

# Chapter 10

## Evaluating IBMEC–RJ’s Intranet Usability Using Fuzzy Logic

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### ABSTRACT

*System usability is a concept that goes beyond the ease of use, and includes several criteria for measurement. This study aims to evaluate the usability and thus the quality of IBMEC-RJ’s Intranet in Rio de Janeiro, Brazil, by the fact that it is of great assistance to teachers and students. The method is applied research through questionnaires. The universe of users was limited by a convenience sample of IBMEC. The methodology that had used Microsoft Excel and Matlab from Mathworks is innovative. Fuzzy logic is a fundamental tool for consolidating and analyzing data.*

### INTRODUCTION

Acquiring new customers and the loyalty of existing ones has led enterprises to restructure, launching and using products with high quality. For enterprises and educational institutions, well-structured information systems are of total importance. Have an Intranet for easy use and excellent quality is essential to minimize the churn (customer turnover). If the system does not cause

satisfaction to the user, it does not become an ally, and certainly seek another system to use.

Fuzzy logic is a facilitator to achieve the goal of research and will serve as a technique to process and analyze the result of feedback from system’s users, since it allows to transform subjective opinions on measurable indicators. First is presented a review of the literature on usability of systems and fuzzy logic, then it is presented the methodology used to conduct the study. Finally the paper presents the results and conclusions.

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## THE FUZZY LOGIC

The first notions of the Fuzzy Logic were developed by Jan Lukasiewicz (1878 – 1956) in 1920. Instead of using rigid rules and a line of logic thinking based upon premises and conclusions, Lukasiewicz attributes levels of pertinence  $\{0, \frac{1}{2}, 1\}$  to classify vague and inaccurate concepts. A short time later, he expanded that set to all values contained in the interval  $[0,1]$ . Yet, the first publication on Fuzzy Logic dates back to 1965 by Lotfi Asker Zadeh, a professor at the University of Berkeley, California (CEZAR, MACHADO and OLIVEIRA JR., 2006).

The power of the Fuzzy Logic stems from its ability to infer conclusions and generate replies based on vague, ambiguous and qualitatively incomplete and inaccurate information. With this regard, the fuzzy systems have the ability to 'think' in a very similar way to humans (OLIVEIRA JR., 1999).

The Fuzzy Sets and the Fuzzy Logic provide the basis to generate powerful problem-solving techniques with a wide applicability especially in the fields of decision-making and decision-control. The power of the Fuzzy Logic stems from its ability to infer conclusions and provide replies based on vague, ambiguous and qualitatively incomplete and inaccurate information. Regarding this matter, the fuzzy-based systems have the ability to think similarly to humans. Their behavior is represented simply and naturally, thus leading to building comprehensible and easy-to-maintain systems.

The fuzzy logic is based upon the theory of the Fuzzy Sets. This is a generalization of the Traditional Sets theory to solve the paradoxes generated from the "true or false" classification of the Classical Logic. Traditionally, a logical proposition has two extremes, namely: either "completely true" or "completely false". Nevertheless, in the Fuzzy Logic, a premise ranges in the 'true' level from 0 to 1, causing it to be partially true or partially false. Upon the implementation of the "true level", the Fuzzy sets theory expands the Traditional Sets

theory. The groups are labeled qualitatively (by using such linguistic terms as: high, warm, active, small, near etc.) and the elements of these sets are characterized by varying the level of pertinence (a value that indicates the level at which an element belongs in a set). For example, temperatures between  $30^\circ$  (thirty degrees) and  $40^\circ$  (forty degrees) belong to the "high temperatures" set, although the  $40^\circ$  temperature has a higher level of pertinence in this set (OLIVEIRA JR. et al, 2007).

In a way that is not well understood, humans have the capability to associate a level of pertinence to a certain object without understanding consciously how to reach it. For example, it would not be difficult for a student to assign a level to the teacher in the "good teachers" set. Such level is achieved immediately with no conscious analysis on the factors that influence such decision (CEZAR, MACHADO and OLIVEIRA JR., 2006).

The level of association is not probability! Basically, it is a measure of the compatibility between the object and the concept represented by the Fuzzy Set. For instance, number 0.7 is the compatibility of the  $35^\circ$  temperature with the definition of the Fuzzy Set for high temperatures. That figure (0.7) is not the probability of  $35^\circ$  being a high temperature, for it is already defined as  $35^\circ$  (CEZAR, MACHADO and OLIVEIRA JR., 2006).

The conventional systems theory is based upon algebraic, differential or difference equations ("crisp" mathematical models). For some types of systems, mathematical models can be obtained such as the electromechanical models, since the laws of physics behind the process are well-understood and well-defined. However, on a daily basis, we come across countless practical problems, whereby an acceptable level of information required for the physical modeling to be made becomes difficult to obtain. Moreover, such task is time-consuming and costly. These systems can be found in chemical and food-processing industries, in financial institutions, in biotechnology, amongst other areas. A large part of such systems

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