countries, this young workforce has high literacy levels. In part due to the decades-long socialist system that mandated access to education to all, literacy is 94%. The current total ICT workforce, which is estimated to be less than 20,000 strong, is a small fraction of the overall 40 million strong working population. New IT-trained college graduates account for 2,500 workers per year. However, computer training is expanding at a rapid rate and is the second most popular subject (after English) for college students. The government plans to expand the ICT workforce to 50,000 by 2005 through incentives and programs.

Traditional universities and new institutions are forming ICT training facilities. There are nearly 250 training centers in Vietnam in 2003 or varying levels and quality. Interestingly, Indian companies like NIIT and ApTech have begun training programs in major cities. The Japanese International Cooperation Agency (JICA) is supporting an e-

learning Center outside Hanoi and advising on curriculum design at the University of Hanoi. Fueled by grants from the International Finance Corporation and other international agencies, Australian and US universities have begun offering training in partnership with local universities. For example, the United Nations[7] supported a project to support of a trade promotion and export development strategy; and the 2001 ADB project ($7.5 million) for the Royal Melbourne Institute of Technology (RMIT) in Ho Chi Minh City. The World Bank has been supporting the Global Development Learning Network (GDLN) as a distance educational tool. GDLN is a partnership of organizations drawn from all sectors of society -- public, private, and non-governmental organizations [World Bank, 1999]. These organizations work together through a fully interactive, multi-channel network of modern technology - including satellites and the Internet -- to provide distance-learning programs that serve development communities around the world.

This investment seems to be paying off for customers of software services in Vietnam. An IT executive from the prestigious biotechnology firm Genentech is quoted in *Computer Weekly* for the following remarks on outsourcing to Vietnam: *"Vietnam has good engineering resources and is extremely cost effective. The engineers are well adapted, can be trained to use new technology and are motivated to do a good job. They can be used to form a virtual software project team…"* In the same report, another expatriate software project manager says *"I have a team of 28 programmers working for me and the only management problems we encounter stem from workers trying to take on too much work because they want the experience and don't like to say no…"* [ComputerWeekly, 2001].

However it must be noted that a significant number of ICT trainees are likely to be less well trained than their counterparts in other Tier 3 and Tier 4 countries. This was tacitly acknowledged by the Deputy Minister of Education and Training, Mr. Tran Van Nhung in 2002 with his comment that *"We can meet the demand for IT trainees in number and partly in quality. However, to meet the requirements of quality we will have to do many things and make more efforts…"*.

4.4 Wages

Average per capita income in Vietnam is approximately $400 a year[8]. This coupled with 95% literacy rates and a youthful workforce makes it a competitive labor pool. Top talent for Vietnamese software programmers with JAVA and C++ skills earn $600 per month. Average wage rates for software development are estimated to be 90% cheaper than the US and roughly a third to a seventh the cost of similar labor skills in India. The Table below gives comparable wages from selected countries.

Country	**Software Wages (in US $)**
USA	65,000
China	5,000
India	5,000 - 7,000
Philippines	6,500 – 10,000
Pakistan	3,500 – 6,000
Vietnam	1,400 – 6000

Table 2: Wage Comparison. Sources: [Carmel, 2002], Computer Weekly, Economist Global Executive

[7]Project VIE/98/021 was supported by UNDP and UNCTAD.
[8] Source: The World Bank

However, in a study of Asian economies Vietnam was in the bottom tier in terms of ICT education and English skills [USAID, 2001].

4.5 Global, Regional, Geographic, Cultural Linkages

International sourcing requires buyers to have a thorough understanding of the markets and environments from where they source [Handfield, 1994]. This is particularly true for ICT and software services [Balasubramanyam and Balasubramanyam, 1997]. Vietnamese immigrants, referred to as "Viet Kieu" (Vietnamese living overseas), settled in significant numbers near the Bay Area in San Francisco. This diaspora effect has helped bridge the gap between the US and Vietnam. Also contributing to the linkages are US attitudes and familiarity towards the Vietnamese people. An entire generation of US baby boomers who lived through the Vietnam War either as GIs or protesters is now occupying positions of authority in US firms. As Vietnam opened its economy, US firms have been first to encourage the change and help local businesses. This is a significant advantage for Vietnam. *Computer Weekly* speculates that most European firms have been slow to spot Vietnam's potential in part due to their lack of familiarity with Vietnam [ComputerWeekly, 2001]. The single European exception is France – who's historical and linguistic ties to Vietnam might explain the large presence of France Telecom in the Vietnamese ICT sector. Traditionally close cultural connections with other large Asian markets like Japan and China bode well for Vietnam.

4.6 Technology Infrastructure

The government agency VNPT controls the telecommunications sector in Vietnam. An ambitious program of modernization and expansion of the telecom system is underway with the opening of several digitized exchanges. There are in excess of 2.6 million telephone lines in the country with a main line tele-density of 3.3 per thousand population. Cell phone lines are fewer in number with less than 750,000 mobile phone users. Vietnam has traditionally had some of the highest international telecommunications costs in the world. However progress has been dramatic. Nearly 1.5 million of the 2.6 million lines were installed in less than two years. Annual international call volume has multiplied by a factor of ten between 1992 and 1997. Today, 2.048 Mbit/sec lines connects Vietnam to the US, Hong Kong and Japan. VPNT has committed to invest $500 million to upgrade the telecommunications infrastructure [US Department of State, 1999].

There are 5 independent Internet service providers in the country serving 175,000 Internet users in 2002 and 45,000 paying subscribers; however, Internet penetration is expected to reach less than 2% of the population by 2005[9]. To put this in perspective, more new users in the US sign onto Internet services in a day than over a two year period in Vietnam. Clearly, Internet penetration is relatively low compared to other parts of Asia (China had a 50% growth from June 2001-June 2002, with 32.8 million subscribers). Personal computers have penetrated into less than 1% of the population with an estimated 750,000 PCs in Vietnam in 2001. Table 3 below summarizes capital investment trends from 1993 to 2001 in key areas of technology infrastructure.

[9] Source: Vietnam Network Information Center (VNNIC)

Spending (US $M)	1993	1994	1995	1996	1997	1998	1999	2000	2001
IT Hardware	$118	$136	$166	$225	$317	$167	$191	$235	$265
IT Services	$10	$13	$17	$20	$36	$23	$25	$24	$30
Telecom	$160	$264	$512	$701	$921	$1,061	$1,426	$1,589	$1,709

Table 3: Related Industry Spending Trends
(Source: Digital Planet 2002, WITSA publication)

4.7 Industry Collaboration

The five factor model suggests that coherence in national policy and strategy for the ICT sector is a critical factor in determining national success. An important aspect of this coherence is the presence of a strong consortium, trade or industry association like NASSCOM in India or the Irish Development Authority in Ireland that works towards building international awareness and publicity for its ICT sector. In this regard, despite the presence of numerous government agencies and ministerial activities, Vietnam does not appear to have a strong, single-point of outward-bound marketing organization for software services.

4.8 Finance

As detailed in other sections of this paper, investment in the ICT sector involves multi-lateral sources of investment – private firms, government spending and international agencies. This is clearly a positive factor for fueling growth of Vietnamese companies for the foreseeable future.

However Vietnam's financial market is in its infancy. The stock market was created in 2000 and had only 12 stocks listed in April of 2002 with a total market capitalization of less than $100 million. The stock market is also highly regulated by the government in terms of trading volume, listing requirements and international holding. While several companies have sought listing in the stock markets, only The Saigon Post and Telecommunication Company is an ICT-related firm. The traditional incentive system in Tier 1 countries like India or Israel, where ICT firms lead their stock markets, issue NASDAQ stocks and sustain the ambition and growth of investors, employees and partners, is currently absent in Vietnam. This is unlikely to change soon. International financial firms expect that reforms will continue and the market is likely to grow, albeit slowly in light of the heightened awareness of risk in emerging markets.

4.9 International Benchmarking

Carmel's research points out that countries wanting to signal world class quality and build their software services marketplace have successfully leveraged international benchmarking - particularly by climbing up "levels" in the Software Engineering Institute's (SEI) Software Maturity Model [Carmel, 2002]. Not surprisingly, the SEI reports that 23% of offshore firms are Level 4 and 5 versus less than 8% of US firms [SEI, 2002]. In the 2002 study of 2,325 assessments of software maturity, less than 10 were done in Vietnam with no firms reported to be in Levels 4 and 5. This does not bode well for Vietnam, particularly in light of the fact that other Tier 4 nations like Pakistan are aggressively seeking the SEI's higher rankings in their bid to capture the attention and market share of the competitive ICT services industry.

5. CONCLUDING REMARKS

Overall, the Vietnamese ICT business is becoming internationally competitive – spurred by local demand, strong national commitment to software and ICT, cost-effective human capital, good international linkages, and a growing financial base. However, Vietnam is starting late compared to other parts of the world and coming to market during a global technology slow down. It needs to find the will and resources to keep improving human capital and infrastructure even to maintain their current level of competitiveness. It lacks strong industry institutions and does very little international benchmarking. Couple this with an infant stock market, a non-English speaking work force and governmental oversight and the picture looks less rosy than before.

Despite the challenges, Vietnam's aspirations to become a global ICT player are undeterred. Government policy, multi-lateral institutions, local entrepreneurs and expatriate businessmen seem aligned in their goal of turning rice paddies into Silicon Valley. It remains to be seen whether their vision will be fulfilled. Regardless of the outcome, Vietnam is worth careful observation and study for investors, corporations, multi-lateral organizations and academic researchers alike.

6. REFERENCES:

Ang, S. and Straub, D. (1998) Production and Transaction Economies and IS Outsourcing: A Study of the U.S. Banking Industry, *MIS Quarterly*, **22**, 4, 535-552.

Balasubramanyam, V.N. and Balasubramanyam, A. (1997) International Trade in Services: The Case of India's Computer Software, *World Economy*, **20**, 6, 829-843.

Carmel. E. (2002) *The Globalization of Software Outsourcing to Dozens of Nations: A Preliminary Analysis of the Emergence of Third and Fourth Tier Software Exporting Nations*, IFIP Conference Working Group 9.4 Paper, Bangalore, India.

Carmel, E. and Agarwal, R. (2002) The Maturation of Offshore Sourcing of Information Technology Work, *MIS Quarterly Executive*, **1**, 2, 65-77.

ComputerWeekly (2001) Coding in the Mekong, *ComputerWeekly*, August 2.

Diromauldo, A. and Gurbaxani, V. (1998) Strategic Intent for IT Outsourcing, *Sloan Management Review*, **39**, 4, 67-80.

Handfield, R.B. (1994) US Global Sourcing: Patterns of Development, *Journal of Operations and Production Management*, **14**, 6, 40-51.

Heeks, R. and Nicolson, B. (2002) *Software Export Success Factors and Strategies in Developing and Transitional Economies*, University of Manchester, Institute for Development Policy and Management, Paper # 20020-12.

Hung, S.-C. (2000) Social Construction of Industrial Advantage, *Technovation*, **20**, 197-203.

Hill, C.W. (2003) *International Business: Competing in the Global Marketplace*, 4th Edition, McGraw-Hill Irwin.

InfoWorld (2001) The United States IncreasesOoffshoreOoutsourcing, *InfoWorld News*, March 5.

Porter, M (1990) *Competitive Advantage of Nations*, New York: Free Press.

SEI (2002) Process Maturity Profile of the Software Community, 2002 mid Year Update.

Tung, L.T. (2002) *Ho Chi Minh City Informatics Association Presentation*, ComputerWorld Expo, Ho Chi Minh City.

UNDP (2001) *UNDP Support for Poverty Reduction Strategies*, Development Cooperation Report, UNDP-Vietnam, 55-59.

USAID (2001) *Vietnam: ICT Assessment Final Report*, USAID Asia Near East (ANE) Bureau Sponsored Study, September.

US Department of State (1999) *Vietnam Trade Reports.*

World Bank (1999) *Vietnam Country Framework Report on Private Participation in Infrastructure*, World Bank Publication.

World Information Technology & Services Alliance (WITSA) (2000) *Digital Planet 2002*, February.

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