



## The computer systems in the industrial processes. A brief analysis

Elizabeth Romero Samaniego<sup>1</sup>, Ana Laura Sánchez Corona<sup>2</sup>, Rigoberto Zamora Alarcon<sup>2</sup>, Pedro Alberto Escárcega Zepeda<sup>3</sup>, Juan Gabriel López Hernández<sup>4</sup>, Cory Magaña Nava<sup>4</sup>, Murillo<sup>4</sup>, Ismael Mata Bojorquez<sup>4</sup>, Rogelio Lopez Rodríguez<sup>5</sup>, José Cupertino Pérez Murillo<sup>5</sup>

<sup>1</sup> Tecnológico Nacional de Mexico, Tecnológico de Ensenada, Ensenada, Ensenada Baja California, Mexico

<sup>3</sup> Departamento de Ingeniería Industrial, Facultad de Ingeniería, Universidad Autónoma de Baja California, Mexicali, Baja California, Mexico.

<sup>3</sup> Departamento de Ingeniería Industrial-Metal Mecánica, Tecnológico Nacional de Mexico, Instituto Tecnológico de Mexicali, Mexicali, Baja California, Mexico.

<sup>4</sup> Centro Bachillerato Tecnológico Agropecuario 146, San Quintín, Baja California, Mexico.

<sup>5</sup> Facultad de Ingeniería y Negocios, San Quintín, Baja California, Mexico.

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### ABSTRACT

*The computer systems involve the software engineering or systems engineering, which is very relevant in the principal sectors as commerce, educational and industrial; essentially of each region in the world. This area of engineering consists in evaluate the necessities of each activity where is used a software, to determine the specifications of the software used in each type of operations in the sectors mentioned above. In this investigation was made a theoretical analysis of the requirements software used in the three essential sectors mentioned, showing the differences between it. In this theoretical brief was analyzed textual information of a lot scientific studies to expose the varied forms of application of the requirements engineering by experts in this relevant topic.*

**Keywords** Computer systems, software, engineering, technology

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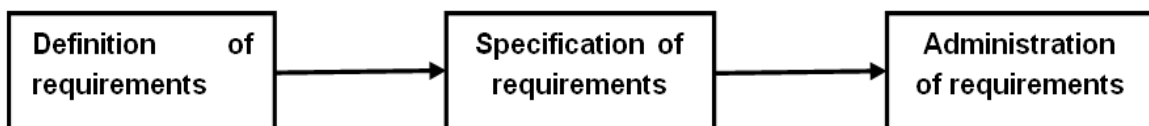
### INTRODUCTION

In this investigation was made an analysis of theoretical information about the requirements engineering, to determine the prioritization of the way to grade or rank requirements in a software development in their order of importance and its implementation and operation. This is very important aspect in the decisions to increase the economic value of the software system (Bano M et al, 2014). In this investigation, it is intended to better understand the fundamental concepts of requirements engineering. It is important to note that when preparing the translation from English to Spanish of the word requirements; confusion is generated, because the word requirement in the Spanish language refers to a circumstance or condition for some type of situation, and many people translate it this way (Bourque P et al, 2014). On the other hand, the word requirements that is widely used even by professionals in the area of computing is an action of requiring that is a common word in the legal field, such as requiring a person for a legal trial. Based on this, mistakes and errors have been

generated in the software development processes, causing that sometimes the software does not comply with its optimal functionality (Wohlin C *et al*, 2013). Thus, in this research, the essential concepts of requirements engineering are detailed, to determine exactly the necessary aspects that are requested on the basis of any need to achieve the pertinent actions that generate an efficient activity of what is needed. Requirement's engineering is very important in the development of software, because according to this, the software instructions functions are elaborated, based on its programming language (Medeiros J *et al*, 2015). At the time of developing software, the characteristic alternatives of each type of programming language must be known, as well as the tools of each type of software for the requirements management process.

### Requirements engineering

Over the years, it has been observed that requirements engineering is very relevant in the development of software for various applications. The requirements are very important to determine from where the development of software will start, as part of the planning of the type of programming language to use, as well as the instructions to develop for the realization of activities with the software (Penprase B, 2018). This is very important because, for example, the levels of productivity and quality of an industrial process can be increased, in addition to developing cost estimation processes for industrial manufacturing or other types of operations. Another relevant aspect is the organization of the functions based on schedules where any type of action to be carried out can be controlled with the instructions of software, and with this elaborate measurement of the scope of objectives and planned goals at the beginning of each activity of a specific project (Eghariani K *et al*, 2016). According to computer experts, a number of projects based on software development do not complete their activities due to inadequate planning of activities at the beginning of each project. This is because they do not know the needs of their clients to develop the software and they do not determine the adequate requirements, with an efficient definition, specification and administration of the requirements. Factors such as lack of user participation, incomplete requirements and poor handling of the change to requirements can be found within this mismanagement. The figure 1 shows the steps of the requirements engineering (Kenneth A *et al*, 2016).



**Figure 1** Diagram of steps of requirements engineering

Figure 1 shows the steps of the requirements engineering in according to the necessities of any type of activities, where is observing as a principal aspect as the definition, specifications and administration of the requirements to an optima operation of the software. Requirements Engineering (IR) has a great relevance in the development of software because based on this, the needs can be determined and the software developers elaborate using the appropriate methods to elaborate the computer programs reliably and quickly required and with the assurance of its efficient functionality (Medeiros J *et al*, 2016). The main objective of this type of engineering is to adequately describe the specifications required for each activity in which software is to be developed, with the characteristics of being clear on the needs, being concise and with the best precision. This is to achieve a fast and optimal action in the development of the software and that it works efficiently. Knowing the needs of the clients or who is going to develop a software appropriately, development times and methods can be minimized, as well as one of the important aspects the optimal functionality and security that this

software is not going to be modified for some risk or control situations. Before starting the process of evaluating the requirements for the development of software, this concept is meaning as the requirement must be considered, being defined in a simple way, as a required condition to be able to access tools that support the requested solution. There are other types of requirement definitions, the most common being the one mentioned above, and it focuses on meeting a need, condition or characteristics that requires some type of solution (Philip A et al, 2014). Analyzing the requirement information, as part of software engineering, is the way to describe a condition that must be met in a system to develop various types of activities mainly in an automated way, ranging from analytical calculations to the management of structures, instruments, equipment and machinery through a computer and currently through virtual operations through a computer network. The requirements for software development can be classified based on two aspects (Wang X et al, 2012):

**a) Functional type.** These types of requirements are used to define the specifications and instructions for how to operate the software according to the required conditions. This is responsible for describing the way in which the software will operate to determine the type and programming language to use and with it the different types of instructions necessary for the development of the software in a fast and efficient way and achieving optimal functionality. They elaborate the transformation processes of calculation signals or signal conversion depending on what is going to be controlled, using the required algorithms, codes and sequential logic.

**b) Non-functional type.** This type of requirement is based on the characteristics that could generate some limitations for the development of the software and its functionality. The main factors may be the operating performance of the software with respect to the operating times and memory capacity of the computer equipment where the software is developed, as well as the amount of user interfaces required and the robustness of the system, in addition to the availability of computer equipment necessary for optimal operation. It also understands the security of software operation based on the requirements.

The requirements engineering is considered a very important area due to the role it plays in software engineering, where the collection of the necessary information for the development of the software is generated, as well as the analysis and verification of said information, to achieve the optimal software functionality (Heck, P et al, 2016). That is why it is relevant to consider that this area of engineering must collect the required information in a correct way and be adequate, whose main objective is to support software developers to understand each problem situation, understanding the needs of customers. In addition, it is relevant to know the way in which users will use each software in each required activity. The specifications of each software generate the adequate communication of the instructions and the specific language of each operation, managing to determine if each software development process is viable to be carried out, and thus reach the validation of the software. According to experts in software development, requirements engineering is very relevant, considering the following aspects (Dingsyr, S et al, 2012):

- a) They develop a correct management of the software needs.
- b) The stages of understanding the needs are adequately achieved by the efficient definition of the requirements.
- c) The planning of the functions to be carried out by the software developers is carried out efficiently.
- d) With the engineering of requirements, there is a beginning of the operations and who or who develops them.
- e) Optimal software maintenance processes are achieved in the required periods.

- f) Unnecessary costs are avoided, so as not to spend time repairing software errors that can be very expensive due to poor decisions.
- g) It generates an optimal quality of the software functionality and an efficient communication is achieved between the teams involved.
- h) Software with high reliability and good performance is developed.
- i) There is an optimal interaction between the software developers and customers with adequate communication, managing to prevent users from rejecting the software.
- j) Software engineering generates an adequate analysis of customer needs.

Requirement's engineering comprises four relevant phases in the process of determining the needs of the software, supporting in knowing each need and its relevance in the development and use of the software. Each phase is explained below (Heikkila, V et al, 2015):

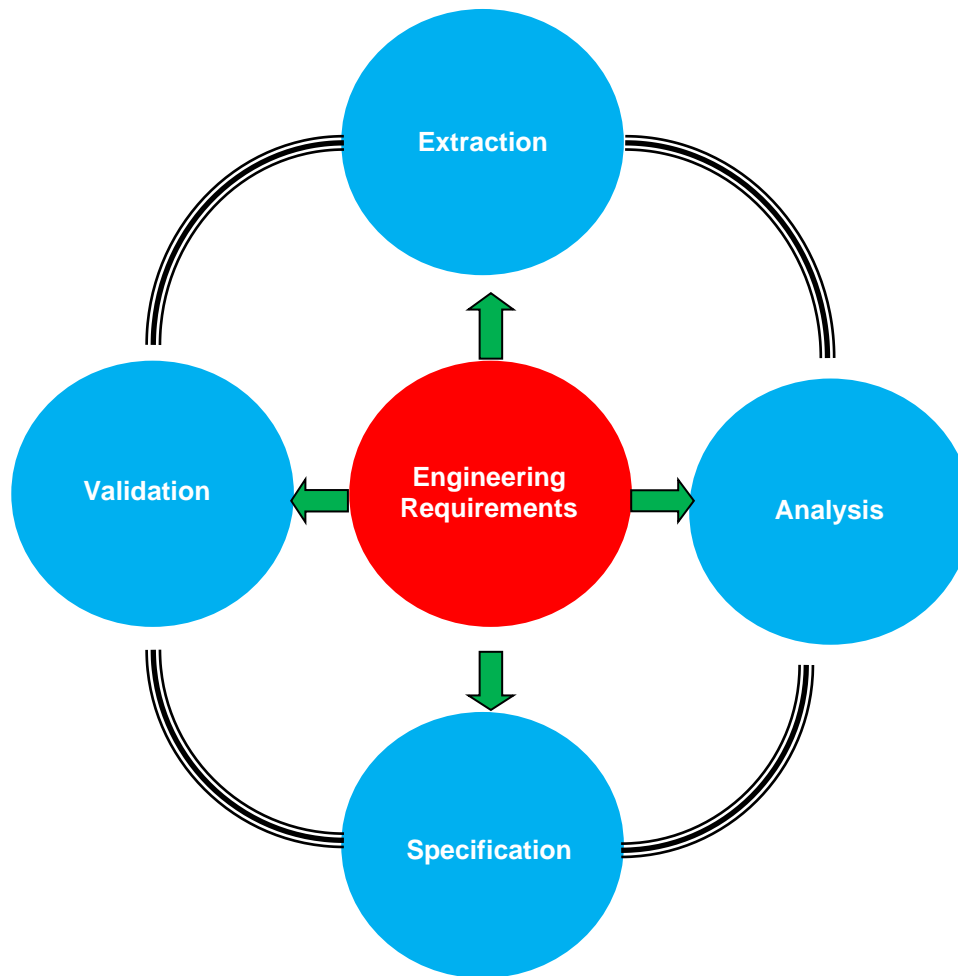
**a) Extraction.** It represents the way in which the information necessary for the development of the software is obtained and determined. In this phase there must be constant communication between software developers, customers and users, to achieve together what is required and find the solution to each problem situation presented. In this phase, great care must be taken in collecting the information to obtain the results planted in the objectives when starting each software.

**b) Analysis.** It is a phase where the problems to be solved with the software are detected, establishing an operations plan to be carried out with a sketch, to obtain the appropriate requirements, through information research, and developing a brainstorming of the problem situation to solve. The degree of severity of each problem situation is also determined and possible solutions are evaluated.

**c) Specification.** In this stage of requirements engineering, agreements are reached between software developers and clients based on user opinions, having excellent communication between them and applying the techniques, methods and standards necessary for optimal software functionality. The Unified Modeling Language (UML) is applied, being a standard used for object modeling processes.

**d) Validation.** It is used as an essential part in the verification of the functionality of each software developed, verifying all the requirements proposed in the extraction and analysis phases, determining that each instruction of the developed software has a priority level of execution. It is here that the requirements are evaluated to be adequate from the initial phase and the instructions and programming language elaborate the operations correctly. There is no standard method for this phase, but each software development can be different, as long as the expected results are achieved.

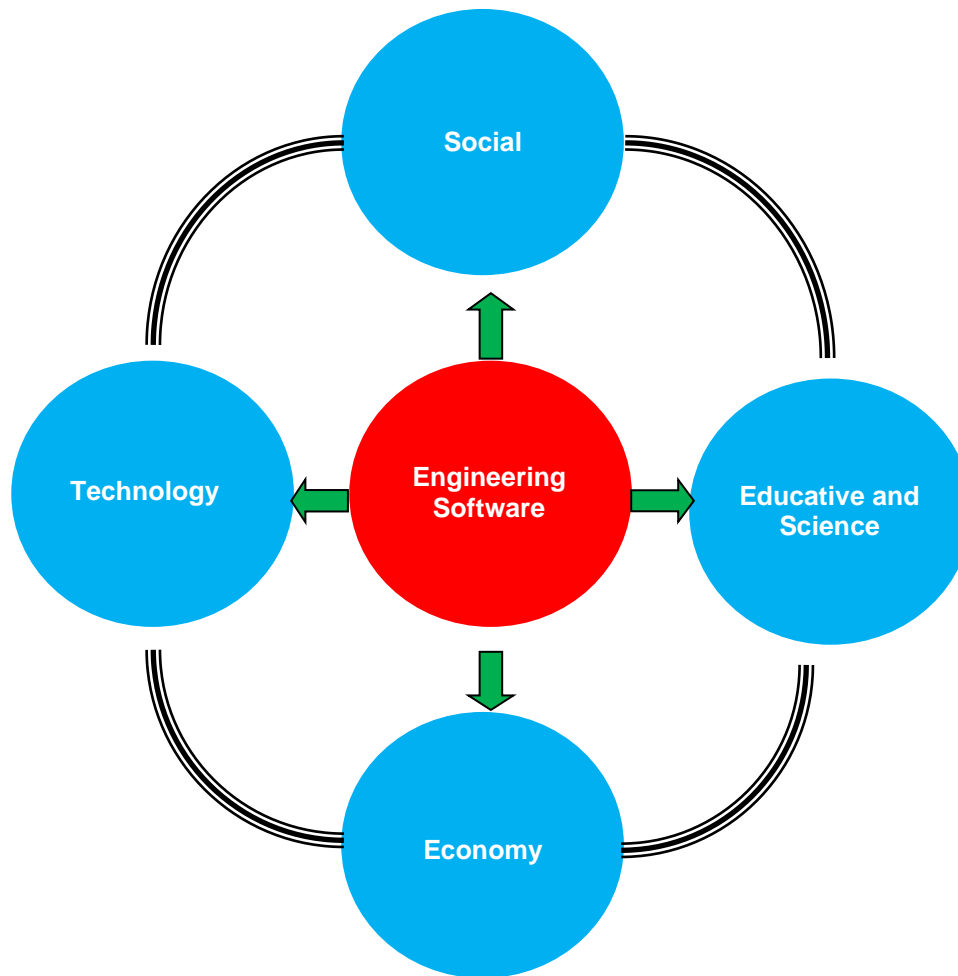
The information described above, is represented in figure 2, with the relation of each factor involved in the requirements engineering (Inayat, S et al, 2015).



**Figure 2** Factors of the Requirements Engineering

### **Software engineering**

It is a branch of computer science, where software development is evaluated with the requirements requested for a specific activity, as well as its operation as productivity and quality indexes (Wohlin C, 2014). The software is created based on the various types of language, as well as different methods and tools of computer engineering acquired, either in educational institutions as students or in books and information on the Internet specialized in computer science. The software development is developed to support various activities of daily life, in addition to agricultural, aerospace, scientific, educational, industrial and medical operations essentially. Software engineers are specialized personnel who develop computer programs according to the requirements for each specific activity (Jalali C et al, 2012). There are four relevant aspects, which the software develops have an effect, and is showed in figure 3.



**Figure 3** Relevant aspects of the software develop

The creation of software is a great factor in the economy of each region of the world, where innovation and high technology systems are developed based on software development, either in the same region or country where the software is constantly being developed, or from sale in other regions, countries, being a relevant aspect in the growth of their economies. Figure 3 shows the relevant aspects that was an effect (positive and negative), from was developed software to any kind of activity, describing in the next information (Monostori, L, 2014):

**a) Social.** The software develop was a positive effect in the society, from the first creation of software, to unit people from different regions or countries, and to receive a support of any type of information to make diverse activities from children to old people. But in the last times, the uncontrolled information (no not true, with violence, showing actions of sex and without moral and civic values), was very dangerous to children's and young people that receive this information and not understand about the danger of this. This debit be controlled by fathers' family and persons to take care children's and teenagers in hoes or specialized places; and teachers in schools.

**b) Educative and science.** Is very important to obtain the specific and adequate knowledge's, especially in computer area or other area to be developed as a professional person as educative and science activities, and improve diverse activities occurred in the daily life.

**c) Economy.** Is very relevant to improve the economy of people and nations, where was developed

software and where use the software to earn money and support to government, industries, social centers or educative and research institutions or centers.

**d) Technology.** With the software develop, there many activities to improve with innovation methods, techniques, devices and systems, to make actions with more security and very comfortable.

### MATERIALS AND METHODS

This analytic investigation was made to support people that have interest in the software develop in diverse activities in the daily life, where this thematic aspect can be applied in any kind of actions. The steps of this investigation were expressed next:

- a) Analysis of important information of the requirements engineering.
- b) Evaluation of relevant activities of the application of the requirements engineering.
- c) Analysis of difference to use adequately or not adequately the requirements engineering in a lot activity.

### RESULT AND DISCUSSION

This investigation expressed relevant information to students from elementary school to universities to obtain adequate information as represented the knowledges to they. Also, this analytic investigation can be support to people to want earn money and help to be easy any kind of actions of the daily life and to any type of activities as agricultural, aerospace, scientific, educational, industrial and medical operations.

#### Analysis of information of RE

This was made with different homepages to search information, being described in the table 1, where is showed the three homepages (Explorer, Google and Mozilla), that are used for people. These three homepages were described because are the most important and easy to search information about the requirements engineering.

**Table 1** Difference of three principal homepages to search information

Factors	Advantages	Disadvantages
Homepages		
<b>Explorer</b>	Is very easy to install, use and to search information in modern computers	Sometimes not work in old computers
<b>Google</b>	Is very easy to install, use and to search information in any type or computers (old and modern computers)	Works with any type or computers (old and modern computers)
<b>Mozilla</b>	Is very easy to install, use and to search information in specific computers	Works with specific computers

Table 1 represents a theoretical analysis of the principal homepages used to search information of the requirements engineering, where the Google homepage was the most used for its characteristics to search the information to this investigation.

#### Evaluation of activities applied with RE

For the development of this evaluation, relevant aspects were considered, which are explained below of features of computer devices used in industrial processes:

**a) Volatility.** It represents in a basic way, the way in which information is stored, only when the computer system is turned on with electricity. In this research for industrial plants installed in the city of Mexicali, the use of micro-memories is proposed that do not require the need for a computer system to be turned on with electrical energy.

**b) Accessibility to information.** Indicates that the information of the memories can be accessed easily and quickly. In this research for industrial plants installed in the city of Mexicali, the use of micro-memories is proposed, with which information can be accessed quickly and easily.

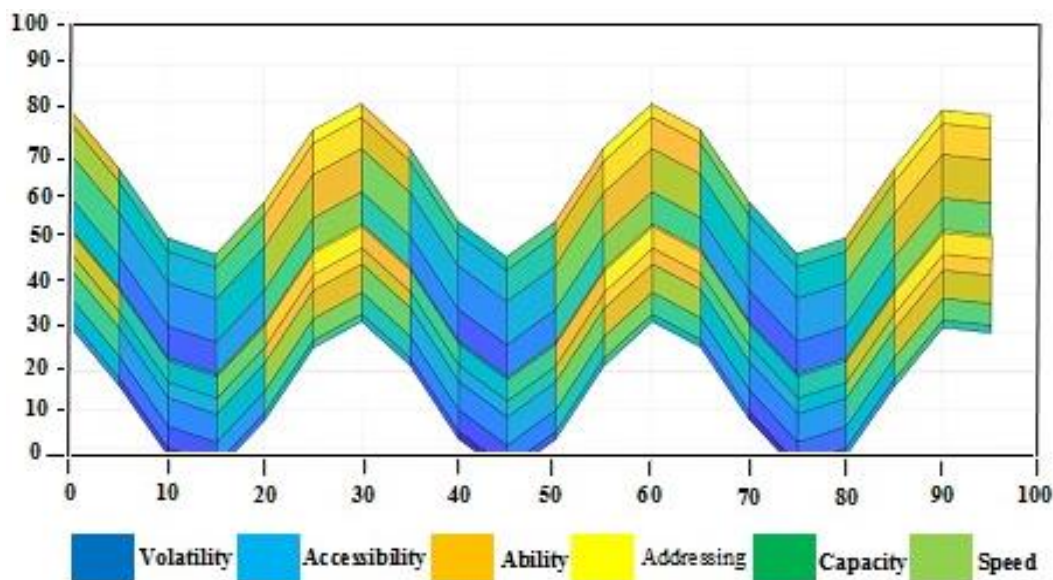
**c) Ability to change information.** It is mentioned to have easy and fast access to modify any type of information. In this research for industrial plants installed in the city of Mexicali, the use of micro-memories is proposed, with which information can be accessed quickly and easily.

**d) Addressing the information.** Represents the locations of the memories, where the information can be stored. In this research for industrial plants installed in the city of Mexicali, it is proposed to focus on the use of micro-memories, with which it is possible to have quick and easy access to information, and with a large capacity of information storage locations.

**e) Memory capacity.** The amount of information that can be stored in the memories is considered. In this research for industrial plants installed in the city of Mexicali, the use of micro-memories is proposed, with which a large information storage capacity can be achieved.

**f) Operation speed.** Indicates the fast way of operating the memories. In this research for industrial plants installed in the city of Mexicali, the use of micromemories is proposed, with which it is possible at high speed in the operation and storage capacity of the information.

The information described above is illustrated in Figure 4.



**Figure 4** Analysis of features of requirements engineering

Figure 4 illustrates the analysis of the principal features of micromemories showing by colors each feature, using the Matlab software as specialized software.



## CONCLUSION

The use of the requirements engineering, with specialized microdevices in industrial processes of industrial plants is considered very relevant, being a great advance in this technology. This has helped to receive more industrial companies of any place of the world generate more job opportunities for the population of this city. In this research of theoretic analysis, the need to use of requirements engineering is important to develop software with the adequate specifications, to increase productivity and quality levels in manufacturing areas of industrial plants of each type. This exists for industrial transformation, or the development of innovations that generate improvements in industrial processes in manufacturing areas, managing to increase productivity and quality indices. This is why it has been promoted in higher-level educational institutions (universities and research institutes), in conjunction with industrial companies, anywhere in the world, for the development of innovative systems and devices, as well as methods applied to areas of manufacturing in all industrial processes. Computer systems and programs have been developed to control, count, compare levels, and pack. One of the actions developed in the industry of this city, is the use of micromemories to control of industrial process and store relevant information.

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