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Requirements Analysis and Specification

Before starting to design a software product, it is extremely important to define the precise requirements of the customer. In the past, many projects have suffered because designers started implementing something without determining whether they were building what the customer exactly wanted. The goal of the requirements analysis and specification phase is to clearly understand the customer requirements and to systematically organize these requirements into a specification document.

The requirements analysis and specification phase is undertaken once the feasibility study phase is complete and the project is found to be financially sound and technically feasible. As the name of this phase implies, it consists of two important and distinct activities:

- Requirements analysis
- Requirements specification

To carry out requirements analysis, a few members of the development team usually visit the customer site. The engineers who analyze customer requirements and write the requirements specification document are known as *systems analysts* in the software industry parlance. Of late, system analysts are also being referred to as *system architects*. System analysts collect data pertaining to the product to be developed and then analyze these data to conceptualize what exactly needs to be done. Once the system analysts have identified the precise user requirements and analyzed these requirements to weed out inconsistencies, they proceed to write the document called the Software Requirements Specification (SRS).

The final output of the requirements analysis and specification phase is the SRS document. Once the SRS document is ready, it is first reviewed internally by the project team to ensure that it is understandable, consistent, unambiguous, and complete. The SRS document is then given to the customer for review. After the customer

has reviewed the SRS document and agreed to it, it forms the basis of all future development activities and serves as a contract document between the customer and the development organization. With this brief introduction to the requirements analysis and specification phase, we now examine the various activities involved in this phase in greater depth.

3.1 REQUIREMENTS ANALYSIS

Requirements analysis involves obtaining a clear and thorough understanding of the product to be developed, with a view to removing all ambiguities and inconsistencies from the initial customer perception of the problem. This may seem like a simple problem. Actually, it is quite difficult to obtain an unambiguous understanding of the problem, especially if there is no working model of the problem to be solved. For example, if a product is being developed to automate the existing activities of an office, the analyst can easily study the input data, the output data, exact formats of these data and the existing office procedures. If the product involves developing something new for which no working model exists, then the task of gathering requirements becomes all the more difficult. Even experienced analysts take considerable time to understand the exact requirements of the customer. They know that without a clear understanding of the problem, it is almost impossible to develop a satisfactory solution. Therefore, many basic questions pertaining to the project such as the following should first be understood clearly by the analyst:

1. What is the problem?
2. Why is it important to solve the problem?
3. What are the possible solutions to the problem?
4. What exactly are the data inputs to the system and what exactly are the data outputs by the system?
5. What are the likely complexities that might arise while solving the problem?

Once the analyst understands the above basic questions, he sets out to collect more detailed information regarding the project. During requirements analysis, the analysts usually carry out the following two main activities:

Requirements gathering This involves interviewing the end-users and customers to collect all possible information regarding the system. If the project involves automating some existing procedures (e.g. automating the existing accounting activities), then the task of the system analyst becomes a little easier as he can immediately obtain

the input and output data formats and the details of the operational procedures. However, in the absence of a working system, much more imagination and creativity on the part of the system analyst is required.

Analysis of gathered requirements. The main purpose of analysis of the collected information is to clearly understand the exact requirements of the customer and resolve anomalies, conflicts, and inconsistencies in the gathered requirements. For example, an inconsistency might arise when one end-user wants a furnace to be switched-off when the temperature of the furnace rises above the specified value, whereas another end-user under similar circumstances wants the water shower to be switched-on instead of the furnace being switched-off. Such anomalies and inconsistencies in the gathered requirements are resolved by further discussions with the end-users and the customers. Some inconsistencies and anomalies can be detected easily while some require elaborate study of the problem. However, a few can be very subtle and escape even the most experienced eyes. If a system is specified and studied using a formal method, then many of these subtle anomalies and inconsistencies get detected too.

After the analyst has collected all the required information regarding the system to be developed, and has removed all inconsistencies and anomalies from the specification, he starts to systematically organize the requirements into a SRS document. The SRS document usually contains all the user requirements in an informal form. For safety of the critical systems, the informally specified requirements often need to be transformed later into a formal requirements specification.