Types of requirements

**Functional requirements**

**Non-functional requirements**

**Business rules** define the corporate policies, government regulations, standards, accounting practices and computational algorithms. *Business rules can be analyzed by assessing specific type of software application.* Other sources are domain experts and legal staff.

**Maintainability requirements** specifies quantification of the time necessary to make specified changes to product as well as it is specification of the intended release cycle for the product and the form that the release will take. It is difficult to foreseen the type of maintenance in future but some factors can be considered for expected changes in organization, environment, business rules, laws apply on product, portability etc. *Maintenance requirement are important for in-house software applications.*

**Flexibility requirements** indicate how much effort is needed to add new capabilities to the software product i.e. changes and expansion where as maintainability requirements only adapt changes in system due to any failure but it may not covers future expansion in the system. Other terms are extensibility, expandability and extendibility and augmentability.

**Robustness requirements** is the degree to which a system or component continues to function correctly when confronted with invalid input data, defects in connected software or hardware components, or unexpected operating condition.

**Availability requirements** refer to the percentage of the planned ‘up time’ during which the system is actually available for use and is fully operational.

**Reliability requirements** are probability of the software executing without failure for a specific period of time i.e. probability of ‘up time’ without failure. These are usually expressed as the allowable time between failures and percentage of correctly performed operations. They are concerned with characteristics such as availability, accuracy of system calculations, and system ability to recover from failure.

**Portability requirement** state the portions of product that must be able to migrate to other environments and identify those target environments i.e. describe other platforms or environments for installation. Portability is critical for some types of software systems.

**Speed requirements** specify the amount of time available to complete specified tasks i.e. response time. It is important for real time systems and dependable system e.g. a ground sensing radar, missile guidance system however less important for payroll system.

**Safety critical requirements** specify quantification of perceived risk of possible damage to people, property and environment. Safety critical requirements can be generated by investigating legal department that is aware of lawsuits resulting from product safety failures i.e. safety experts are best source of relevant safety critical requirements.

**Precision requirements** specify quantification of the desired accuracy of the results produced by the product i.e. accuracy to two decimal places. All types of software applications systems related to accounting and mathematics or algebra may need this type of requirements.

**Capacity requirements** specify the throughput of processing and volume of data to be stored by the product. It can be derived by analyzing number of concurrent users and operations i.e. analysis of 80 users simultaneously, at peak time.

**Space requirements** describe how much memory system requires. i.e. fast execution of system is also due to good memory.

**Performance requirements** are concerned with characteristics such as throughput, accuracy, response time, recovery time, startup time, and shutdown time. Performance requirements are critical for database and real-time systems. It defines how fast system must execute or how rapid response time is etc. It also specifies the number of concurrent users or operations to be supported and timing relationships for real-time systems. Performance requirements include capacity, precision, speed, reliability, reliability, robustness, availability, expandability, safety critical requirements.

**Efficiency requirement** is concerned with performance and space requirements. It is a measure of how well the system utilizes processor capacity, disk space, memory, or communication bandwidth. System consuming all the available resources i.e. processor time and memory, is indication of inefficiency.

**Look and Feel requirements** specify intention of appearance. *These requirements are more important in consumer oriented products as this makes product appear relatively simple to operate i.e. e.g. video camera, personal organizers etc.* These requirements are related to the way a potential customer will see the product i.e. business products should have professional look; products related to children are colorful, conservative, colorful, artistic and have attraction for them.

**Usability requirements** specify how much product will be easy for users to operate. It is concerned with characteristics such visual, creative, ease of user and consistency in the user interface. ‘Easy to use requirement’ are more important for in-house software applications. ‘*Easy to learn requirements’ are more important for public software products i.e. public telephones or dispensing machines*.

**Delivery requirements** specify the software products and its documentation to be delivered.

**Implementation requirements** are restrictions or limitations on developers’ end to use certain implementation language. It specifies the coding and implementation of system i.e. required coding standards, implementation tools and language such as COBOL.

**Design requirements** specify or constraint the options for designing a system i.e. structure analysis tools or relational database is a design requirement or constraint.

**Standards requirements** describe the organizational standards and policies i.e. constraints in process such as quality standards of process or business rules that enforce the system. Example: the product must comply with the appropriate military standard.

**Organizational requirements** defines the organizational polices, procedures and standards used within the organization. These requirements include software implementation, design, delivery and standard requirements. Organizational requirements are derived from policies and procedures of client organization e.g. software application should implement certain language i.e. VB as front end and Oracle as database system with complete documentation; application must conform to standard accounting practice, tax policies etc.

**Software interfaces** describe the connections between the software product and other external software components including databases, operating systems, tools, libraries and integrated commercial components.

**Communication interfaces** describe the requirements associated with any communication functions the product will use, including email, network communications standards or protocols etc.

**Hardware and technological requirements** describe the characteristics of each interface between software, technologies and hardware components of the system that makeup the operating environment for the new product i.e. supported device types, the nature of data and control interactions between software and hardware, and communication protocol to be used. *It is useful for acquisition and installation of integrated products.*

**Physical requirements** specify a constraint imposed on the hardware used to house the system e.g. shape, size, or weight etc. These requirements describe special condition and physical environment in which product would be used e.g. the product is to be used by a worker, standing up, outside in cold, rainy conditions.

**Ethical requirements** ensure that all the functional and nonfunctional requirements will be acceptable to its users and the general public. These requirements are concern with external factors such as social, political, legal, cultural etc.

**Legislative requirements** ensure that system operates with in the law and it should not violate any ethical requirement, safety and security requirement because any violation to safety and privacy is enforceable under law. *Legal staff or contractual lawyer would be useful for analysis of different laws that are applicable.* Analyzing external factors such as data protection, privacy laws, guarantees, consumer protection, consumer credit, copyright, standards, and adjacent systems are useful for deriving legal requirements.

**Interoperability requirements** describe how easily the product can interact or exchange data or services with other systems. These requirements can be derive by assessing the other applications that would be connected to developed software product and data that is expected to exchange.

**External requirements or interfaces** are concern with software, communication, hardware, technological, physical, legal, interpretability requirements. It describes requirements that ensure the new software product will connect properly to external components or adjacent systems. External interfaces can be derived from description of workplace where product would launch, analysis of adjacent system and their connections and requirements related to their physical environment. Other external requirements are related to compliance of legal standards and ethical requirements.

**Constraints** are restrictions for designers and developers for designing and development of software product. These constraints include external, implementation and design requirements such as limitations on developers’ end to use certain design tool i.e. structure analysis tools etc or implementation tool i.e. COBOL. The decisions of using these tools are based on cost and time also. Some time organization cannot afford high cost tools so option depends on availability of other substitutes. SQL is cheaper than Oracle. Constraints can also derive by analyzing certain limitation on achieving software quality such as using certain language put constraints on software portability. Requirement external to the system such as legal, ethical etc or exiting data also put constraints on application.

**Operational requirements** specify expected physical environment, technological environment and partner applications i.e. external interfaces that product must interface. It includes hardware and technology requirements for running software; physical environment in which product will operate and requirements for interfacing other components. These requirements describe special condition and physical environment in which product would be used such as product will be used in dark or in rain or by disable people. The operational requirements are directly derived from description of the workplace where product would launch, analysis of adjacent system and people interfaced with system, and requirements related to their physical environment. Organizational and environmental factors are important for analyzing operational environment.

**Cultural and political requirement** specify requirements that are specific to sociological and political factors that affect the acceptability of the product. These requirements are derived from company policies, profession and social, cultural, and political factors related to target environment or country of software system, other factors are habits, holidays, superstitions, language or cultural norms that are different for various countries. For example: icons used in product should not be offensive in specific country where product would be launched, restriction of acquiring products such as software and hardware components from specific country.

**Confidential requirement** specify the authorization access to the product that is granted under different circumstances. It specifies that system or software operators do not have access to any data that they do not need. It can be determined from users of systems and organizational policies.

**File integrity requirements** is more specific to files. It specifies the required integrity of databases and other files. It prevents information from being out of date.

**Integrity requirements** specify that products’ data is same as the source or authority of data. It deals with preventing unauthorized access to system functions, preventing information loss and ensuring that software is protected from virus infection.

**Audit requirements** specify required audit checks. It is useful to build a software product with appropriate audit rules.

**Safety requirements** specify those requirements that are concerned with possible loss, damage or harm that could result from the use of the software product. It ensures that system should be safe from any unauthorized access or virus attack.

**Security requirements** specify any requirements regarding confidentiality, audit and integrity. They are concerned with protection of the data used or created by the product. It ensures that system as well as data is safe from illegal access from any unauthorized user or from any virus infection. These requirements are critical for software products used for banks, financial organization or military use. The security are derived from analysis by policies of companies related to security and privacy issues, issues related to licensing and copyright, authorization of data and function to staff of organization, data protection and backup plan, audit policy etc. Some software projects cannot implement whole definition of security requirements due to cost and time limitations i.e. organizations may contract for only confidential requirements which exclude integrity and audit requirements. .

**Reusability requirements** indicate the extent to which a software component can be used in applications other than the one for which it is initially developed. It is long-sought goal of software development. Part of system need to be reusable in future.

**Supportability requirements** are concerned with characteristics such as testability, adaptability, maintainability, compatibility, configurable, installable, scalability, localizability, licensing and deployment requirements. Packages, installation and licensing requirements are important for development of commercial software product while deployment and maintenance requirements are important for development of in-house information system.

**Data definition** defines data requirements for input to system and output from system. Data is also associated for implementation and delivery of some type of software systems. Data definition defines the format, data type, allowable or default values for data item. Users or customers may not give data directly but it requires understanding their inputs to extract data. Different methods such as SASD, OOA etc help in identifying data requirements.