Software Quality Practice in Singapore: Is It Adequate for Today’s Global Information Systems?

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Information Technology (IT) is recognized as one of the important sources of new business for the Asia Pacific countries to grow in the global market place. Riding on this growth, many Asian nations are trying to establish software hubs. However, it is important for software organizations to recognize that product quality is the way to sustain their competitive edge. Indeed, the need for quality improvement is also an important element of long term survival.

The objective of this study is to investigate the extent to which software quality is practiced in Singapore, and the challenges that Singapore faces in establishing itself as a software hub to compete in the global market. The exploratory study, conducted among companies in Singapore which develop software, is based on two guidelines: the ISO 9001 standards and the Software Engineering Institute (SEI) Capability Maturity Model (CMM) for Software. Although currently, Asian software developers may not have the prerequisites to meeting international quality standards, nevertheless, they may still have certain advantages in selling their software globally.

Most countries in the Asia Pacific region have recognized that information technology (IT) is one of the key sources of generating new business for globalization. Along with strong economic growth (in Asia Pacific countries) arising from the deregulation of industries (for instance in telecommunications), trade harmonization and liberalization, it is clear that the Asian software industry would see double digit growth over the next decade. Indeed, sales of software for personal computers (PC) reached US$1.14 billion in the Asia Pacific region during 1995, a staggering 57 percent growth rate over 1994. Software sales revenue may have been even greater if not for software piracy that costs US$44.7 million in 1994 (Agence France-Presse International, 1995). The German-based SAP, a world leader in client/server enterprise application software, expects revenue growth for Asia to leap 140 percent in 1996, and grow by 100 percent annually over the next five years (Straits Times, 12 July 96).

To further support the unprecedented growth of software industries in Asia, various governments in the Asia Pacific are emphasizing and prioritizing the building of their national information infrastructure so as to take their economies into the next millennium of growth and competition (Tan, Bui and Blanning, 1996). For example, it is well known that Singapore’s economic growth has been largely attributed to its very comprehensive IT vision, plans and strategies. Malaysia is developing the Multimedia Super-corridor to achieve its Vision 2020; Thailand, is not far behind in building an information infrastructure for social equity; and even Philippines is not loosing out either - its IT strategy is aimed at enriching its economy and society.

It is clear, therefore, that Asian software development is on a fast-forward track. However, the size of the Asian software market is still relatively small compared to the European and U.S. software markets. In 1995, Asian software sales amounted US$13 billion (Millin, 1996). However, beginning 1994, software sales had already risen to US$80 billion in Europe (Bellin et al., 1996) and US$35.2 billion in the U.S. (Computer Business Review, 1995). By 1999, the Asian software market is projected to grow to more than US$24 billion (Millin, 1996). In comparison, the U.S. software market will swell US$71.1 billion by 1999 (Computer
Nonetheless, Asian software development is coming of age. Japan is setting up a consortium comprising seven major companies to develop software for information networks (Straits Times, 17 Jan. 95). Hong Kong is establishing a science park and technology center to build software for cyberspace (Straits Times, 7 March 96). Taiwan now creates and bundles specific software with the hardware. Singapore is focusing on security systems for electronic commerce on the Internet. Of course, India and China are fast developing their software hubs, too. For instance, while India’s annual increase in software sales is growing at a rate in excess of 125 percent, China's software industry recorded an explosive growth rate of 189 percent in 1995 (LaPedus, 1996).

Asia has been a fertile ground for American and European MNCs to develop their software, and there are many reasons for the explosion of the Asian software industry. First, there is cheaper labor in Asia, compared to the United States or Europe. For example, the programmers in India typically earn about a quarter of what their American counterparts make. Second, there is the untapped potential markets in the developing countries of the Asia Pacific. Also, Asian software may suit their Asian users better than those developed in the West. Third, the different time zone allows projects to be worked on round the clock, hence providing a shorter delivery time.

However, there are just as many reasons that Asian software may not be attractive for the global market. Software piracy is one main concern, but more important is whether Asian software could match the world’s quality and standards. Countries exporting software, and especially those exporting to the European market, must meet mandatory quality requirements. The most notable standard is that of the International Standards Organization (ISO), that issues the ISO 9000 series; others include TickIt, a British standard, the Capability Maturity Model (CMM) of the Software Engineering Institute (SEI), and Software Process Improvement and Capability dEtermination (SPICE).

It is interesting to note countries which are seriously developing a software export industry have also incorporated some quality enforcement by establishing their local institutions. For instance, there is the National Association of Software and Service Companies (NASSCOM) in India, the Software Production Control Board (SPC) in Japan, the Software Quality Research Institute (SQI) in Australia, and the International Standards Organization (ISO 9001) IT certification scheme adopted by the Singapore government in 1992 as the symbol of IT quality. This scheme, administered by the National Computer Board (NCB) and the Singapore Institute of Standards and Industrial Research (SISIR), gives recognition to companies for having properly planned, designed, established, maintained, and implemented quality management systems in software development in conformance with the requirements of ISO 9001 standard.

Does the growth of the huge software market suggest that Asian software developers or companies could compete globally? Can Singapore or even India or China meet or conform to world class standards? Do these Asian software houses have the necessary software quality management systems incorporating process improvement techniques and state-of-the-art tools? What are the concerns in not having quality management systems? This study will provide insights into these issues through an exploratory investigation of software quality practices in Singapore, based on two guidelines: the ISO 9001 standards and the Software Engineering Institute (SEI) Capability Maturity Model (CMM) for software development. As Singapore has a rather mature approach to developing and implementing IT since the 1980s, and often serves as a “consultant” to her neighbors, this study may also provide some indication of the level of practice of software quality management systems in neighboring developing countries. It must be noted that the results of this study cannot be construed as representative of all Asian countries.

**Importance of Software Quality Assurance**

According to a study by Niederman et al. (1991), software quality is one of the key issues facing IS management in the 1990s. This issue is of particular significance with increasing applications of information technology being applied to critical areas like medicine, aircraft, transport, and defense, which affect safety of lives and security of nations. Poor quality software is no longer tolerable. In his book, Peter Neumann (1995), provided many examples of how failed or poor quality software culminated in catastrophic disasters claiming human lives.

In the commercial world, just as good quality software provides strategic advantages, poor quality software is especially problematic and disruptive. In February 1994, Chemical Bank in the United States found that it has deducted US$23 million by mistake due to an error from a single line of code in an updated computer program (Straits Times, 19 Feb. 94). And nearly one year later, in January 1995, the Singapore POSBank cardholders were left in the lurch due to a software problem in the ATM networks. Citing another example from Singapore, on the 12th October, 1994, the Singapore telephone lines were disrupted for several hours due to bugs in the software. Ironically, the new software was installed in an attempt to improve telecommunication services!

Jobber et al. (1989) found that software vendors that have a software quality assurance certificate add value to and increase customer confidence in the software product. The Japanese quality experiences (Schumeyer, 1990; Hames, 1991) show the strategic importance of quality in raising the competitiveness of a country, its companies, and its workforce. It was noted in general that stock prices of companies that embraced the quality concept grew at a 16.9 percent compound annual rate (AT Kearney, 1992). The National Productivity Board in Singapore in a study entitled “1992 survey on cost of quality” reported that 43 percent of companies surveyed had significant impacts such as increased profitability, lower costs, and larger market share as a result of their quality initiatives.