Terms of Reference
For

System development of social registry and integrated MIS of one stop shop for welfare programs – (ICTA/GOSL/CON/QCBS/2016/88)

1. Introduction and background

The Sri Lankan Government is experiencing financial and social pressures to deliver services more efficiently. Information technology is recognized as being central to redesigning the way in which organizations work together to deliver better services to the community. When combined with the commitment of government organizations to collaborate and consider alternative ways of business, the potential for improvements to services can be significant.

Sri Lanka has been providing social welfare to its citizens since the independence. The Sri Lankan government has implemented various welfare programs from time to time to alleviate poverty. The Samurdhi Program became the main social welfare program since 1994. There are 1.4 million Sri Lankan families who are directly benefitted from this program.

However, the necessity of having social protection programs in order to assure a minimum standard of living for the vulnerable groups has been recognized by all consecutive governments since independence and still evolving through converging on the situation in a timely manner. Accordingly, a number of protection initiatives such as social security, social safety net, social welfare services etc. have been implemented spending approximately one fifth of annual government expenditure where a gradual increase was noted.

Social Welfare

In addition, there are welfare programs implemented to ensure the rights of access to basic necessities. Provision of universal free education and medical supplies are the majority of them.

Social Safety net

A large number of welfare and safety-net schemes are also currently being implemented with an aim to reduce the vulnerability of disadvantaged segments of the society. Accordingly, individuals or families who have either old-old, deprived,

handicapped, displaced, undernourished or destitute are being attended by around 30 safety net schemes. They are designed to enhance income and wellbeing and/or provide care and facilities targeting the poor, elders, children and women in the above circumstances. Authorities are given to these schemes under different legal enactments, cabinet decisions, budget proposals etc.

Annually, around Rs.200 billion spent on universal and targeted welfare programs to implement these schemes through line ministries as well as ministries under Provincial Councils using different payment mechanisms. In this context, targeted welfare programs are considered under this document. Benefits are given mostly in terms of cash grants though there are few in-kind transfers as well. While most of these programs are financed through the Consolidated Fund some benefits are driven through foreign grants, such as World Food Program.

Current issues

All these schemes are implemented in a group specific manner; such as poor, old, disabled etc. and therefore, combinations of benefits given for one person is a frequent phenomenon. Absence of a unique process to implement these schemes and lack of coordination among the implementation agencies also cause to selecting real recipient to receive welfare benefits.

At present, selection of targeted beneficiary is always challenging due to:

- The absence of an integrated selection and targeting information system. There are incidences where the intended beneficiary has some time excluded from the scheme and ineligibles getting benefits.
- However, it should be noted that, benefits are provided to a different categories of people for a different purposes, application of common single selection criteria also impossible.
- The current operations are handled manually, therefore the administration cost of some schemes is comparatively high
- Many line ministries/ provincial councils implement programs but retrieving the data which kept in a consolidated manner is not currently available.
- Lack of system to ensure where the grants provided are successfully utilized for the relevant purposes especially when benefits given to a third party to provide care and facilities.
- Inconsistency of the line ministries and provincial councils with identifying beneficiaries.
- Difficulties in obtaining benefits on time due to inefficiency or complexity of the systems have.

Background

As a national policy, government has identified that, key citizen welfare services to be integrated through integrated development projects under Digitization of government national program for fostering social integration, peace, growth, and poverty reduction.

In this context, ICTA intends to Design, Develop and support for the implementation of Integrated Social Welfare Management Program -

1. Improve efficiency and effectiveness of targeted welfare service delivery programs implemented under the government of Sri Lanka.
2. Improve the accessibility and responsiveness of social welfare services, reduce transaction costs to the government
3. Make welfare program more transparent and accountable, in addressing the urgent needs of low income communities and isolated regions in the country.
4. Minimize errors and promote adoption of the accurate process in selection of beneficiaries by introducing appropriate selection criteria across the programs at provincial and national level.
5. Improve the necessary ICT and human capacities required to ensure the best use of resources allocated for integrated social welfare management programs and enhance the monitoring and evaluation skills.

2. Concise statement of the project objectives

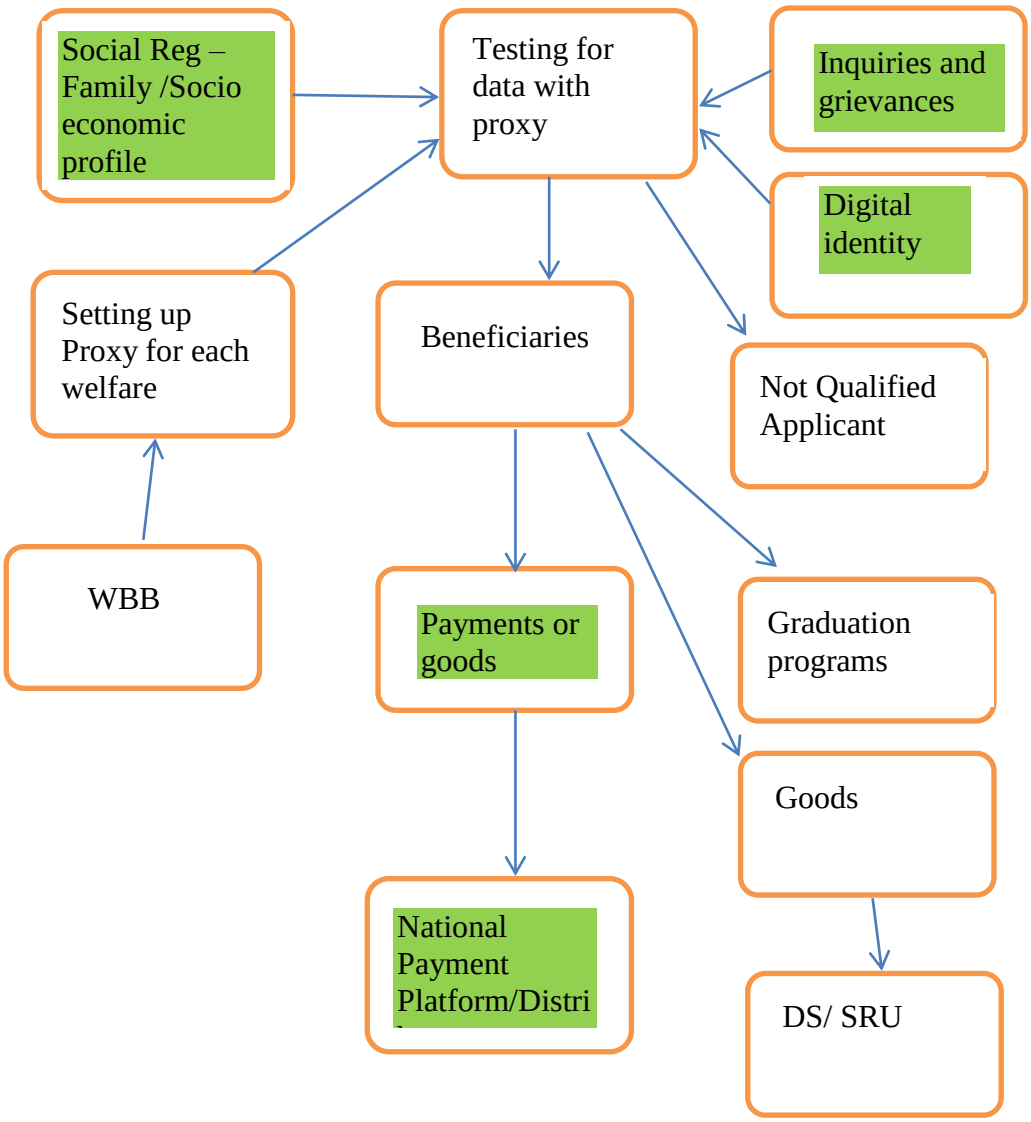
The main objective of the project is to design, develop, deploy and maintenance of Social Registry, Public Inquiry and Grievance Handling, and Beneficiary Selection System,

1. Establishment of the social registry MIS
2. Identity verification process for social registry
3. Grievance handling and inquiry management system for the social registry
4. Establishment of beneficiary targeting and selection process
5. To train the users of all offices of related organizations as trainers.
6. Channelling benefits to beneficiaries.

3. Scope of Work

3.1. Conduct a system requirement verification study of the processes
3.2. On completing the above, submit a requirement verification report.
3.3. Design and develop the system, upon obtaining ICTA approval for the above.
3.4. Implement in collaboration with the SPA consultants appointed by ICTA, or review committee and facilitate the 'Software Process Audit (SPA)' specified by ICTA. Refer Annex C
3.5. Maintain project source code in the ICTA Source Code Management system (SCM).
3.6. Maintain all issues in the Issue tracking system maintained by ICTA.
3.7. Adopt a proper application release procedure to release the system releases to ICTA during the deployment in the staging / production environments.
3.8. Participate for Project Review Committee meeting and Project Implementation Committee (PIC) Meetings as a member.
3.9. Obtain User Acceptance (UAT) for the implemented processes.
3.10. Deploy into production environment at Lanka Government Cloud (LGC).
3.11. Provide support and maintenance services, from the date of launch to an agreed time period.
3.12. Adhere to the Service Level Agreement, during the support and maintenance phase (SLA) indicated in Annex B.
3.13. Adherence to e-Government Policy of Sri Lanka [1].
3.14. Adherence to Web 2.0 concepts, open standards and Service Oriented Architecture (SOA) principles.
3.15. Adherence to LIFe standards [2].
3.16. Work collaboratively with ICTA and other stakeholder organizations

3.17. Followings are the functional requirements at higher level



3.18. Detailed requirements relating to above processes are documented in Business Process Re-engineering study report into detail levels such as main processes, sub processes, process components, steps and related forms.

3.19. The developer should follow BPR report (summary indicated below) to prepare the Detailed Software Requirement Specification (DSRS) document by translating such requirements into a software requirement specification.

Functional Area	Sub Functions	Notes
The setting-up and Updating of Statistical Information for each DS Division / District Secretariat.	Receive and Update Statistical Information on the System	The objective of this component of the process is to ensure all information received is captured accurately onto the System.
The setting-up and Updating of the Criteria for Eligibility for each GN Division	Periodicly updating the Criteria for Eligibility for each GN Division on the System	The objective of this component of the process is to ensure all information relevant to the Criteria for Eligibility are accurately captured onto the System.
	Receiving feedback from village representatives	
	Review Finalizing of Eligibility Criteria	
Receiving of applications and updating of eligibility based on the specific criteria of the GN	Capturing prospective Welfare subsidy applicant details into the System & Prepare Criteria Evaluation Form	The objective of this component of the process is to ensure all information relevant to an application is captured into the System.
	Managing inconsistency of information in the application as informed by the applicant	This process will correct the information when informed by the applicant that it is not accurate.
	Obtain feedback for Eligibility Criteria Evaluation Form and update the System	This process will assist in generating the 'Eligibility Criteria Evaluation Form'.
	Managing inconsistency of information in the Evaluation Form	This process will correct the information claimed to be inaccurate when informed by the applicant, a current

		recipient or any other person. Such a person will be classified as an informant.
	Prepare Listing of Eligibility for eligible applicants & Listing of applicants NOT eligible	This process will define how the prospective recipients will be ranked within the system.
	Managing inconsistency of information in the Eligibility and Eligibility Lists	This process will correct the information claimed to be inaccurate when informed by to the Welfare Office through the CRM System. Such a person will be classified as an informant
Finalizing of the recipients based on the Cut-off Criteria and informing the prospect.	Finalize list of selected applicants based on the regional	This sub-process will define how to select the recipients based on their eligibility and statistical information for the specific GN Division.
	Finalize and Publish Welfare subsidy recipient list by WBB	The sub-process will define how to generate and publish the Selected Subsidy Recipient List.
Update Changes to the beneficiary family Unit (births, marriage, employment, death, etc.).	Receive information on Changes to the Beneficiary Family Unit informed by the recipient	The objective of this component of the process is to ensure all information received from the recipient in connection with a change to the Family Unit is captured accurately onto the System.
	Receive information on Changes to the Beneficiary Family Unit informed through the	The objective of this component of the process is to ensure all information received at

	Population Register	the Population Registry is made available to the System.
	Receive information on Changes to the Beneficiary Family Unit informed through the CRM System	The objective of this component of the process is to ensure all information received through the CRM System is updated on the System.
	Verify and Update Information on Changes to the Family Unit	The objective of this component of the process is to ensure the information received is verified validated and confirmed on the System.
Updating of Other Information and any special status of recipients (e.g. pregnant mothers)	Receive information on Change of Information within the System	The objective of this component of the process is to ensure all information received in relation to a change is accurately captured onto the System @SAM.
	Receive information on Changes to the Beneficiary informed through the HHL (House Holder's List) System.	The objective of this component of the process is to ensure all information received HHL System is made available to the System.
	Receive information on Changes to Information related to the Beneficiary informed through the CRM System	The objective of this component of the process is to ensure all information received through the CRM System is updated on the System.
	Verify and Update Information on Changes to the Beneficiary Information	The objective of this component of the process is to ensure the initial information received validated and updated on

		the System.
Modify the beneficiary eligibility of the Subsidy Scheme (enhance, reduce or new subsidy)	Changes to Subsidy due to an Addition or Reduction to an individual within the Family Unit	The objective of this component of the process is to ensure the subsidy scheme within the System modified subsequent to the addition or reduction of a member to the Family Unit.
	Changes to the Subsidy due to a Change in the Status of a Member within the Family Unit	The objective of this component of the process is to ensure the necessary changes to the Subsidies are updated on the System following the change in the Status of an Individual within the Subsidy Scheme.
	Changes due to change in location of receiving the Subsidy (Within the same GN Division)	The objective of this component of the process is to ensure the necessary change to the location of receiving the subsidy is updated on the System following the changes to the point through which the benefits are received within the GN Division. (Note: until the documentation and distribution of the subsidy are complete – the subsidy must be received from the existing distributor).
	Changes due to change in address and location of receiving the Subsidy (when moving from one	The objective of this component of the process is to ensure the necessary change to the location of

	GN Division to another GN Division)	receiving the subsidy is updated on the System following the changes to the address and the point through which the benefits are received across GN Divisions.
	Notification of Cessation of Time Based Schemes	The objective of this component of the process is to ensure the cessation of time based schemes are notified.
Removal of recipients from the list of beneficiaries and informing the beneficiary	Finalizing the Cancellation of a Subsidy with the approval of WBB	This sub-process will define how a subsidy being issued to a beneficiary is removed.
Creation of the Subsidy Schemes with the approval of WBB	Naming the Subsidy Scheme with the approval of WBB	The objective of this component of the process is to ensure that the Basic Information related to the Subsidy Scheme is accurately captured into the System.
	Ensuring the details of the Eligibility Criteria are being Captured within the System	The objective of this component of the process is to ensure all information related to the criteria for the scheme is accurately entered into the System.
	Defining the Values for each Eligibility Criteria	The objective of this component of the process is to ensure all specific values related to the eligibility criteria in relation to the subsidy scheme is captured into the System .
	Defining the Benefits	The objective of this

	Associated with the Scheme	component of the process is to define the benefits associated with the Subsidy Scheme within the System.
	Approval of the Subsidy Scheme, Eligibility Criteria and the Associated Benefits	The objective of this component of the process is to obtain the final approval for the entire scheme form the Officer Responsible for Welfare.
Modify the Benefits within the Scheme and Eligibility Criteria with the approval of WBB	Modification (additions/deletions) to the Eligibility Criteria with the approval of WBB	The objective of this component of the process is to ensure that the modifications required to the eligibility criteria within a subsidy scheme are updated on the System. (Note: The new criteria will come into effect only when evaluating a subsequent applications).
	Modifications to the Values within the Eligibility Criteria	The objective of this component of the process is to update the System with the values related to the eligibility criteria.
	Addition of Specific Benefits associated with the Subsidy Scheme	The objective of this component of the process is to enable the addition of benefits to a specific subsidy scheme.
	Removal of Specific Benefits associated with the Subsidy Scheme	The objective of this component of the process is to remove specific benefits from the subsidy scheme and update the System accordingly.

	Modify the Value of Specific Benefits associated with the Subsidy Scheme	The objective of this component of the process is to modify the value of a specific benefit within the subsidy scheme. (Note: the enhancement of the benefit could be done immediately, while a reduction will be done only with the annual issue of the subsidy).
Prepare a schedule of benefits to be disbursed to beneficiaries.	Defining the monthly benefit distribution cycle	The objective of this component of the process is to ensure that a schedule is prepared defining the period the benefits will be distributed to the beneficiaries.
	Generating the 'Benefit Distribution Statement'	The objective of this component of the process is to ensure that each distributor could generate a document indicating the benefits that he needs to distribute prior to the date of the distribution. (Note: Due to timing issues if a beneficiary though eligible was unable to receive a benefit – such a beneficiary may be permitted to use 2 stamps).
Prepare and re-imbursement of benefits distributed	Update benefits issued to beneficiaries	The objective of this component of the process is for the distributor to update the System with the benefits distributed. (Note: It should be possible to receive this

		information as a input to the System or as a web service from the distributor's system).
	Reimbursement by Cash at DS	The objective of this component of the process is to reimburse the distributor in cash at the DS.
	Reimbursement by through Bank Transfer	The objective of this component of the process is to reimburse the distributor in cash at the DS.
Receive MIS Information Request.	Receive Request for MIS Information through the System	The objective of this component of the process is to receive information regarding MIS requirements through the System.
Updating Data Capture Formats.	Update the Data Capture Formats	The objective of this component of the process is to identify the appropriate format and modify the format so that the additional data could be captured in the future.
Deployment of MIS Report and informing users.	Deployment of One-Off Reports	The objective of this component of the process is to distribute a 'One-Off' Report to the relevant users.
	Deployment of Regular Reports (New or Modified)	The objective of this component of the process is to deploy Regular Reports on the System.

3.20. Integrate the new processes with the existing welfare benefit program related processes which contain functions of deed registration.

3.21. ICTA or its designated entity (end user) shall have the ownership rights to client specific components arising from the requirements specified in the DSRS. The ICTA may consider shared ownership rights to such components provided there is a cost benefit to ICTA or its designated entity (end user) at the discretion of the ICTA.

3.22. ICTA or its designated entity (end user) should have the right to access, modify, further develop and enhance the system at no cost to ICTA or its designated entity (end user).

3.23. The evaluation and the selection of the successful Bidder will be based on Total Cost of Ownership to ICTA or its designated entity (end user)

3.24. Refer following Annexes which form a part and partial of the "Terms of Reference".

Annex A- Non-Functional Requirements
Annex B- Service Level Agreement (SLA) for Support and Maintenance Services
Annex C- Software Project Audit Process

4. Final outputs, Reporting Requirements, Time Schedule for Deliverables

Project duration is 6 months including requirement Verification, designing, developing and deploying the system.
Consultancy firm is required to submit the following list of deliverables for the System development of social registry and integrated MIS of one stop shop for welfare programs project.

No	Deliverables	Phase
4.1	Implementation Proposal 4.1.1 Inception report 4.1.2 Requirement verification report 4.1.3 Implementing schedule 4.1.4 Acceptance criteria for the UAT 4.1.5 Proper maintenance of issues in the Issue tracking System	Inception
4.2	4.2.1 Design and Architecture Document 4.2.2 Data migration and integration plan (if applicable) 4.2.3 Release Management plan (including staging, production and support and maintenance) 4.2.4 Proper maintenance of issues in the Issue tracking System	Elaboration
4.3	4.3.1 Iteration one release note 4.3.2 Iteration two release note 4.3.3 Iteration three release note 4.3.4 Proper maintenance of source code in SCM for all three iterations 4.3.5 Proper maintenance of issues in the issue tracking System	Construction
4.4	4.4.1 Solutions deployment and installation guide 4.4.2 Online help and the User manual for back office application 4.4.3 Administrator Manual 4.4.4 Proper maintenance of issues in the Issue tracking System 4.4.5 Successful UAT acceptance of the system 4.4.6 Production deployment confirmation report	Transition

5. Qualifications of the key consultants

Preferable Minimum Qualifications;

- **System implementing team**

Key Professional Staff	**Academic Qualification**	**Experience in the PROPOSED ROLE**	**Experience in working in SOA / web services / integration projects**	**Exposure SQA Process**
Project Manager	B. Sc or equivalent	5 years	2 years	2 years
Software Architect	B. Sc or equivalent	3 years	2 years	2 years
Technical Lead	B. Sc or equivalent	2 years	1 years	2 years
Business Analyst	B. Sc or equivalent	3 years	1 years	2 years
Quality Assurance Lead	B. Sc or equivalent	2 years	1 years	2 years
Software Engineer	B. Sc or equivalent	2 years	1 years	1 years
UI Lead	B. Sc or equivalent	3 years	2 years	1 years
UI Engineer	B. Sc or equivalent	2 years	1 years	1 years
QA Engineer	B. Sc or equivalent	2 years	1 years	1 years
DB Specialist	B. Sc or equivalent	3 years	2 years	1 years
IS Security Specialist	B. Sc or equivalent	3 years	1 years	1 years

- **Support and Maintenance team**

Key Professional Staff	**Academic qualification**	**Experience in the PROPOSED ROLE**	**Experience in working in SOA / web services / integration projects**	**Exposure SQA Process**
Technical Lead	B. Sc or equivalent	2 years	1 years	2 years
Software Engineer	B. Sc or equivalent	2 years	1 year	1 year

6. Services and Facilities Provided by ICTA

6.1.Web-based access to the ICTA SCM system
6.2.Designs of the existing system
6.3.Access to staging/ production servers
6.4.Issue Tracking System
6.5.SQA dashboard

7. References

[1] e-Government Policy Approved by Cabinet of Sri Lanka
http://www.icta.lk/index.php/en/e-governement-policy

[2] Lanka Interoperability Framework - http://www.life.gov.lk/ - Check with Kanishka about personal domain.

8. Review Committees and Review Procedures

The Software Development Service Provider is required to work closely with the ICTA Technology Team and the Software Process Audit (SPA) consultants.

All versions of deliverables will be reviewed by/either the SPA consultants, SAGE, or ICTA Technology Team.

All the deliverables must be verified and confirmed to be accurate and complete by the Project Implementation Committee (PIC) or the Project Management Committee (PMC). Deliverables must be formally endorsed by the PIC or PMC or CTO or Head of Technology Team.

Annex (A)
Non-Functional Requirements

1. **Workflow based operations**
   A workflow is activated when an initiating event occurs. The workflow would guide a user in actioning an event. It would define the requirements to initiate a workflow. Once initiated, the processing should be controlled as to the sequence of activities, and the officers who execute it.
   Some key terms and concepts of workflow based operations are:

- Task: Work performed to effect a single change. A workflow would consist of several tasks. In workflow construction, the task definition is a template for action. The task must be associated with an actual event in order to carry out the action.
- Activated Task: When an action is required, and a task is associated with a specific item which must be actioned, the task is instantiated and a single instance of the task is created. It is the instance of a task (ie- Activated Task) which can be executed. (Note: This is not a standard workflow term, and has been adopted for clarity).
- Work Item: A workflow-item moving through a work process. A work item would be associated with a single instance of a workflow, and Activated Tasks within the workflow.

   Refer Annexure A1.1 for more supporting services

2. **Security**
   1. User authentication and authorization
   An administrative application need to be developed wherever applicable.

   2. Availability
   The system should be developed to ensure "High Availability" to remain the system available all the time. (e.g. Portlets clustering capability should be taken into consideration in the development)

   3. Non-repudiation
   The system should ensure non-repudiation by having standard audit-trails and provisions to have WS-Security using digital signatures.

3. **Audit Facilities**
   Wherever applicable, an audit trail of all activities must be maintained. On a service or operation being initiated, the system should log the event, creating a basic 'audit log entry'. It should not be possible for the operation to be executed without the log entry being made.

   The information recorded in the audit trail depends on the type of activity which takes place. Each service would be responsible for logging detailed information. The different types of operations are -
   1. Data Capture & Maintenance
   2. Creation of an entry / item
   3. Modification an item

4. Deletion
5. Control (or status change)
6. Process execution
7. Data synchronization
8. Print (only selected item)
9. Retrieval
10. Monitor

Detail logging may be enabled or disabled for each type of operation, and/or for each business object. It should be possible to configure which attributes of a data item should be traced at the detail level. Tracing of some attributes may be considered mandatory, and they should not be turned off.

4. **Backup and Contingency Planning**

The main contingencies that should be considered and the training with regards to these shall be given to the relevant staff -

1. Equipment failure
2. Physical / natural Disaster
3. Messaging or communication facilities.
4. Changes in operations and policy
5. Sudden absence of key personnel
6. Breach in Security

Automatic Backups daily, weekly and monthly should be taken. All the backup procedures and backups needs to be tested regularly for restoration.

5. **Performance**

Following performance criteria is provided as a guideline only. If the actual performance is falling below the stipulated figures, the consultant is to justify the reasons. However, the performance level must be accepted by the technical evaluation committee appointed by the client.

The bandwidth is assumed at 512kbps (shared) (point to point between LIX and the Department web service) with 1,000 concurrent users (50% load factor) in total.

Item	**Performance**
Screen Navigation: field-to-field	< 10 milliseconds
Screen Navigation: screen-to-screen	< 5 seconds
Screen Refresh	< 3 seconds
Screen list box, combo box	< 3 seconds
Screen grid – 25 rows, 10 columns	< 5 seconds
Report preview – (all reports) – initial page view (if asynchronous)	< 60 seconds in most instances. It is understood that complicated / large volume reports may require a longer period

Simple enquiry – single table, 5 fields, 3 conditions – without screen rendering	< 5 seconds for 100,000 rows
Complex enquiry – multiple joined table (5), 10 fields, 3 conditions – without screen rendering	< 8 seconds for 100,000 rows
Server side validations / computations	< 10 milliseconds
Client side validations / computations	< 1 millisecond
Batch processing (if any) per 100 records	< 120 seconds
Login, authentication, and verification	< 3 seconds
Daily backups (@ Dept.) – max duration	1 hour (on-line preferred)
Total Restore (@Dept) – max duration	4 hours

Annex (B)
SERVICE LEVEL AGREEMENT *for*
SUPPORT AND MAINTENANCE SERVICES

1. **Introduction**

The aim of this agreement is to provide a basis for close co-operation between the Client and the Consultant for support and maintenance services to be provided by the Consultant, thereby ensuring a timely and efficient support service is available. The objectives of this agreement are detailed in Section 1.1.

This agreement is contingent upon each party knowing and fulfilling their responsibilities and generating an environment conducive to the achievement and maintenance of targeted service levels.

1.1 Objectives of Service Level Agreements

1. To create an environment conducive to a co-operative relationship between Client, Consultant and Client's representatives (government organizations) to ensure the effective support of all end users.
2. To document the responsibilities of all parties taking part in the Agreement.
3. To define the commencement of the agreement, its initial term and the provision for reviews.
4. To define in detail the service to be delivered by each party and the level of service expected, thereby reducing the risk of misunderstandings.
5. To institute a formal system of objective service level monitoring ensuring that reviews of the agreement is based on factual data.
6. To provide a common understanding of service requirements/capabilities and of the principles involved in the measurement of service levels.
7. To provide for all parties to the Service Level Agreement a single, easily referenced document which caters for all objectives as listed above.

1.2 Service Level Monitoring

The success of Service Level Agreements (SLA) depends fundamentally on the ability to measure performance comprehensively and accurately so that credible and reliable information can be provided to customers and support areas on the service provided.

Service factors must be meaningful, measurable and monitored constantly. Actual levels of service are to be compared with agreed target levels on a regular basis by both Client and Consultant. In the event of a discrepancy between actual and targeted service levels both Client and Consultant are expected to identify and resolve the reason(s) for any discrepancies in close co-operation.

Service level monitoring will be performed by Client. Reports will be produced as and when required and forwarded to the Consultant.

1.3 **Support Levels**

The consultant must provide support and maintenance services during Support Levels mentioned below;

Support Level: **High**	
Component/ Service	Core Components of Lanka Gate
Support Hours	24 hours a day, all days in the week (including public and mercantile holidays)
Support Level: **Medium**	
Component/ Service 1	Government Interface and related backend services (deployed at Government organization site)
Support Hours	From 08:00 AM to 05:00 PM Monday to Friday (excluding public holidays)
Component/ Service 2	For front-end portlets and supporting back-end applications (web services, etc.. deployed at Lanka Government Cloud (LGC))
Support Hours	From 08:00 AM to 09:00 PM, all days in the week (including public and mercantile holidays)

1.4 **On-Call Services Requirements**

Consultant MUST make at least ONE qualified personnel available to the Client by telephone and email for the reporting and resolution of non-conformities or other issues, defects or problems. Dedicated telephone numbers and emails should be available for reporting issues. Client will nominate the personnel who are authorized to report non-conformities or other problems with the system from the departments. Reporting of non-conformities includes requests by the Client to apply critical software updates or patches.

Table-1 shows the response priority assigned to faults according to the perceived importance of the reported situation and the required initial telephone response times for the individual priority ratings. All times indicated represent telephone response time during specified Support Levels. The indicated telephone response time represents the maximum delay between a fault/request being reported and a Consultant's representative contacting the Client by telephone. The purpose of this telephone contact is to notify the Client of the receipt of the fault/request and provide

the Client with details of the proposed action to be taken in respect of the particular fault/request.

Support Level	**Business Critical**	**Business Critical**	**Non-Business Critical**	**Non-Business Critical**
	Fatal	**Impaired**	**Fatal**	**Impaired**
High	60 minutes within Support Hours	90 minutes within Support Hours	90 minutes within Support Hours	120 minutes within Support Hours
Medium	120 minutes within Support Hours	150 minutes within Support Hours	150 minutes within Support Hours	180 minutes within Support Hours

Table-1: Response Priority

Note:
Fatal - Total system inoperability
Impaired - Partial system inoperability
Business Critical - Unable to perform core business functions
Non-Business Critical - Able to perform limited core business functions

Consultant notification can occur outside Support Level time, and thus the response may occur after the next Support Level begins. Furthermore, "Time to Arrive On-Site (Table-3)" starts from Support Level starting time and "Time to Resolve the Problem" is Support Level time starting from the actual time of arrival on site.

1.5 **Problem Resolution and Penalties**

If problems have not been corrected within two (2) hours of the initial contact, the Consultant shall send qualified maintenance personnel to the respective Client's site to take necessary actions to correct the issue reported (defect, problem or non-conformity).

If faults are not corrected within the time limits specified in the Table-2, the Client shall be entitled to a penalty payment for each hour that the Consultant fails to resolve the fault.

Maximum ceiling of penalty for a given month is 10% of the monthly support and maintenance price.

The time to arrive on-site is specified in the Table-3.

Support Level	Business Critical	Business Critical	Non-Business Critical	Non-Business Critical
	Fatal	**Impaired**	**Fatal**	**Impaired**
High	6 Hours LKR 5,000.00 per hour	10 Hours LKR 3,000.00 per hour	10 Hours LKR 3,000.00 per hour	15 Hours LKR 2,000.00 per hour
Medium	8 Hours LKR 5,000.00 per hour	12 Hours LKR 3,000.00 per hour	12 Hours LKR 3,000.00 per hour	20 Hours LKR 2,000.00 per hour

Table-2: Resolution Time and Penalties

Support Level	Business Critical	Business Critical	Non-Business Critical	Non-Business Critical
	Fatal	**Impaired**	**Fatal**	**Impaired**
High	Not applicable	Not applicable	Not applicable	Not applicable
Medium	2 Hours	3 Hours	3 Hours	5 Hours

Table-3: Time to arrive on-site

Annex C

Software Project Audit Process

Version 1.2

Information and Communication Technology Agency of Sri Lanka

1. Introduction

1.1 Purpose

Purpose of this document is to describe the Software Project Audit Process which is capable of auditing and ensuring the quality of different activities carried out throughout a software project life-cycle. The main purpose of this process is to provide much higher level of confidence in the quality of the deliverables received by the client from the developer. The quality level of the audited activity is presented using a measurement technique called metrics.

The process should be followed by both the development team and the Software Project Audit team to derive their own metrics to measure the quality status of a software product in its life cycle. Eventually, the trend analysis of such metrics can be used to identify any potential project issues or failures and to come up with solutions.

This document explains several guidelines which can be used within the audit process for project progress calculation and mapping payment milestones with project deliverables or and project artifact reviews to effectively manage the project.

Further, the document contrasts the Software Project Audit process from typical software development life cycle and illustrates how it has been automated by integrating several testing tools and testing methodologies as well as embedding best industry standards.

1.2 Scope

Scope of this document is to provide an insight about the Software Project Audit Process, importance of metrics, analysis of metrics, automated process of metric generation, skills required to generate certain metrics, guideline for project progress calculation, guideline for mapping payment milestones with deliverables and guideline for Review of Project artifacts.

1.3 Definitions, Acronyms and Abbreviations

Acronym	Definition
AQI	Architecture Quality Index
AD	Architectural Design
CQI	Code Quality Index
DD	Defect Density
DQI	Design Quality Index

DSI	Defect Severity Index
ISI	Issue Severity Index
PERI	Project Execution Readiness Index
RCI	Requirement Clarity Index
SPA	Software Project Audit
SR	Software Requirement
TTEI	Tasks Tracking Efficiency Index
TR	Transfer
UAT	User Acceptance Test
OAT	Operational Acceptance Test

2. Process Overview

It is often said that if something cannot be measured, it cannot be managed or improved. There is immense value in measurement, but you should always make sure that you get some value out of any measurement that you are doing.

What is a Metric?

It is a standard of measurement which can be used to measure the software quality. It gives a confidence in the software product. They are typically the providers of the visibility of the software product you need.

Why Measure?

When used appropriately, metrics can aid in software development process improvement by providing pragmatic, objective evidence of process change initiatives. Although metrics are gathered during the test effort, they can provide measurements of many different activities performed throughout a project. In conjunction with root cause analysis, test metrics can be used to quantitatively track issues from points of occurrence throughout the development process. In addition, when metrics information is accumulated, updated and reported on a consistent and regular basis, it ensures that trends can be promptly captured and evaluated.

What to Measure?

When considering the metric driven process, it can be divided into two parts. The first part is to collect data, and the second is to prepare metrics/charts and analyze them to get the valuable insight which might help in decision making. Information collected during the software development process can help in:

- Finding the relation between data points
- Correlating cause and effect
- Input for future planning

Normally, the metric driven process involves certain steps which are repeated over a period of time. It starts with identifying what to measure. After the purpose is known, data can be collected and converted into the metrics. Based on the analysis of these metrics appropriate action can be taken, and if necessary metrics can be refined and measurement goals can be adjusted for the better. Data presented by Development/testing team, together with their opinion, normally decides whether a product will go into client or not. So it becomes very important for Development team/test teams to present data and opinion in such a way that data looks meaningful to everyone, and decision can be taken based on the data presented. Every software project should be measured for its schedule and the quality requirement for its release. There are lots of charts and metrics that we can use to track progress and measure the quality requirements of the release. In Figure 1.0 shows some of main metrics which can be derived at specific level of the software development life-cycle.

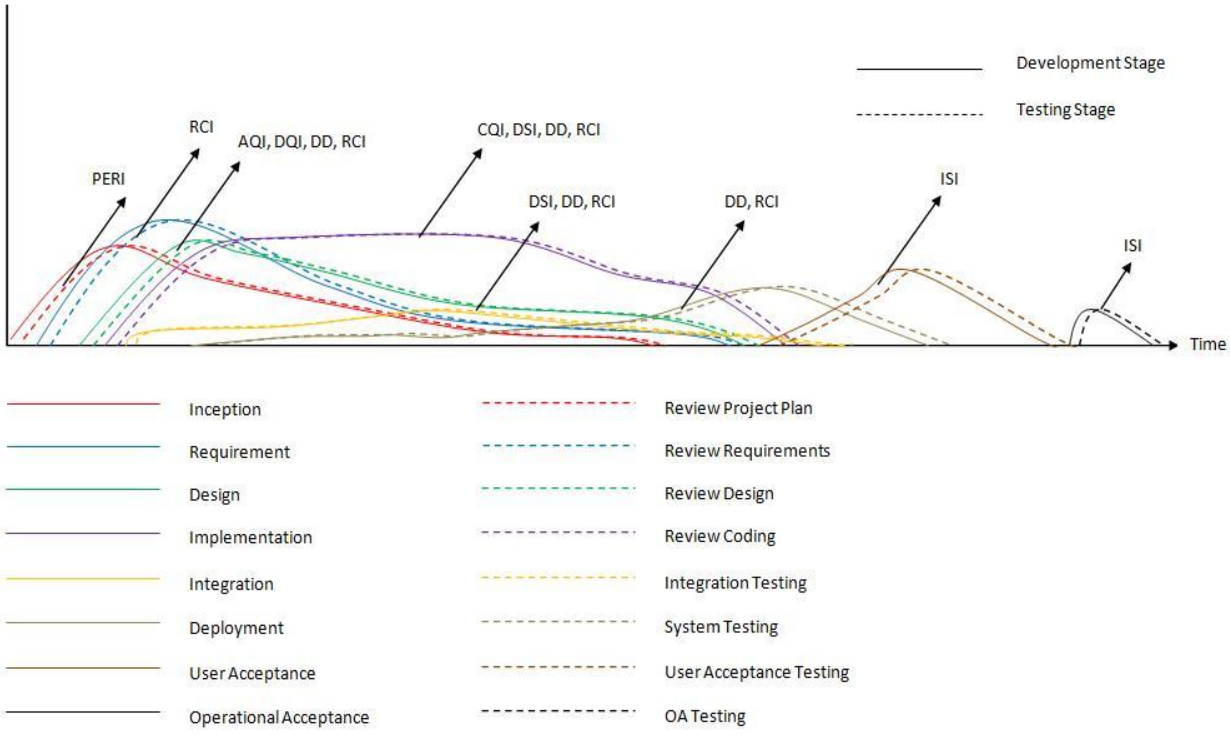


Figure 1.0 - Various Metrics derived at different levels of SD process

2.1 Metrics in Brief

Metric	Purpose
Project Execution Readiness Index (PERI)	This Proposed index at requirements stage is derived based on quality of the documents involve with this phase. The main Documents involve in this phase are; * User Requirements Document * Acceptance test plans * Project management plan for the SR phase * Configuration management plan for the SR phase * Verification and validation plan for the SR phase * Quality assurance plan for the SR phase When reviewing, reviewers can verify the document by checking its content with a checklist. Each of these content in a checklist is categorized under their Severity to the System. All defects in those contents should be logged in a defect tracking system. Finally, index can be derived as; Weighted average of the total number of Open Issues in the product detected till date against all categories (Blocker (B), Critical (C), Major (Ma), Normal (N), Minor (Mi), Trivial(T)). Metric: $\frac{(B*162 + C*54 + Ma*18 + N*6 + Mi*2 + T)*10}{\text{Total weight } (162+54+18+6+2+1)}$ Note: Can be calculated based on the review cycles
Requirements Clarity/Change Index(RCI)	This index measures following two criteria relevant to requirements 1. Requirements Clarity This is the proposed index is at Specification Stage which should indicate how well each member of the Software development team comprehend the requirements and also indicates How well the requirements are cleared for Software Development Team. 2. Requirement Changes Requirement changes may be arisen at any stage of a project. Therefore, this index should be continued till UAT phase of a project and all the requirement changes arisen during that period should be captured under this index. The index indicates, weighted average of the total number of Open Issues in the product detected till date against all categories (Blocker (B), Critical (C), Major (Ma), Normal (N), Minor (Mi), Trivial (T)). Metric: $\frac{(B*162 + C*54 + Ma*18 + N*6 + Mi*2 + T)*10}{\text{Total weight } (162+54+18+6+2+1)}$ Note: Can be calculated based on the review cycles.
Architectural Quality Index (AQI)	Testing indicator for Architectural design level. The main documents of the AD phase are; *Architectural Design Document (ADD); *Software Project Management Plan for the DD phase (SPMP/DD) *Software Configuration Management Plan for the DD phase (SCMP/DD) *Software Verification and Validation Plan for the DD Phase (SVVP/DD) *Software Quality Assurance Plan for the DD phase (SQAP/DD)

	*Integration Test Plan (SVVP/IT) When reviewing, reviewers can verify the document by checking its content with a checklist. Each of these content in a checklist is categorized under their Severity to the System. All defects in those contents should be logged in a defect tracking system. Finally, index can be derived as; Weighted average of the total number of Open Issues in the product detected till date against all categories (Blocker (B), Critical (C), Major (Ma), Normal (N), Minor (Mi), Trivial(T)). Metric: $\frac{(B*162 + C*54 + Ma*18 + N*6 + Mi*2 + T)*10}{\text{Total weight } (162+54+18+6+2+1)}$ Note: Can be calculated based on the review cycles
Design Quality Index (DQI)	This is the Index proposed at Detailed Design Level. Should define a quality index (DQI) to measure and evaluate the quality of the Detailed Design based on the quality of the documents involve with the Detailed Design phase. The main documents of the AD phase are the; *Detailed Design Document (DDD) *Software User Manual (SUM) *Software Project Management Plan for the TR phase (SPMP/TR) *Software Configuration Management Plan for the TR phase (SCMP/TR) *Software Quality Assurance Plan for the TR phase (SQAP/TR) *Acceptance Test specification (SVVP/AT) When reviewing, reviewers can verify the document by checking its content with a checklist. Each of these content in a checklist is categorized under their Severity to the System. All defects in those contents should be logged in a defect tracking system. Finally, index can be derived as; Weighted average of the total number of Open Issues in the product detected till date against all categories (Blocker (B), Critical (C), Major (Ma), Normal (N), Minor (Mi), Trivial(T)). Metric: $\frac{(B*162 + C*54 + Ma*18 + N*6 + Mi*2 + T)*10}{\text{Total weight } (162+54+18+6+2+1)}$ Note: Can be calculated based on the review cycles
Code Quality index (CQI)	- Indicates how well the software codes are written and maintained. - To be derived using considering multiple aspects. This will be decided in project execution. - Index can be derived as; Weighted average of the total number of Open Issues in the product detected till date against all categories (Blocker (B), Critical (C), Major (Ma), Normal (N), Minor (Mi), Trivial (T)). Metric: $\frac{(B*162 + C*54 + Ma*18 + N*6 + Mi*2 + T)*10}{\text{Total weight } (162+54+18+6+2+1)}$
Defect Density (DD)	- Number of defects per unit size of the application (KLOC) - Calculated end of each drop cycle. - The Number of Known Defects is the count of total defects identified against a particular software entity, during a particular time period - Size is a normalizer that allows comparisons between different software entities

	(i.e modules, releases, products). Size is typically counted either in Lines of Code or Function Points.
Defect Severity Index (DSI)	- Indicates application stability - Weighted average of the total number of Open Defects in the product detected till date against all categories (Blocker (B), Critical (C), Major (Ma), Normal (N), Minor (Mi), Trivial (T)). Metric: $\frac{(B*162 + C*54 + Ma*18 + N*6 + Mi*2 + T)*10}{\text{Total weight } (162+54+18+6+2+1)}$ Note: Calculated weekly and delivered by drop
Issue Severity Index (ISI)	During the User Acceptance Test(UAT) time issues can be arisen. All those issues should be logged in UAT documentation as well as in the bug tracking System. - Weighted average of the total number of Open issues in the product arisen during the UAT period against all categories (Blocker (B), Critical (C), Major (Ma), Normal (N), Minor (Mi), Trivial (T)). Metric: $\frac{(B*162 + C*54 + Ma*18 + N*6 + Mi*2 + T)*10}{\text{Total weight } (162+54+18+6+2+1)}$
Defect Category	attribute of the defect in relation to the quality attributes of the product. Quality attributes of a product include functionality, usability, documentation, performance, installation, stability, compatibility, internationalization etc. This metric can provide insight into the different quality attributes of the product. This metric can be computed by dividing the defects that belong to a particular category by the total number of defects.
Defect Cause Distribution Chart	This chart gives information on the cause of defects.
Defect Distribution Across Components	This chart gives information on how defects are distributed across various components of the system.
Defect Finding Rate	This chart gives information on how many defects are found across a given period. This can be tracked on a daily or weekly basis.
Defect Removal Efficiency	The number of defects that are removed per time unit (hours/days/weeks). Indicates the efficiency of defect removal methods, as well as indirect measurement of the quality of the product. Computed by dividing the effort required for defect detection, defect resolution time and retesting time by the number of defects. This is calculated per test type, during and across test phases.
Effort Adherence	As % of what is committed in contract. Provides a measure of what was estimated at the beginning of the project vs. the actual effort taken. Useful to understand the variance (if any) and for estimating future similar projects.
Number of Defects	The total number of defects found in a given time period/phase/test type that resulted in software or documentation modifications. Only accepted defects that resulted in modifying the software or the documentation are counted.
Review Efficiency	# of defects detected /LOC or pages reviewed per day
Test Case Effectiveness	The extent to which test cases are able to find defects. This metric provides an indication of the effectiveness of the test cases and the stability of the software. Ratio of the number of test cases that resulted in logging defects vs. the total number of test cases.

Test Case Execution Statistics	This metric provides an overall summary of test execution activities. This can be categorized by build or release, module, by platform (OS, browser, locale etc.).
Test Coverage	Defined as the extent to which testing covers the product's complete functionality. This metric is an indication of the completeness of the testing. It does not indicate any thing about the effectiveness of the testing. This can be used as a criterion to stop testing. Coverage could be with respect to requirements, functional topic list, business flows, use cases, etc. It can be calculated based on the number of items that were covered vs. the total number of items.
Test Effort Percentage	The effort spent in testing, in relation to the effort spent in the development activities, will give us an indication of the level of investment in testing. This information can also be used to estimate similar projects in the future. This metric can be computed by dividing the overall test effort by the total project effort.
Traceability Metric	Traceability is the ability to determine that each feature has a source in requirements and each requirement has a corresponding implemented feature. This is useful in assessing the test coverage details.
Scope Changes	The number of changes that were made to the test scope (scope creep). indicates requirements stability or volatility, as well as process stability. Ratio of the number of changed items in the test scope to the total number of items
Task Tracking Efficiency Index (TTEI)	This index indicates the average time taken to attend to general project tasks. $TTEI = \frac{\Sigma \text{ Time taken to attend task}}{\Sigma \text{ open task}}$

Table 1.0 – Metrics

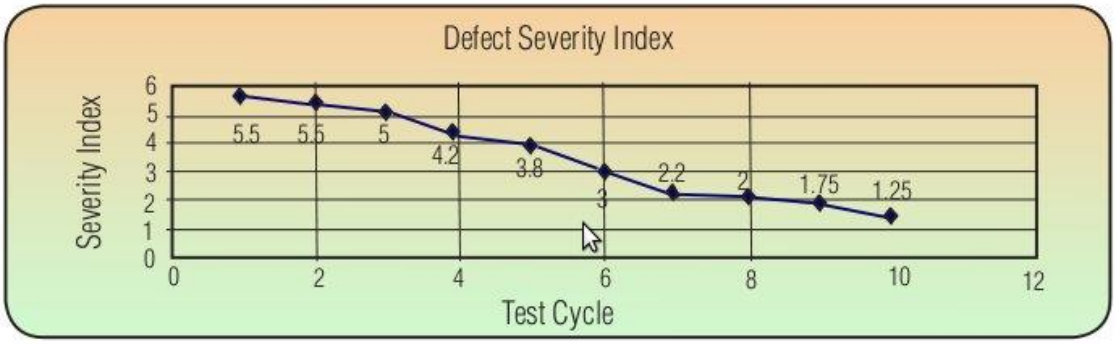
2.2 Metrics Analysis

Much as the time is spent gathering or maintaining metrics, enough time should be spent to review and interpret on a regular basis throughout the test effort, particularly after the application is released into production. During review meetings, the project team should closely examine all available data and use that information to determine the root cause of identified problems. It is important to look at several metrics, as this will allow the project team to have a more complete picture of what took place during a test.

Let's assume that as part of the SPA Process, the following metrics are collected by the SPA team.

Metric	Purpose
Defect Severity Index	Weighted average index of the Severity of defects. A higher severity defect gets a higher weight. S1 is a show stopper, S2 is high severity, S3 is medium & S4 is low. Ideally, this should slope down as test cycles progress.

For instance, if the test team has generated the following metrics:



the graphs one can safely deduce the followings;

Defect Severity Index Trend:

What does the graph indicate? The defect severity index is sloping down consistently. This indicates an increasingly favorable trend. As the test cycle progresses (from cycle 1 to cycle 10), the severity index is sloping which suggests increasing quality of the application (as lesser number of critical and high severity defects are being reported).

This is what it could mean: While a fall in the defect severity index is definitely a good trend, looking at this index in isolation could be misleading. Following factors need to be considered in order to have a meaningful analysis.

Number of defects logged - let us consider an example where the test team executed two cycles of testing (assuming other things as constant). The number of defects logged against each of these cycles along with the calculated severity index is shown below.

Number of Defects		
Defect Severity	Cycle 1(# of defects)	Cycle 2(# of defects)
s1	5	5
s2	10	15
s3	50	30
s4	100	100
Severity Index	1.52	1.50

At first thoughts, when we compare cycle 1's Severity Index with cycle 2's Severity Index, cycle 2 looks to be favorable (as the severity index is lower). If you go into the details of the number of defects logged and their severity, the picture turns out to be the opposite. While the total number of Severity 1 and Severity 2 defects for cycle 1 is 15, the number of Severity 1 and Severity 2 defects for cycle 2 is 20. In terms of quality, cycle 1 is better than cycle 2 as cycle 1 has lesser number of high severity defects (though the total number of defects logged in cycle 1 is more than cycle 2 defects and the severity index is greater than cycle 2 severity index). Test coverage has a similar impact. A lower test coverage coupled with reducing severity index would not be a healthy trend.

Severity of Defects		
Defect Severity	Cycle 1(# of defects)	Cycle 2(# of defects)
s1	4	0
s2	4	0
s3	42	75
s4	27	2
Severity Index	1.81	2.03

- Defect Severity - let's consider another example where the test team executed two cycles of testing (assuming other things as constant). The severity of defects logged against each of these cycles along with the calculated severity index is shown below.

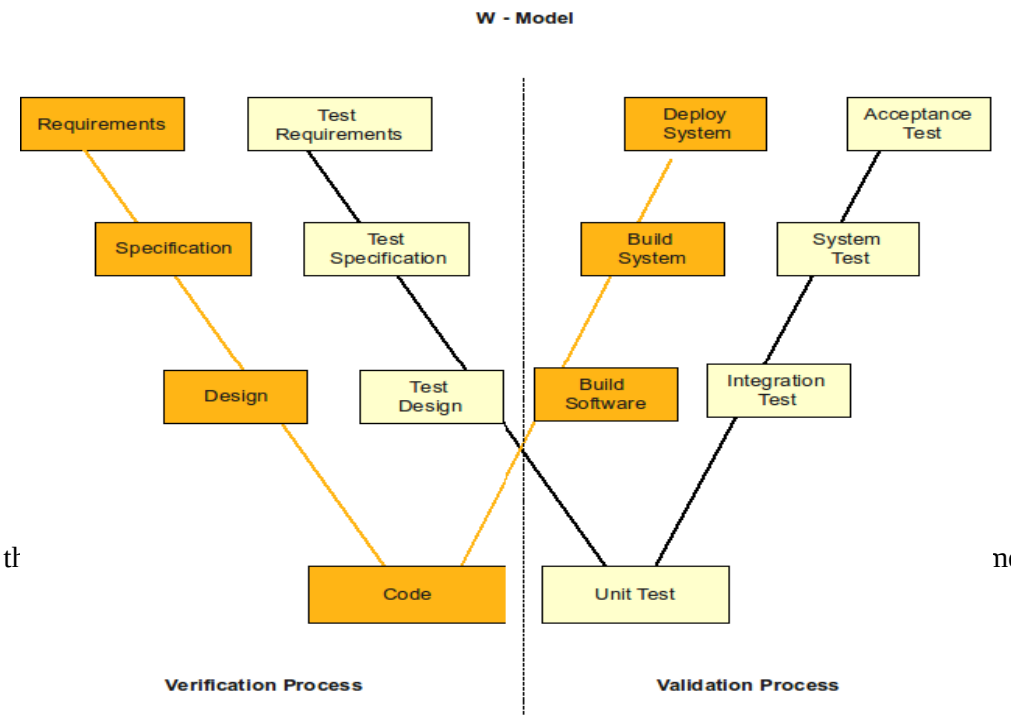
Looking at the severity index, it looks like cycle 1 is better than cycle 2 (as the severity index is low for cycle 1 compared to cycle 2). However, cycle 2 is better than cycle 1 as total number of Severity 1 and Severity 2 defects is zero compared to a total of 8 severity 1 and severity 2 defects of cycle 1. Just because the severity index is low, do not believe the quality of the application is better than the earlier cycle.

3. Process Automation

In following section describes about the testing methodologies, process and tools to be used while automating the typical software development life-cycle in order to deriving the metrics.

3.1 Testing Methodology

According to the automated testing process, every development activity is mirrored by a test activity. The testing process follows a well-proven testing methodology called W-model. Following Figure-2.0 explains, the way of testing activities of W-model involve with the standard software development life-cycle.



While th netrics.

3.2 Skills required to generate Metrics

During the different stages of a software project, several roles and parties will be involve with development, reviewing and testing activities. In Figure 3.0 shows the different stages of a software project, the main activities which should perform during those stages, the roles/parties should involve and the metrics which derive and maintain in those stages.

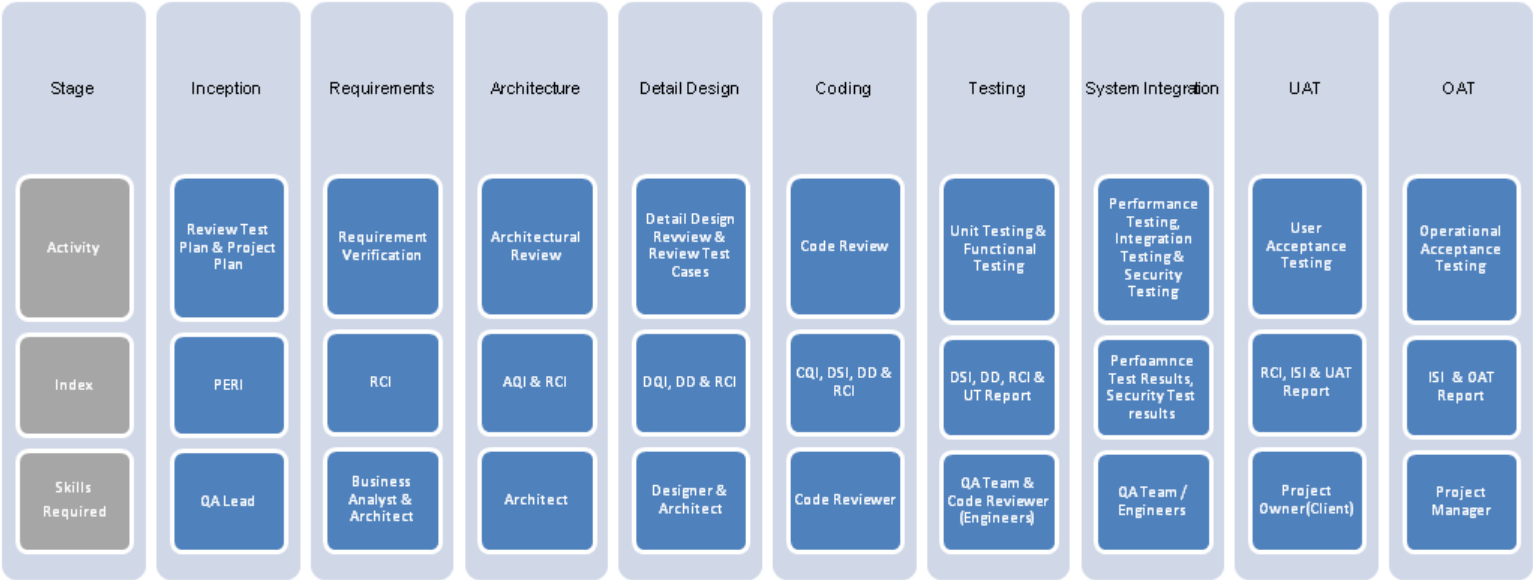
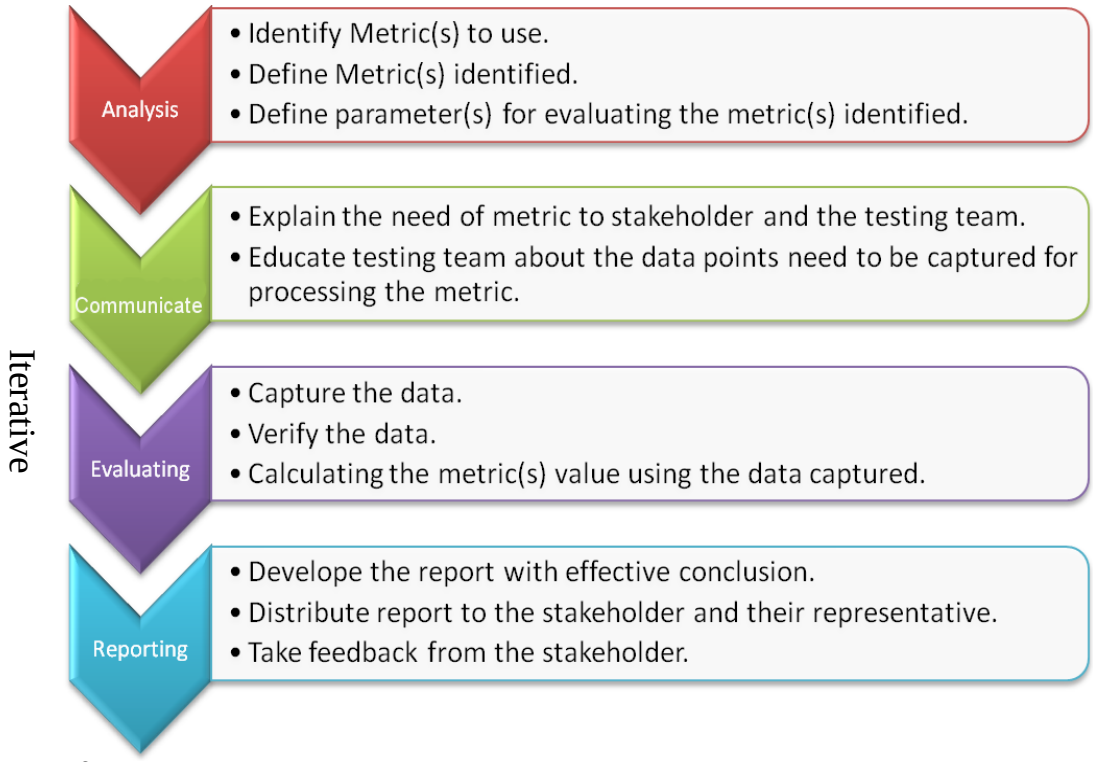


Figure 3.0 - Skills required to generate Metrics

3.3 Process of Setting-up a Metric

The Figure-4.0 explains the life-cycle of a Metric or the process involved in setting up the metrics:



s Life-Cycle

When implementing this process, several testing tools and techniques will be used along with the automated testing process in order to generating, maintaining and evaluating the metrics derived at specific level of the Software development life-cycle.

3.4 Integration of testing tools/process

Below you find a list of tools /process which will be used when automating the typical SD life-cycle suits to the Software Project Audit Process.

- **Fagan inspection -** Fagan Inspection defines a process as a certain activity with a pre-specified entry and exit criteria. Activities for which Fagan Inspection can be used are:
  1. Requirement specification
  2. Software/Information System architecture (for example DYA)
  3. Programming (for example for iterations in XP or DSDM)
  4. Software testing (for example when creating test scripts)

- **Cruise Control** – It is both a continuous integration tool and an extensible framework for creating a custom continuous build process. It includes dozens of plug-ins for a variety of source controls, build technologies, and notifications schemes including email and instant messaging. A web interface provides details of the current and previous builds.

- **Bug-zilla -** It is a Web-based general-purpose defect tracking and testing tool.

- **SVN -** It is a revision control system which use Subversion to maintain current and historical versions of files such as source code, web pages, and documentation.

- **Git -** Git is a **free & open source, distributed version control system** designed to handle everything from small to very large projects with speed and efficiency.

- **SCM -** For Configuration identification and Identifying configurations, configuration items and baselines. Also for Configuration control ,Configuration status accounting and Configuration auditing

9. 3.5 Displaying Metrics –The Dashboard

The Dashboard is the interface to help project teams to visualize their project statuses by several indexes. And also it could be used to displaying the test results of specific tests carried by the SPA team who responsible for the given project. As an example; in Figure 5.0 displays the current status of the project with its estimated effort against the predicted effort.

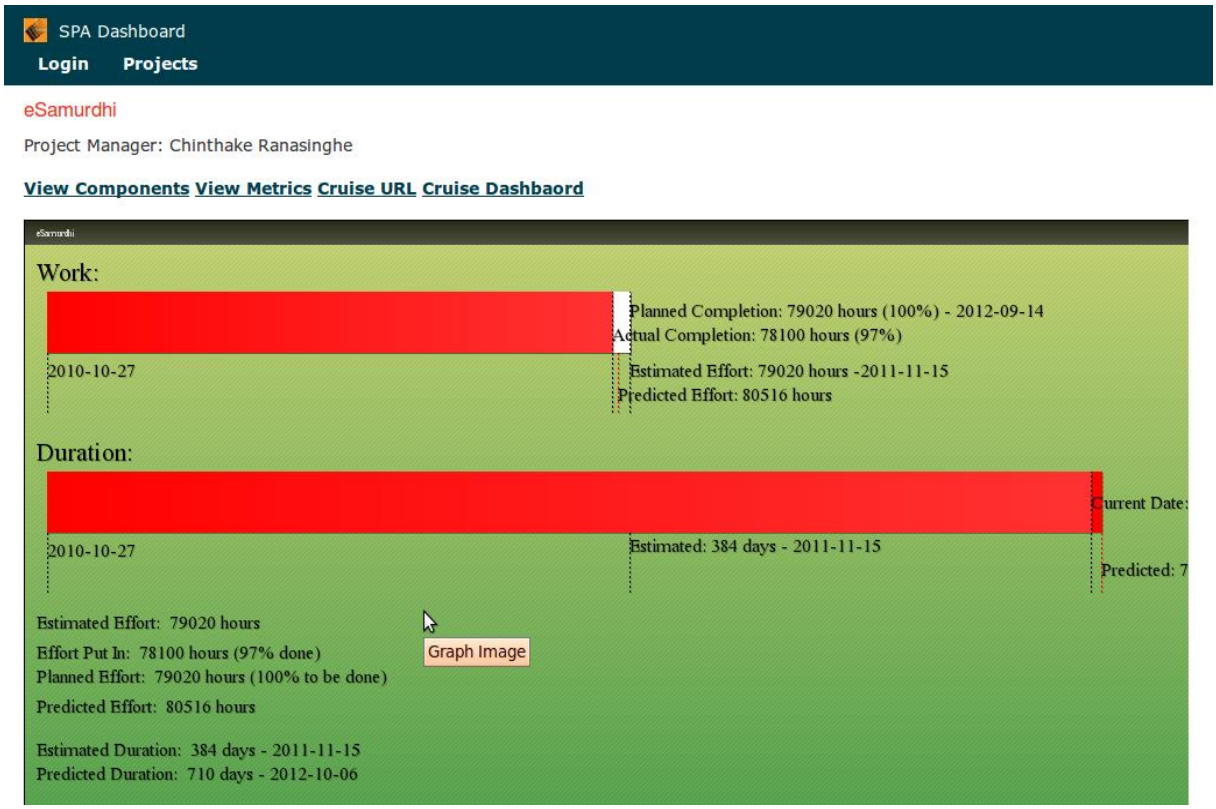


Figure 5.0 – SPA Dashboard view