

**Office of the
Government Chief Information Officer**

**GUIDELINES ON
SYSTEM MAINTENANCE CYCLE**

[G22]

Version : 2.8

Jul 2012

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Amendment History				
Change Number	Revision Description	Pages Affected	Revision Number	Date
1	Reviewed upon expiration. No amendment required except formatting changes to align with the amended Document Style Manual [S14]	Nil	2.1	Jun 2002
	Major updates to version 2.1 issued in June 2002		2.2	Jun 2003
2	Remove the banner 'Standards & Methods Document'	Front Cover Page		
3	Remove the Distribution and Release Page	Amendment History, Table of Content		
4	Remove the page number of Amendment History and Table of Content	Amendment History, Table of Content		
	Major updates to version 2.2 issued in June 2003		2.3	Jul 2004
5	Review the document due to the merging of ITSD into the Commerce, Industry and Technology Bureau on 1 July 2004.	Whole document		
6	Replace logo of ITSD by OGCIO.	Front Cover Page		
7	Replace 'Information Technology Services Department (ITSD)' by 'Office of the Government Chief Information Officer (OGCIO)'.	Whole document		
8	Rephrase the footnote on the memo of Delegated Authority for approving implementation of the change request.	5-3		

9	Review for update-ness		2.4	Sep 2005
10	Review for update-ness		2.5	Aug 2008
	Major updates to version 2.5 issued in Aug 2008		2.6	Dec 2009
11	Add “maintained by OGCIO”	1-1		
12	Replace “OGCIO” at the footnote by “Maintenance Team”	5-1		
13	Replace “developers” by “staff”	5-2		
14	Replace the footnote on page 5-3 by “Guidelines for OGCIO Staff on Acquisition of Stores & Services”; and add the guide as footnote on page 6-12 and Appendix A	5-3, 6-12, Appendix A		
15	Replace “branches” at footnote by “OGCIO divisions”	5-4		
16	Update “via telephone” by “via email or telephone”	6-8		
17	Update the para. “Approve the change request” and add note for “appropriate level of authority”	6-12		
18	Add “Best Practice for IT/IS Management webpage at ITG InfoStation” as the location for the sample of Maintenance Plan.	7-1		
19	<ul style="list-style-type: none"> - Remove “contact point” of the requester w.r.t. the CFF in Appendix A - Replace “OGCIO staff” by “maintenance team member” 	7-2		

20	<p>Update the 2nd para. Of Section 8.1:</p> <ul style="list-style-type: none"> - replace “OGCIO” by “the department” - add “in-house IT officer” as a group name for SSM, SM etc. - add “or equivalent” to the IT officer group 	8-1		
21	<p>Update the CRF:</p> <ul style="list-style-type: none"> - (Part B) replace “OGCIO staff” by “maintenance team” - (Part C) remove “recommended” - (Part C) remove “in accordance with Technical Approval of OGCIO” - (Part C) add footnote for “appropriate authority - (Part B & D) remove “Technical Serv. Branch”, “Admin. Branch”, and “Departmental Serv. Branch” from the table of staff resources 	Appendix A		
22	<p>Update [G38] document name as “Practitioner Guide on PRINCE”</p>	3-1	2.7	May 2011
23	<p>Update the URL of the Guidelines for OGCIO Staff on Acquisition of Stores & Services.</p>	5-3, 6-12, Appendix A	2.8	Jul 2012

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1. PURPOSE

The major purposes of this document are :-

- to define the organisation set-up required for effective maintenance of an application system maintained by OGCIO;
- to describe the various activities to be conducted in the System Maintenance Cycle; and
- to lay down the procedures and products to be followed and produced in the System Maintenance Cycle.

2. SCOPE

This guide defines the System Maintenance Cycle (SMC) in terms of organisation structure, procedures and products.

This guide is applicable to all large administrative systems with non-recurrent expenditure over \$10 millions. For other administrative systems, the guide acts as a reference for designing the organisation structure, procedures and deliverables required in SMC. The system maintenance or minor enhancement should be under a limited size, risk and cost that can be catered for under the budget for annual maintenance, with an evaluation of the existing system showing that no major change of the basic design is required.

This guide consists of the following sections, namely:-

1. SMC Organisation & Roles;
2. System Maintenance Cycle;
3. SMC Deliverables; and
4. Contracting out of Maintenance Activities.

The ‘SMC Organisation & Roles’ section defines the organisation structure and responsibilities of SMC roles in system maintenance activities.

The ‘System Maintenance Cycle’ section describes the SMC process in details.

The “SMC Deliverables” section defines the products (i.e. maintenance plan, Change Request Form and control reports) which should be produced in SMC.

The “Contracting out of Maintenance Activities” section describes the approaches in contracting out the maintenance activities in SMC.

3. REFERENCES

3.1 STANDARDS

Practitioner Guide on PRINCE [G38]

Resources Estimation Guide [G19]

Software Configuration Management Process Guide for Application Software [G46]

3.2 OTHER REFERENCES

IEEE Std 1219-1993, Standard for Software Maintenance (ANSI)

IEEE Std 1074-1995, Standard for Developing Software Life Cycle Processes

International Standard ISO/IEC 12207, Information Technology - Software life-cycle processes 1st edition dated 1995

4. DEFINITIONS AND CONVENTIONS

4.1 DEFINITIONS

None.

4.2 CONVENTIONS

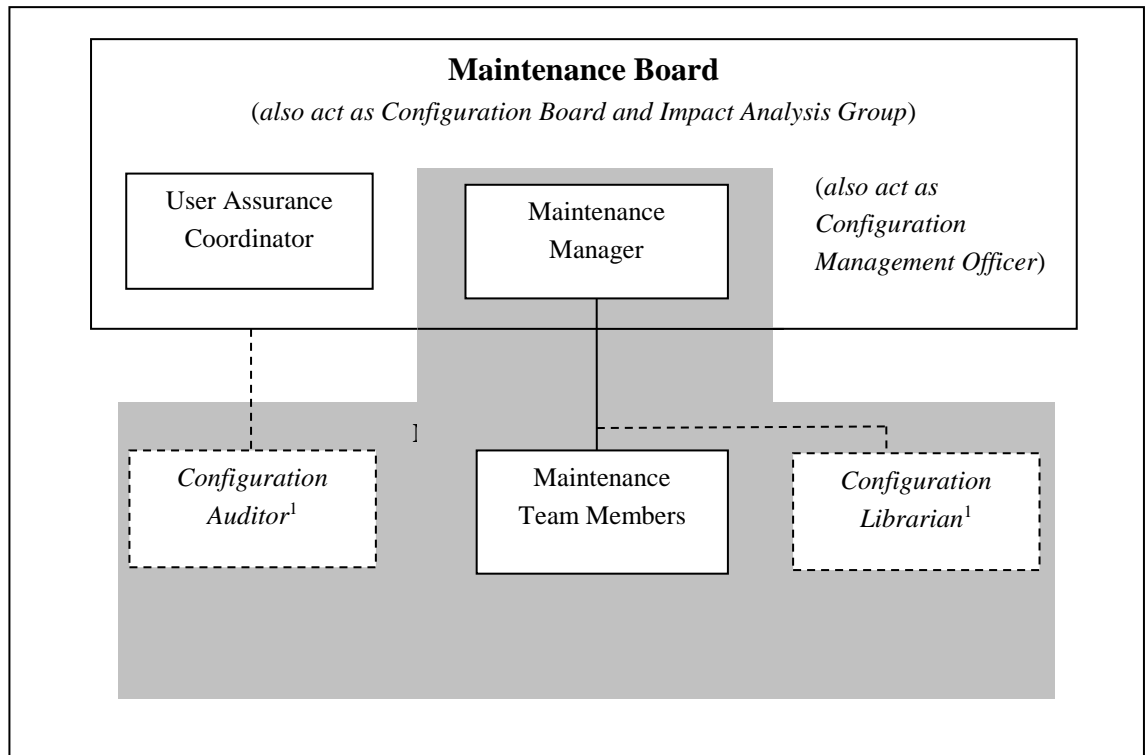
The following acronyms are used in the text of this guide:-

CRF	Change Request Form
PSC	Project Steering Committee
SMC	System Maintenance Cycle

5. SMC ORGANISATION & ROLES

5.1 SMC ORGANISATION STRUCTURE

A proper SMC organisation is essential for the effective maintenance of an application system. It should be formed in the Project Closure Stage with the roles appointed by the Project Steering Committee (PSC). The diagram below depicts the organisation structure of various roles suggested in SMC.



The roles specific to Software Configuration Management are shown on the above Organisation Structure with text in *italic*. The responsibilities of these roles in Software Configuration Management can be found in the “[Software Configuration Management Process Guide for Application Software \[G46\]](#)”.

The roles and responsibilities of the respective SMC set-ups are described in the following sub-sections.

¹ Both Configuration Auditor and Configuration Librarian should be staff of Maintenance Team. Configuration Auditor should report to the Maintenance Board while Configuration Librarian should report to the Maintenance Manager.

5.2 SMC ROLES AND RESPONSIBILITIES

5.2.1 Maintenance Board

Maintenance Board is an organisation set-up required for the overall management and quality assurance of the daily operation and maintenance activities of an application system. It oversees the daily activities and ensures smooth operation of the system. For maintenance activities, it ensures all changes are in line with the business objectives, technically feasible and properly approved by the appropriate level of authority.

A Maintenance Board is composed of:-

Maintenance Manager : Representing all technical staff of the application system.

User Assurance Coordinator : Representing the overall interests of the business and all users of the application system.

Maintenance Board meeting should be held on a regular basis (e.g. monthly). The purposes of the meeting are to:-

- review the on-going activities and highlight any exception cases for discussions and necessary actions;
- decide the disposition for change requests;
- prioritize new and outstanding change requests;
- monitor the progress/status of the maintenance activities;
- monitor the resources utilization; and
- review the implemented changes.

Other parties such as change initiator, end-user, computer operation staff, etc. may be invited to the meeting to explain the raised change request and/or to provide advice/comment on their related area when necessary.

5.2.1.1 Maintenance Manager

The main tasks of the Maintenance Manager are to:-

- prepare and update the maintenance plan (refer [Section 7.1](#)) and get approval from appropriate authority;
- monitor progress, expenditure and resource utilization of the maintenance process;
- prepare regular reports to the Maintenance Board on the progress/status of the maintenance activities;
- assign technical resources as required in the maintenance process;
- advise on the technical impact to the system with respect to each change request submitted;
- resolve conflicts concerning technical requirements and their priorities;
- ensure all agreed products are produced to the required level of quality and are delivered on time and within budget; and
- ensure the implementation of the change request is properly approved by the appropriate level of authority².

5.2.1.2 User Assurance Coordinator

The main tasks of the User Assurance Coordinator are to:-

- consider and review the maintenance plan;
- ensure the change request matches with the business objectives and is properly approved;
- ensure the users' requirements are clearly specified and well understood by the maintenance team;
- assign user resources as required in the maintenance process;
- resolve conflicts concerning users' requirements and/or their priorities;
- advise on the impact of the changes on user related area; and
- coordinate with users on the maintenance acceptance and implementation.

² Please refer to the "[Guidelines for OGCIO Staff on Acquisition of Stores & Services](#)" in OGCIO Portal.

5.2.2 Maintenance Team

Maintenance Team is responsible for the on-going maintenance activities of the application system. It consists of the Maintenance Manager and the Maintenance Team Members².

5.2.2.1 Maintenance Manager

Maintenance Manager is the leader of the Maintenance Team as well as a representative from IT community in the Maintenance Board.

Please refer to [section 5.2.1.1](#) for the main tasks of the Maintenance Manager.

5.2.2.2 Maintenance Team Members

The main tasks of the Maintenance Team Members are to:-

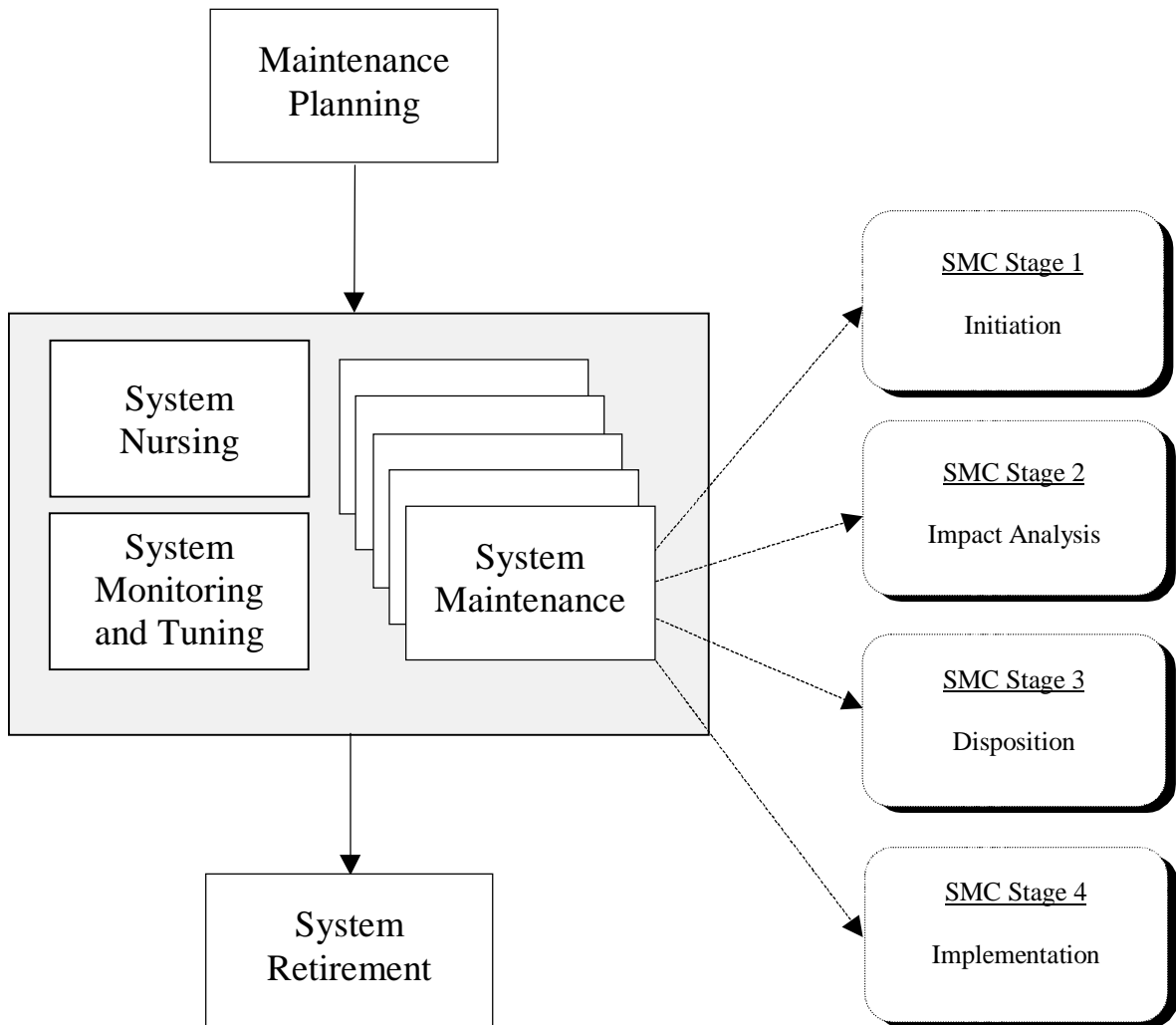
- assist Maintenance Manager in conducting impact analysis for changes on the application system;
- assist Maintenance Manager in estimating the resources required for the change;
- advise on the action that should be taken to resolve the change request;
- design and implement the change according to the request;
- design and perform testing for the implemented changes; and
- assist users in the user acceptance process.

² In some cases where dedicated staff from other OGCIO divisions are assigned for maintenance of an application system, they may be included as one of the Maintenance Team Members.

6. SYSTEM MAINTENANCE CYCLE

System Maintenance Cycle (SMC) of an application system commences when the system is accepted and put into production. On-going monitoring and maintenance of the system have to be performed during the SMC so as to ensure the performance and functionality of the system match with the business needs of the users.

The System Maintenance Cycle of an application system is depicted in the following diagram:-



6.1 MAINTENANCE PLANNING

System Maintenance Cycle of an application system commences when the system is accepted and put into production. A maintenance plan should be prepared in the Project Closure Stage and submitted to PSC for approval. Review of the plan should be conducted by the Maintenance Board as need arises and approved by the immediate supervisor of the Maintenance Board members. Details of the maintenance plan will be described in [Section 7.1](#).

6.2 SYSTEM NURSING

Before the handover of the application system from Development Project Team to Maintenance Team, a system nursing period should be allowed to ensure smooth transition of the system. During the period, intensive system monitoring and tuning should be conducted to ensure the system operating smoothly and performing at user's agreed level. In general, the following system control and performance aspects should be reviewed:-

- Transaction load and error statistics

If there has been a wrong estimate in the volume of data to be handled, a remedial action should be determined (e.g. rescheduling of the computer operation work). If one particular transaction/terminal has an unexpected amount of errors, action should be taken to determine whether enough training/appropriate procedures have been incorporated to that particular area, or whether some validation rules will have to be relaxed.

- Computer system performance

The performance log of the system should be carefully examined to see if the system is performing at the required performance level. If the application system is installed on a multi-purpose machine, the impact/interference of the new system should be reviewed to ensure appropriate processing scheduling and priority are given.

- Computer resources planning

The actual utilization of computer resources including computer time, data preparation, stationery, magnetic tape and disc usage, should be reviewed against the estimated resources requirement. Any design flaw due to incorrect evaluation of resources sizing should be rectified.

- System security and control

The new system should be reviewed to ensure that the program recovery and restart facility, backup arrangement, and disaster planning are adequate, and also to ensure that sufficient control figures/totals are provided for reconciliation.

- Manual procedures

The manual procedures of the system should be reviewed to determine if any improvement could be made to enhance the system performance. Examples of such improvements are :-

- the despatch of data to the computer before the prescribed time;
- a partial sorting of data in order to save computer time, when this involves no extra manual effort; and
- changes in the order of production of results if certain types of reports are more voluminous, or take longer to deal with than expected.

The duration of system nursing period is system dependent and may vary from one month to several months. After changes emerging from the review are incorporated, the application system will be settled into regular operating pattern and is then ready for handover. The major handover criteria are summarized as follows:-

- all documentation, programs, macros, security procedures, etc. conform to OGCIO Standards;
- documentation is complete and contents are consistent;
- production resources requirements are submitted to and agreed by user; and
- smooth operation of the system.

Having satisfied the above criteria, the following documents should also be available for handover checking:-

- endorsed Project Evaluation Report;
- approved maintenance plan;
- system documentation³;
- system test plan, data and result;
- program sources, macros, data files, etc; and
- list of maintenance items and outstanding requirements agreed among user, development team and maintenance team.

³ The system documentation refers to the manuals stipulated in the "[Documentation Standards for Implementation Phase \[S8\]](#)"

6.3 SYSTEM MONITORING AND TUNING

Apart from handling the requests for maintenance and enhancement, Maintenance Team is also responsible for continuous monitoring and tuning of the application system to ensure its smooth operation and enhance its effectiveness and efficiency.

System Monitoring

System monitoring is the keep tracking of the application system's operation to ensure the provision of system functionality/services is at an agreed level. The purpose of system monitoring is to ensure the smooth running of the system operation to meet user's expectation.

The following major system aspects should be kept track and closely monitored by the maintenance team:-

- System resources utilization like CPU, memory, data storage, etc;
- Network and transaction loading;
- Printing and terminal requirement;
- System security and control;
- System response time;
- System failure rate; and
- System down time.

In case one or more system aspects have dropped to an unacceptable level or need improvement, the Maintenance Manager should report to Maintenance Board for review and suggest possible solution. Any system tuning arisen should be treated as change request and handled with the procedures stated in [Section 6.4](#).

System Tuning

The objective of system tuning is to improve the system performance through better utilization of the system resources. Resources to be considered should include manpower, hardware, software and other supporting equipment and consumable. Latest technologies and facilities should be considered to bring the most benefit to the system being tuned.

Before tuning, the system should be reviewed to identify areas where improvements could be made. The following are some of the suggested review activities:-

- evaluate the design and effectiveness of input/output documents;
- analyse and review current data and transaction volume;
- review file design, placement and storage capacity;
- review data communication facility and capacity;
- review computer operating procedures and its processing capacity;
- review data preparation procedure; and
- review the interface between the computer system and manual system.

From the collected facts and review results, recommendations in priority sequence and with expected benefits could be made.

6.4 SYSTEM MAINTENANCE

A number of maintenance activities which arise from problem report, enhancement request or ad hoc request may occur concurrently in the System Maintenance Cycle.

Each maintenance activity will go through the following four SMC stages:-

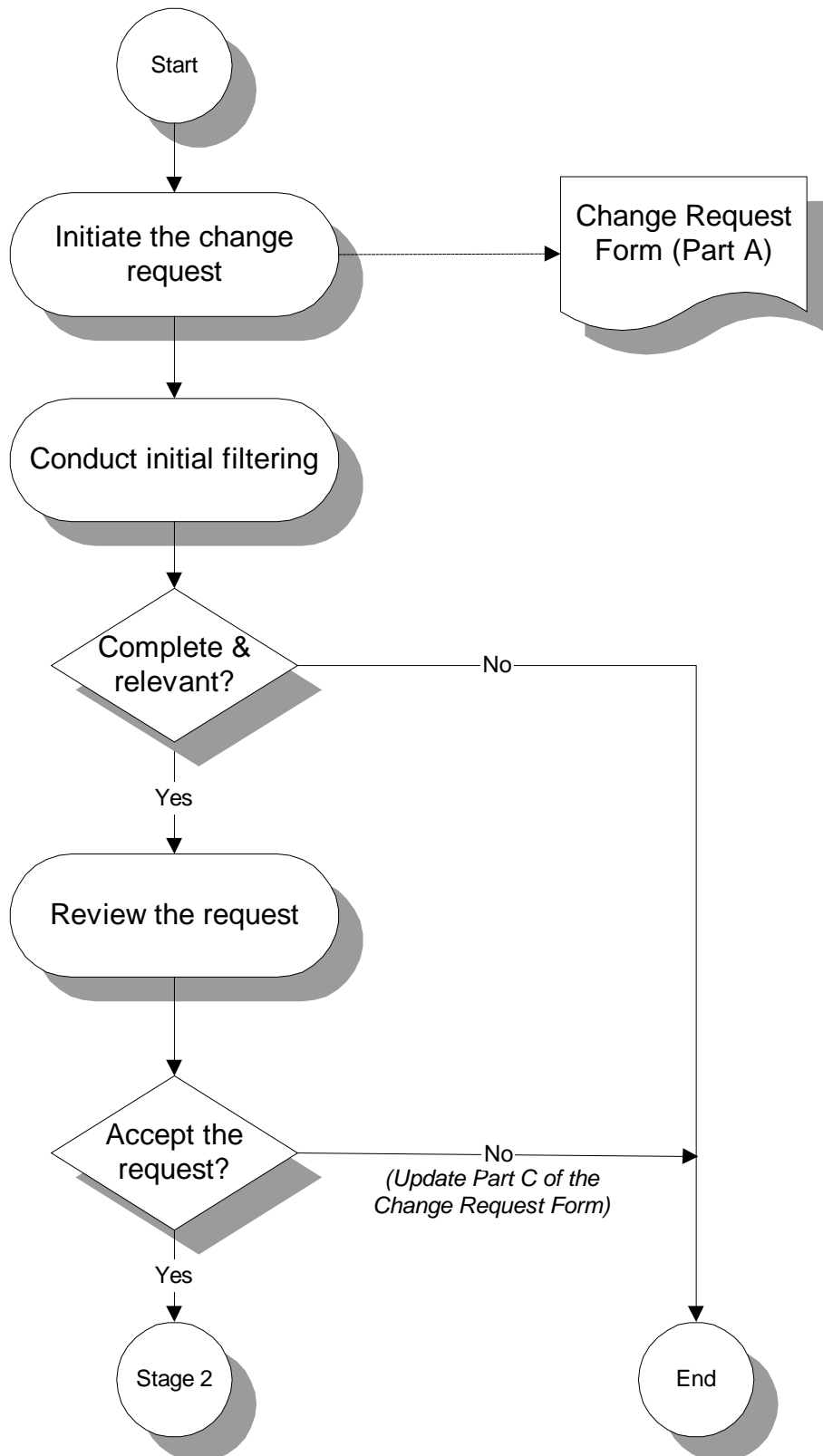
- Stage 1 - Initiation;
- Stage 2 - Impact analysis;
- Stage 3 - Disposition; and
- Stage 4 - Implementation.

The processes to be undertaken and deliverables to be produced in each stage will be described in the subsequent sub-sections.

In case of “fire fighting” maintenance, it may happen that the changes have to be implemented immediately and it is not feasible to follow strictly with the above processes before implementing the changes. Maintenance Manager should be delegated with the authority to approve such urgent maintenance. The Maintenance Manager should report to the Maintenance Board on all such urgent maintenance within a pre-defined period (usually not more than three working days) as specified in the Maintenance Plan and complete the formality as stipulated in the SMC.

6.4.1 SMC Stage 1 - Initiation

The flow in the SMC Stage 1 - Initiation is summarized in the following flowchart:-



6.4.1.1 Initiate the change request

Change Requests may be triggered for a variety of reasons (enhancement need, software problem fixing, ad hoc request, etc.) and from a wide variety of sources (users, maintenance team, operator, etc.). All the requests should be initiated by completing a Change Request Form (CRF). Details of the requested change, reasons for change together with the requester's information should be clearly specified on Part A of the CRF. The CRF will be described in [Section 7.2](#).

Requests raised from the users of the application system should be submitted to the Maintenance Board for consideration via the User Assurance Coordinator. Requests raised from the IT community should be submitted to the Maintenance Board via the Maintenance Manager.

6.4.1.2 Conduct initial filtering

Upon receipt of the CRF from the requester, the User Assurance Coordinator or the Maintenance Manager is responsible for conducting initial vetting and assessment on the change request. Incomplete/irrelevant change requests are filtered out and returned to the originator. Supported requests are countersigned and forwarded to Maintenance Board for consideration.

6.4.1.3 Review the request

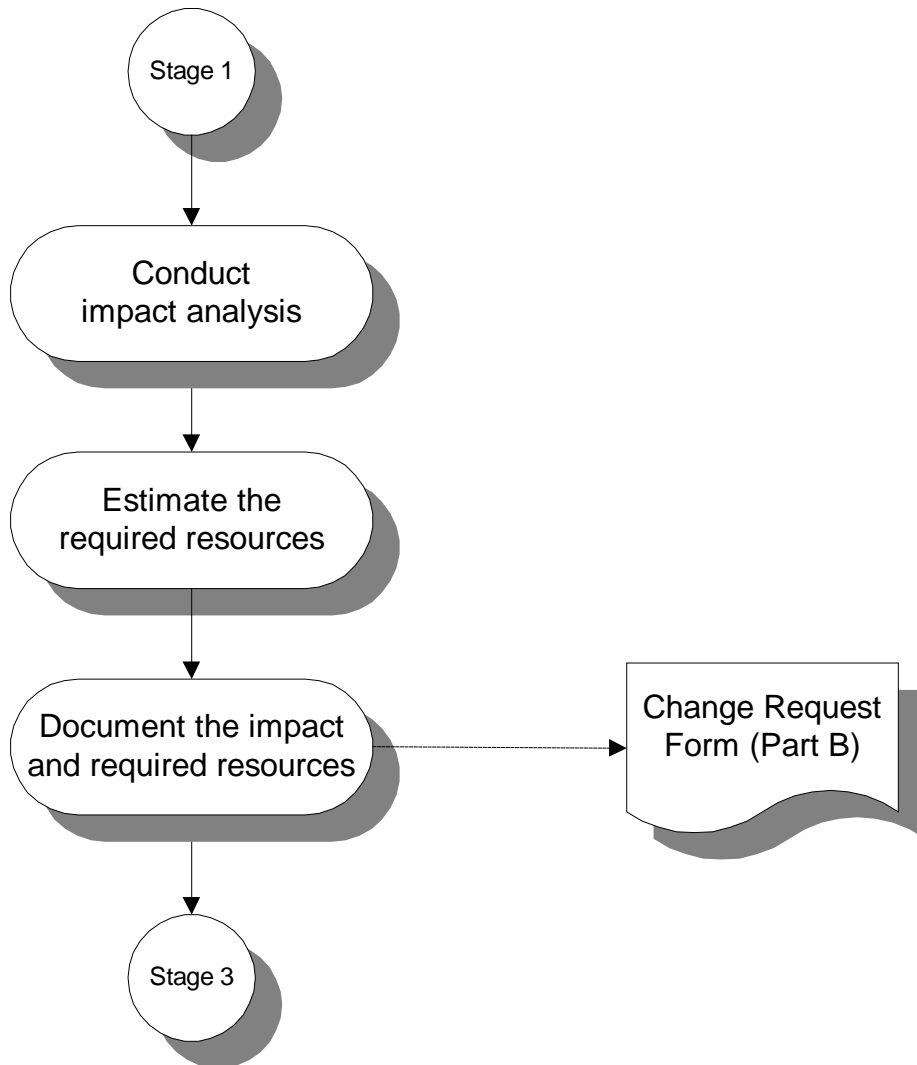
All CRFs will be reviewed by Maintenance Board in the regular meeting.⁴ A Change Request Ref. No. will be assigned and recorded on each CRF for tracking purposes. Change requests will be considered in terms of their needs, urgency, benefits, etc. Besides, the type and priority of the change requests will also be assessed and revised if necessary. The Board should decide whether to accept or reject the requests.

The accepted change requests will be passed to next stage for impact analysis. Rejected requests will be returned to the originator with reason for rejection stated in Part C of the CRF.

⁴ In case of urgent change request, ad hoc meeting (or even via email or telephone) may be held to make urgent assessment and decisions. However, all the maintenance activities should still be properly controlled and recorded.

6.4.2 SMC Stage 2 - Impact Analysis

The flow in the SMC Stage 2 - Impact Analysis is summarized in the following flowchart:-



6.4.2.1 Conduct impact analysis

Maintenance Team is responsible for thoroughly analysing the accepted change requests on technical perspectives. The analysis should assess the feasibility, scope, impact and potential ripple effects caused by the change as well as the possible solutions. Maintenance Team should also assure the impacts on business and user perspectives have been adequately analysed. The following major items should be considered in the impact analysis:-

For business and user perspectives

- user's organisation and roles;
- operating procedures;
- staffing;
- skills; and
- scope of services.

For technical perspectives

- system functionality;
- user interfaces;
- other systems which interface with the application system;
- documentation;
- capacity and performance;
- safety and security;
- reliability; and
- data sharing.

6.4.2.2 Estimate the required resources

Based on the impact analysis result, resources required for the implementation of the requested change are estimated. Factors to be considered in the estimation include:-

- software and hardware;
- manpower;
- costs & schedule; and
- function point.

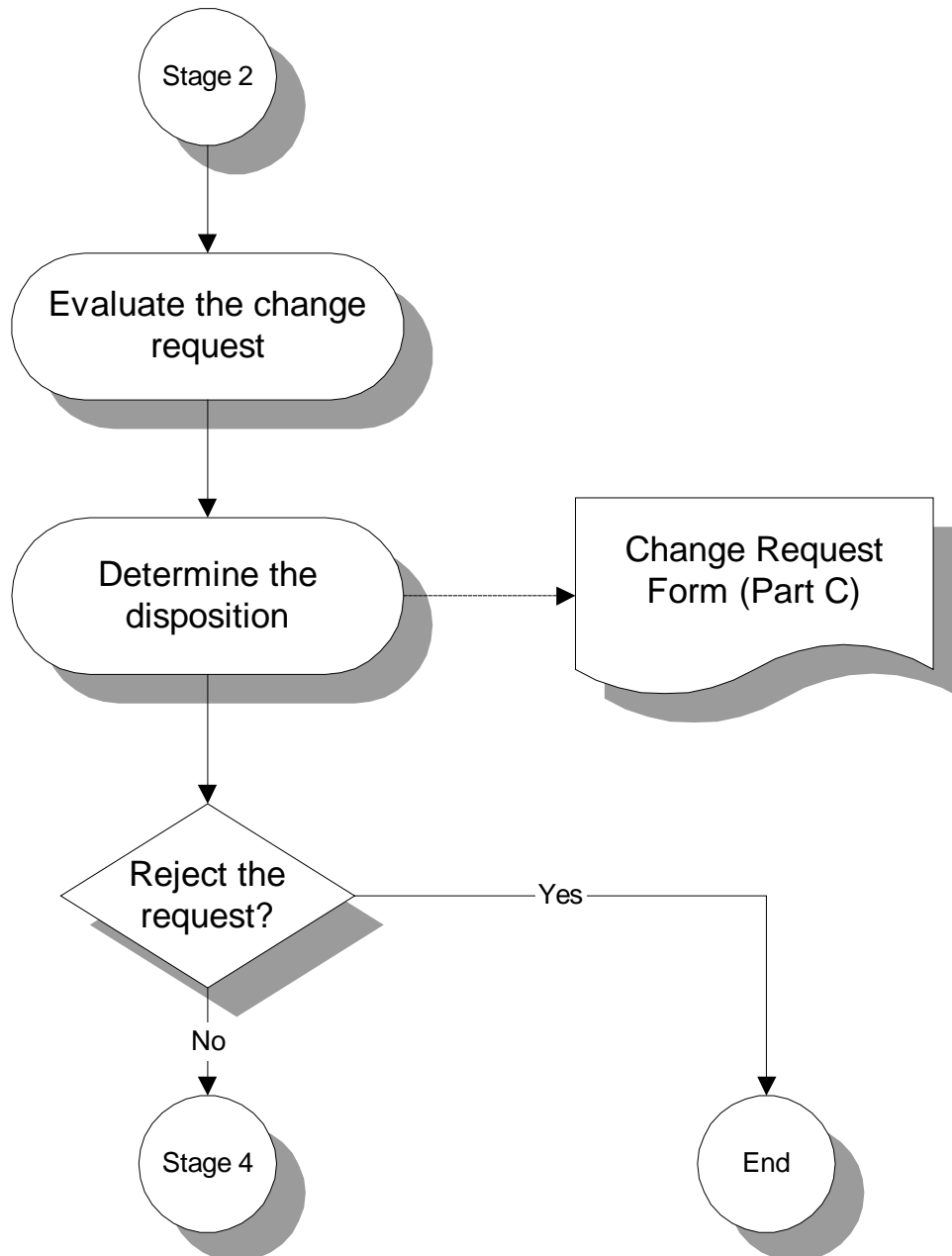
Guidance on resources estimation can be found in the OGCIO "[Resources Estimation Guide \[G19\]](#)".

6.4.2.3 Document the impact and required resources

The impact analysis result and resources estimation should be documented in Part B of the CRF. Details of the CRF will be described in [Section 7.2](#). At the end of Stage 2, the updated CRF will be returned to the Maintenance Board for further processing.

6.4.3 SMC Stage 3 - Disposition

The flow in the SMC Stage 3 - Disposition is summarized in the following flowchart:-



6.4.3.1 Evaluate the change request

Based on the results from Stage 2, the Maintenance Board evaluates the justification of the change request. Factors to be considered depend on the specific application system but should generally include the following:-

- tangible and intangible benefits gained from the change;
- total cost of the change;
- manpower required to implement the change;
- elapsed time needed to implement the change;
- disruption to current service; and
- retraining effort for operation personnel and user groups.

6.4.3.2 Determine the disposition

The Maintenance Board should finally reach a decision on the disposition of the change request. The following are possible dispositions:-

- Reject the change request

If the change request is determined to be rejected, Part C of the CRF will be updated with the reasons for rejection and returned to the originator.

- Defer the change request

If the change request is determined to be deferred for later re-consideration, Part C of the CRF will be updated and filed. Deferred request will be brought up by the Maintenance Board for review when required.

- Approve the change request

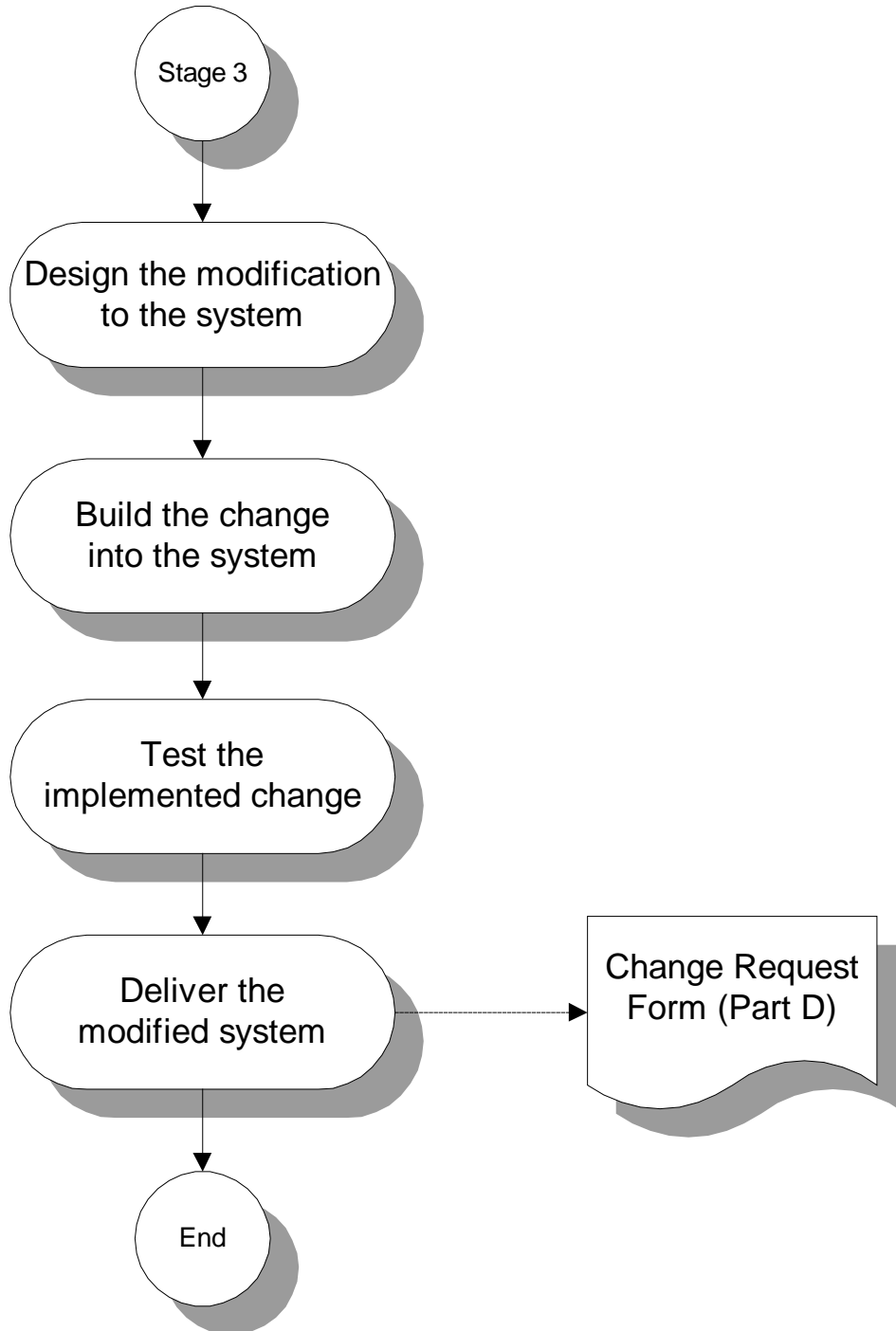
If the change request is determined to be approved, Part C of the CRF will be updated accordingly with the reasons for approval. Appropriate level of authority⁵ for approval should be followed.

The Maintenance Board will also assess the approved request with the existing outstanding requests and assign an implementation priority for it. Finally, the change request will be passed to the Maintenance Team for implementation.

⁵ [“Guidelines for OGCIO Staff on Acquisition of Stores & Services”](#) in OGCIO Portal can be referenced.

6.4.4 SMC Stage 4 - Implementation

The flow in the SMC Stage 4 - Implementation is summarized in the following flowchart:-



6.4.4.1 Design the modification to the system

Based on the implementation priority assigned by the Maintenance Board, the Maintenance Team will conduct detailed design for the change request. The impact analysis result and resources estimation produced in Stage 2 will be used as input for the design work.

In general, the main tasks include:-

- identify the affected software modules;
- update the revised design of the system; and
- develop test plan and implementation plan.

Based on the analysis results, the Maintenance Team should identify the software modules to be modified. The system documentation should also be modified to reflect the new design. Test plan and implementation plan should be produced which clearly state how the testing, implementation and delivery of the changes are to be accomplished with a minimal impact to current users. The design will form the blueprint for subsequent modification of the system.

The test plan should state the testing requirements and arrangement for the proposed changes. In general, the plan should cover the following areas:-

- Testing approaches like unit test, integration test, user acceptance test, regression test, etc.;
- Test resources like hardware, software, staffing, testing tool, etc.;
- Test data and expected results;
- Testing, problem reporting, error correction and retesting procedures; and
- Testing acceptance criteria.

The Implementation plan should define the implementation and delivery arrangements for the proposed changes. In general, the plan should cover the following areas:-

- Implementation and delivery approach;
- Implementation and delivery schedule;
- Implementation and delivery procedure; and
- Backup and recovery procedures.

Maintenance Team should be aware of and coordinate all changes on the software components and control the concurrent access of program sources/documentation to ensure integrity and traceability throughout the System Maintenance Cycle. This is of particular importance when the application is subject to large scale enhancements (e.g. a major enhancement due to year 2000 compliance issue), in which some maintenance activities have to be done in parallel with others or even some SDLC activities.

6.4.4.2 Build the change into the system

The Maintenance Team is responsible for building the approved change into the application system according to the design. In general, the building processes involve modification of the software modules and revision of the associated system documentation (e.g. manuals stipulated in the “[Documentation Standards for Implementation Phase \[S8\]](#)”). After the modifications are coded and unit-tested, or at appropriate interval during coding, the modified software should be integrated with the system and integration test should be refined and performed. All effects (e.g., functional, performance, etc.) of the modification on the existing system should be assessed and any unacceptable impacts should also be noted. A return to the coding and testing may be required to remedy such impacts.

The Maintenance Manager should carefully monitor the progress of the implementation as well as the use of allocated resources. Any large discrepancy in the schedule and resource utilization should be reported to the Maintenance Board for consideration. Besides, periodic control reports on the progress and status of the maintenance activities should be produced as stated in the maintenance plan and submitted to Maintenance Board for review. Details of the control reports will be described in the [Section 7.3](#).

6.4.4.3 Test the implemented change

Once change has been made to the software modules, it should be thoroughly tested to ensure the change is correct and does not introduce other errors to existing functions.

Once the change is completely tested on the technical aspect, it should be tested on the user aspect where appropriate. The user acceptance tests should be conducted by the user representatives of the modified system. This is to ensure that the implemented change is satisfactory to the customer. The acceptance should cover the application system as well as the associated documentation.

Please refer to the “[Guidelines for Application Software Testing \[G20\]](#)” for the various testing techniques and guidelines.

6.4.4.4 Deliver the modified system

After successful testing, the implemented change could be delivered. To reduce the risks associated with the delivery of the change, the Maintenance Manager should plan for and document the delivery procedures to ensure minimal impact on the user and the system due to unforeseen software failures not detected during testing. To reduce the impact to users' daily operation, it is suggested to arrange with users regular time slot (e.g. the first Thursday of every month) for implementing changes.

When a change is a significant modification of user interfaces or functionality, user training should be arranged.

The main tasks in the delivery processes involve:-

- conduction of physical check;
- notification of the user community;
- preparation of archives of the old system for backup and testing of recovery if required; and
- conduction of installation and training.

Finally, upon the successful delivery of the change, originator of the change request should accept the implemented change by signing on Part D of the CRF and returning to the Maintenance Board. Besides, the Maintenance Manager should also record the details of implementation, the actual resources expenditure and the alteration of the system's function point on Part D of the CRF.

6.5 SYSTEM RETIREMENT

The SMC runs to end when the application system is retired. System retirement is the removal of an existing system from its active use either by ceasing its operation, or by replacing it with a new system. The retirement process should be well planned and with detailed procedures specified.

All users of the system should be formally notified about the retirement. The actual date of the removal of the retiring system or the available of the replacement system should be made known to the users and time should be allowed for users to make necessary arrangements. Besides, the notification should include statement as to why the system is not being used or replaced.

In case the retiring system is replaced by a new one, the system cut-over strategy (e.g. direct cut-over, parallel run, multiple phases, etc.) should be considered to ensure smooth transition and minimal impact to users.

7. SMC DELIVERABLES

7.1 MAINTENANCE PLAN

A maintenance plan is required for efficient and effective maintenance of an application system in SMC. A maintenance plan should be prepared by the Maintenance Manager in the Project Closure Stage and submitted to PSC for approval. Review of the plan should be conducted by the Maintenance Board when need arises and approved by the immediate supervisor of the Maintenance Board members. The plan also serves as a user guide for system maintenance.

The following main areas are suggested to be covered in the plan:-

1. Organisation

This area defines the maintenance organisation adopted for the application system. Staff assignment, responsibilities and delegated authority of each SMC role are also included.

2. Maintenance Process

This area documents the procedure of the maintenance activities. The System Maintenance Cycle suggested in [Section 6](#) of this guide should form the basis of the process and be customized according to individual situation. In particular, characteristics of the application system like risk of failure, application size, number of users, etc. should be taken into consideration in the customization. Besides, the mechanisms employed and system statistics collected for monitoring and control of the maintenance activities are also included.

3. SMC Deliverables

This area lists out deliverables which will be produced in the SMC. These include Change Request Form and control reports required for effective management of the maintenance activities. The purpose and content of the deliverables are also covered.

4. Maintenance Resources and Facilities

This area lists out the resources and facilities (scheduled time slot, hardware, software, system documentation, personnel, office facilities, etc.) dedicated to the maintenance activities.

A sample of Maintenance Plan is available on the [Best Practice for IT/IS Management](#) webpage at ITG InfoStation for reference.

7.2 CHANGE REQUEST FORM (CRF)

The Change Request Form records the processing information of the change request from initiation of the request to acceptance of the implemented change.

The CRF consists of four parts corresponding to the four SMC stages of System Maintenance activity.

Part A - Initiation

This part should be completed by the requester upon initiation of the change request.

Details include:-

- Name of application system and/or Sub-system;
- Type and priority of the change request;
- Expected date of implementation;
- Description of change required;
- Reasons for the change;
- Name, designation, signature of the officer making the request;
- Date of request; and
- Name, designation, signature of the User Assurance Coordinator or Maintenance Manager supporting the requester.

Part B – Impact Analysis

This part should be completed by the maintenance team member who is responsible for the analysis of the change request.

Details include:

- Results of impact analysis ;
- Estimation of the required resources on cost and staff effort;
- Estimation of the system's function point value;
- Name, designation and signature of the officer responsible for the analysis; and
- Date of analysis.

Part C – Disposition

This part should be completed by the Maintenance Board.

Details include:

- Disposition (e.g. approve, reject or defer) of the change request;
- Reasons/remarks on the disposition;
- Name, designation and signature of the User Assurance Coordinator and Maintenance Manager;
- Date of disposition;
- Name, designation and signature of the endorsing officer;
- Date of endorsement; and
- Remarks on the endorsement.

Part D – Implementation

This part should be completed by the requester and Maintenance Manager after the successful delivery of the implemented change.

Details on acceptance include:

- Date of User Acceptance Test (if applicable);
- Date of delivery;
- Name, designation and signature of the officer accepting the implemented change; and
- Date of the acceptance.

Details on implementation⁶ include:

- Date of start and completion of the implementation;
- Actual resources utilization on cost and human effort;
- Total adjusted function point of the system after the maintenance;
- Remarks on the implementation;
- Name, designation and signature of the recording officer; and
- Date of recording.

The completed CRF, together with the test plan/implement plan should then be filed in appropriate project file for future references.

⁶ Since the details on implementation are internal to OGCIO maintenance team, the team may decide, if appropriate, to record this information in separate form.

The change requests should be categorized into different type according to the following classifications:-

- **Problem Report**
For changes which are initiated due to the deviation of the application system from the original design specification.
- **Enhancement Request**
For changes which are initiated to improve the services provided by the application or entertain new user requirements.
- **Ad hoc Request**
For changes which are initiated due to ad hoc requirement. It usually involves the extraction of production data of the application system and compilation of one-off report.

The priority rating of the change request should be initially suggested by the requester and subject to revision according to the Maintenance Board's disposition. The following are the criteria for consideration:-

- **High**
Causing loss of service or severe usability problems to a large number of users. Immediate action required. Allocate resources to implement immediately.
- **Medium**
No severe impact or only a few users are affected, but rectification should be performed as soon as possible and probably after the high priority request. To be allocated medium priority for resources.
- **Low**
A change is justified and necessary, but can wait until the next scheduled release or upgrade. To be allocated resources when available.

A sample of Change Request Form (CRF) can be found in [Appendix A](#). Maintenance teams are not required to strictly follow the format of the sample CRF. In case maintenance teams are already using their change request form, they are required to review their existing form, and when necessary, revise the form to ensure the mandatory items listed in this section are included.

7.3 CONTROL REPORTS

The control reports summarise the information about outstanding, rejected and completed change requests. It should be prepared by the Maintenance Team periodically as defined in the maintenance plan and submitted to the Maintenance Board for on-going monitoring of the maintenance activities.

The major information to be included on the control reports is:-

1. List of outstanding change requests
 - Reference No. of the change request;
 - Short description of the requested change;
 - Type of the request
 - Problem Report;
 - Enhancement Request; or
 - Ad hoc Request.
 - Priority of the request;
 - Date of request; and
 - Status of the request
 - Pending for impact analysis;
 - Pending for approval;
 - Pending for implementation;
 - Implementation in progress;
 - Deferred to mm/yyyy.
2. List of change requests completed/rejected
 - Reference No. of the change request;
 - Short description of the requested change;
 - Type of the request;
 - Priority of the request;
 - Dates of request; and
 - Date of delivery / Reason of rejection.

Samples of control reports can be found in [Appendix B](#).

8. CONTRACTING OUT OF MAINTENANCE ACTIVITIES

In general, there are two major approaches on contracting out maintenance activities involved in the SMC. They are:-

1. Contracting out all SMC activities; and
2. Contracting out the implementation of change requests.

8.1 CONTRACTING OUT ALL SMC ACTIVITIES

In this approach, all the activities involved in the SMC are contracted out. The vendor will take up the roles of both the Maintenance Manager as well as the Maintenance Team Members. They are responsible for all the maintenance activities including the preparation of maintenance plan, performing on-going monitoring/support and conducting impact analysis and implementation in response to change requests raised.

Notwithstanding the contracting out of maintenance activities, the department is still accountable for the maintenance services provided to the users. An in-house IT officer (at the rank of Senior Systems Manager, Systems Manager, or equivalent) should be assigned to the maintenance project and be responsible for arranging the contract out agreement, its administration, overall management and quality assurance. The Maintenance Manager (from the outsourcer) should report to the in-house IT officer regularly.

8.2 CONTRACTING OUT THE IMPLEMENTATION OF CHANGE REQUESTS

In this approach, Maintenance Manager and Maintenance Team Members are still manned by in-house staff and are responsible for the preparation of maintenance plan and performing on-going monitoring/support. Besides, they are also responsible for the maintenance activities involved in Initiation Stage, Impact Analysis Stage and Disposition Stage (i.e. Stage 1 to 3) of SMC. The activities in the Implementation Stage will be contracted out as required. These include the modification, testing, revision of system documentation and the delivery of the requested change.

Remark: For the estimation of in-house resources required in monitoring contract-out projects, please refer to the “[Resources Estimation Guide \[G19\]](#)”.

9. APPENDIX A – CHANGE REQUEST FORM

See next page.

CHANGE REQUEST FORM

End User Ref. No.:

OGCIO Ref. No.:

PART A – INITIATION

CHANGE REQUEST *(To be filled by the Requester)*

Application System/Sub-system Name: _____

Change Request Type : Problem Report Enhancement Request Ad hoc Request

Priority : High Medium Low

Expected Delivery Date: _____

Request Details: (use separate sheets if necessary)

Reasons for the Change: (use separate sheets if necessary)

Requested by: _____

Signature : _____

Rank/Post: _____

Date: _____

Supported by: _____

(User Assurance Coordinator / Maintenance Manager)

Signature : _____

Rank/Post: _____

Date: _____

End User Ref. No.:
OGCIO Ref. No.:

PART B – IMPACT ANALYSIS

ANALYSIS DETAILS *(To be filled by Maintenance Team)*

Results: (use separate sheets if necessary)

System Costs (Estimated):

	<u>One-time</u>	<u>Annual Recurrent</u>	<u>5-Yr. Total</u>
Total System Cost:	HK\$ _____	HK\$ _____	HK\$ _____
Exchange Rate applied:	_____		

Function Point Analysis (Estimated):

Project Category: _____ Added F.P.: _____ Changed F.P.: _____ Deleted F.P.: _____

Resources	SM	API	APII
Man-days (Estimated):			

Remarks:

Analysed by:	_____	Rank/Post:	_____
Signature:	_____	Date:	_____

PART C – DISPOSITION

DECISION *(To be filled by Maintenance Board)*

Approved Rejected Deferred to _____
 Reasons/Remarks :

By: _____ <small>(User Assurance Coordinator)</small> Signature : _____ Rank/Post: _____ Date: _____	By: _____ <small>(Maintenance Manager)</small> Signature : _____ Rank/Post: _____ Date: _____
--	---

(To be filled by appropriate authority)*

Endorsed by:	_____	Rank/Post:	_____
Signature:	_____	Date:	_____
Remarks:	_____		

(*) [“Guidelines for OGCIO Staff on Acquisition of Stores & Services”](#) in OGCIO Portal is available for reference.

End User Ref. No.:
OGCIO Ref. No.:

PART D – IMPLEMENTATION

I. ACCEPTANCE *(To be filled by the Requester)*

User Acceptance Test Date (if applicable): _____

Delivery Date: _____

Accepted by: _____

Rank/Post: _____

Signature: _____

Date: _____

II. ACTUAL RESOURCES UTILIZATION *(To be filled by Maintenance Manager)*

Implementation Start Date: _____

Implementation Completion Date: _____

System Costs (Actual):

		<u>One-time</u>		<u>Annual Recurrent</u>		<u>5-Yr. Total</u>
Total System Cost:	HK\$	_____	HK\$	_____	HK\$	_____

Exchange Rate applied: _____

Function Point Analysis (Actual):

Project Category: _____ Added F.P.: _____ Changed F.P.: _____ Deleted F.P.: _____

Total adjusted F.P. of the system after maintenance: _____

Resources	SM	API	APII
Man-days (Actual):			

Remark:

Recorded by: _____

Rank/Post: _____

Signature: _____

Date: _____

10. APPENDIX B – SAMPLES OF CONTROL REPORTS

See next page.

Maintenance Progress Report
List of Outstanding Change Requests
as at 30 Nov. 2009

Application System/Sub-system ID: _____

Ref ID	Change Request Description	Type (Prob./Enh./Ad hoc)	Priority (H/M/L)	Date of Request	Status*
09/021	To round up the total cost of on	Enh.	L	22.1.09	Pending for Implementation
09/030	To add a flag forto indicate	Enh.	M	4.2.09	Deferred to 12/2009
09/033	To amend the value forto store	Prob.	M	8.2.09	Pending for approval
09/036	To generate the record list for Aug. 09	Ad hoc	L	10.2.09	Pending for implementation
09/037	To correct the calculation of the total field on when ...	Prob.	H	15.2.09	Implementation in progress
09/038	To add an option for on the	Enh.	M	25.2.09	Pending for impact analysis
09/040	To generate the report break down by month in 2008	Ad hoc	H	27.2.09	Implementation in progress
.....
.....

Number of problem reports:	9
Number of enhancement requests:	8
<u>Number of ad hoc requests:</u>	<u>4</u>
Total number of outstanding change requests:	21

* Possible status of outstanding change request are:-

- Pending for impact analysis;
- Pending for approval;
- Pending for implementation;
- Implementation in progress;
- Deferred to mm/yyyy.

Maintenance Progress Report
List of Completed/Rejected Change Request
from 1 Nov. 2009 to 30 Nov. 2009

Application System/Sub-system ID: _____

Ref ID	Change Request Description	Type (Prob./Enh./Ad hoc)	Priority (H/M/L)	Date of Request	Date of Delivery or Reason of Rejection
09/005	To add a total cost of on the report GS043...	Enh.	L	29.9.09	Delivered on 25.11.09
09/012	To amend the due to inconsistent data displayed in ... and ...	Prob.	H	22.10.09	Delivered on 9.11.09
09/022	To correct the value offor..... due to the update of	Prob.	M	3.11.09	Rejected as problem already resolved by the enhancement in 09/009
09/025	To . due to the update of	Enh.	M	3.11.09	Rejected due to
09/027	To generate the report of for	Ad hoc	H	13.11.09	Delivered on 28.11.09
.....
.....

	<u>Completed</u>	<u>Rejected</u>
Number of problem reports:	4	1
Number of enhancement requests:	3	1
Number of ad hoc requests:	3	0
Total number of change requests:	10	2