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1. Preface

The HK Software Quality Assurance Model provides the standard for local software organizations (independent or internal; large or small) to:

- Meet software quality requirements;
- Improve on software quality practices;
- Use as a bridge to achieve other international standards;
- Assess and certify them to a specific level of software quality conformance.

2. Purpose of Implementation & Improvement Guide

This *Implementation & Improvement Guide* describes an effective process that should be followed to install and use the HK Software Quality Assurance Model in a software organization.

As part of the overall package, the *Implementation & Improvement Guide* should be one of the earliest to be referenced after a software organization has made the decision to adopt the HK Software Quality Assurance Model as the standard to improve its practices.

3. General Overview of Model

The HK Software Quality Assurance Model consists of:

- *descriptions* of the seven of most essential practices in a software organization are included in:
 - *a Procedure Handbook* that details the procedures that are required to be followed for each of the seven practices;
 - *a Guidebook* that provides guidelines, templates and tools that should be used in adhering to procedures.

As part of the overall model package, the following supporting pieces of documentation are also provided:

- an *Introductory Guide* to serve as an introduction to the model, the seven practices and a reference to the other supporting pieces of documentation in the overall package.
- an *Implementation & Improvement guide* describing the steps that should be followed to

- install and use these practices in a software organization;
 - enable a software organization to reach a higher degree of software quality conformance in adherence to the model.
- an *Assessment Tool* to enable a software organization to effectively evaluate its degree of software quality conformance in adherence to the model.

The seven practices that form the basis of the HK Software Quality Assurance Model are:

- a) *Software Project Management*-the process of planning, organizing, staffing, monitoring, controlling and leading a software project.
- b) *Software Testing*-the process of evaluating a system (where the software resides to:
 - confirm that the system satisfies specified requirements;
 - identify and correct defects in the system before implementation.
- c) *Software Outsourcing*-the process that involves:
 - Establishing a software outsourcing contract (SOC);
 - Selecting contractor(s) to fulfill the terms of the SOC;
 - Managing contractor(s) in accordance to the terms of the SOC;
 - Reviewing and auditing contractor performance based on results achieved;
 - Accepting the software product and/or service into production when it has been fully tested.
- d) *Software Quality Assurance* – a planned and systematic pattern of all actions necessary to provide adequate confidence that the item, product or service, and conform to established customer and technical requirements.
- e) *User Requirements Management* – the process of discovering, understanding, negotiating, documenting, validating and managing a set of requirements for a computer-based system.
- f) *Post Implementation Support* – the process of providing operations and maintenance activities needed to use the software effectively after it has been delivered.
- g) *Change Control*-the process of evaluating proposed changes to software configuration items and coordinating the implementation of approved changes to ensure the integrity of the software remains intact and uncompromised.

4. Implementation & Improvement Process

An overall process for implementing the HK Software Quality Assurance Model and improving on existing practices in an organization is provided in Figure 1 below:

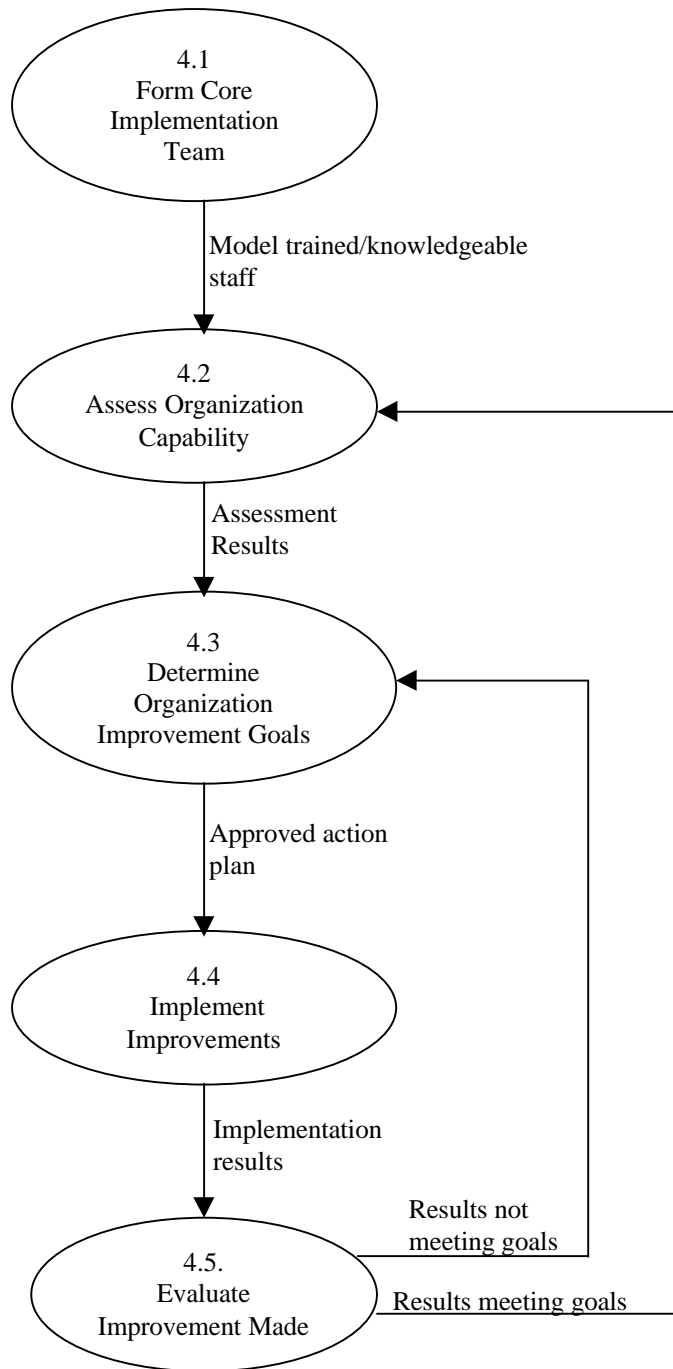


Figure 1 : Implementation & Improvement Process Diagram

Individual processes are further described below:

4.1 Form Core Implementation Team

4.1.1 When a software organization has made the decision to adopt the HK Software Quality Assurance Model as the standard to improve its practices, a core implementation team should be formed to lead the implementation of the model in the organization. The core implementation team should normally comprise respected members of the software organization perhaps including:

- a) The QA manager;
- b) The manager or deputy of the software organization;
- c) One or more lead project managers or system analysts;
- d) The manager or deputy of computer operations;
- e) One or more key users.

4.1.2 With the ultimate goal that all organization staff would be competent in using the model, members of the core implementation team should be the earliest to reach model competency through:

- a) Studying model literature in the recommended sequence of:
 - Introductory Guide;
 - Procedure Handbook & Guidebook;
 - Improvement Guide.
- b) Attending HK Software Quality Assurance Model training courses offered by the Hong Kong Productivity Council.
- c) Arranging consulting sessions offered by the Hong Kong Productivity Council.

4.1.3 Having acquired some level of model competency, members of the core implementation team should then be tasked to train the rest of the organization staff.

4.1.4 In leading the implementation of the model, the core implementation team should also be held responsible for:

- a) Aligning improvement effort to organization's needs and business goals (refer section 4.3.1 onwards);
- a) Identifying improvement targets, required actions and measures (refer section 4.3.4);
- b) Participating in, monitoring progress and evaluating results of improvement projects (refer section 4.4.2);

- c) Supporting continuation of software process improvement (refer section 4.5);
- d) Reviewing the software process improvement process itself in the light of the lessons learnt.

4.2 Assess Organization Capability

4.2.1 The next step is to determine the capability of the organization using the assessment tool provided with the model.

4.2.2 The assessment tool will prompt the user to answer a number of carefully selected questions related to the degree in which procedures are being followed for each of the seven practices.

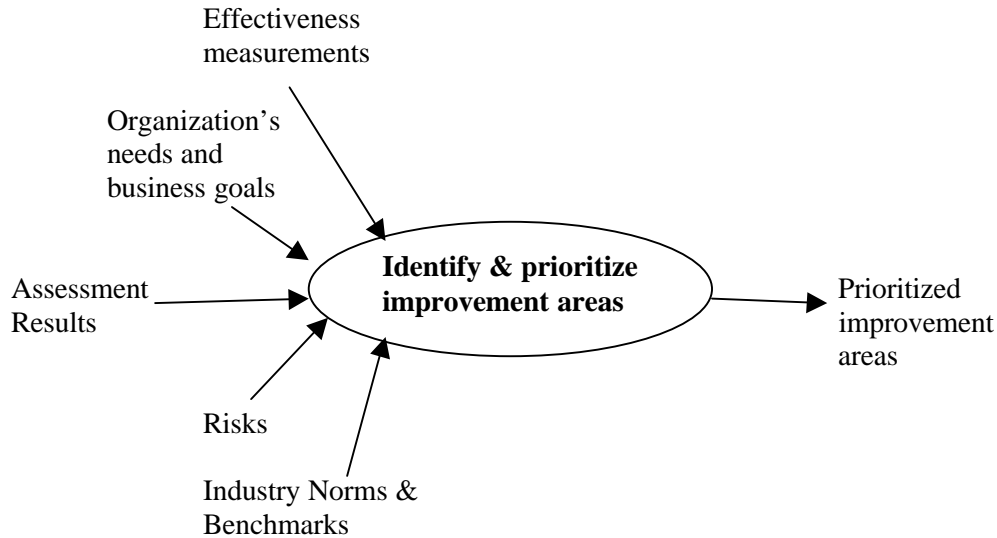
4.2.3 The output from using the tool will be a report showing

- the capability level (1=Baseline; 2=Intermediate; 3=Advanced) that the organization is assessed for each of the seven practices;
- Improvement recommendations under each practice classified into:
 - general recommendations;
 - requirements to reach a higher level of capability;
 - requirements to reach other international standards requirements

4.2.4 Please refer to Assessment Tool Handbook for more details.

4.3 Determine Organization Improvement Goals and derive action plan

4.3.1 Having assessed the organization's capability and obtained assessment results by way of improvement recommendations, the next step is for the core implementation team to use these results along with other factors to identify and prioritize areas for improvement as shown in Figure 2 below:



4.3.2 The factors that should be considered in arriving at a prioritized list of improvement areas include:

- a) Assessment results, which show weak and strong areas of practices;
- b) Organization needs and business goals, which provide general improvement goals to be achieved from the improvement program;
- c) Effectiveness measures, which, if already in place, identify improvement priorities for the organization;
- d) Industry norms and benchmarks that provide a basic comparison framework for assessment results;
- e) Risks related to either not achieving the stated improvement goals or failure of improvement actions.

4.3.3 The selected improvement areas will likely include:

- a) Practices or parts thereof that should be included in the improvement initiative;
- b) Organizational boundaries for improvement

4.3.4 Having selected areas for improvement, the next task is for the core implementation team to define specific improvement goals and set targets for improvement. The key steps in performing this task include:

- a) defining qualitative goals for each priority area of improvement;

- b) devising metrics to measure achievement of these goals;
 - c) setting target values for these metrics, taking due account of risks.
- 4.3.5 Having determined goals and targets for improvement, the next task is to define a practice improvement action plan which should contain:
- a) improvement actions with associated goals and improvement targets;
 - b) responsibilities for actions;
 - c) initial estimates of costs, benefits and schedule.
- 4.3.6 Note that it is advisable to start with an improvement project (s) that is relatively small in effort size but significant in terms of results, to ensure that:
- a) Organization staff impacted are given sufficient time to be trained in, buy in and adjust to changes;
 - b) There is minimum disruption to existing workload and commitments.

For example, the software organization may wish to implement one of the seven practices as a start on one software project, before taking on other practices in the model and across all projects.

4.4 Implement Improvements

- 4.4.1 In implementing the practice improvement action plan, it is critical to take account of human and cultural factors including:
- a) How management can give support and leadership;
 - b) What changes may be needed in values, attitudes and behavior;
 - c) How to establish commitment to goals and targets;
 - d) How to foster open communication and teamwork including implications for organizational structures and reporting lines;
 - e) Whether changes are needed to recognition and reward systems;
 - f) What education and training is required.
- 4.4.2 The practice improvement project should be monitored by the organization's management and the core implementation team against the action plan to:
- a) Ensure that tasks progressed as planned initiating appropriate corrective action if they do not;

- b) Check that achievement of the planned goals and targets continues to be both realistic and relevant to the organization's needs;
- c) Gather data on effort and resources expended in order to improve estimates for future practice improvement projects;
- d) Evaluate the impacts of the implemented improvement actions on the practice capability level ratings.

4.5 Evaluate Improvements Made

4.5.1 When a practice improvement project has been completed, the organization should:

- a) Confirm that the planned goals and targets have been achieved and the expected benefits realized;
- b) Confirm that the desired organizational culture has been established;
- c) Reevaluate risks, costs and benefits.

4.5.2 Management and the core implementation team should be involved in approving the results and to evaluate whether the organization needs, practice goals and improvement targets have been met. If so, management and the core implementation team may wish to continue the improvement activities by taking on another improvement project and/or model practice i.e. going to Section 4.2. If not, it may be desirable to redefine the practice improvement project or activity by returning to Section 4.3.

5. Glossary of Terms

Change Control

Through the exercise of relevant controls, this aspect of maintenance & support focuses on all the work required to ensure the integrity of hardware and software that are being changed in the course of development and when systems are moved into production. Parts of Change Control impact or are related to Configuration Control and Problem Tracking or vice versa.

Change Management

Through communication and regular interaction with users, this aspect of IT management focuses on the integrity of hardware and software that are being changed in the course of development and when systems are moved into production. Parts of Change Management impact or are related to Configuration Management or vice versa.

Configuration Control

Through the exercise of relevant controls, this aspect of maintenance & support focuses on all the work required to ensure the integrity of hardware and software that are being used during development and when systems are in production mode. Parts of Configuration Control impact or are related to Problem Tracking or vice versa.

Configuration Management

Through communication and regular interaction with users, this aspect of IT management focuses on the integrity of hardware and software that are being used during development and when systems are in production mode.

Development Documentation

This represents the documentation that is required to be developed as software/systems are being developed to ensure continuity and auditability of development effort, and to provide the means for support and operations of the software/systems as they are moved into production.

Documentation Control

This represents the area of maintenance & support where documentation that is required to be updated as software/systems are being changed to ensure continuity and auditability of development effort, and to ensure their reliability as software/systems are moved into production.

Guideline

Rules and instructions on how work should be done or tasks should be carried out.

Help Desk

To satisfy user requirements, this area represents all the activities that are required to exist to operate the Help Desk which serve as the first point of contact by users for IT services related to problems encountered or change requests.

Implementation

This area represents the work needed to execute jobs to move the already tested and checked software/system(s) into the production environment.

Implementation Checklist, Review & Audit

Before implementation takes place, this area represents the work needed to conduct a final check that everything has been completed successfully before moving the software/system(s) into the production environment. The areas that need to be checked for completeness include

- *maintenance, operations, user documentation,*
- *tested software results,*
- *signoffs to signify approval of key systems development work,*
- *user and business preparedness in using the new or changed system(s),*
- *IT operations preparedness to run and support the system in production mode &*
- *the readiness of the business and users to accept the new system including any required marketing and communication preparations.*

IT Management

That aspect of the organization which is responsible for the operations of the IT function including people, projects, other resources, financial and coordination with users.

IT Operations

That function of the IT organization that is responsible for executing jobs to operate software/system(s) in the production environment.

Maintenance & Support

That function of the IT organization that is responsible for maintaining and supporting existing software/system(s).

Method

A way of achieving an objective.

Metric

A metric is a quantitative measure of the degree to which a system, component or process possesses a given attribute.

Operations Procedures

This area represents the procedures needed to execute jobs, load/unload disk storage devices, tape drives, operate telecommunication devices, respond to console messages and error conditions, track operational problems, maintain operating room environment etc.

Policy

A statement of top management directives to decision-makers at lower levels to guide and determine present and future actions within an organization. (QAI)

Post Implementation Review

This area represent the work needed to assess a recently installed or existing system against their intended objectives and how well they are performing in meeting customer requirements.

Practice

A method of doing work which through common usage has become an accepted way used in producing products and providing services in an organization. (HKJC).

Problem Management

Through communication and regular interaction with users, this aspect of IT management focuses on problems identified during development and/or in production mode from their identification through to their final resolution. Parts of Change

Management impact or are related to Configuration and Change Management or vice versa.

Problem Tracking

Through the exercise of relevant controls, this aspect of maintenance & support focuses on monitoring software problems identified during development and/or in production mode from their identification through to their final resolution.

Procedure

A set of manual steps to be followed to accomplish a task each time the task is done. (IEEE)

Process

A formal method for doing work which allows the same quality to be replicated from product/service to product/service; implies the use of standards and procedures. (QAI)

Project Management

Mainly to ensure the success of an IT project, that aspect of IT management that deals with the management of an IT project (s) with responsibility over planning, organizing, staffing, monitoring, controlling and leading the IT project (s).

Delineation between software and system project management must be made since the former is by definition only a part of the latter. It should also be clear that the management, development, support and operations of software also involves the hardware aspects as one has to live with the other.

Quality Control (QC)

QC represents the techniques and activities that are used during software development that serve to detect and correct defects surfaced during inspections, reviews, walkthroughs and testing.

Quality Management

Mainly to satisfy user requirements, that aspect of IT management that focuses on the quality of products and services provided by IT by such means as quality planning, quality control, quality assurance and quality improvement.

Request Management

To ensure continuing integrity of software/systems in use, this area of maintenance and support covers the time when a request for software change (due to a problem or new product feature) is generated from users to the time when the change is implemented.

Service Level Monitoring

This area represent the work needed to measure the effectiveness of IT operations in meeting predefined service level agreements (SLAs) and steps taken to improve service performance in satisfying customer service requirements.

Software Development Process (SDP)

Mainly to minimize the risk of software defects and for consistency purposes, the SDP represents a formal method used for developing software.

Software Distribution

Mainly through the exercise of relevant controls and the proper use of specific techniques, this aspect of IT management focuses on the work required to ensure that the software/systems continue to perform at status quo as they are being moved to a different location/site and/or platform.

Software Purchase

Mainly through the exercise of relevant controls and the proper use of specific techniques, this aspect of IT management focuses on the work required to ensure that the software products/packages acquired serve the objectives and purpose they were purchased for.

Software Tools Utilization

Mainly to ensure that software tools serve the purpose they were acquired for, this aspect of development represents techniques used in selecting, installing and applying software tools used during the development of software.

Software/System Installation

That function of the IT organization that is responsible for implementing software/system(s) into the production/operating environment.

Software/Systems Development

That function of the IT organization that is responsible for developing new software/system(s).

Standard

Mandatory requirements employed and enforced to prescribe a disciplined and uniform approach to software development. (CMM)

Standards Management

Mainly to ensure consistency of practices employed in IT, that aspect of IT management that focuses on managing the standards that are used in IT including policies, processes, procedures, technical & product standards, and guidelines.

Sub-contractor Management

Mainly to ensure that user requirements are satisfied, that aspect of IT management that deals with the management of contractors or outsourcing organizations who have been recruited to provide a particular IT service or deliver a particular IT product.

Systems Maintenance Process (SMP)

Mainly to minimize the risk of software defects and for consistency purposes, the SMP represents a formal method used for developing changes to software. Parts of the SMP impact or are related to the Systems Development Process (SDP) B1 and Quality Control (QC) B3 above and vice versa.

Task

A sequence of instructions treated as a basic unit of work. (IEEE)

User Management

Mainly to ensure regular communication with users, that aspect of IT management that focuses on involving the users of systems or projects that are being supported or developed by IT including the communication and participation of the users in resolving management, quality, resources and project issues.