The problem of producing a quality requirements specification with SSADM version 4: an evaluation

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ABSTRACT

The product of the analysis process is the 'requirements specification'. This is the statement of the prblem that has to be solved. Two phases , Requirements Analysis and Requirements Definition can be jointly referred to as Requirements Engineering. Requirements analysis and specification are arguably the two most important aspects of systems development. The objectives of systems analysis is to examine all aspects of the system: the equipment, personnel, operating conditions, and its internal and external demands, to establish a basis for designing and implementing a better system. Failure to elicit a correct and feasible set of requirements from the customer/client at the outset of development can result in the user receiving a final system that bears little resemblance to the original system he envisaged. Alternatively they may receive a system that appears to fit the requirements, but does not have inherent *quality*. Many solutions to the problems of communication in Requirements Engineering have been proposed with varying degrees of success. This paper will demonstrate how SSADM Version 4. handles (or fails to handle) issues of quality during the requirements engineering phase.

INTRODUCTION

It is important that in the early stages of systems development the user's needs are ascertained and specified. If a system is developed without taking heed of the user's view(s) then the end product will undoubtedly be a system of poor quality,Hogarth and Fletcher [1].

Quality is increasingly becoming an issue in most business environments (witness the growth in BS5750 !). We shall define quality as follows:

Quality = In conformance with user requirements

i.e. **Quality = Fitness for use.**

A quality system is therefore a system that meets the needs of the user. This means that the user must be a participant throughout the life of a systems project i.e. from Project Initiation to Analysis to Design through

to Implementation and to Training and beyond. Clearly, then, the early stages of systems development are vital to the future success of a project: if the needs of the users are determined and agreed by all relevant parties - in the form of a Requirements Specification - at an early stage then there is a greater chance of the system gaining acceptance at the implementation stage. It is these early stages of systems development and the issues of quality with which this paper is concerned.

A structured methodology that aspires to tackle the issues of quality in the production of a user specification is SSADM Version 4.

QUALITY AND SSADM VERSION 4: REQUIREMEMNTS ANALYSIS, REQUIREMENTS SPECIFICATION

SSADM Version 4[2] consists of a number of modules that together form a structured approach to the problems of systems development. The two modules that lead directly to the production of a **Requirements Specification** are the **Requirements Analysis Module (RAM)** and the **Requirements Specification Module (RSM)** and they occur after the Feasibility Study. These two phases are normally referred to as the Requirements Engineering phase.

The **Requirements Analysis Module** basically investigates the current environment (mainly processing and data) and considers business system options, i.e.:

Requirements Analysis Module

Stage 1	**Participants**
Investigation of Current Environment	"The investigation team will work to the project manager, and should comprise a senior and experienced analyst, assistant analysts and an active user representative ....." SSADM Version 4[3]
Stage 2	
Business Systems Options	Requirements analysts with both SSADM and business knowledge;users; IT service providers; staff representatives".SSADM Version 4 [4]

The above two stages result in the production of various progress reports, catalogues, activity/product descriptions and the selection of a

business system option.

A common scenario is that once a project initiative has been deemed feasible, a group of analysts tend to descend on a site and implement an Investigation of the Current Environment producing in the process a wealth of Data Flow Diagrams, Requirements Catalogues, Process Descriptions, Logical Data Structures, etc. Thus from the outset the systems development is **Analyst Driven.** The user is often an onlooker with little input. The main participants are often the analysts with the user merely 'represented' by an in-house member of IT staff. It is at this early stage of systems development, then, that the project loses sight of quality.

Requirements Specification Module

The **Requirements Specification Module** can be represented as shown in Figure 1:

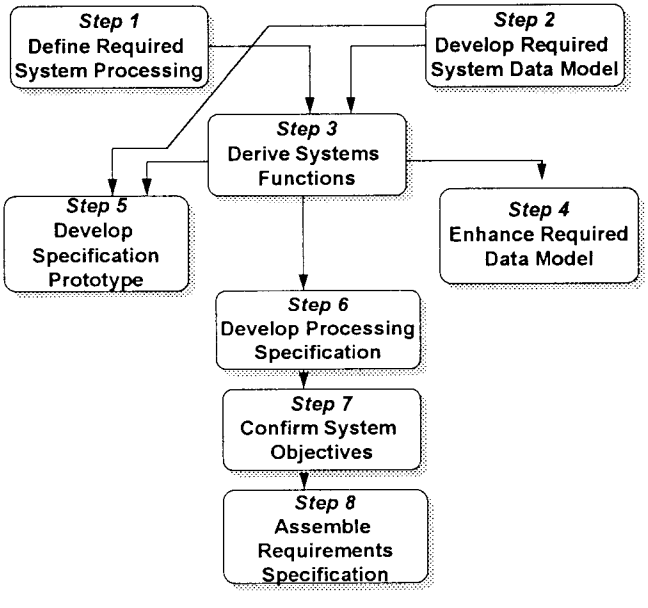

Figure 1: Requirements Specification Module (SSADM V.4.)

The purpose of this phase is to produce a **Requirements Specification.** After the selection of a business system option, the Definition of Requirements are expanded to finally produce a **Requirements Specification.** The techniques employed involve Data Flow Modelling, Dialogue Design, Entity-Event Modelling, Function Definition, Logical data Modelling, Relational Data Analysis, Requirements Definition and

Specification Prototyping. The participants are: "Requirements Specification team including data modellers and analysts, functional modellers, entity life history practitioners and other specialists in requirements areas such as capacity planning, security and prototyping."SSADM V.4[5]

Once again there is an emphasis on analysts and techniques with little attention paid to the views of the user. Indeed, the **Requirements Specification** is 'verified' by the user (normally an IT specialist) only after all the above tasks have been carried out. The **Requirements Specification Module** continues where the **Requirements Analysis Module** left off, and further distances the user from the development of the system by being **Analyst Driven** and placing an emphasis on **completeness** and **consistency** to the detriment of quality. Although prototyping is generally believed to be a good idea because "user understanding is enhanced" Hogarth and Rao[6] it needs to be made clear that if the user is rarely involved in the early stages of systems development then what is 'enhanced' is not the user's understanding of his own requirements but the user's understanding of what the analysts believe is the user's requirements. Garbage in, garbage out.

The official SSADM documentation has a section on Quality Control. This document describes quality thus: " it is worth making the distinction between the terms 'quality' (i.e. is the information content of a document correct ?) and 'correctness' (i.e. are all the SSADM conventions being used correctly?)." The same document then illustrates what it considers to be methods of ensuring quality: 'running software against test data ...[reviews to] produce error-free products." SSADM V.4.[7]

The interpretation of quality as an attempt to produce a system appropriate to the needs of the user is not the definition of quality adopted by practitioners of SSADM. SSADM views quality as an attempt to produce a system that exhibits **completeness** and **consistency**. This is emphasised by the time allocated to checking and cross-referencing processes, data flows and data stores etc. The purpose of SSADM is to produce a 'correct' system, which is not necessarily the same as producing an appropriate system.

QUALITY AND SSADM VERSION 4: AN ALTERNATIVE APPROACH

We start from the premises:

1. that **completeness** and **consistency** enhance a **Quality System**. In

themselves they do not guarantee quality, but they are necessary attributes.

2. a **Quality System** necessarily involves the users. Thus a type of Soft Systems approach is inevitable.

3. the system requires to be documented. SSADM consists of well tried and tested methods of documentation which also meet the criteria for completeness and consistency.

4. **Quality Procedures** require to be incorporated into any **Quality System** (these are introduced into the **Requirements Analysis Module** and the **Requirements Specification Module** of SSADM Version 4).

The SSADM model would be retained but supplemented by a Soft Systems approach and incorporating **Quality Standards**. This approach has been adopted and used by a staff unit at **Glasgow Caledonian University** with pleasing degrees of success. The approach is aimed at producing a **Quality Requirements Specification** and the methodology is called:

Quality Standards Methodology:
Requirements Analysis and Requirements Specification

The basic analysis model adopted by practitioners of SSADM is shown in Figure 2::

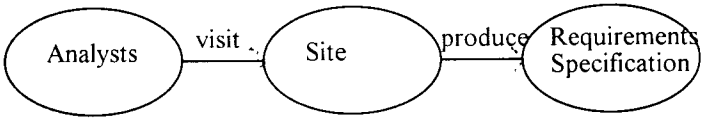

Figure 2

would be replaced by the one shown in Figure 3:

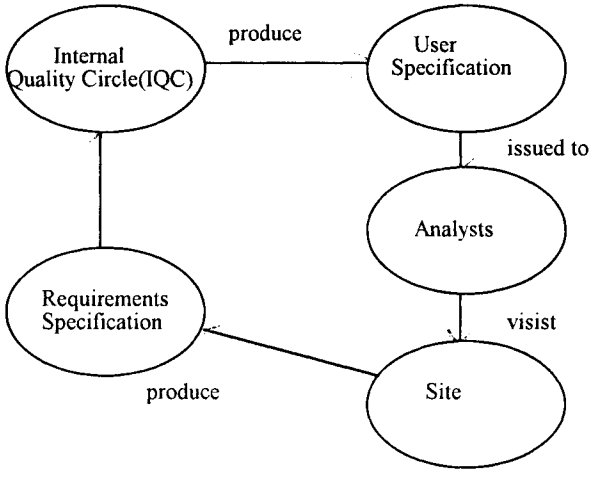

Figure 3

This is an iterative process whereby after the initiation of the project an internal **Quality Circle** produce their view of what they want the system to do, i.e. a **User Specification**. This specification must be produced before the analysts investigate the current system. This ensures that the user's view(s) are of paramount importance in the 'rich picture'. (A Quality Circle consists of those whom are most likely to be effected by the system, because the best people to fix a problem are those who stand to benefit from the solution). The analysts then, after studying the user's view(s) investigate the current system applying a mixture of Hard Systems methodology Jayaratna[9] - SSADM - and Soft Systems Methodology to produce a **Quality Requirements Specification**. Users are always represented and have a continual and final say in the appropriateness of the system.

OVERVIEW OF SOFT SYSTEMS APPROACH

The **Soft Systems** approach fits into the overall methodology as follows:

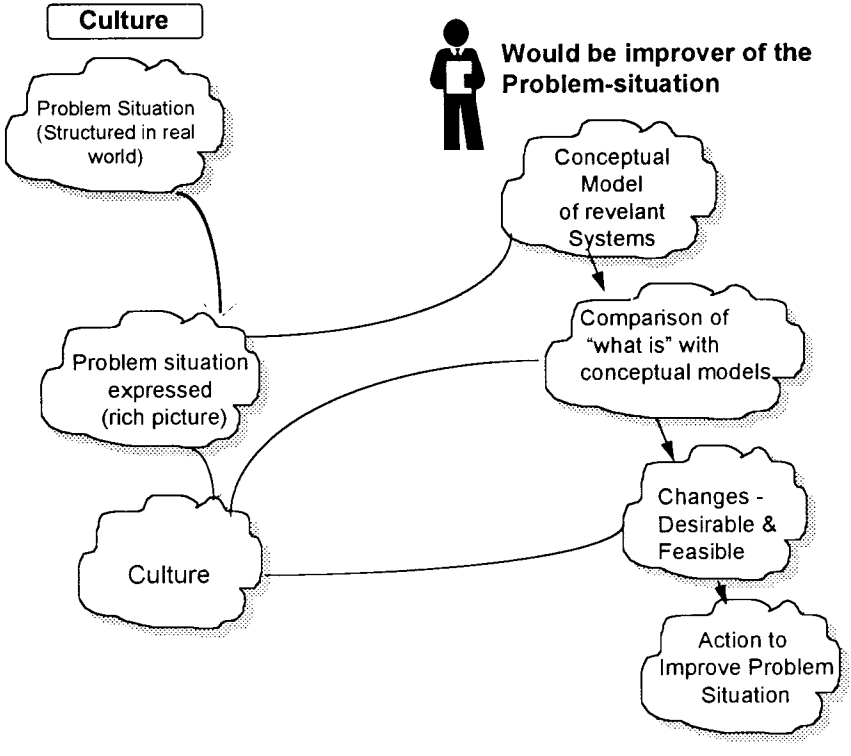

Figure 4: An outline of the process of SSM

The SSM approach as outlined in Fig 4. differs from SSADM in that it is user driven not analyst driven. SSM is useful in that it allows many views (weltanschauungen)) of a system which in turn provides a rich picture and therefore a better understanding of the problem situation in which the players and actors in the system find themselves. However where the authors differ from the traditional SSM approach is that they see it as an appropriate front-end tool in the development of a Quality Requirements Specification(QRS). i.e. SSM is one of a number of tools that can be utilised in the production of a QRS.

QUALITY STANDARDS METHODOLOGY (QSM)): QUALITY VERIFICATION

There are a number of **worksheets** that have to be addressed before the final production of the **Quality Specification Requirements**. There are four worksheets,Hochstrasser[10]

Worksheet 1: Requirements Analysis Module Worksheet(Appendix 1)
Worksheet 2: Requirements Specification Module Worksheet(Appendix 2)
Worksheet 3: System Costs Worksheet(Appendix 3)
Worksheet 4: System Quality Value Worksheet(Appendix 4)

All the above worksheets can be regarded as reflecting a set of critical success factors that all have to be satisfied before design begins. Worksheets 1, 3 and 4 are completed during the SSADM module **Requirements Analysis**; worksheet 2 is completed before the end of the SSADM module **Requirements Specification**. The completion of these worksheets, together with the application of SSADM tools and techniques coupled with a Soft Systems approach, should ensure the production of a **Quality Requirements Specification**.

CONCLUSION

SSADM Version 4 views quality as an issue related to consistency and completeness. The methodology is also Analyst Driven. As a result, the following criticisms can be levelled at SSADM: it produces a system, although 'correct', is generally inappropriate to the needs of the user. A solution proposed by the authors is to redefine the definition of quality - a system that is in conformance with user requirements - and to use this definition as a basis for producing a Quality Requirements Specification (QRS). The QRS is to be produced using a combination of Soft Systems Methodology and SSADM modules, Requirements Analysis and Requirements Specification, with a number of worksheets for quality verification. This alternative approach was designed by the authors to overcome the problems associated with a quality system using SSADM Version 4; and the methodology is called **Quality Standards Methodology(QSM) :Requirements Analysis and Requirements Specification.**

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Appendix 1

WORKSHEET 1: Requirements Analysis Module	
Investigation of Current Environment by users: * Produced Quality Circle User Spec? * Obtained other user view(s)? * Rich picture agreed and resolved? Investigation of Current Environment by analysts: * Obtained User Driven Req. Spec.? * Investigated Current Environment? * Compared and resolved views? * Cost of Required system determined (using Systems Costs Worksheet) * Business Systems Option selected (using Quality Value Worksheet)	More work Needed? Yes

Appendix 2

WORKSHEET 2: Requirements Specification Module	
* Agreed System Processing and System functions with users? * Agreed on required Data Model with users? * Specification Prototypes concur with user requirements? * Is completeness and consistency maintained? * Are users prepared to accept the new system?	More work Needed? Yes

Appendix 3

WORKSHEET 3: System Costs	
1. Hardware Costs	_____
2. Software Costs	_____
3. Specification Costs	_____
4. Programming costs	_____
5. Installation Costs	_____
6. Environmental Costs	_____
7. Running Costs	_____
8. Maintenance Costs	_____
9. Security Costs	_____
10. Networking Costs	_____
11. Training Costs	_____
12. Consultancy Costs	_____
13. Transistional Costs	_____
14. Phasing Out Costs	_____
15. Management Costs	_____
16. New Salary Structures	_____

Appendix 4

WORKSHEET 4: System Quality Value (>1 system)

Primary Objectives:	Scores -5 to +5	Weights 1 t0 5	Priorities Score X Weight
1. Perceived value for money			
2. Offering better internal efficiency			
3. Offering more external business			
4. Offering new business opportunities			
Second order effects:			
a) Opportunities:			
5. Social and Political implications			
6. Impact on Job Functions			
7. Impact on salary scales			
8. Impact on organisational structure			
b) Potential Barriers:			
9. Organisational Barriers			
10. Human Barriers			
11. Educational Barriers			
12. Cultural Barriers			
Strategic Integration:			
13. Allignment to long-term strategic business direction			
14. Offering short-term tactical business bonus			
15. Integration into information strategy			
16. Integration into technical strategy			
17. Offering flexibility to change			
Risks:			
18. Business Risks			
19. Technology Risks			
20. Risk if no investment			
Total Quality Value			
(Total Priorities/Total Weights employed)			