

Introduction to Software Engineering

By: Sakshi Jain

This reference book can be useful for
BBA, MBA, B.Com, BMS, M.Com, BCA, MCA
and many more courses for Various Universities



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Published by:



NEERAJ PUBLICATIONS

(Publishers of Educational Books)

Sales Office : 1507, 1st Floor,

Nai Sarak, Delhi-110 006

E-mail: info@neerajbooks.com

Website: www.neerajbooks.com

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Sample Preview of The Chapter

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INTRODUCTION TO SOFTWARE ENGINEERING

DEVELOPMENT OF SRS



Characteristics of SRS

INTRODUCTION

Software Requirement Specification (SRS) is a requirement specification for the software that forms the basis for the development of a software product, program or set of programs that perform the desired functions. Depending on the writer of the SRS, various purposes could be served. It could be used by the following:

- Customer and users for understanding what is expected from them.
- Developer for writing the desired software product that is to be built.
- Testers for performing testing activities.
- Managers for estimating and planning the project to be delivered.
- Maintenance team for maintain the software in future.

SRS minimizes the time consumed by developers in developing as it becomes an ease in understanding the software project which in turn leads to less development cost. A good SRS will define all the software requirements correctly. No design and implementation details should be present in a SRS.

SRS should only define 'WHAT' a system does and not 'HOW' it is done.

CHAPTER AT A GLANCE

CHARACTERISTICS OF SRS

The SRS should be correct, unambiguous, complete, consistent, ranked for importance and/or stability, verifiable, modifiable and traceable.

In this chapter, we will discuss the following characteristics:

- Completeness
- Unambiguity
- Inconsistency

COMPLETENESS

The SRS is complete if, and only if, it has the following properties:

1. Description of all significant requirements relating to functionality, performance, design, attributes or external interfaces.
2. Definition of the response of the software system for all the situations.
3. All the diagrams, tables and figures should be fully labelled and referenced.
4. All the abbreviations should be defined properly.

This is most difficult to achieve as it is difficult to specify all the system requirements at the beginning. Missing requirements are difficult to trap since they are not visible.

UNAMBIGUITY

The SRS is said to be unambiguous if every stated requirement has only one interpretation independent of the person or the time when the interpretation is done. The SRS needs to be unambiguous for all the users who will create and use the document that is to the authors, the users, the reviewers as well as developers and testers. A sentence in the SRS is said to be ambiguous if given to few people and asked for the interpretation and there is more than one interpretation. In cases, if a term that is

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to be used for particular context has multiple meanings, the term should be included in the glossary where all the meanings should be specified.

Some of the issues related to ambiguity are as follows:

1. Requirements are often written in natural language. Natural language being imprecise and ambiguous in nature, so any SRS written in natural language should be reviewed by an independent party to identify the ambiguity in SRS and correct the language.
2. Ambiguity can be avoided by writing the SRS in a particular requirement specification language, which has a processor that automatically detects any lexical, syntactic and semantic errors. However, there is a disadvantage associated with it. It takes a lot of time to learn such language and sometimes it is not even understood by the users or customers.
3. The requirements could also be depicted using diagrams, tables or flow charts. These techniques improve the precision of the requirements, but it is a bit difficult to convert the requirements.

INCONSISTENCY

The SRS should not be inconsistent. The SRS is consistent if, and only if, no requirements described in it conflict. Any conflict between the described requirements should be identified and resolved. There are three types of conflicts that are likely to be seen between the requirements. They are as follows:

1. Characteristics of real world objects interacting with the system may conflict. For example:
 - (a) Format of an output report can be described in tabular form in one requirement whereas in other it can be stated in textual form.
 - (b) One requirement may state that all lights are red whereas other states that the colour of all lights is blue.
 - (c) In a time sheet system one requirement states that a worker cannot work more than 16 hours a day whereas in other requirement it may assume that a worker can work for 24 hours a day.
2. Two specific items can have logical or temporal conflict between them. For example:

- (a) One requirement states that two numbers should be added while the other says that they should be multiplied.
- (b) One requirement says that “A” should always follow “B” whereas the other says that “A and B” occur simultaneously.
- (c) In time sheet one requirement says that the work must be done by the end of the week (Sunday) whereas in other, it states that the work should be done by the last working day of the week (Friday).

3. The requirements describing same real world entity may have different terminologies. For example, a program’s request for a user input may be called a “prompt” in one requirement or “cue” in another. In one requirement start of week may be used as Monday whereas in another it may be used as Sunday.

The use of standard terminology and definitions promotes consistency.

IEEE SRS

The Institute of Electrical and Electronics Engineers (IEEE) has published the guidelines and standards to organize an SRS document. The SRS should be selected or defined at the beginning of all the activities. Different projects require differently organized requirements thus, the SRS should be selected accordingly.

The general organization of an SRS is as follows:

1. Introduction
 - 1.1 Purpose
 - 1.2 Scope
 - 1.3 Definitions, Acronyms and Abbreviations
 - 1.4 References
 - 1.5 Overview
2. The Overall Description
 - 2.1 Product Perspective
 - 2.1.1 System Interfaces
 - 2.1.2 Interfaces
 - 2.1.3 Hardware Interfaces
 - 2.1.4 Software Interfaces
 - 2.1.5 Communication Interfaces
 - 2.1.6 Memory Constraints
 - 2.1.7 Operations
 - 2.1.8 Site Adaptation Requirements
 - 2.2 Product Functions
 - 2.3 User Characteristics
 - 2.4 Constraints

- 2.5 Assumptions and Dependencies
- 2.6 Apportioning of Requirements
- 3. Specific Requirements
 - 3.1 External Interfaces
 - 3.2 Functions
 - 3.3 Performance Requirements
 - 3.4 Logical Database Requirements
 - 3.5 Design Constraints
 - 3.5.1 Standards Compliance
 - 3.6 Software System Attributes
 - 3.6.1 Reliability
 - 3.6.2 Availability
 - 3.6.3 Security
 - 3.6.4 Maintainability
 - 3.6.5 Portability
 - 3.7 Organizing the Specific Requirements
 - 3.7.1 System Mode
 - 3.7.2 User Class
 - 3.7.3 Objects
 - 3.7.4 Feature
 - 3.7.5 Stimulus
 - 3.7.6 Response
 - 3.7.7 Functional Hierarchy
- 4. Change Management Process
- 5. Document Approvals
- 6. Supporting Information

Now we will study the explanation of the above SRS format.

Introduction: The sub-sections of this topic will provide an overview of the entire SRS.

Purpose: In this sub-section identify the purpose of the SRS and specify its intended audience.

Scope: In this sub-section we will:

- (i) Identify the names of the software product to be produced.
- (ii) Tell about what and what not a software product will do.
- (iii) Application of the software being specified is being described along with the relevant benefits, objectives and goals.
- (iv) Be consistent with similar statements in higher-level specifications, if they exist.

Definitions, Acronyms and Abbreviations: This section provides the definitions of all the terms, acronyms and abbreviations that are required to understand the SRS. This information may be provided by referring the document or an Appendix.

References: This sub-section will:

- (i) Provide a complete list of all documents that are referenced in the SRS.
- (ii) Identify the document by title, report number, date and publishing organization.
- (iii) Sources from which the references are obtained should be specified.

Overview: This sub-section will include:

- (i) Description of the rest of the SRS.
- (ii) Explanation of how SRS is organized.

The Overall Description: The factors that affect the product and its requirements are being described here. This section does not state specific requirements instead it makes easier to understand the requirements that are stated later as it provides background for those requirements.

Product Perspective: Product is being put into perspective with other related products. Independent and self-contained product should be stated here. If the product defined in the SRS is a component of a larger system, then this sub-section relates the requirements of the larger system to functionality of the software interfaces between the system and the software is being identified.

System Interfaces: All system interfaces are listed and the functionality of the software to accomplish the system requirement and the interface description to match the system is being identified.

Interfaces: In this sub-section, we will specify:

- (i) The logical characteristics of each interface between the software product and its users.
- (ii) All the aspects of optimizing the interface with the person who must use the system.

Hardware Interfaces: The logical characteristics of each interface between the product and the hardware component of the system are specified. Configuration characteristic is also included. It also tells about what and how devices are to be supported and protocols.

Software Interfaces: The required software products and interfaces with other application system are specified. The required software product includes the following:

- (i) Name
- (ii) Mnemonic
- (iii) Specification number
- (iv) Version number
- (v) Source

Each interface provides:

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- (i) The software relating to the software product is being discussed.
- (ii) The interface in terms of message content and format is defined.

Communications Interfaces: This sub-section specifies the various interfaces to communications.

Memory Constraints: The applicable characteristics and limits on primary and secondary memory are specified.

Operations: In this sub-section, we will specify the normal and special operations that are required by the user. Some of them are:

- (i) Modes of operation in user organization.
- (ii) Periods of interactive and unattended operations.
- (iii) Data processing support functions.
- (iv) Backup and recovery operations.

Site Adaptation Requirements: In this sub-section:

- (i) The requirements specific to a given site, mission, or operational mode for any data or initialization sequences is defined.
- (ii) The site that should be modified to adapt the software for particular installation is specified.

Product Functions: In this section, we will provide the major functionality that the software will perform. Sometimes the function summary is taken from the section of higher level specification that allocates the functions to a software product.

For clarity:

- (i) The functions should be organized in such a way that they are understandable and readable by the customer or anyone who is reading the information for the first time.
- (ii) Different functions and their relationships could be shown using textual or graphical methods.

User Characteristics: It describes the characteristics of the intended users of the product that is the educational level, experience and technical expertise. It also tells about why a specific requirement is discussed later in the SRS.

Constraints: Provide a general description of those items that could limit the options for developers. They can include regulatory policies, hardware limitations (for example, signal timing requirements), interface to other applications, parallel operation, audit functions, control functions, higher-order language requirements, signal

handshake protocols (for example, XON-XOFF, ACK-NACK), reliability requirements, criticality of the application and safety and security considerations.

Assumptions and Dependencies: All the requirements that are affected in the SRS are listed. These factors are the changes to the design constraints that can affect the requirements in the SRS. For example, an assumption might be that a specific operating system would be available on the hardware designated for the software product but instead it is not present, so the SRS has to change accordingly.

Apportioning of Requirements: The requirements that may be delayed until the future versions of the system are identified.

Specific Requirements: This section contains all the detailed information of the software requirements required by the designers to design the system, for tester to test the system for those software requirements. Throughout the section the requirements stated are perceived by the user, operators or both. These should include at least a small description of every input, output and functions performed by the system.

The following principles apply:

- (i) Requirements should be stated in accordance with the characteristics of a good SRS, that is it should be, correct, unambiguous, complete, consistent, ranked for importance and/or stability, verifiable, modifiable and traceable.
- (ii) Requirements should be cross-referenced to earlier requirements that relate.
- (iii) For maximum readability of the SRS the requirements should be organized carefully.

External Interfaces: This sub-section contains all the information of all inputs and outputs of the system. It contains both content and format as follows:

- Name of item
- Description of purpose
- Source of input or destination of output
- Valid range, accuracy and/or tolerance
- Units of measure
- Timing
- Relationships to other inputs/outputs
- Screen formats/organization
- Window formats/organization
- Data formats
- Command formats
- End messages.