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Abstract

The Policy for buying chips is determined from Original Equipment Manufacturer (OEM's) laptops and computers through similarity criteria and probability rules. This study aims to create expert system that is prediction of purchase behavior in Semiconductor market. similarity criteria and probability rules are extracted from Quarterly list OEM's Information Order in Semiconductor market. we analyze and extract rules form OEM purchase behavior data by Data collection and statistical methods of data mining and then convert them into Fuzzy sets. In addition to information received from market nature, we create an expert system for deduction. our analysis of similar products show that there is two major groups of OEM in purchasing similar products That restoration information is done for a period of one year by using probability rules and getting approximately 95% of average score quarterly.

Keywords: expert system, probability rules, semiconductor market, similarity size, fuzzy inference

Introduction:

Sales prediction is an important issue for companies and Many methods are used, including its qualitative and quantitative and all are applied in order to describe the method of goods selection and procurement policies and prediction of customer behavior. Giving to Today's rapidly changing environments and major innovation in products in order to check Experimental forecast in semiconductor market, we provide new method by focuses on Intel's approach that is implemented by Intel's advanced demands and results of indicators is accompanied with good success

Different parts of the article are as follows:

• explaining the problem and describing the conceptual model
•. Data and video presentation
•. Simulating and designing expert system (Methods and Analysis)
•. Fuzzy rules and fuzzy reasoning system data
•. Conclusion and Suggestions for future

Problem statement and Conceptual Model:

In this paper, using a data mining approach we find purchase behavior in the semiconductor market (Brotko, 2003). For this purpose and further investigation and application of data mining techniques, We refer to Padhy, Mishra2012 . Similarly, studding the law Results, we will realize the following fundamental question: Which producer (OEM) must buy which Intel's microprocessor in which time for the laptop market?

For this purpose, we calculate the possibility of changing to a new product in a moment or after a changing quarterly. The results are Analysis of sales data for the semiconductor market that are applied using similar criteria and extracting probability rules of sales to determine decisions policy. In this study we try to model these policies that are studied thoroughly. The study issue is Semiconductor market that we implemented it based on Information that are extracted from a sales prediction system and developed and validate the expert systems. This study aims to extract fuzzy rules and fuzzy inference for an expert system based on designed rules and predictor of future sales in the semiconductor market.

Generally, in the semiconductor market, life cycle stages of a microprocessor are as follows

1-step before commissioning: designing new product, producing sample, a preliminary assessment of the customer, transportation chipset for testing Customer and supply process.

2- Ramp up phase: from product launch to 40% of the meted life cycle of the product or to reach 40% of the estimated market size of the product.

3. Ramp down phase: according to the previous step and continue until the end when we reach 90% of the estimated life cycle or 90 percent of estimated market share size.

4. End of Life: Determining the end of product life

During the life cycle of a product, different decision strategies will appear at different times for manufacturers, providers and purchasers. For example, for company's philosophy and related foreign information such production - costs - market position, economic and political news, we provide Different strategies by OEM to determine which product must be sell or buy and how many of them. Some OEM may buy new product immediately after it is released in market. But some may wait and observe the reaction of the other OEM. Some OEM may follow a particular philosophy in their decision and some may choose their Working strategies with their partners. In addition to this strategy, following leaders may be seen in some OEM Where some of OEM mimic other products in selecting OEM products.

The conceptual structure is shown in Figure 1. A microprocessor (chip) is described by memory architectures (M), platform (P) and CPU family (C). Memory architecture is referring to chip set and Platform refers to all the components that work together on microprocessor that called CPU chip set family. CPU family is a plan that work in a technology and specific process. Note that changes in chip characteristics occur in time intervals. Changing the external storage architecture in Intel happens in two years.

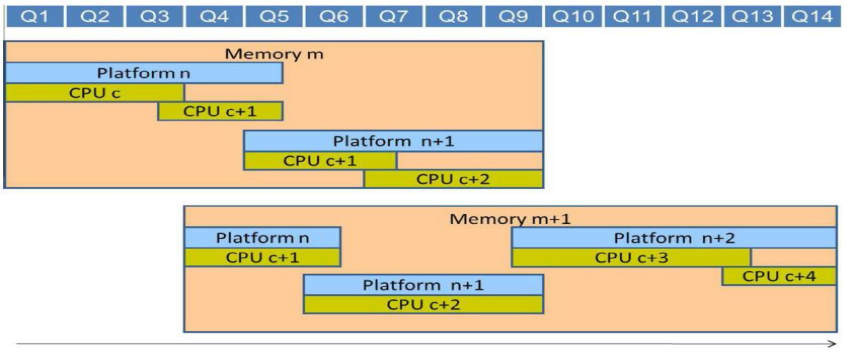

Figure 1- conceptual structure of overlapping in Products Company during the quarter

When We want to predict OEM's purchase behavior to introduce a new product with specific set of characteristics through suppling any platform (P), CPU family (C) or a new memory supply (M), we need to find rules and Hierarchy that OEM buy new memory chip or a CPU new family and a new platform. For example, analyzing past data, we find: An OEM prefers product with a new CPU family and an old memory to new memory and older CPU.

The data and visual representation:

The data that we use in this study, have provided by Intel, largest manufacturer of microprocessors in the world market, from OEM's information for 20 quarters. The final set of data involve about 3,000 files that each of them represent a deal between Intel and an OEM in a period of three months. giving the high volume of transactions and requires high computational power and human inspection in order to find similar examples in data sets, we trusted the information that are provided by the seller

microprocessor(Bille, P. 2005). Sellers choose speed memory that be available and Intel usually chooses supplier based on memory (lateral bus unit). We study data and information for all suppliers as follows:

memory components of M place in the interval (1,2,…,8) platform of P in the interval (1,2, ..., 7) and family CPU of C in the interval (1,2, ... 11) . For example, P1 and M1 represents the first version of the platform and the first version of the new memory, respectively and C1 describes the first version CPU family. OEM names and their data are encrypted and hidden. we refer to OEM with the company name of A, C, D, E, F, G, H, I, J, O. we measure the latter GEM as a total sales of all OEM in one group and the letter O refers to others means O OEM that it represents the sum of all purchasers on the market.

In this study, a variety of suppliers have been studied from small to large and excluded B OEM from the results and analysis due to privacy considerations in studies, figure 2 shows the accumulated volume for A OEM in a quarter for the family C and Platform P indicated that both are shown as a cumulative and in 20 quarters.

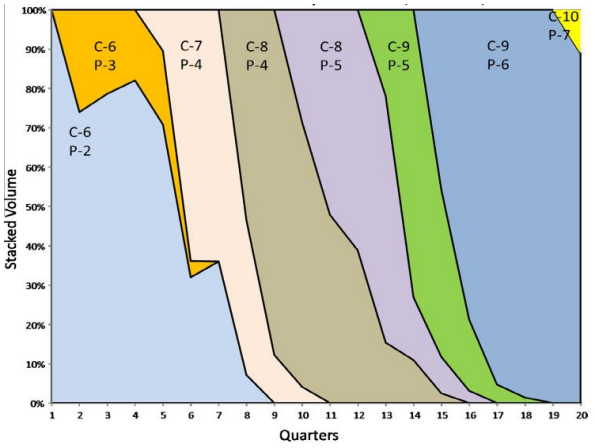

Figure 2 -shows the accumulated volume in a period of three months for C families and platform P for A OEM

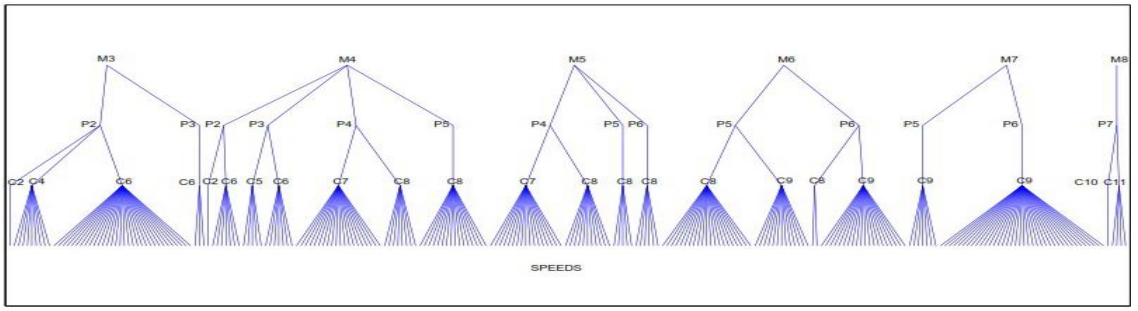

Figure 3 –possible Orders of each buyer by a tree structure

And Figure 3 shows possible orders of each buyer by created a tree structure and it is Made up of different combinations of M {8, ..., 1,2} and platform P {7, ..., 1,2} and CPU family C {11, ..., 1,2} that is in the lowest level of tree (However, it is not labeled in figure in order to visualize the surface better) Note that the M1 and M2 memory and platform P 1 and CPU family C1 are not shown due to their less volume in market share.

Analyzing purchase behaviour

In this section, we use the two methods for analyzing purchase behavior of OEM to measuring the similarity of purchasing behavior. Then, in Section 5, one method is offered to extract rules and deduction in order to create a fuzzy expert system and predict the buyer's behavior.

1.Selecting and purchasing similar products between OEM's:

There is similarities and different distances for Comparing data structure such as tree diagrams or arrays, here the similarity equation that is used is cosine equation. To compare and measure similarities, selected product between OEM are obtained by calculating the coordinates of point product and two vectors (Dawid, H. 2006). Equation 1 represents the inner of X and Y vectors that is divided by multiplying the size of each of them and S(X, Y) shows the similarity of selected products by two different OEM. Each element in vector represents the combination of product components that is added to shopping cart of OEM.

Equation1

$$S(X,Y) = \frac{X.Y}{\|X\| \|Y\|}$$

Figure 4 shows symmetric similar matrix to select production of OEM for all quarter period. The similar matrix represents the similarity measure of equation 1 for all Comparison and possible combinations in selecting two production method by OEM in all periods of quarter that The mean similarity was calculated over time it means if The mean similarity is higher than 85%, it is considered as a strong resemblance and if The mean similarity is between %70 and %85 ,it is considered as a week resemblance (Mishra, P., Padhy, N., & Panigrahi, R. 2012). Using these calculations we achieved to network of similarities that are shown in Figure 5. In Figure 5, strong resemblance is represented by thick lines and weak similarity is represented by thin lines. Two main groups can be identified in Fig. One is made up of OEM of E, F and C and others composed of OEM and O, I, F. In addition, as shown in Figure 5, many producers shows strong resemblance to the products that are offered by Intel z . Almost all OEM purchase all things that offered by Intel and observed that OEM F plays an important role it means besides the factthat F has a number of strong communication similarity. This is possible that F OEM selection occur only for imitation of other OEM's that make F The only common node for the listed OEM .

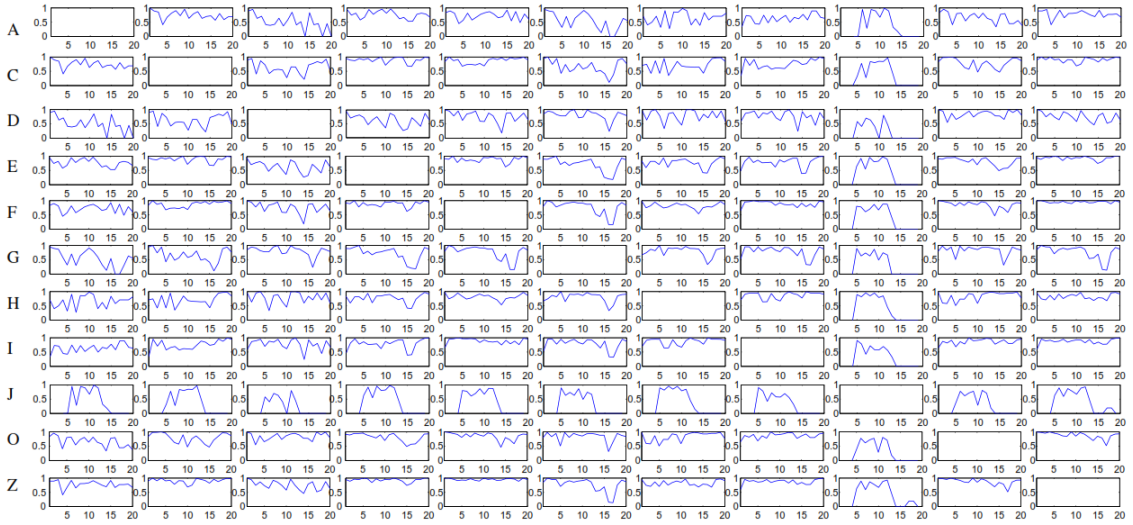

Figure 4 - similarity of symmetric similar matrix in selection of OEM product for all quarter

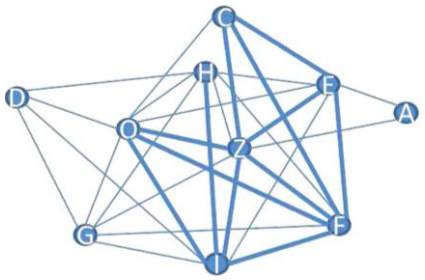

Figure 5. The similarities networks in purchasing products for OEM

The similarity in each of the two categories shows that they purchase from Intel, using a similar strategy (Olson, D., & Delen, D.2008). Producer A, B, G don't have any strong resemblance to other OEM and indicating that they are the individual actors, also It has a strong resemblance between I, H. Since I OEM has a powerful communication in network. It is likely that its H-election is mimicked.

2. The probability rules for product selection:

The main problem and case study in this research is Intel, As a major producer of microprocessors, is interested to be determine that How long after the release of a new member in the products delivered to the market , OEM select and accept and purchase them ? To answer these questions, Different probability rule are extracted for the time of adoption all kind of OEM. For example, one definition can be expressed as follow

If Intel has introduced a new product with new components and structure, called X at time of t-y, Which OEM buys it in time t with probability NX (t-y). Purchase probability laws is extracted based on measuring the frequency and repeat - buying and supplying frequency table. This measuring method calculate the average number of times that at least one new product has been purchased during the period. The probability calculations can be seen in a variety of fuzzy logic in real models. Note that each rule is defined by probability distribution that is associated with the number of quarterly periods of time introducing a new product to market. Table 1 represent the extracted possibilities in terms of data frequency in 2equation in order to indicate things that OEM are independently decided to add new products to shopping cart that offered by Intel. At the same time, it should be noted that other OEM act toward new products (Schwoon, M. 2006).

Equation2- extracting probability in terms of frequency

$$P(X,Y) = \frac{f_{x,y}}{\sum_{\forall x}\sum_{\forall y} f_{x,y}}$$

Note that almost all OEM buy product quickly or finally after a period of time, For example, the OEM of O, H, D more likely can add a new memory P M and the new platform quickly and at the same (Quickly add them to your shopping cart at t = 0) But OEM of E, C, An added memory and platform to your shopping cart with a delay or after a period (t = 1) . we can see for CPU family (c) that D, H, S, G, J.I Manufacturers for a new CPU family is much more active a nd it quickly purchased and also observed that OEM of O, D, H buy new members quickly after the Intel supply it and Finally some of the findings that were explained in Part 1-4 of choice for similar products, are according to 1 .For example, two groups were noted in Figure 5, made up of OEM 's F, E, C, as well as F, I, O, which are linked and showed through probability accurately. OEM F probability values are very close to OEM C and E in table1 With the exception of OEM F and The possibility of OEM H is very close to the I and O (J. E. Navarro, Barrientos 2014).

The fuzzy rules and fuzzy reasoning of sales data of semiconductor devices

In this part, we study and make a fuzzy expert system in order to Investigate and response to the questions raised in each of the products supplied by Intel and conclude and inference with the presentation of assumptions through fuzzy logic and we will see the final result

1. create fuzzy sets applied to the problem

To further explore rules extraction by probability that provide from frequency sales table that are derived from sales data and presented in table1, and in order to create hypothesis and study the Method of reasoning about hypotheses to study the accuracy of each, before making assumptions, First, each of the probabilities based on data extracted and according to frequency table are presented in column of table 1 and estimate it to fuzzy set and will be examined in the following. For this purpose the methods proposed in (E. Abbasi 2013) and (R. Yazdanpanah 2013) were used to create the fuzzy sets.

	$NM(t-0)$	$NP(t-0)$	$NC(t-0)$	$NM(t-1)$	$NP(t-1)$	$NC(t-1)$
A	0.20	0.17	0.40	0.80	0.83	0.60
C	0.20	0.17	0.50	0.80	0.83	0.50
D	1.00	1.00	0.83	0.00	0.00	0.17
E	0.20	0.33	0.75	0.80	0.67	0.25
F	0.60	0.67	0.67	0.40	0.33	0.33
G	0.60	0.67	0.71	0.40	0.33	0.29
H	0.80	0.83	0.86	0.20	0.17	0.14
I	0.60	0.66	0.71	0.40	0.33	0.29
J	0.33	0.33	1.00	0.66	0.66	0.00
O	0.80	0.83	0.83	0.20	0.17	0.17

Table 1-percent of sales data based on the data according to frequency table (J. E. Navarro, Barrientos 2014)

It should be mentioned that the seller is interested to determine how to select and accept and eventually purchased product after distributaries of it and new Components in an OEM product. To answer these questions, we tried to reason with different fuzzy rules and fuzzy sets creating in order to solve the problem It should be noted that symptoms of table is expressed (Table 1) in a way that if Seller introduce new product with components and a new structure X (M or P or X = C) at the time t-y, OEM will buy it with probability)t-y(NX).

In studying problem, fuzzy sets have been created as follows and if collection is not normal, according to rules they will have become normal fuzzy collection that All cases have been brought in relation 3 to 21.

$$\tilde{M}_0 = \left\{\frac{0.2}{A}, \frac{0.2}{C}, \frac{1}{D}, \frac{0.2}{E}, \frac{0.6}{F}, \frac{0.6}{G}, \frac{0.8}{H}, \frac{0.6}{I}, \frac{0.33}{J}, \frac{0.8}{O}\right\}$$

(Equation 3)- Fuzzy collection of products purchase possibility with new memory at the time t = 0 by OEM's

$$\tilde{M}_1 = \left\{\frac{0.8}{A}, \frac{0.8}{C}, \frac{0}{D}, \frac{0.8}{E}, \frac{0.4}{F}, \frac{0.4}{G}, \frac{0.2}{H}, \frac{0.4}{I}, \frac{0.66}{J}, \frac{0.2}{O}\right\}$$

(Equation 4) - Fuzzy collection of products purchase possibility with new memory at the time t = 1 by OEM's

$$\tilde{M}_1 = \left\{\frac{1}{A}, \frac{1}{C}, \frac{0}{D}, \frac{1}{E}, \frac{0.5}{F}, \frac{0.5}{G}, \frac{0.25}{H}, \frac{0.5}{I}, \frac{0.82}{J}, \frac{0.25}{O}\right\}$$

(Equation 5) - $\tilde{M}_1$ Normalized

$$\tilde{P}_0 = \left\{\frac{0.17}{A}, \frac{0.17}{C}, \frac{1}{D}, \frac{0.33}{E}, \frac{0.67}{F}, \frac{0.67}{G}, \frac{0.83}{H}, \frac{0.66}{I}, \frac{0.33}{J}, \frac{0.83}{O}\right\}$$

(Equation 6) fuzzy collection of products purchase possibility with new memory at the time t = 0 by OEM's

$$\tilde{P}_1 = \left\{\frac{0.83}{A}, \frac{0.83}{C}, \frac{0}{D}, \frac{0.67}{E}, \frac{0.33}{F}, \frac{0.33}{G}, \frac{0.17}{H}, \frac{0.33}{I}, \frac{0.66}{J}, \frac{0.17}{O}\right\}$$

(Equation 7) fuzzy collection of products purchase possibility with platform at the time t = 1 by OEM's

$$\tilde{P}_1 = \left\{\frac{1}{A}, \frac{1}{C}, \frac{0}{D}, \frac{0.8}{E}, \frac{0.39}{F}, \frac{0.39}{G}, \frac{0.20}{H}, \frac{0.39}{I}, \frac{0.79}{J}, \frac{0.20}{O}\right\}$$

Equation 8 - $\tilde{P}_1$Normalized)

$$\tilde{C}_0 = \left\{\frac{0.4}{A}, \frac{0.5}{C}, \frac{0.83}{D}, \frac{0.75}{E}, \frac{0.67}{F}, \frac{0.71}{G}, \frac{0.86}{H}, \frac{0.71}{I}, \frac{1}{J}, \frac{0.83}{O}\right\}$$

(Equation 9) fuzzy collection of products purchase possibility with new family at the time t = 0 by OEM's

$$\tilde{C}_1 = \left\{\frac{0.6}{A}, \frac{0.5}{C}, \frac{0.17}{D}, \frac{0.25}{E}, \frac{0.33}{F}, \frac{0.29}{G}, \frac{0.14}{H}, \frac{0.29}{I}, \frac{0}{J}, \frac{0.17}{O}\right\}$$

(Equation 10) fuzzy collection of products purchase possibility with new family at the time t = 1 by OEM's

$$\tilde{C}_1 = \left\{\frac{1}{A}, \frac{0.84}{C}, \frac{0.28}{D}, \frac{0.41}{E}, \frac{0.55}{F}, \frac{0.48}{G}, \frac{0.23}{H}, \frac{0.48}{I}, \frac{0}{J}, \frac{0.28}{O}\right\}$$

(Equation 11) - $\widetilde{C}_1$ –Normalized

According to study the CPU purchase probability with new memory(M) and new platform (p) and CPU new family (c), The assumptions are represented as follow in order to study and test the likelihood of feasibility through fuzzy sets and fuzzy inference that are provided through introduced collections (Wu, S. D, 2006)

Before we gather two sets $\tilde{M}_0$and $\tilde{M}_1$ that means purchase is done at time t = 0 and t=1 by OEM, we use Fuzzy social performance. It worth to say, the same works applies for$\tilde{P}_0$ and$\tilde{P}_1$ as well as $\tilde{C}_0$ and $\tilde{C}_1$ that the result is generally visible in 12 to 14.

$$\mu(x)_{\tilde{M}_0 \cup \tilde{M}_1} = \left\{\frac{1}{A}, \frac{1}{C}, \frac{1}{D}, \frac{1}{E}, \frac{0.6}{F}, \frac{0.6}{G}, \frac{0.8}{H}, \frac{0.6}{I}, \frac{0.82}{J}, \frac{0.8}{O}\right\}$$

(Equation 12) -Using fuzzy union between $\tilde{M}_0 \cup \tilde{M}_1$

$$\mu(x)_{\tilde{P}_0 \cup \tilde{P}_1} = \left\{\frac{1}{A}, \frac{1}{C}, \frac{1}{D}, \frac{0.8}{E}, \frac{0.67}{F}, \frac{0.67}{G}, \frac{0.83}{H}, \frac{0.66}{I}, \frac{0.79}{J}, \frac{0.83}{O}\right\}$$

(Equation 13) -Using fuzzy union between $\tilde{P}_0 \cup \tilde{P}_1$

$$\mu(x)_{\tilde{C}_0 \cup \tilde{C}_1} = \left\{\frac{1}{A}, \frac{0.84}{C}, \frac{0.83}{D}, \frac{0.75}{E}, \frac{0.67}{F}, \frac{0.71}{G}, \frac{0.86}{H}, \frac{0.71}{I}, \frac{1}{J}, \frac{0.83}{O}\right\}$$

(Equation 14) -Using fuzzy union between $\tilde{C}_0 \cup \tilde{C}_1$

2. Propositions concepts and hypotheses and fuzzy inference

Statements are terms that their accuracy can be evaluated, the term ""Edison is the inventor of Power" is Statements. Assumptions are statements that are expressed explicitly and clearly and need to inference and reasoning that Inference is a system process and reasons can be seen based on it. This means that if p is considered as an introduction then value of q can be a true statement that represented by p→q (Wu, S. D., Aytac,2006) and checked if statements in assumptions is intuitionally true or false. Finally, argument end to a clear and real statement, in fuzzy logic, at least one of the propositions of p or q are fuzzy for fuzzy inference

2.1 Fuzzy hypothesis conception

these assumptions will be examined for a definite Antecedent and fuzzy consequent and if several hypotheses have proposed simultaneously and done in a form of all union by following rules and using fuzzy inference rules it means if we want to study a set of assumptions at the same time, As mentioned relations (Li, D., & Day.2008) in Figure 1, we have:

$$\left.\begin{array}{l} (\text{fuzzy})\ \tilde{H}_1 \text{ then } (\text{certain})\ E_1 \text{ if} \\ (\text{fuzzy})\ \tilde{H}_2 \text{ then } (\text{certain})\ E_2 \text{ if} \\ \vdots \\ (\text{fuzzy})\ \tilde{H}_N \text{ then } (\text{certain})\ E_N \text{ if} \end{array}\right\} \text{assumption}$$

$$\tilde{H}_1 \cup \tilde{H}_2 \cup \ldots \cup \tilde{H}_N \ \therefore \ E_N \ldots \text{and } E_2 \text{ And } E_1$$

Figure 6 set of fuzzy assumptions in order to inference

So that all consequent are related to $\tilde{H}_i$ antecedent, in this case all union of $\tilde{H}$ and degree of membership are as 15 (Ghazanfari Vkazmy 1393)

$$\mu_{\tilde{H}} = max\left(\mu_{\tilde{H}_1}, \mu_{\tilde{H}_2}, \dots, \mu_{\tilde{H}_N}\right)$$

Equation-15- the way for union $\tilde{H}$ and degree of membership $\tilde{H}$

2.2-definition and study the assumptions

In this paper, the fuzzy to identify the majority or minority in selecting the products by OEM as a fuzzy set is expressed as the relation 16:

$$b(x) = \left\{\frac{0.3}{\text{minorities}}, \frac{0.5}{\text{high minorities}}, \frac{0.7}{\text{Majority}}, \frac{0.9}{\text{Top majority}}, \frac{1}{\text{absolute majority}}\right\}$$

Relation 16 - fuzzy sets diagnosis majority and minority status in the selection of products

In this article, assumptions discussed and results according to paragraph (a) to (c) has been studied

The result: a product is produced with memory and a new platform?

Due to Set forth in both assumption refer to fuzzy set, as definition, so the possibility of both hypotheses is explored through union of membership functions, Equation 17:

$$\mu(x) = max\left\{\mu_{\tilde{M}_0 \cup \tilde{M}_1}(x), \mu_{\tilde{P}_0 \cup \tilde{P}_1}(x)\right\}$$

Equation -17- the way to calculate assumptions membership function

The membership function of H1 18 will be as follows

$$\mu(x) = \left\{\frac{1}{A}, \frac{1}{C}, \frac{1}{E}, \frac{0.67}{F}, \frac{0.67}{G}, \frac{0.83}{H}, \frac{0.66}{I}, \frac{0.82}{J}, \frac{0.83}{O}\right\}$$

Equation -17 -membership function relate to result of H1

If the memory and new platform are new , OEM of A and C and E will surely buy them and OEM of G and A possibility buy them and only OEM of I , G and F will be hesitant and the assumption is confirmed because OEM from 6 to 10 purchase it with high probability

The result: product with new CPU family and new memory is produced

Again, the way for calculate the membership function and obtained membership function is in accordance with relations 19 -20

hypothesis2:

$$\mu(x) = max\{\mu_{\tilde{M}_0 \cup \tilde{M}_1}(x), \mu_{\tilde{C}_0 \cup \tilde{C}_1}(x)\}$$

Equation 19. The calculation assumptions regarding membership function

$$\mu(x) = \left\{\frac{1}{A}, \frac{1}{C}, \frac{1}{D}, \frac{1}{E}, \frac{0.67}{F}, \frac{0.71}{G}, \frac{0.86}{H}, \frac{0.71}{I}, \frac{1}{J}, \frac{0.83}{O}\right\}$$

Equation 20- .Membership function of H2 result

If the numbers above 70.0 is considered high possibility of purchase, 8 OEM has the top purchase possibility above 70.0 and this hypothesis is confirmed

The result: a product is produced with platform and new CPU family?

According to the above, membership function in hypothesis 3 is calculated as equation 21 (Ghazanfari Vkazmy1393)

$$\mu(x) = \left\{\frac{1}{A}, \frac{1}{C}, \frac{1}{D}, \frac{0.8}{E}, \frac{0.68}{F}, \frac{0.71}{G}, \frac{0.86}{H}, \frac{0.71}{I}, \frac{1}{J}, \frac{0.83}{O}\right\}$$

. Equation 21- Membership function in hypothesis 3

Here also taking into account the criteria above 0.7 for studying majority of fuzzy sets (To identify the majority or minority in the selection of products by OEM) which was expressed in equation 13. It can be seen, 9 OEM are standard higher than 0.7 in all sets of inference and OEM is the only name F that it is possible to buy with standard less than 0.7 in all categories

Evaluation and conclusions

To review the membership function , results obtained from the fuzzy inference in each of the three hypotheses should be compare in order to study and conclusion from these number in terms of Criterion , so the best goods in market is determined to seller that provides more opportunities to sell in this purpose, α slices is used . Table 2 shows the cutting process for α=0.9 and α =0.8 that show each situation of hypothetical results.

Table 2 - different α slices represents the product choice by a set of buyers

α	α=0.8	α= 0.9
Product selection will be supplied by this set of buyers as a result of H1	{A,C,E,H,J,O}	{A,C,E}
Product selection will be supplied by this set of buyers as a result of H2	{A,C,D,E,H,J,O}	{A,C,D,E, J}
Product selection will be supplied by this 3set of buyers as a result of H	{A,C,D,E,H,J,O}	{A,C,D,J}

According to the results of table:

The second hypothesis, production with CPU new family and new memory has better condition in terms of purchase probability for OEM at different levels for the manufacture company (Intel) and according to this assumption, a greater number of buyers will have the high possibility to buy than other assumptions , so according to the result of this study, The microprocessor manufactures company should produce new product with new memory and new microprocessor family in order to be able to govern most part of market. It is recommended for future research in this area that Products supplied by Intel examined by competitors company's products and their strategies and it is assessed how effective competitors will act in the selection of supplied goods and products.

References:

ghazanfari mehdi and zohre kazemi 1393- Foundations of expert systems with the seasons about artificial neural networks and fuzzy set theory- Fifth Edition- Tehran-Iran University of Science and Technology

J. Emeterio Navarro Barrientos, Dieter Armbruster, Hongmin Li, Mogan Dempsey, Karl G. Firm (2014).Characterization and analysis of sales data for the semiconductor market: An expert Approach. Expert Systems with Applications 41 (2014) 893-903

Bille, P. (2005). A survey on tree edit distance and related problems. Theoretical Computer Science, 337, 217–239.

Bratko, I., & Suc, D. (2003). Qualitative data mining and its applications. Journal of Computing and Information Technology, 3, 145–150.

Dawid, H. (2006). Agent-based models of innovation and technological change. In L.Tesfatsion & K. L. Judd (Eds.). Handbook of computational economics (Vol. 2, pp. 1235–1272). Elsevier (Chapter, 25)

Li, D., & Du, Y. (2008). Artificial intelligence with uncertainty. Chapman Hall/CRC.

Lin, R.-J., Che, R.-H., & Ting, C.-Y. (2012). Turning knowledge management into innovation in the High-tech industry. Industrial Management Data Systems, 112, 42–63

Mishra, P., Padhy, N., & Panigrahi, R. (2012). The survey of data mining applications and feature scope. Asian Journal of Computer Science and Information Technology, 2, 68–77.

Olson, D., & Delen, D. (2008). Advanced data mining techniques. Berlin Heidelberg:Springer-Verlag

Abbasi, E., M.J. Mahjoob and Yazdanpanah R., (2013) “Controlling of Quadrotor UAV Using a Fuzzy System for Tuning the PID Gains in Hovering Mode,” International Workshops in Electrical Electronics Engineering, ACE-2013, Koc University, 5-7 September 2013.

Yazdanpanah, R., M. J. Mahjoob, and E. Abbasi. (2013) "Fuzzy LQR Controller for Heading Control of an Unmanned Surface Vessel." International Conference in Electrical and Electronics Engineering, ACE 2013, Koc University, September 2013.

Schwoon, M. (2006). Simulating the adoption of fuel cell vehicles. Journal of Evolutionary Economics, 16, 435–472.

Wu, S. D., Aytac, B., Berger, C. A., & Armbruster, C. A. (2006). Managing shortlifecycle technology Products for agere systems. Interfaces, 36, 234–247.