CHAPTER 1

INTRODUCTION

Success in software development is measured by the quality of the product delivered to the customer. Requirements engineering is a critical phase for the success of a project since this phase ensures that the software system reflects the customer needs. The requirements engineering phase focuses on deciding precisely what to build and this is the most difficult part of building a software system. A good set of requirements cannot be obtained by an ad hoc process. Instead, they need to be engineered through a systematic and well-defined process. Therefore, the requirements analysis phase in the SDLC has evolved into the requirements engineering, which is defined as “a systematic process” of developing requirements through an iterative co-operative process of analyzing the problem, documenting the resulting observations in a variety of representation formats, and checking the accuracy of the understanding gained. The objective of the requirements engineering phase is to obtain a complete and clear software requirements specification (SRS), which captures the user’s intent. However, if the requirements engineering process fails to generate quality requirements, the potential impact is substantial. Errors committed during the requirements phase often remain latent and are not detected until well after the stage in which they are made. The later in the development life cycle that a software error is detected, the more expensive it is to repair.

Requirements engineering, in its broadest sense is; trying to understand the customer's perception of values and align the organizations
management strategy to synchronize with those values. It will be a distinct advantage if one can effectively capture the genuine customer requirements, systematically analyze and transform them into the appropriate product features.

1.1 CONCEPTION AND EVALUATION OF IDEAS

Largest financial losses and waste of human output in the software industry have been due to errors at the requirement analysis stage of the Software Development Life Cycle (SDLC). Much study of this is being done at institutes financed by large vendors like Department of Defence of the US Govt., NASA etc.

The possibility of doing something dramatically useful resulted in the motivation to work in the field of Requirement Analysis. Although much research is going on in the field very little effort mostly only in Japan was being put into using Fuzzy logic processes in Requirement Engineering. Ramachandran et al at the School of Computer Science and Engineering at Anna University as a continuation of their work on the paper Fuzzy Decision Making Approach for Long Range Planning of Software Development Process had suggested the usefulness of fuzzy processes in requirement engineering and recognized the use of concepts like Fuzzy Associative Memory (FAM), Fuzzy Approximation Theorem (FAT) and Adaptive Neural Nets for getting better requirements. This resonated with the difficulty in handling the huge numbers of parameters in pollution mapping and forecasting; a field in which the Environmental Pollution Lab at A.C Tech. was devoting considerable resources. Hence as an inter-departmental research work in the Chemical Engineering Department and Computer Science Department of Anna University, this idea was encouraged and taken forward resulting in this work.
1.2 SCOPE OF THE PRESENT INVESTIGATION

Requirements engineering is the foundation of Software Development. It is this initial activity that has the most influence on the quality and utility of the resulting Software Product.

The present investigations deal with the dimensions and complexity of this very vital phase of software development, brings out its importance throughout the software development life cycle and suggests a novel process using Fuzzy Logic to arrive at a better result.

We suggest a novel approach for analyzing customer requirements and projecting them into the design, engineering and product attributes in order to guide downstream software development activities.

The proposed system incorporates the principles of fuzzy set theory to tackle the complex problems encountered in customer requirement management. It offers an intelligent method for decoding and prioritizing the vague and imprecise Voice of Customer. As a result, the appropriate product features can be mapped to their relevant requirements.

In this framework, imprecise requirements are interpreted using fuzzy logic and the relationships between requirements become implicit. This framework facilitates the inference of relationships between requirements; assess the relative priorities of requirements and handles requirement changes. The human brain interprets imprecise and incomplete sensory information provided by perceptive organs. Fuzzy set theory provides a systematic calculus to deal with such information linguistically, and it performs numerical computation by using linguistic labels stipulated by membership functions. Moreover, a selection of fuzzy if then rules forms the key
component of a fuzzy information system that effectively model human expertise in specific applications.

Over the past few years, the real importance of requirements engineering has surfaced. Hence, much research is now being directed towards generating quality requirements. However, the existing requirements generation models do not sufficiently stress the importance of identifying intermediate requirements documents. In addition, the models rarely specify how those documents support the objectives of the related activities.

1.3 ORGANIZATION OF THE THESIS

In Chapter 2, the importance and roles of requirements engineering and how it was recognized as a vital part in the software development process is discussed. The problems faced in requirement engineering and present current approaches to addressing them are then examined. The last section describes the necessity for this research in the requirements engineering field.

Chapter 3 gives a short introduction to Fuzzy Logic and the various processes adopted with reference to current usage and the present investigation.

In Chapter 4 this investigation; a novel method applying Fuzzy Logic process to Requirements Engineering with reference to an Environmental Pollution problem and an adaptive method using a neural net to discover and fine tune rules used in the Fuzzy process is described.