Trust Vs Complexity of E-Commerce Sites

Devendera Agarwal, R.P.Agarwal, J.B.Singh, S.P.Tripathi

Abstract— E-Commerce suffers from uncertainty which can produce devastating results. The user first checks the level of security and then proceeds further. At the same time the user switches to another e-commerce site if he has to deal with several layers of security. To overcome this drawback e-commerce sites are now finding a solution of maintaining high security (Trust) with lesser complexity as far as possible. Our paper focuses on the issue of development of a framework to provide an optimal relationship between the two.

Index Terms— Complexity, Threat to e-commerce, Fuzzy Rule, Security, Tradeoff, Transaction, Trust.

1 INTRODUCTION

INDIA today is facing with various kinds of threat to e-commerce systems. The problem arises when we increase the security of the e-commerce website, the complexity at the user level also increases, which in turn affects the volume of sale. While traditional marketing does not involve any type of complexity since the consumer deals directly with the supplier. Since internet marketing does not involve any face to face direct interaction so a visual interface is essential. There are various types of online buying behavior models like Bettman (1979) and Booms (1981) in which the focus was on personal characteristics viz. Culture, Social Group and Physiological Behavior. Lewis and Lewis (1997) identified five different types of web which remain valid today:

- **Directed information-seekers:** These users will be looking for product information and are not typically planning to buy online.
- **Undirected information-seekers:** These are the users, usually referred to as 'surfers', who like to browse and change sites by following hyperlinks. Members of this group tend to be novice users and may also click banners of the website.
- **Directed buyers:** These buyers are online to purchase specific products online. For such users, brokers that compare product features and prices will be important locations to visit.
- **Bargain hunters:** These users want to find the offers available from sales promotions such as free samples or competitions.
- **Entertainment seekers:** These are users looking to interact with the Web for enjoyment through entering contests such as quizzes, puzzles or interactive multi-player games.

Under all the above categories the main focus is the trust of web users [24], [25] which will finally lead to purchase. The communication between server and client are not secure unless it is providing a safe and secure transaction. To reduce the risk we have to deal with development of trustworthiness of the web services, which finally means increasing the complexity of the website.

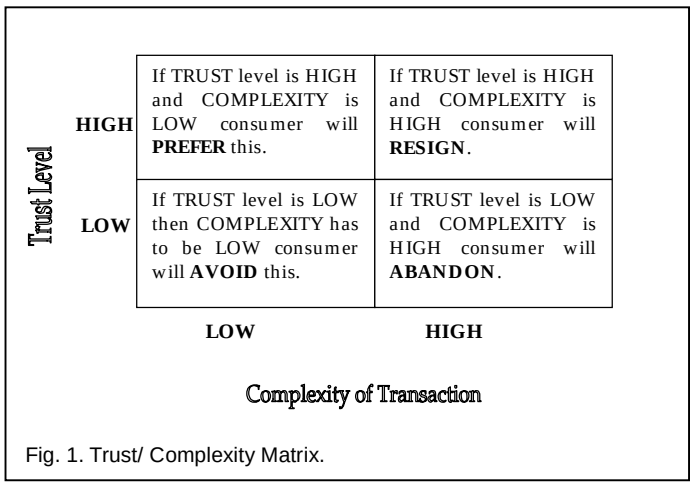

Fig. 1. Trust/ Complexity Matrix.

From the above figure we can conclude that there has to be some situation in which a trade off between Trust Level and Complexity of the transaction has to be maintained. This trade off can be achieved by the help of development of Fuzzy Rule base, but simple Fuzzy Rule base will not be sufficient for this purpose, so we extend this problem and solve it using Evolutionary Multi-objective Optimism [9], [10], [12].

2 LITERATURE SURVEY

The work by H. Ishibuchi & H. Tanaka (1994) highlights the construction of Fuzzy Classification of various entities using genetic Algorithms. Later on they extended their work (1995) using If-Then-Else rules. M. Setnes (1998) developed a Rule-Based system for developing the Precision & Transparency. D. Nauck (1999) worked on the interpretability aspect of Medical Data; we are motivated by their work and extending it for e-commerce websites. Y. Jin (2000) developed a framework for modeling high dimensional system in finding out their Complexity and Interpretability aspect. L.Castillo (2001) developed the best rule in a genetic fuzzy learning algorithm. M.Setnes (2000) also developed a mechanism of GA-based Modeling & Classification which measures the Complexity and Perfor-

- *Devendera Agarwal is currently pursuing his Ph.D. from Shobhit University, Meerut, India. E-mail: dev_goel@in.com*
- *Prof. R.P.Agarwal & Prof. J.B.Singh, Shobhit University, Meerut, India, E-mail: prajanag@gmail.com, jbs.tomar@shobhituniversity.ac.in*
- *Prof. S.P. Tripathi, Department of Computer Science, I.E.T, Lucnkow, India, E-mail: spt@ietlucknow.edu*

mance of the system.

3 OUR PROPOSED MODEL

Genetic Algorithms [6], [8], [17] have been frequently used to model a solution for conflicting goals. Let Trust (T) be a measure of security which the customer will be provided and Inverse of Complexity (C) be the user comfort level. Applying the Fuzzy Rule base we can get

Maximize Trust (T) (1)

But it leads to compromise in the complexity (C) of fuzzy rule based systems [2], [3], [5], [7]. According to consumers survey most of consumers in India considers Trust and Ease of Use (Lower level of Complexity) at the same time. The above problem can be formulated as

Maximize Trust (T) subject to
Inverse complexity (C) (2)
where complexity (C) is the measure of fuzzy rule system.

We can develop a single objective function to the above solution given as:

Maximize f(Trust (T),
Inverse of Complexity (C)) (3)

We can also use weights in order to determine the exact function for e-commerce site.

Maximize (w_1) Trust (T) +
(w_2) Inverse of Complexity (C) (4)

We proceed with development of more refined stages in which we can focus on various stages of membership functions. Consider a simple single output function y = f(x) an application of Takagi-Sugeno method [7], [11], [15] we can write it as:

Rule R_i : if x is A_i then $y=a_i+b_jx$, i=1,2,…N
Rule R_k : if x is A_k then $y=a_k+b_kx$, k=1,2,…N
:
:
Rule R_z : if x is A_z then $y=a_z+b_zx$, z=1,2,…N (5)

This output value is given as:

$$y(x) = \frac{\sum_{i=1}^{N}(a_i + b_x)\mu_{Ai}(x)}{\sum_{i=1}^{N}\mu_{Ai}(x)} \quad (6)$$

where y(x) is the estimated output value for the input value x and μA_i (x) is the membership value of the antecedent fuzzy set A_i.

From the input-output data we can derive the relationship between Trust and Complexity of the e-commerce site considering three Sugeno Rules.

We develop a heuristic rule[1], [2] denoted by three lines A, B and C as the subsequent of the linear function with fuzzy sets A1, A2 and A3. Each of the Fuzzy Rule can be represented in triangular Fuzzy Sets.

Rule R1: If TRUST is SMALL and COMPLEXITY is HIGH Then User's Ease of Use is MEDIUM.

Rule R2: If TRUST is LARGE and COMPLEXITY is MEDIUM Then Users Ease of Use is HIGH

Rule R3: If TRUST is SMALL and COMPLEXITY is SMALL Then Users Ease of Use is HIGH

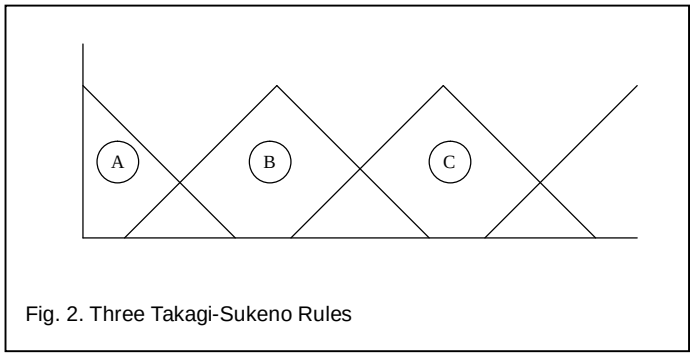

Fig. 2. Three Takagi-Sukeno Rules

Based on the above rules we try to develop a plot between Complexity and Trust and develop our interpretable solution [13], [14], 16], [18], [19] between the two entities.

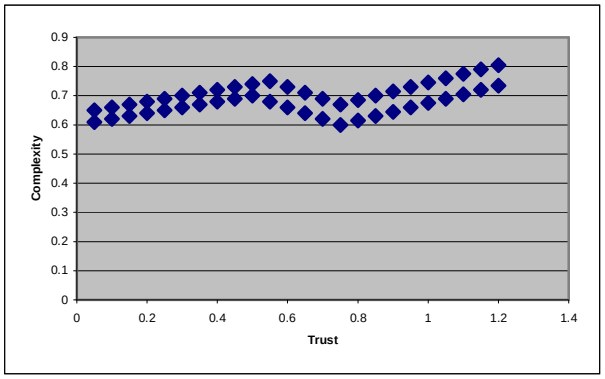

Fig. 3. Input Output Data using Fuzzy Data Set

Possibly we can also merge the above set of rules to achieve more refined results, but a relationship generated by optimization rules gives some gridlines in the area of relationship between the two entities.

4 CONCLUSION

It is very difficult to interpret the exact relationship between the two entities. Different Fuzzy rule are being applied in order to determine the appropriate interpretability. The method that we have used is the application of Fuzzy Optimization Theory [20], [21], [22], [23] to find the probable relationship between Complexity and Trust. The future extension would be to use Evolutionary Algorithm [4], [5] in finding out the best possible trade-off between the two entities.

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