Lack of Attention to Singular (or Atomic) Requirements Despite Benefits for Quality, Metrics and Management

Abstract

There are seemingly many advantages to being able to identify, document, test, and trace single or "atomic" requirements. Why then has there been little attention to the topic and no widely used definition or process on how to define atomic requirements? Definitions of requirements and standards focus on user needs, system capabilities or functions; some definitions include making individual requirements singular or without the use of conjunctions. In a few cases there has been a description of atomic system events or requirements. This work is surveyed here although there is no well accepted and used best practice for generating atomic requirements. Due to their importance in software engineering, quality and metrics for requirements have received considerable attention. In the seminal paper on software requirements quality, Davis et al. proposed specific metrics including the "unambiguous quality factor" and the "verifiable quality factor"; these and other metrics work best with a clearly enumerable list of single requirements. Atomic requirements are defined here as a natural language statement that completely describes a single system function, feature, need, or capability, including all information, details, limits, and characteristics. A typical user login screen is used as an example of an atomic requirement which can include both functional and nonfunctional requirements. Individual atomic requirements are supported by a system glossary, references to applicable industry standards, mock ups of the user interface, etc. One way to identify such atomic requirements is from use case or system event analysis. This definition of atomic requirements is still a work in progress and offered to prompt discussion. Atomic requirements allow clear naming or numbering of requirements for traceability, change management, and importance ranking. Further, atomic requirements defined in this manner are suitable for rapid implementation approaches (implementing one requirement at a time), enable good test planning (testing can clearly indicate pass or fail of the whole requirement), and offer other management advantages in project control.

Atomic requirements atomic use cases development process Metrics pubcrawl requirements creation requirements metrics requirements verification and validation Resiliency Scalability singular requirements software engineering work factor metrics