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Importance and the Role of Requirement Engineering

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Abstract

Since critical and specific software systems last longer and they are ought to work for an organization for many years, maintenance and supporting costs of them will grow to high amounts in next years. Development and production of special software requires different requirements to be categorized (different requirements can be categorized using software requirements engineering) .In other words, we have to see all requirements during the software's life cycle, whether they are important and necessary for our software at present time or they are not important for the software currently but will become important in future.

Requirements engineering , aims is to recognize the stockholder' requirements and their verification then gaining agreement on system requirements, is not just a phase completed at the beginning of system development not required any more, but includes parts of next phases of soft ware engineering as well.

To achieve this purpose, we acquired a comprehensive knowledge about requirements engineering. First, we defined requirements engineering and explained its aim in the software production life cycle. The main activities and purpose of each requirements engineering activity is described. Moreover, the techniques used in each activity are described for a better comprehension of the subject.

Keywords: requirement, requirement engineering, stockholder, software requirements specifications

1. introduction

Requirements engineering is a process based method for defining, recognizing, modeling, linking, documenting and maintaining software requirements in software life cycle that helps to understand the problem better. Several techniques have been employed in requirements engineering process to guarantee the completeness compatibility, unambiguousness and correctness of requirements. Success of each software project is measured by considering level of fulfilling the project's goals. Requirements engineering is process of discovering these goals that is completed by identifying stockholder, their needs and documentation of these needs in away that responses to analyzing, making communications and implementing them in future .But it should be noted that requirements do not specify the way of implementation[1].

2. Requirements engineering process

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Requirements engineering process includes 5 main activities [1,4,5] that can be implemented simultaneously or parallel. These activities are as follows: 2-1requirements extraction 2-2 discussing and analyzing requirements-2-3 requirements documentation (describing specifications of requirements) 2-4 requirements validation 2-5 requirements management.

Requirements engineering actually includes 2 main process of requirements development and requirements management (figure1).Requirements development includes all activities involved in requirements extraction, analysis and validation [2]. Requirements management includes all activities involved in making change in requirement baseline request, performing analysis for change request, ratifying or not ratifying the changes and implementing ratified changes.
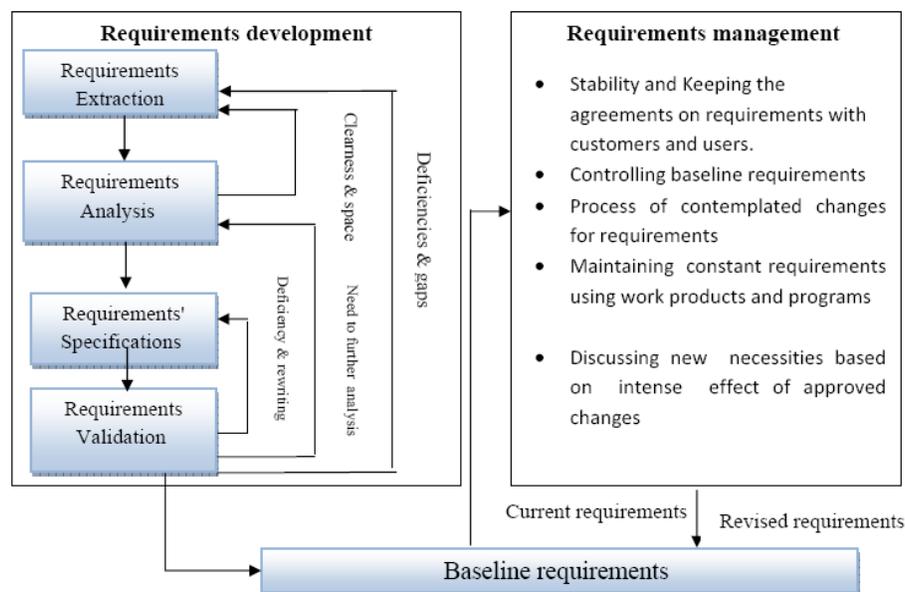
Requirements engineering[6]:

figure 1: requirements engineering process(based on Wiegers [7])

Most of product developments activities occur in requirements phases and primary definitions of life cycle. Details of requirements in software development life cycle are also transferred to next phases.

- **Coarse-Grain model [4]**

In Coarse-Grain model there is no clear limit between activities. Cloud shapes in figure 2 indicate this fact.
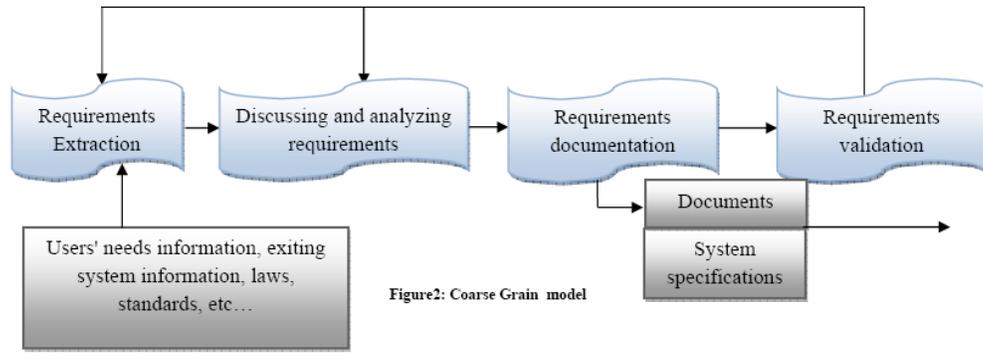
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Figure2: Coarse Grain model

- **waterfall model**

In this model the goal of requirements engineering is to identify requirements of stockholder and users before system development phase starts so we can avoid reworks leading to wasting time and cost. This goal is defined on the basis of 2 assumptions:

Correction of discovered errors in the system always needs spending high cost.

This goal provides possibility of determining a set of constant requirements before starting to designing and implementing.

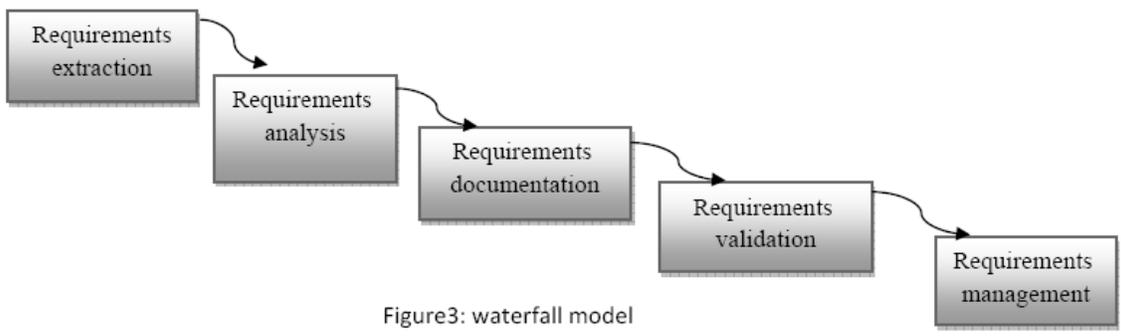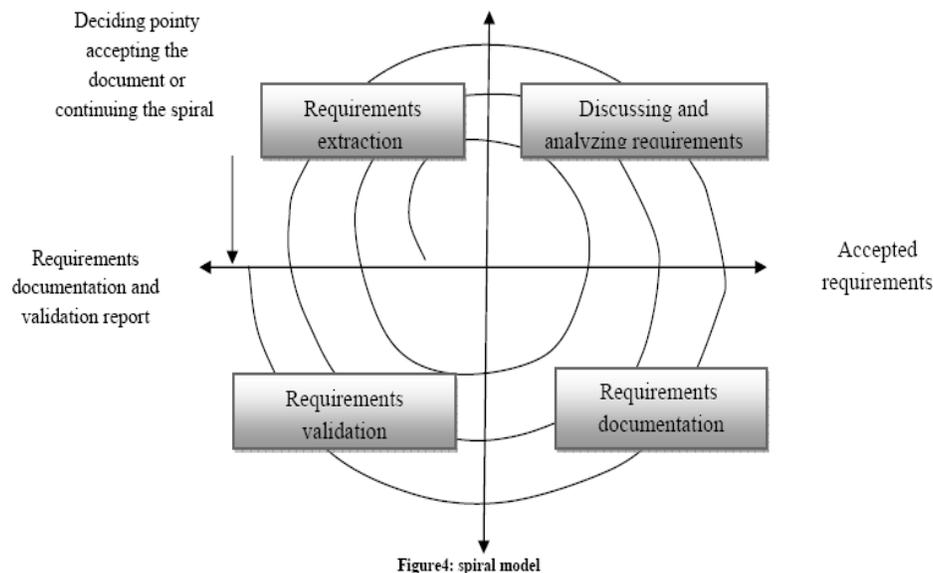Cascade model specifies a series of requirements engineering phases which are performed one after another.

Figure3: waterfall model

- **spiral model [4]**

In spiral model, that is shown in figure4, all different requirements engineering activities should be repeated until a decision is adopted about acceptability of requirement documents.

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Figure4: spiral model

2.1. Requirements extraction

Requirement extraction process is the phase of collecting information in requirement development process. In this phase requirements and stockholder of requirements are identified, an indicator is chosen for each requirement class and finally requirements of each class of stockholder and limitations of system are determined by consulting with customers, developers and users.

Sources of requirements extraction:

(Real or potential)customer, specifications of costumer's requirements, documents dependant to existing systems, new system's users, potential users of new software system, etc…

Requirements engineering extraction techniques [4]:

Interview, scenarios, brain storming, watching and analyzing, concentrated groups, soft system methodology, reusing requirements, making prototype

Potential issues of this phase

    1-Lack of a specified and clear limit for the system cause bewilderment and ambiguity in the issue and makes it difficult to identify unnecessary requirements.

    2-Stockholder do not have a complete and assured insight in to what they need and lack a complete understanding about extents of the issue and limitations of their computational environment.

    3- Stockholder avoid contacting system engineering for discussion so the customer, user and engineers may not get a clear insight in to the issue.

    4- Issue of system changes that may occur any time.

In this phase requirements are unprocessed, unrelated, unstructured and incompatible and have dropt points.

2.2. Discussing and analyzing requirements

Discussing and analyzing requirements is a process in which of requirements are studied in regard of necessity, compatibility, completeness and possibility. During this process requirements are analyzed and modeled and possible interference of requirements are omitted by

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prioritizing discussions and risks of the issue are identified. Output of this level is a complete compatible and prioritized set of requirements.

Techniques of requirements analysis

Joint applied development meetings (JAD), requirements prioritization, modeling, quality function deployment (QFD)

Requirements are modeled using three different types of languages.

Official language, semi-official language and unofficial language

2.3. Requirements documentation

The final goal of requirements engineering is to document requirements to be met and purpose of requirements documentation is making relation between requirements understood by stockholder and developers. Requirements document describes application extent as well as under development system. Requirements document can be considered as a base for controlling changes and evaluating future products and processes (system design, system test cases and validation). Documentation of accepted requirements is done with suitable symbols in suitable details level. Good requirements documentation should be complete, correct, unambiguous, revisable, improvable and understandable. Requirements documentation level has a direct relation with requirements management. Requirements specifications can be mentioned in small projects in one software requirements specification document or in bigger projects can be specified in several documents. For example:

- Functional and nonfunctional requirements and limitations are documented in requirements specifications.
- External interfaces are put in software requirements specifications or in external requirements documents separately.
- Business requirements are documented in business requirements document.
- Then we can have predefined frameworks for requirements specifications. This cause requirements analyzer to focus on content instead of framework and helps to make sure that key cases are not dropt during requirements documentation.

For example if requirement assumptions are inserted in document it leads to misunderstanding in future. Another option is to use requirements tools (data base). This requirements tool is the most valuable thing in requirements and project management.

2.4. Requirements validation

Validation in requirement engineering is done for controlling the quality. Requirements validation means confirming that requirements are complete and well- written and supply needs of customer. This phase may continue repeating other requirements development phases because of identified deficiencies, gap between requirements, additional information and other issues. Implemented software product is validated in software life cycle test phase on the basis of its requirements.

Validation techniques

Requirements reviewing (complete, compatible, unambiguous, and testable), requirements testing, making samples for requirements.

2.5. Requirements management

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Requirements management includes all activities involved in basic requirements change request. They analyze requested changes effect, confirm or deny changes and implement applied changes. Requirements management also include activities used in maintaining products and project planning that are being used .It includes condition of requirements during progress of software development process as well. Requirements tracing is a technique for linking requirements together, designing and implementing. Use of this technique leads to gain ability of managing the system changes. Requirements management is a continuous activity during software development life cycle.

3. Requirements engineering product

The product of requirements engineering is software requirement specifications. In other words, it is a document that describes requirements of functions, limitation of design, functionality and qualitative specifications of software and external interfaces clearly and exactly.

Things to be considered when software requirement specifications (SRS) [3] are being written are as follows:

Nature, environment, qualities, preparation, evolution, making prototype, prepared design and finally project requirements improvised in software requirement specifications.

Qualities of good software Specifications include:

Being revisable, correctable, traceable and usable in operation and maintenance phase.

4. Conclusion

As explained in previous sections, necessity of defining the requirements lies in the need to pass different phases. This necessary action for defining requirements engineering, whose goal is to identify requirements of stockholder, their validation and providing agreement on requirements of developing system, is not just a phase to be completed at the beginning of system development process that is not required any more ,but includes parts of next software engineering phases as well. Importance of requirements engineering becomes apparent in special aimed software which require high costs for maintenance and support in long time. For developing special aimed software, we should categorize, combine and prioritize functional and non functional needs, co- requisites, prerequisites and different requirements. Requirements engineering process helps to categorize requirements. In other words, we have to see all requirements during the software's life cycle, whether they are important and necessary for our software at present time or they are not important for the software currently but will become in future. Using requirements engineering completely and correctly, software developer organizations confront less fails and they will not loose their capital, profit, marketing and resources.

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