Requirements Engineering: Dealing with the Complexity of Sociotechnical Systems Development

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Abstract

This chapter introduces requirements engineering for sociotechnical systems. Requirements engineering for sociotechnical systems is a complex process that considers product demands from a vast number of viewpoints, roles, responsibilities, and objectives. This chapter explains the requirements engineering terminology and describes the requirements engineering process in detail, with examples of available methods for the main process activities. The main activities described include system requirements development, requirements allocation and flow-down, software
requirements development, and continuous activities, including requirements documentation, requirements validation and verification, and requirements management. As requirements engineering is the process with the largest impact on the end product, it is recommended to invest more effort in both industrial application as well as research to increase understanding and deployment of the concepts presented in this chapter.

Introduction

The concept of sociotechnical systems was established to stress the reciprocal interrelationship between humans and machines and to foster the program of shaping both theoretical and social conditions of work (Ropohl, 1999). A sociotechnical system can be regarded as a theoretical construct for describing and explaining technology generally. This chapter helps to describe a multidisciplinary role of requirements engineering as well as the concept of workflow and patterns for social interaction within the sociotechnical systems research area.

Requirements engineering is generally accepted as the most critical and complex process within the development of sociotechnical systems (Juristo, Moreno, & Silva, 2002; Komisirviö & Tihinen, 2003; Siddiqi, 1996). The main reason is that the requirements engineering process has the most dominant impact on the capabilities of the resulting product. Furthermore requirements engineering is the process in which the most diverse set of product demands from the most diverse set of stakeholders is being considered. These two reasons make requirements engineering complex as well as critical.

This chapter first introduces background information related to requirements engineering, including the terminology used and the requirements engineering process in general. Next a detailed description of the requirements engineering process, including the main phases and activities within these phases, is presented. Each phase will be discussed in detail, with examples of useful methods and techniques.

Background

A requirement is a condition or capability that must be met or possessed by a system or system component to satisfy a contract, standard, specification, or other formally imposed documents (IEEE Std 610.12, 1990). A well-formed requirement is a statement of system functionality (a capability) that must be met or possessed by a system to satisfy a customer’s need or to achieve a customer’s objective, and that is qualified by measurable conditions and bounded by constraints (IEEE Std 1233, 1998).
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