CHAPTER 3: Software Quality SWOT Analysis

In this section a SWOT (strength, weakness, opportunity and threat) analysis will be performed on the existing software quality standards in discussion. This SWOT analysis will form the basis for the recommendations to be made in the later chapter

3.1 Software product Attribute & IT Dimension impact

Before we go on further it is mandatory to review the attributes that determines the software product quality. Some of the main software quality attributes that can be used to measure the software quality levels are as follows

- defects
- consistency & accuracy
- software development cycle times
- portability & expendable
- response time

The number of defects will how good a software quality it. No program is without defect, but the question is what is the acceptable defect level. So the level of defects is currently one of the acceptable method to determine quality of the software product. The software consistency and accuracy is another measurable attribute that determine the software product quality and is also the attribute used to measure software quality level.

The software product change/development cycle time is growing to be an important quality of a "quality IT service". This is a tangible service that comes with the tangible software application. In today's information world, If the product takes ages to be release – it looses its competitiveness and will be substituted with other product.

The ability to port and enhance software product is another software quality attributes that is been seek. The Information technology today has moved away from the proprietary application and rather many firm have software applications that's are purchase from more than 1 or 2 suppliers. In addition the response time of the software application has increasingly become a critical factor and is becoming an integral part of the software product definition.

Most of the 10 dimensions Beedan (97) identified, have direct or indirect impact on the IT quality. Though Beedan applied the 10 perspectives/dimensions to the marketing world but since IT is a seemly growing recognition to be an integral part of marketing – most of the 10 perspectives will have a significant and application to software. The 10 perspectives are defined as :

Based on this background we can summarize some of the dimensions that have an impact on the IT Quality.
In this research project the term 'dimension' will refer to the item that have direct impact on the software quality. The

- Organization
- Customers
- Hardware
- New technology

The organization is the most important part of the software quality model and can be the main deterministic of whether the quality can be achieved or not. The organization style, the organization structure, the organization strategy and firm focus will normally have great impact on the quality initiatives. The customer is the reason for the quality initiative and hence is the another deterministic of quality. If the customer are non-quality awareness is low then

the level of the quality drive will be low. In short, customers' changes requirements on Quality.

Since software and hardware are going together very integral the hardware component has a significant impact of software quality. For instance if we take the telecommunication line that connects 2 country offices. In the case of DHL that have a WAN environment, there are many recorded cases where the response time is below the expected value and it is perceived that the software quality has failed but in reality the telecommunication has failed the software. New technology for both the hardware and the software has a significant impact on technology. New programming tools, new programming methodology (such as RAD), new have significant change the face of quality model and the level of quality requirement and expectation have move higher.

3.2 Software Quality Standards Analysis

It can be considered that the CMM looks at the organization from the macro view whereas the ISO 9000 views the organization from a micro view. CMM tends to look at specific processes in a particular order (for instance at level 2 the requirement, CSM and review process are looked at) whereas ISO looks at the process without considering the other processes.

Gilhooley (1987) stated categories that need to identify and assess "Emerging Technologies and Auditing". The 4 categories are

(a) hardware and firmware,
(b) software and languages,
(c) Communications, and
(d) systems development and maintenance methods.

All these categories are not fully handled by the existing standards. A major trend is greater connections between hardware, software, and communications. He calls for a need for corporate awareness of issues as

they relate to auditability and control in these 4 areas. The hardware and firmware has somewhat never been discussed by the ISO/SEI standards.

3.3 Comparison between ISO900 and SEI

ISO 9001 and CMM have a strong correlation. Paulk (94) has done a good comparison of ISO 9001 and sw-CMM[2]. With the support received for his study (by SEI, Carnegie University) it would be pointless to repeat his effort. Furthermore his was sponsored by the US Functions of Defense (also the sponsor of SEI). This research will use Paulk's report as the base for comparison.

Here the comparison will be only done between ISO 9000 and SEI and not include ISO 15504 since ISO 15504 is a new standard that is still in the drawing board.

Lately (in the late 90's) there are more articles/studies that have shown the comparison between ISO 9000 and SEI/CMM. The SEI/CMM for Software, was intended to be a coherent, ordered set of incremental improvements, all having experienced success in the field, packaged into a roadmap that showed how effective practices could be built on one another in a logical progression. Judging by its acceptance in the software industry, the CMM has already been a major success. However, CMM is not without its critics (Herbsleb, Zubrow, Goldenson, Hayes & Paulk, 97). The debate is partly concerned with scope, policy issues, and conceptual questions (such as whether the model harmonizes appropriately with international standards such as ISO-9000), but also with the supposed consequences of adopting CMM as the basis for software process improvement efforts. The results of SEI's efforts to test critical claims and assertions about the CMM are presented.

Some of the similarities between ISO 9000 and SEI

[2] *Note" 'sw-CMM' is the same as 'software CMM'.*

(a) ISO and SEI both are process driven software quality system
(b) Both ISO and SEI are very documentation oriented quality system
(c) Both ISO and SEI discourages Ad hoc software development and defines document process.

Differences between ISO 9000 and SEI

(a) SEI started with the software intention whereas ISO is a branch from the manufacturing
(b) SEI looks from a macro view whereas ISO 9000 tends to concentrate on some particular process (such as testing)

(c) SEI was original created for software quality standard, but ISO represents a general quality standard and software quality standards are subset of ISO.
(d) ISO 9001, deals with software development and maintenance, identifies the minimal requirements for a quality system, whereas the CMM emphasizes the need for a continuous process improvement. (Paulk, 95)
(e) The certification process of SEI follows a sequential process whereas the ISO takes a total score for all the process and determines the level of certification from there on.

SEI implementation starts from the organizational focus (top-down methodology) and has a wider implementation scope as compared to ISO which takes the bottom-up approach. Normally SEI certification is done at the organizational level whereas the ISO certification can be done from the functional level. For instance if the IT organization consists of the development and operation functional group. The SEI certification will be for the whole organizational level. Unlike SEI, ISO certification can be confined to a particular function organization. For instance, JKL-Malaysia had achieved ISO 9001. Certification for its gateway functions while rest of the function goes uncertified.

SEI certification process is more systematic than that of ISO. SEI certification process operates step-by-step to maturity whereas ISO requires all the process in place for an ISO certification. The step-by-step maturity is more realistic for firms that have no quality plan in place. Paulk (94) states that a SEI level 3 certification is quite equivalent to an ISO 9001 certification.

SEI-CMM (level 3) also tends to increase group involvement as compared to ISO. This is because SEI starts at the top level of the organization and implementation follows the top-down path, whereas ISO is implemented from a functional group with the impact on other functional group. For instance JKL-Malaysia gateway's function was ISO 9002 certified without much involvement of other functional groups (such as IT). In short, SEI takes a macro view in implementing its standards, whereas ISO tends to take a micro view in its standards' implementation.

SEI tends to be more pro-active than ISO. ISO is considered more of a documentation process. Both ISO and SEI puts focus on continuously improvement processes via metrics tracking/analysis, such as a defect analysis and estimates analysis. The SEI estimation forecasting and risk management requirements are explicitly stated as the key process area, whereas in ISO it is not clearly defined. SEI also has a better metrics tracking & an analysis process than ISO.

CMM is a better IT quality model than ISO (because SEI started with software quality base whereas ISO 9001 started as manufacturing base).

It is argued that some SEI's key process areas (KPA) are not defined in the correct levels. For instance the KPA for training falls in SEI level 3 and should be in level 2. Most of SEI issue (sort of the one just mentioned) is been addressed in the SEI CMM version 2.0 (which is yet to be released). Both SEI and ISO has the same objective of moving the firm from a people knowledge base to a process knowledge base.

One point worth noticing is that ISO started from the manufacturing background and as time progressed the software quality standards was incorporated. On the other hand SEI was created for tackling the software quality issue. For this reason SEI has a stronger software quality base as compared to ISO.

ISO recognizes SEI as a leader in IT quality, as the result, ISO 15504 (SPICE) standards were created based on ISO 9001 & SEI CMM v1.1. This is one of the factors that will be used to determine the firm choice – between ISO or SEI certification. On point worth noting is that, CMM takes longer to achieve than ISO because of its organizational application scope (assuming to reach to SEI level 3)

One of the other factor worth noticing is that ISO certification is required in order to have business with a European market. In terms of certification cost, SEI costs more than ISO 9001 certification (in Malaysia). The reason for this is because in Malaysia there is a local firm (SIRIM) that is accredited by the Government and ISO for their certification, on the other hand SEI certification is still US based. This have caused a very low level of SEI-CMM awareness among the Malaysian companies.

One area SEI-CMM is weak is in the purchaser-supplier product management practice which is soundly defined by ISO's. ISO tends to have a strong element in defining the integration of a 3rd party software .

3.4 STRENGTHS of the existing quality standards

Some of the strengths that exist in the (specifically) ISO and SEI software quality standards models have been listed below.

a) Quality models as marketing tool

ISO is seen as a major market tool, is becoming the factor for a market requirement for companies that wish to do business with the EC - competitive

edge. On the other hand SEI is the market requirement for those who wish to do business with the US.

b) Quality model international recognition

Both ISO and SEI have become nationally and internationally recognized Software quality certification systems in the European and American region respectively. In addition ISO standards tend to be more globally recognized. SEI/CMM though has a growing recognition but it has a bigger support as compared to the ISO in the United States – the biggest software market in the world. SEI/CMM has made a new breakthrough in recognition and one place is in Malaysia.

c) Quality Model with proven record

It is not a doubt that the existing software quality standards have improved the company's software quality level. The process of achieving ISO and/or SEI certification gives a firm opportunity to upgrade a company's standards and provide better service to its customers - because it forces a closer look at the quality aspects of marketing and customer support activities. The process of achieving ISO and/or SEI certification gives a firm opportunity to upgrade a company's stand.

d) Quality models provides consistency in IT measurement

Though the existing software standards do not define the IT measurement standards but it does support and enforce the measure of the IT key process indicators. These measurements though not universal, provide the IT organizations to use as a baseline to improve their organizations. Be it whether the existing standards are applicable or obsolete for the current times, they still provide some sort of measurement for quality and have helped in defining the interfaces with vendor and supplier much easier. This measurement have strengthen of the existing standards which has helped many firms in determining their outsourcing partnership. The GHI-Corp IT organization, selected their outsource partner by looking at their SEI CMM certification level.

e) Quality Models enables to increase group involvement

All quality standards require the participation of the entire organizations and hence the certification process is also able to increase the participation of groups involvement in the quality process, foster stronger sense of quality ownership among the employees in an organization, it enables the recording and integrating of individuals know-how into company know-how. As has been discussed, SEI has a wider application scope as compared to ISO.

f) Quality Models encourages Documentation and recording habits

Though documentation is loitered by most and tends to prolong the process execution time but there is a good intention behind it. This strength has helped the out-source areas to define the scope effective and since the documentation is shared by 2 different organizations, the quality of the documents improvement. If you ask most of the document creators as how often the documents are created before the actual work is performed, the answer predicted will be alarmingly negative (propose survey area).

g) Quality Models have good software testing focus

One of the greatest strength that is directly related to software development is the quality guideline on testing. Both SEI and ISO have good coverage on testing requirement (with ISO's testing coverage a much more in details).

h) Quality Models creates an organized and controlled IT environment

Most of the Software Quality Standards tend to put IT organizations in a better position than what it was earlier and tend to increase the quality awareness and customers requirement for quality. This is fact can be easily confirm by analyzing an IT organizations or functions do not have any defined quality goals. A great change can be seen in these organizations when they pursue software quality standards. JKL-Malaysia was one such organization. Before 1995, JKL-Malaysia IT functions was operating without any standards or quality goals. As a result, countless applications were created, requires enormous amount of effort and cost to be maintained. In some cases it was beyond maintenance and hence have to be rewritten again causing rework and wastage of IT resources. With the introduction of IT quality standards

(within 2 years) the whole dept looks organized and with controlled environment.

i) Quality Models (SEI and ISO) are in line with TQM standards

SEI and ISO are in line with the TQM (Total Quality Management) requirement. TQM is a universally accepted quality framework.

j) Other strengths

The other strengths of software quality standards are that they create a quality audit environment, encourage moves towards automation (SEI) and can be a starting point for IT organizations to get started.

3.5 WEAKNESS of the existing quality standards

In this chapter the weakness in the existing software quality standards will be discussed. Unless specified, the weakness gathered below applies to all the 3 software quality standards in discussion (SEI, ISO and SPICE). This weakness will form the basis of the proposed recommendation that will be addressed in the following chapters. As much as possible the weakness will be related to the 'definition of the software quality' that has been adopted earlier.

a) Process driven, rather than 'process and product driven

The existing software quality standards are It focuses on Process rather than product. Its a model for Organizational Improvement with the underlying structure for "Reliable" and "Consistent" software process instead of the product too. It creates a process management and a quality improvement concept to the software development and maintenance. Again it is process driven.

b) No standard measurement for IT quality

With the increased portability and cheaper software there are now many applications off-the-shelf that are interfaces among one another. One of the

most frequently areas where system failure occurs are in the system interfaces / integration. This assumption needs to be confirmed via survey. Most of the existing software quality standards do not have sufficient rule governing the integration of systems. Currently, there is no standard rules to define this. A clear example is the handling of the 2 year digit field. MS Excel has 20 – windowing logic whereas Powerbuilder has it as 50.

c) No Software & Hardware integration into consideration.

All the existing standards do not consider hardware except of the variable in IT which is becoming an increasing new variable in the IT quality.

d) No standard measurement matrix for IT Quality

Though all the current software quality standards define their requirements and need to have measurement for IT quality, but it falls short in defining how these standards can be measured to improve productivity. If there are some guidelines available for the matrix then standards matrices can be devised instead we are now seeing hundreds of different ways of measuring just productivity.

e) SEI certification is in sequential

The SEI certification process is a set of a sequential step of 5 levels and these levels need to be achieved one at a time rather, and achieve some first and the other later. This view tends to take the software process flow of an organization as a sequential step rather than a recursive. So if a firm has a poor review process but strong requirement process the organization will still stay in level 1. This sort of certification process is very debatable as to whether it can really measure the IT organization quality standards. This shortcoming has caused some organizations with innovative tools and technology to be poorly reviewed and hence not certified to higher than level 1. Software companies such as Microsoft are not categories at level 4 but they have a bigger market share of the software industry than IBS who is categorized as level 5.

f) Increases bureaucracy in IT

Most quality standards tend to be preserved to be seen (by non-IT person) as an additional bureaucratic process in IT by implementing the approval and review processes. The impact of this is to increase in the software development time. 21st century will have different challenges. Quality standards will not vary much (because of automation) but speed will be the game. The approval and review requirement of both the ISO and SEI have create a layer of bureaucratic level, that requires 'human' approval. This could be reduce by have automated approval. Many views ISO/SEI as model that is pushing firm back to bureaucracy process. An organization that follows the "Political management style will tend to discourage ISO/SEI certification for their nature of operation style is very reactive. Formal systems give rise to a bureaucratic structure of rules and from are created and IT system is an automatic part of the formal system . An informal system gives rise to belief, meaning, intention and responsibilities (Dhillon & Backhouse, 96) .

g) Outsourcing factor not considered if not mentioned

All existing standards fail to address the IT out-sourcing. IT out sourcing has become a growing trend in the late 90's. The definition of out-sourcing is to create a business partnership with a vendor so that we take responsibility to provide that the service is responsible. For instance, APIS has out-sourced it's software development functions to MNO-CORP. ISO, SEI and SPICE do not have a guideline as to how to address the 'business partnership alliance' though they have taken care of software contracting (which is not based on the business partnership alliance but rather a buyer-supply form of relationship.)

h) CMM (/ISO) does not address all issues important for successful projects

The CMM is not a silver bullet (Brooks, 87) and does not address all of the issues that are important for successful projects. For example, the CMM does not currently address expertise in particular application domains, advocate specific software technologies, or suggest how to select, hire, motivate, and retain competent people. Although these issues are crucial to a project's success, some of these issues have been analyzed in other contexts (Curtis, 90) . They have not, however, been integrated into the CMM. The CMM was

specifically developed to provide an orderly, disciplined framework within which to address software management and engineering process issues.

i) No consideration of the environmental factor

The current existing standards do not consider the environmental factors such as the economical situation, the competitors, the technology innovation. If the competitors are producing software products, it will be an advantage for the company so as not to introduce software standards which will add additional overhead and constraint.. The new technology innovation is not enough or implied in the existing software quality standards. The 10 perspectives define in Beadon (96) namely: Global relationship, ethical, quality and value, productivity, ecological, entrepreneurial, executive and visionary are not fully in place in the existing software standards. This includes the introduction of the new tools.

Both SEI and ISO are not dynamic enough to adopt a new concept and methodology. Some of the new concepts which are not supported by the existing software quality standards are the CASE tools, Data warehousing. The current models of information system originated before the widespread use of Computer Aided System Engineering (CASE) tools. The aim of CASE is to automate part of the development process, thus increasing productivity and quality (King & Gallier, 1994) . Most CASE tools have almost build on almost the same basic assumptions. They have evidently improved productivity and reliability. Data warehousing is an old concept but looks from a fresh point of view. In definition, data warehousing is the storage of raw data in one location and kept in a 'data-normalized' orientation so as to extract information using the data extraction tools available. This mechanism to create a good data warehouse is very important because if it is not right the data retrieval can be very time consuming and hence costly. The tools that exist currently are very easy to be used and easily handled by users themselves. All the existing software standards have ignored this important aspect of IT.

j) One software quality standard for all

Mostly all software standards ignores the company business requirement, the company size, the company's nature of business . For instance a company that is in the floor industry do not need to have as high a quality standard as that in the air industry.

k) Assumption not as per 'current business requirement'

The existing standards were founded from the non business need of the past. The ISO 9000 is base on manufacturing needs, whereas the SEI/CMM needs are more on software development process requirement. They actually do not meet the current business needs.

l) SQA Role

Most software quality standards propose to have independent software quality assurance functionality. This is a very practical role in the manufacturing organization where the SQA person will also ensure the quality of the non-software related product (such as manufacturing products). But, the influence of the SQA diminishes when the firm business is purely software development and the managing director or the general manager has short led time to deliver customer software. This diminished SQA role is also the result of the business drive and the nature of the firm strategic policies. Rather than having an independent software assurance functional role is better to have software audits to ensure quality standards are preserved.

m) Existing Quality standards Ignores Firms nature of business

The existing quality standards tend to ignore the firm's nature of business and tends to apply the same quality standards all across the firms. In short these standards assume that the software quality requirements (from customers) are standards and same all across the industries. Is this correct? Many would agree its not. To prove this hypothesis we can take 2 kinds of software applications, first (a) an airline radar software and second (b) a home computer game software. It is very obvious that an airline radar software needs to have very high and stringent quality standards than compared to the

games software. The software products failure risk is not measured to the level of quality standards required.

n) Do not consider firms IT size

The existing software quality standards fail to take into factor that the IT organization is very small. For instance, Motorola has a small IT functions of 4 software developers. The impact is that the tester and the developer are different. Besides that the IT knowledge varies from the 4 (2 are Tandem base Cobol programmers, 1 is mainframe JCL/Nomad programmer, the other is PC base application expert. These wide ranges of knowledge base avoid a proper code review and an independent testing to be done. With these number sand available expertise the It application systems do not provide a good testing ground and review.

o) Ignore Corporate Governance of the Firm

Most of the existing software quality standards tend to ignore the company corporate governance of the firm that is the key player in determining the firm business Strategy. The business of the organization and the corporate governance of the firm (refer...). If the organization is in the air industry the firm is highly dependent on the quality of the business application which if it fails may cause disaster (for instance failure in the Radar system may cause air plane to crash.

p) IT Ethics not defined

Both ISO and SEI ignores the moral factor of software. Dakin (96) emphasizes that every programming shop should adopt and honor a code of ethics to help control the conduct of programmers in all the areas from programming to quality control and customer support. This is one approach to quality control and can be a tool used to deal disruption or destruction of businesses.

q) Does not consider software cycle-time as the driver

The business idea of software quality currently does not match the CMM or ISO9001 idea of software quality. Business (currently) views quality in terms

of reliability, availability and sustainability. Business need changes from company to company whereas the IT Quality requirement is preaching 'fix' across companies. Organization does take into consideration the business needs/requirement or the IT needs/requirement.

r) Does not provide means to measure ROI

One of the greatest disadvantages of SEI and ISO is there is really no 'Return on Investment' measurement for these two quality standards. What guarantee is there that the SEI and ISO quality standards will improve your business returns... it may improve the software quality but what does it provide the company in return. Most of the time the firms end spending more (out of profits) to support these software quality initiatives. The Europe requirement for ISO certification before entering the Europe market is a good incentive for the moment.

s) Not prepare for new challenges not address

Currently the IT industry is facing different kind of challenges as compared to the late 80's or early 90's. Technology factor, security factor, infrastructure design factor, software tools selection factor, hardware selection factor all have new faces in the nineties. The selection process is defined by existing quality standards, but ensuring the right selection is made is not defined by the quality standards. Some of the new emerging technologies are: RAD technology, CASE tools, OOP/OOD, AI and virtual reality.

RAD (rapid application development) (McConnell, 1996) is a new software development that focuses on delivering applications as fast as possible. The exiting software quality standards do not have a provision for this software development methodology. RAD tends to violate many of the ISO and SEI standards. The 4 dimensions (Steve 96) of RAD development are: (a) speed (b) people (c) Process (d) Product and technology. RAD methodology suggests that if the requirements are poor then Spiral or the prototyping software development paradigm is the end excellent approach. This is in contrast to SEI and ISO standards that require the requirement to be defined up front. This is a requirement for the waterfall or code-and-fix approach

(which is normally common) in the 3rd generation software language or the mainframe environment where the implementation of change control is somewhat tedious and time consuming.

AI or Artificial Intelligence is the new form of programming generation. AI software are applications that have knowledge base and expert system engine that is used to extract or expend the knowledge base system. It behaves like a human brain – except it does not forgets what it has learnt. This new programming language is not at all addressed by the existing quality standards. The usage of expert system is at many places still in the research level but there are already software products available in the market. One such product is the natural language processing product – which converts the English language to Japanese language and wise versa. The current setback of this programming style is that it requires fast computer and lots of disk space. The 21st century will see a greater use of the AI methodology when the computer speed and disk space has reached the acceptable level.

OOP is the object oriented programming tool. IN relation the OOD is the Object Oriented Design. These are new programming tools that reduce the software development life cycle drastically (sometime by 10 folds) and in additional have its own in-built software quality controls. Unlike the AI programming tool, this programming tool is currently widely used by many firms.

t) Unable to cope with the estimation methodology.

The estimation requirement is addressed by most software quality standards by Currently the IT industry is facing different kinds of challenges as compared to the late. Estimation methodology – not perfected to this point – only works if the project is more than 1 man year of effort. Function point estimation – is increasingly becoming important with outsourcing and estimation coming to play a major role. And also can be the point of conflict between the outsourcing partnership

u) High overhead to implement Software Quality standards

Both ISO and SEI need a certain amount of budget to be implemented and (later) to sustain this certification. For firm in Malaysia the cost can be quite substantial because of the lack of SEI/CMM expertise.

v) Too much emphasis on Testing

The current software quality standards tend to put too much emphasis on software testing. SEI tends to view software process in a sequential flow but in reality we know that IT does not follow the 'waterfall paradigm any longer. There are companies that have automated tools and able to develop software products that meet customers' satisfaction, but yet if they have a poor requirement mechanism that will not go higher that SEI level 1. It is not denied that software testing plays an important part of the software quality process, but with the emergence of the automated testing tool this takes a different shape. The question should not be whether the test was done – rather how much of the software functionalities were tested.

w) No control over selection and use of testing/Case tools

With the emergence of the relative cheap solution of CASE and Testing tools most of the quality requirements are absorbed in the tools itself. There needs to be a standard to address the selection process to meet these standards. CASE tools need currently follow their own standards.

x) ISO not actual created to address software quality standards.

One of the greatest weakness is that it tends to threat the software it was found on the physical product manufacturing and made suited for the IT organizations – treating it as a service organization. This has been recognized by the ISO organization and hence has resulted the emergence of ISO 15504 standards.

y) Software quality not guaranteed

ISO and SEI refines the process in achieving an IT development infrastructure for a good application requirement and analysis, but it fail to define the attributes of a good software application. We can have a great expensive

system that have automatic approval, auto PO generation, auto invoicing, but if we fail to produce the relevant reports to support these software application, the usage and the acceptance of the system will be difficult to be met. There were applications that were thrown away just because they were either too rigid for expansion or too tedious to enhance. Rigidity is not specified in IT standards.

z) Other weaknesses

Some areas in KPA fall under a gray area and are not strongly defined and depend on (assessors) professional judgements. Some of the KPA are not aligned according to the Level (a proposal for CMM v2.0). The other weakness is the degree of quality requirement varies from organizations to organizations. The air industry, radar tracking the satellite tracking requirements are associated with a high risk and require a great deal of controls and audit point. On the other hand a low level /cheap product such as the software program in the Barbie doll is practically risk free and a lower level is control/audit is recommended. The current quality model failed to link risk is degree of quality. It one model for all – high tech or low tech.

3.6 THREATS of the existing quality standards

A 1995 assessment of 440 organizations (Williamson,96) showed that over 70% of the organizations are still at SEI level one. One reason for the high rate of failure among IS shops is the high rate of scope creep due to changing user requirements. To get these demands under control, many managers use 'time boxing,' in which large projects are broken down into small steps, each with a specific deadline.

1. SEI assessment view an organization at certified level
2. SEI and ISO 900 do not really encourage "ad-hoc" and impromptu request.

Impromptu / Ad-hoc request has a "wastage" price tag in term of resources cost and effort. But is the ad-hoc request that bring about much of the change

within the business work. These are quality system. ISO 9000 and SEI view ad-hoc request or effort as a forbidden. This rule directly contradicts the new direction of "rapid development strategy" paradigm.

Some of the factors the ideal Organization must have are

- Long term IT strategy plan
- Short term Strategy plan
- Ad hoc and Impromptu strategy plan
- Business Planning – In line with
- Immediate business need
- Shorter cycle time to retrieve product

Both SEI and ISO does not bother whether the application is to be used for a short period or a long strategy plan of the company (e.g. infrastructure application). The development cycle time under the SEI and ISO depends on the size of the process (e.g. size of the final product) rather than the period the application is to be used. The development cycle time of the 'less' critical systems can be reduced by cutting some processes, such as a code review. By cutting processes – cost is saved, immediate business needs are met. One point that needs to be considered, there are many occasions that a temporary system can be a permanent system. In the case of DHL the SIS (Shipment Information System) was written in an ad-hoc (without proper documentation) and as a reporting system in 1980's in Middle East – while the finance system were dominating the IT world. Today SIS is one of the DHL infrastructure and is used worldwide by all the DHL worldwide centers. The initial cost and development time was small – today this product is engineered with full documentation and designed statements.

Backward re-engineering of an application system is now possible by the tools such as TI IEF (Integrated Engineering Facility). The object oriented language – does not follow the convention method of review and testing which ISO and SEI addresses. Both SEI and ISO falls short in defining the "data warehouse" concept .

SEI and ISO tends to create a more hierarchical structure than a less flatter organization – the direction of most organizations. It does not strongly support the "empowerment concept of TQM by creating the independent review and testing.

During the 20th Annual Software Engineering Workshop (McSharry, 96) an issue relating to the effect of process investment on software was debated. The panel that debated this issue concentrated on art versus engineering, with an emphasis on people, processes, tools, and technologies. Members of the panel included Tom DeMarco of The Atlantic Systems Guild, Jim Herbsleb of SEI, Dieter Rombach of the University of Kaiserslautern, Tony Wasserman of Software through Pictures fame, and Victor Basili of the University of Maryland. From the above section, it can be concluded that on of the probably threat to the existing quality systems is that they will become obsolete and may not meet the challenges of the 21st century.

3.7 OPPORTUNITY of the existing quality standards

To meet ISO 9000 certification requirements, software developers must know what the production process is and have inspection points at cleanly-defined breaks in the process. Unfortunately, few software producers are familiar with formal software inspection techniques or have a map of their software development process. For such producers, numerous changes will have to be made in the development culture (Inwood, 1993).

Quality monitoring is becoming an accepted method for purchasers, patients, and providers to evaluate the value of health care expenditures. Important advances in the science of quality measurement have occurred over the past decade, but many challenges remain to be addressed so that quality monitoring may realize its potential as a counter force to the demands of cost containment. According to McGlynn (1997), the Six challenges that need to be addressed are:

- balancing perspectives,
- defining accountability,
- establishing criteria,
- identifying reporting requirements,
- minimizing conflict between financial and quality goals, and
- developing information systems.

3.8 Summary of the SWOT Analysis

The SWOT analysis shows that in spite of the numerous weaknesses in the current Software Quality Standards – the strengths supersede the weakness and the weaknesses are of less importance.

It is worth noting the disadvantages or weaknesses of the SWOT analysis itself when making the final decision or conclusion. One of the greatest

weakness of the SWOT analysis is, it does not provide the weightage for the strength and weakness. For instance in this cases there are about 30 weakness as compared to the 10 strengths, but yet the decision is more in favor of the "strength" because the SWOT analysis fails to show the weightage in total. This SWOT analysis is overcome (in this research project) by applying judgment . The other disadvantages is that the SWOT analysis just give a snap shot of the current situation and does not provide an inside of the future situation of the analysis. To overcome this limitation, the 'future strength and weaknesses are to be considered in a different context.

Some of the other weaknesses of SWOT analysis tool is that it looks at the internal environment alone instead of external environment. , it ignores the vision/mission statement of the company (GAP analysis this better), it ignores future trends or conditions, it ignores the driving forces (Value analysis is better here) odes look at innovation ideas. Its approach lacks an explicit focus on strategic capabilities, differentiation and strategic advantage. Proposed to perform value chain analysis, PEST (political, economical, social-cultural and technological) analysis and Porter 5 forces Analysis for get a fair analysis of the Quality model.