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Role of Scenarios in Work Analysis during System Design

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User-centred development is a process of system development that starts with users and their requirements rather than technology. The objectives of a user- or human-centred design approach is to enable users to be in control of the advancing technologies by enhancing human abilities, overcoming human limitations, and fostering user acceptance [1]. To meet these objectives, designers have to understand users and the tasks they wish to achieve. A user-centred design approach is *participatory* in nature, in the sense that users participate and make effective contributions throughout the system development life cycle. Direct participation of the end-users is a means of collaboratively identifying, interpreting, and jointly developing system requirements that reflect the users' needs and perspectives.

However, the user-centred design approach does not take into account the *context* or situational factors in which the users will perform the tasks such as the work processes, work practices, organisational structure, its policies, etc. [2]. Quality of the design and the resulting system is improved through better understanding of the users' work and the interactional work practices of individuals within an organisation. It is critical to understand the current social and work context in order to propose technological solutions that support and automate the existing work processes, and, furthermore, to envision the implications of the new technology on these work practices. A system design approach that takes into account the organisational and social factors, such as informal work practices and shared artifacts (or 'things' of the work), is called a *socially-centred design* approach [2].

In a socially-centred design approach, early requirements specifications serve as an impetus for an initial system design, which are further validated and elaborated through *work analysis*. Work analysis involves studying the day-to-day interactions of users in their natural work settings by the system designers to derive the *context* of system use. Rapid ethnography [3] and contextual inquiry [4] are two techniques that have recently been proposed for gathering data about users, their requirements and the context of use. Rapid ethnography is an observational technique that involves going to the prospective users of a system and observing the activities they perform, their interactions and their work environment. The contextual inquiries involve observing and interviewing users in their workplace to identify the task requirements, system specifications, environmental factors, and both direct and indirect user characteristics that must be supported by the system. All of these variables contribute to the context of system use. Equipment, user, task and environmental information from contextual inquiry are used to formulate system design decisions.

However, the goal of work analysis in a socially-centred design process is to take into account the

divergent views of users and other stakeholders and enable them to be active participants in the process of discovering and understanding their requirements for performing work. This requires shared media or artifacts of analysis and design as well as shared terminology in which users and system designers / software developers can equally participate. Such shared media or artifacts are not developed during rapid ethnography and the contextual inquiry methods. We propose a scenario-based methodology for work analysis and requirements development in a socially-centred design process [5] wherein scenarios can serve as effective shared artifacts between the users and system designers.

A *usage* scenario is a narrative description of user activity that the user engages in a *work situation*, a description sufficiently detailed so that the design implications can be inferred and reasoned about [6]. A work situation describes the work of the users in an existing situation within the users' workplace: what the users do, what the users perceive, what it all means to the users and how the users' work would be altered and improved with technological support. A work situation in a usage scenario is described in terms of *work flow* of the activity in that situation. The work flow defines how an activity is broken across several users and how these users co-ordinate to ensure that the work gets done. What are the responsibilities of different users? How do the users communicate to get the work done? What are the artifacts that are shared or exchanged? What are the characteristics of the work environment? How can *exceptions* arise? Exceptions are situations when the work does not get done due to problems or breakdown in co-ordination or communication. A usage scenario is, thus, not merely a user task description, but a 'big' picture of how some particular kind of work gets done and this contributes directly to concrete requirements and design possibilities. Through the usage of scenarios about specific work situations, the descriptions of work moves from the abstract and decontextualised toward the concrete and situated.

Usage scenarios are informal, work-oriented and serve as a meeting ground for communication and collaboration between the users and system designers. This makes it possible that a representative and efficient diversity of relevant domain knowledge will actually be brought to bear on the design problem. Since scenarios are generated through discussions with users, the users are able to describe and discuss their requirements, work processes and expectations with greater clarity and with a sense of ownership to the proposed system and to the scenarios that express their requirements for this new system.

Usage scenarios are, thus, a rich source of requirements and capture the social, historical and cognitive rationale for what users do in different work situations. However, several scenarios may be necessary to simulate all possible work situations of a complex system. There is an increased recognition that guidelines are required to generate and use a set of meaningful scenarios. We, at City University, have developed a scenario-based method, as a part of an ongoing ESPRIT project, that provides guidance for generating and analysing usage scenarios. The proposed method can function within the traditional software and usability engineering methods. The usage scenarios can be presented in text, or video mock-ups, or scripted prototypes. We have also proposed representing scenarios as *rich pictures* [7]. A rich picture depicts the users and other stakeholders, their interrelationships and concerns in getting work done. The usage scenarios developed during the work analysis, and system analysis and design activities can provide the backdrop when using prototypes to validate requirements, as test cases for evaluating conformity of software implementations to the functional specifications, to develop training programs, and to create system documentation. In the paper, we will present the method that we have developed and demonstrate its usage through a Case Study of a Service Engineer Support System.

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