CHAPTER 1: Introduction

In this chapter the items related to this research project (thesis) will be discussed. The items that will be included in this section are as follows:

- the objectives of this report,
- the scope of this report,
- the software quality standards problem that will be address by this research,
- the research methodology that will be used in this report, and
- the literatures review (in general) relating to the reports topic.

1.1 Introduction

This report will attempt to determine, from empirical deduction, as to whether the current ***Software Quality Standards*** meet today's need. In addition, it will attempt to determine what changes (if any) are required to the current ***organizational decision structure*** to meet the needs of the future IT challenges. In this research the terms "*organizational decision structure*" and "*organization structure*" will be used interchangeably. Both will mean the same thing and refers to the organizational power structure (example the flow of authority rather) rather than the physical structure of the IT department.

This thesis is divided into 5 Chapters. Chapter 1 (this chapter) will include: objectives and scope of this report; the software quality standard problem that will be address by this report; the research methodology to be used and; a literature review (in general) relating to the topic in discussion. Chapter 2 will include the definition of the standards and concepts related to this research. In chapter 3, the SWOT analysis (strength, weakness, opportunity and threats) will be documented. Chapter 4 will document the IT organizational structure analysis relating to software standards. Finally in chapter 5 the recommendation and summary of the report will be presented.

1.2 Scope and Objectives of the Thesis

Some of the existing software process standards are: ISO series, SEI-CMM, DoD Standards, IEEE/ANSI, ISO/IEC TRS9294-90, ISO/SPICE and JIS X. The scope of this study will be confined to the main 3 international standards that identify software quality standards. These 3 standards are ISO9001 (subsection 10), SEI-CMM (Software Engineering Institute, Capable Maturity Model) and SPICE (Australian Quality Standards). Greater emphasis will be made on ISO 9000 and SEI CMM than on SPICE, since SPICE is still new and not many firms are using it. The reason why these software quality standards are chosen is because of their recognition, scope and spread of application in the software industry and functions. Since the organizational

structure is an integral part of these software quality standards, the IT organization will be analyzed/reviewed too. An empirical deduction will be made as to what general characteristics of the IT organizational decision structure should have. As mentioned earlier the physical structure of the IT organizational structure is out of scope of this research.

The key objectives of this project will be addressing the problems discussed above and mainly will be:

- To provide the challenges of ISO 9000 and SEI and other software quality standards in Malaysia
- To provide a comparison between ISO9000 and SEI CMM – by looking at the conflicts and the synchronization between these standards.
- To recommend the key characteristics/attributes that are required of an IT organization structure to fits/meets all the above quality standards.

1.3 Software Quality Standards Problem

Observation Analysis: Typical scenario: APIS will take about 5 day to create an software application to produce a simple management report. A similar report can be generated within a day by the country IT department, but the reports produced by APIS could be used by all countries, whereas the Country report needs to be modified before it can be used by other countries. The software applications by APIS may be over-tested and documented on the other hand the software applications created by Countries are normally under-tested (with minimum testing). In addition the software applications created by APIS may go from hand to hand unlike that of Countries' software application goes to one person. The 'total' cost for both these cases would be higher than that done with continuous improvement processes in place.

Another scenario: (inter functional issue within IT) an operation group manager have just purchased a software and wants to unload 6 Informix database into one ASCII file. Goes to IT functions – no resource. Goes to

BSD functions – estimates that it will only be looked at after 1 month. How to handle this quick fixed and effort that will bring about immediate return to the business?

One of the greatest challenges faced by a firm is trying to balance the software quality standards requirements and at the same time trying to meet the ever-changing business requirements. Quality standards are often viewed as a bureaucratic process by the user community, and often enough IT specialist has used it to put a blame on the delay in the project deliverable. Big corporations, like IBM, with the best quality standards in the world, has miserably failed in businesses, because it was slow to react to the customer's changing requirements. New companies like Microsoft who were poorly certified poorly by SEI, have instead defined their own internal standards and profit vise overtaken[1] the 'once' corporate giants (like IBM) with their ad-hoc approach to software problem solution. On the other hand, there are sufficient documented cases that show that lack of quality standards prove to be disastrous. So where is the break-even point for a balance in software quality standards and business focus? One point to be noted is that: those who have adopted ISO or/and SEI standards have found beneficial, though the degree of benefits varied from firms to firms, but all had used it to garner more customers (and it has worked).

Another factor, that is effected by the software quality standards, is the IT position within the firm organization. IT (then called EDP) was born as an integral function of the Finance functions, mainly because the first system ever to be computerized in a large scale was the finance systems. As the IT scope increased, the IT functions were born, but the IT functions still built itself around the IT functions (such as Planning, Development and Support) rather than the business functions. Then came decentralization, and the concept of 'Regional and site IT' evolved. As Managers understood IT more and used it as a competitive tool the IT function started to build around

[1] *Though one point of consideration is that Microsoft target market is not the same as that of IBM but the technology is making the larger computer (such as Mainframe is becoming scarce now and only confined to very large corporations)*

business function (such as Finance, Shipping, Purchasing). The introduction of IT out-sourcing further introduced complication. Occasionally the major complains in the corporate world is that the IT functions work with its own objectives which are somewhat different from that of the companies. The question we will ask is how to place IT within an organizational structure, in order to make it a competitive edge.

Some of the questions this study will attempt to answer will be:

(a) Are current existing standards overstated/over-defined and does not meet the current needs?

(b) Are today's quality standards adding a massive bureaucratic process into IT?

(c) Many of the organizations who have been rated SEI level 2 are major players in the market – will they loose their edge in the future?

(d) Will the current quality standards be applicable in the next millennium?

(e) Are software quality standards meeting business needs?

(f) Are quality of new programming language and concept (such as the 5th GL, Object oriented languages, Artificial Intelligence, Expert System, Virtual Reality, client-server) realize and address sufficiently by our existing standards?

(g) Quality check on quality tools. Many of the organizations purchase tools that are "certified" up to a certain standard of quality. Are these tools audited?

(h) The future development will emphasize precision and speed – does our current quality standard have this provision?

(i) Do the quality standards have a provision to balance between quality need and business needs?

All the questions above are associated with the first questions of this research report. This research project will attempt to answer all the questions listed above.

1.4 Research Methodology

The research methodology used in this report is purely analysis based on published articles/journals. This report will be dependent on the secondary data that are gathered and recorded in journals or published books. In additional cases studies which will focus on 2 multi-national organizations will be carried out. Most of the data collection mechanism for this project paper will be derived from the journals and IT literature.

This report assumes that the main software quality standards are ISO and SEI, and SPICE is the new emerging software quality standards that need to be considered.

The approach that will be taken to achieve the above will be as follows:

- To define the quality problem
- To define the existing Software Quality Standards
- Perform SWOT analysis on the software quality standards
- Analyze the current IT organization within the company selected
- Analyze the current software development trends
- Provide recommendation to improve the current software quality standards

This report will make references (if any) to the 5 organizations listed below. The names of the companies are with held-until approval is obtained.

(a) ABC-Malaysia — ABC-Malaysia is a semiconductor Company based in Malaysia with its headquarters based in US

(b) DEF-Corp. — DHL is Brussels bases Air Express firm which operates in 200 countries and with its offices in 8,000 cities, branches all around the world.

(c) GHI-Corp.	GHI-Corp (a subsidiary of DEF-Corp) is the regional IT center in the country based company in Malaysia
(d) JKL-Malaysia	JKL-Malaysia is the Malaysian based country office of the DEF-Corp.
(e) MNO-Corp	MNO-Corp is a software house based in India. GHI-Corp has form a partnership by out-sourcing it's software development to this firm.

A summary of the firms can be found in appendix E.

1.5 Literature Review

In this chapter the general views regarding software quality system will be discussed. Quality and Software Quality will be defined.

Software is increasingly becoming the key player in most industries. Stan Davis and Bill Davidson (Peters, 93) envisioned that by 2020, 80 percent of business profits and market value would come from that part of the enterprise that is built around info-business. In other words this means, IT will be the key role player in the future business. We might see a shift in organizational decision structure and quality focus will be shifted from the inventory management of material and product to the inventory and management of information. This is a good enough reason for us to review Software and its key attributes of quality to ensure we are ready for the 21 century challenges.

There are many existing software quality standards. Three of the most common are ISO, SEI and SPICE. The ISO 9000 and its series (specifically the ISO 9001) have been the most commonly used in ensuring software quality in Europe and Britain and also many parts of Asia (such as Malaysia). SEI/CMM, an American version of software quality is very widely used by US

and major US corporations based overseas. SEI-CMM use is currently on an upward slope as compared to ISO 9000. Finally the SPICE, which uses CMM as its base has a smaller circle of users. Many firms embark on having quality software systems to better manage and create more cost-effective software systems. ISO 9000 ad SEI are the international efforts to develop international software standards in order to meet these requirements (Braun, Edelstein, 94).

There are many documented literatures available that supports the use of ISO and SEI standards in software quality control. But at the some time there are growing concerns. Some of the concerns are as follows:

- CMM Key Process Area Miss-match (Paulk, 94)
  No research on SEI-CMM must be without the review and feedback of Paulk's comparison of the ISO standard with the SEI standards. Paulk was one of the key players in defining the standard for the new version of CMM (version 1.1 and 2). The version 2 of CMM had some of its Key Process Areas (KPA) rearranged because of the earlier weakness in the CMM v 1.1 model. These changes were highlighted in the Paulk study and in addition he provided a detailed analysis of each CMM KPAs and ISO 9001 (20) elements. This conclusion was focused on what was available and did not look in other areas.

- Process Evaluation inability (Simmon,96)
  One of the example is presented in Simmon's study that produced the framework for measuring information technology (IT) to improve business performance. This study provides a useful framework of the business benefits of good software and can be used with a different justification method and in different organizational contexts. It can help companies to determine another dimension of the quality of an information system, namely, its outcome. The study views software quality wherein the benefits derived are such as increased efficiency, increased effectiveness, adds value, marketable product, and development of corporate IT infrastructure.

ISO & SEI do not seem to have followed this evaluation process – rather they take it from the technical perspective

- Inability related to Object-Oriented (Hatton,97)
  The choice of programming language and the use of object-oriented technology has little influence on system reliability. Formal methods only improve software reliability if used with other techniques, such as effective testing. ISO 9001 and level of integrity do not have a big influence on intrinsic product quality. The defect density initially falls as a component size is reduced, but as the component size falls to below the 150-250 line range the defect density begins to increase. Finally, the influence of re-use is a very complex question to which there appears to be no simple answer.

- One study showed how the company improves their customer service and ultimately ending with the ISO9000 certification. Most ISO certification are initiated the other way round – getting ISO 9000 then 'hoping' the service level will improve. This fallacy approach is the great price many organizations are having. This calls for a review of the existing software quality standards and ensures it caters for the technological growth and fits the business needs.

- Inability of ISO to address out-sourcing (Rijsenbrij & Bauser,93)
  Both ISO 9001 and SEI CMM limits itself to the in-house software development or contract software task, but fails to address the new emerging trend, outsourcing. Unlike sub-contracting (where the relationship is that of vendor-supplier), out-sourcing is built on a partnership alliance. Rijsenbrij & Bauser (93) calls for a highly flexible quality system for such a software house, to allow there be sufficient freedom to incorporate the specific/additional quality requirements of the customer.
- Coallier's study shows how ISO 9001 (Coallier, 94) fits into the software world. He further gives the advantages and disadvantages of ISO

9001/9000-3 certification for software companies. These are described and compared with capability growth processes, such as the Capability Maturity Model of the Software Engineering Institute.

- New articles such as Edmund's "Control quality" (DeJesus, 1996) are showing alternative ways to achieving quality in client/server relationships. These new measurements do not have sufficient cases to be covered by the ISO9000 and other quality standards New tools and strategies make it possible to simplify, automate, and generally lessen the stress of achieving quality in client/server applications. It is recommended that ISO and SEI can come up with standard on how to achieve high-quality design, development, and testing procedures in this areas.

- The document process is highly and strongly linked to ISO and SEI. Tools like electronic document management system (EDMS) (Grasso & Gibson, 96) provide opportunity for automated handling of documents giving companies stay competitive.

- This Plenary Panel addresses a number of issues on selected topics regarding the future of software engineering standards (Poon,1997) . Examples of the topics are:
    1. Integration of systems engineering and software engineering,
    2. Market forces influencing the future of software engineering standards,
    3. Software process improvement and capability determination in the new millennium,
    4. A new concept for compliance of software engineering standards,
    5. Requirements engineering and consolidation of software engineering standards,
    6. Adoption of standards by industry. For each of the above topics, a number of specific issues have been identified and presented here.