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Smart Event Tree Modeling and Genetic Algorithm to Optimize Customer Loyalty to brand

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Abstract

The purpose of this research is to find a model for optimizing customer loyalty to brand and evaluate the organization's position from the customers' point of view and to find the optimum combination for investing in the improving of brand strength for the customers. The modeling is carried out while considering factors regarding the reliability, replacement and retention of the customers. In fact, the main concern of this research has been to combine the analysis of event tree and genetic algorithm in order to achieve an integrated model to reach the above-mentioned objective. The best combination is identified through those factors which affect the value structure of a given brand. The genetic algorithm is employed as well to adjust these parameters and reach the best combination. The model achieved in this paper can provide an optimized design considering the factors mentioned earlier.

Keywords: Customers' loyalty, brand strength, genetic algorithm, analysis of event tree, brand optimization.

Introduction

In today's world, marketing is defined as to tote and lead the customers towards loyalty. Businesses should not simply suffice to customers' satisfaction; rather, creating loyalty in customers' needs to be taken into consideration as well. Factors such as quality, price, and variety in services, sales staffs' attitude and advertising in organizations are of great importance since they improve customer satisfaction and loyalty. Such parameters are those which boost the sales objectives, and the possibility of recommending the organization to other customers and presenting appropriate references. One of the keys to creating and increasing customer loyalty is the quality. In fact, loyalty is an inward issue shaped by the beliefs and tendencies of customers, and in turn shapes their attitude. However, the customer's attitude in itself cannot prove or dismiss the issue of loyalty since there are other factors which practically affect the attitude, and may bring back the customer again. Organizations constantly attempt to increase customer loyalty through the optimization of their brands, as this can exalt the brand, create added value and bring about customer maintenance, which are of considerable importance in the organization's survival. Thus, recognizing the research variables can help clarify the relation between them. To this end, the present paper has made an attempt to use the smart event tree modeling and genetic algorithm to find the factors affecting customers' loyalty to the brand.

Literature review: The purpose of this article is to introduce an optimized model for customers' loyalty to a brand based on the factors which affect the creation of loyalty in them; this has been carried out taking into consideration the costs incurred by loss of loyal customers and the subsequent attempt to find new customers and to turn them into loyal ones. Considering parameters of customers' loyalty and the manner of combining of them into the policy making processes of the organization aimed at making the customers into loyal ones, and also in order to the achieve the best combination of such parameters, we need to search in a solution space with specific characteristics. In fact, we need to employ random search methods; since the genetic algorithm is capable of searching the solution space, it has been used for the random search on the stated issue. As manual preparation of the event tree is categorically time-consuming and costly, and the probability of error is high, computer simulation and modeling system was used in order to analyze the event tree.

In the first stage, questionnaires were used to study the desired parameters within the statistical society; the relation between such parameters was as well evaluated using field method the results of which would follow. Then, using the combination of genetic algorithm and event tree, these factors have been rated and marked according to their capabilities in planning.

The understanding of the factors that affect the brand strength and customer loyalty work on the occurrence or non-occurrence of undesirable results in creating loyalty among the customers. Thus, the tree branches are defined based on the variables of the problem, and the function would be formed according to the problem stated, and the final function value would be resulted by multiplication of the sequences of different branches.

A considerable body of research has been conducted on the customers' loyalty to a brand. In an instance, the results from a research done on the effect of electronic banking on customers'

satisfaction and loyalty in the banks of Jordan showed that factors such as ease of access, security, speed, design, rates, privacy, satisfaction and costs have positive effect on the loyalty and satisfaction of clients in bank of Jordan[1]. Beerli's studies showed that customers' satisfaction affects customers' choice, loyalty, perceived quality and costs of change in banking industry[2]. In a paper named "Perception of Loyalty and Customers' Satisfaction", Zhaohua presented a model which introduced factors such as trust, quality of services, perceived value (functional, emotional, social and financial) and costs of change are those which affect customers' loyalty and satisfaction[3]. Some other researches as well list the experience as another factor to affect customers' loyalty to a brand. The result from researches conducted so far indicate the effect of the customers' experience on their satisfaction and loyalty. Convergent frameworks and theories establish a foundation for the institutions on which basis they can manage the customers' experience[4]. Some researchers believe that being client-centered can increase the possibility of maintaining the customers. Where the staff delivers services with effective and efficient quality, the demand for customers' loyalty and maintenance is of even greater significance as the competition gets more intense[5]. Meller considers the vast number of customers as an asset to a brand, and names it as the main indicator of the brand's equity[6]. While most scholars focus on the repeated purchase of consumer goods, he also believes that the loyal customers' sensitivity to the change of prices is greater than that of non-loyal ones. In a study done on cosmetic products in order to evaluate the effect of customers' perception of the brand on their loyalty, in this research brand image is conceptualized as a multidimensional construct which consists of eight dimensions of image attributes (price-value for money, brand reputation, brand's origin, advertising credibility, brand's sales personnel, channel reputation, after-sales service and product ingredients) and four dimensions of image benefits (functional, social, symbolic and experiential benefits). The results showed that four perceptions can affect the customers' loyalty to the brand: functional, social, external and experimental perspectives, which have positive relation with the customers' loyalty and satisfaction[7].

The result of a study about such businesses as tourism where distance marketing is employed that most of them enjoy government support and their primary objective is to expand their span of work over geographical areas. The finding of research was shows relatively little discussion on the complexity involved in capturing the essence of a multi attributed destination with a succinct and focused brand position, in a way that is both meaningful to the multiplicity of target audiences of interest to stakeholders and effectively differentiates the destination from competitors[8].

Methodology

Brand: Brand is a sign branded on the products of a given company, and is used to differentiate them from those of other institutions. When registered, these signs gain legal validity and are supported by law. A brand is a name, phrase, sign, logo or design, or a combination of some of them, used in order to recognize products or services of a seller of a group of sellers, and to distinguish them from the products and services of their rivals. As stated in trademark law, the seller gains the perpetual right of using the brand.

A definition of a brand was originally provided by the American Marketing Association as 'a name, term, sign, symbol or design, or a combination of these intended to identify the goods and services of one seller or a group of sellers and to differentiate them from those of competitors'[9]. Although criticized for being too product oriented, this definition has endured contemporary literature and is viewed as a common starting point for works associated with brands[10].

A study has been carried out regarding the effect of culture on the customers' loyalty, where the two different American and Korean cultures have been examined. The results show that personal collectivistic orientation had a significant effect on both brand loyalty and equity among both Americans and Koreans. The findings indicated that regardless of their national culture, collectivist consumers would show higher brand loyalty and equity than individualist consumers[11]. Another study carried out on the effect of eservice failures and recovery on customer loyalty. The result show that: the detrimental effects of failures are present online and problem resolution increased the loyalty[12].

Customer Loyalty: Customers' loyalty has been defined in variety of ways. From an overall perspective, the concept can be defined as the possible reaction of the customer to the brand, services, outlets and categories of products and activities[13]. Jacoby and Kyner define loyalty as a behavioral response i.e. purchasing, which is done at each time by the decision-making unit taking into consideration a range of various brands; this is a decision-making and assessing process[14]. It can be stated, however, that the most renowned and comprehensive definition of loyalty has been presented by Oliver: loyalty is deeply felt commitment to repeating the purchase of the preferred product or service[15]. The act of purchasing is done on a continuous and consistent basis in the future, and results in re-purchasing from a certain brand or chain of brands while there are effects from the situation as well as efforts made to replace or change the customer's behavior in the outer environment[14]. There are as well other definitions which outline loyalty considering the past purchasing models. There are considerable debates on what loyalty is. Majumdar states that customer loyalty is a complicated and multidimensional concept whose complexity is proved by absence of one unanimously accepted definition for it[16].

The result of paper has been to study the effect of familiarity with the brand on evaluation of satisfaction and behavioral intentions of customers, highlighted that there are certain

similarities and differences between customers of various levels of familiarity with brand regarding the formation of satisfaction and behavioral intentions[17].

Research of peng lin conceptualizes and tests are an integrative model of customers' loyalty through combination of two important theories: theory of expectation-confirmation and theory of self determination theory. The results prove that loyalty affects both intrinsic regulation and identified regulation, while internal and external regulations have negligible effect on loyalty, and positive effect on expectations and service confirmation,. Meanwhile, customers' satisfaction has a significant and positive effect on the four dimensions of self-motivation, intrinsic regulation, identified regulation, interjected regulation, and external regulation[18].

Event Tree Analysis: Nowadays, event tree charts are being widely used for a variety of reasons including ease of use, easy modeling of the network, computerizing of the network model, and considerable capabilities of the results. Among the most important analyses done using tree diagrams are analysis of fault tree and event tree. Analysis of event tree is usually carried out at the design, development and operation phases, but it is as well feasible in construction, integration, testing and evaluation phases. In fact, event tree is a deductive modeling technique in which two branches of success and failure are simultaneously made to assess the reasons of one single event. This technique describes responses of the system towards an initiating challenge, and makes possible the assessment of possibility of a desirable or undesirable consequence [19].

Genetic Algorithm: Known as one of the stochastic methods for optimization, genetic algorithm was created by John Holland in 1967. Later, it came to be better recognized thanks to the efforts made by Goldberg[20], as is now of certain significance among other methods because of its capabilities. The optimization in genetic algorithm is based on a guided random process. It is formulated on the basis of Darwin's basic ideas and his Evolution Theory. In this method, first, some random target parameters are defined for fixed number referred to as population. Then, after running the simulation program, a number which indicates the standard deviation of the collection of information in question is attributed to the given member of the mentioned population. This is done for all the created members of the population, and after that, by calling all the operators of genetic algorithm such as fertilization, mutation, and selection, we create the next generation. This procedure would thus continue to satisfy the convergence criteria.

Results and Discussion

Research framework and Hypotheses: As for data gathering methods, the research is of descriptive and correlative type. In this type of studies, the relation between the variables is analyzed according to the objectives of the research. The statistical society of the present paper is the customers and consumers of *Barfab* (producer of household appliances) over a certain period of time. It is conducted based on previous studies, and the experts' opinions have been observed for a six-month course. The number of items sold in domestic market over this period has been 100,000, and the company was provided with data from 1200 buyers of these products, who formed our statistical society. They had filled out feedback forms sent to them and sent them to the customer relation system.

Sampling Method: The following formula has been used in this study in order to figure out the number of samples:

$$n = \frac{Z^2 NP(1-P)}{(N-1)d^2 + Z^2 P(1-P)}$$

$$n = \frac{(1.96)^2 1200 \times \frac{1}{2} \times \frac{1}{2}}{(1200-1)(0.1)^2 + (1.96)^2 \times \frac{1}{2} \times \frac{1}{2}} = 60.94$$

Based on this formula, the size of sample society with an error of 1% is as follows: if we want the opinion of the sample to be the representation of the opinion of the original society, 61 questionnaires must be handed over; in order to ensure the results, 100 questionnaires were distributed.

Validity and Reliability: By validity, it means that if tools of measuring are applied to a certain group of people several times over short time intervals, they yield similar results. We use "reliability coefficient" to assess the reliability[21].

One of the most creditable and most widely employed methods for evaluating reliability is Cronbach's Alpha questionnaire. The reliability of questionnaire was measured by SPSS19 software using Cronbach's Alpha method, resulting in 0.910, which indicates that the questionnaire is highly valid (table-1).

Table-1
Reliability Statistics

Cronbach's Alph	N of Items
0.910	15

Data Analysis: In this study, the descriptive statistics method has been used for the description of research data (table-2). Data and information collected through questionnaires underwent correlation tests using SPSS software. Tschuprow's correlation coefficient was used to assess the correlation between various components in the industry under research.

Hypotheses test: First hypothesis: there is a significant relation between the customers' loyalty to the seller and to the brand.

Second hypothesis: there is a significant relation between the advertising rate and customers' loyalty.

Third hypothesis: there is significant relation between lowering the price of products and customers' loyalty.

Fourth hypothesis: there is significant relation between quality of products and customers' loyalty.

Fifth hypothesis: there is significant relation between after sales services and customers' loyalty.

Table-2
Descriptive statistics for demographic characteristics

Descriptive statistics		**Absolute distribution**	**Relative distribution**
Distribution of customers by gender	Female	16	16%
	Male	84	84%
Distribution of customers by education	Under high school diploma	34	34%
	High school diploma	29	29%
	Bachelor's	24	24%
	Master's and above	13	13%
Distribution of customers by profession	Self-employed	39	39%
	Government-employed	61	61%
Distribution of customers by marital status	Married	14	14%
	Single	86	86%

Table-3
First Hypotheses test

Correlation coefficient	**R square**	**Adjusted R square**	**Standard Error of the estimate**	**(Sig. (2-sided)**
-0.508	-0.258	-0.247	2.232	0.005

Table-4
Second Hypotheses test

Correlation coefficient	**R square**	**Adjusted R square**	**Standard Error of the estimate**	**Sig. (2-sided)**
0.723	0.555	0.541	1.494	0.043

Table-5
Third Hypotheses test

Correlation coefficient	**R square**	**Adjusted R square**	**Standard Error of the estimate**	**Sig.(2-sided)**
0.670	0.450	0.441	0.139	0.032

Table-6
Fourth Hypotheses test

Correlation coefficient	**R square**	**Adjusted R square**	**Standard Error of the estimate**	**Sig.(2-sided)**
0.545	0.298	0.266	2.471	0.187

Sixth hypothesis: there is significant relation between customer job and customers' loyalty.

Seventh hypothesis: there is significant relation between customer education and customers' loyalty.

As showed in table 3 to 9, since the obtained significance levels are smaller than 0.05 and considering the correlation coefficients, it is conclude that there is a significant relation between these variables and the customers' loyalty. Therefore, defined parameters were proved by questionnaires within the desired statistical society. At this stage, based on the proposed algorithm, decision tree and genetic algorithm are employed for the optimum rating of factors.

Proposed Algorithm: The proposed algorithm for this problem is as shown below, which describes the interaction and relation between genetic algorithm and the event tree (Figure1). In fact, through creating an interaction between the genetic algorithm model and the proposed model for the event tree, a combination of the best order for using parameters that affect customer loyalty and the distribution of the investment for achieving the optimum condition can be obtained. The following flowchart clearly shows the stated interaction:

Specifications, Operators and Performance of the Proposed Algorithm: The algorithm proposed for this problem is a discrete genetic. In this genetic model there is no need for binarizing the genes, and the genetic solution space is in fact the various permutations of these layers. First, the identity of genes in chromosomes should be defined; each of the genes within the genetic algorithm proposed for this problem is one of the factors that affect the brand. In effect, the number of genes in the chromosomes equals the number of factors studied in the statistical society being tested using questionnaires. These parameters each have the characteristics and features of their own.

Various chromosomes yield different orders of factors, which occurs as a result of permutation of effective factors. These chromosomes with their varied orders are the input of the event tree. Each branch of the event tree represents one chromosome gene, or, in other words, the equivalent effective parameters. Some of the parameters are the costs, average time required attracting customers, and, based on the latter, the man-hours needed to attract customers in respective units; all these parameters are required in this model.

Determination of the Objective Function and the problem Variables: The objective function of the genetic algorithm is to minimize costs. Fitness function = MINΣ Cost, Problem variables, X: number of factors affecting customers' loyalty
Objective variables in this problem include cost-related variables: CM: costs incurred by man-hour of respective units for attracting customers, CS: costs incurred by loss of loyal customers, The ultimate cost is Cost = ΣCM + CS. M: man-hour of respective units for attracting target customers, The factors affecting customers' loyalty, which are the chromosome genes of genetic algorithm, are the input parameters and variables of the event tree.

Rate of losing loyal customer: λ i i = 1... X, Mean time required for attracting new customers: MTAC i i = 1... X. The value of objective function for each chromosome of the population of genetic algorithm is obtained using event tree model. Probability of the right impact of factors R (t) when the density function of customer loss in each given factor has an exponential distribution with λ rate.

Man-hour of repair and maintenance for each protective layer:
Rei = Ri× M × t × K, K: costs of each man-hour in the respective units for attracting customers

Table-7
Fifth Hypotheses test

Correlation coefficient	R square	Adjusted R square	Standard Error of the estimate	Sig. (2-sided)
0.763	0.583	0.564	2.019	0.025

Table-8
Sixth Hypotheses test

Correlation coefficient	R square	Adjusted R square	Standard Error of the estimate	Sig. (2-sided)
0.755	0.568	0.575	1.850	0.034

Table-9
Seventh Hypotheses test

Correlation coefficient	R square	Adjusted R square	Standard Error of the estimate	Sig.(2-sided)
0.822	0.623	0.678	1.720	0.023

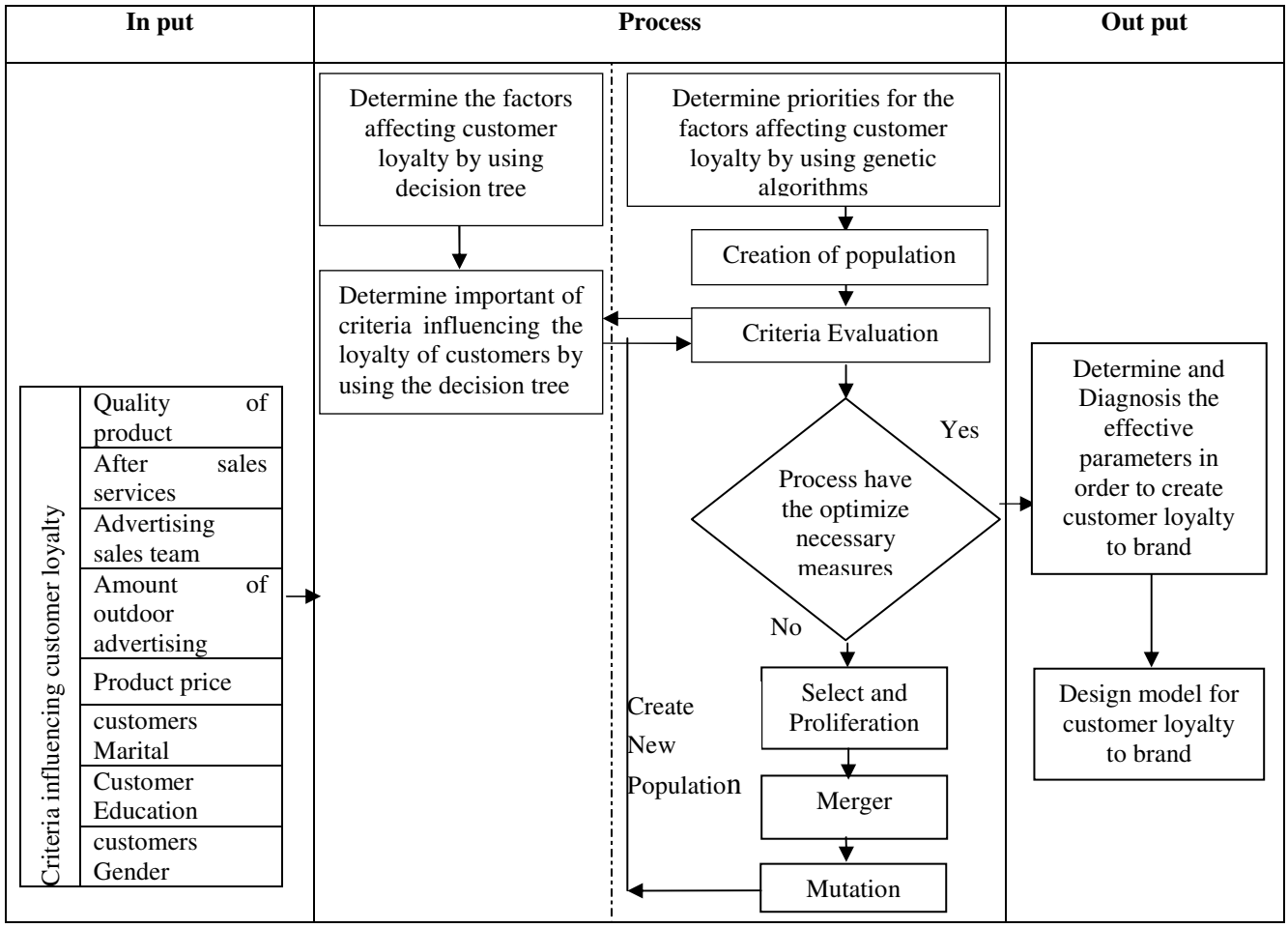

Figure-1
Proposed algorithm

Calculating the Objective Function and Event Tree Modeling: As described in the previous part, analysis of event tree is required for obtaining the objective function of the genetic algorithm and calculating the costs incurred due to the loss of customers and attracting new ones. In fact, in this problem the capability of effectiveness on the customers' loyalty must be calculated so it can be used to obtain the probable results regarding prevention of loss of loyal customers using a variety of effective factors. We assume that the density function is the probability of non-effectiveness of all the factors with a mean of λ. Thus, the values of probability of effectiveness (success) and probability of losing customers (failure) can be calculated using the customer loss rate which was mentioned above. Number of event tree branches is determined by the number of factors that can affect loyalty. The probability of correct and incorrect performances of specified parameters based on the indicated course of time will be calculated as well. After calculation of objective function, parent chromosomes are chosen according to the decided technique (the roulette wheel technique in the present research) and the rate of selection, and are then entered into the next stage of the genetic algorithm for the merger.

The Proposed Merger: In ordinary genetic algorithms, integration is done using various methods such as single-sight crossover, multi-point crossover, etc. In the present issue, however, we seek to produce the best chromosomes considering the effective factors; in other words, the best order of factors affecting customer loyalty should be produced as children. For this stage, an innovative crossover operator has been proposed as the characteristics of effective factors are taken into consideration in this operation. Based on the research works done, we attempted to consider those characteristics which yield better, more appropriate children in the GA after each round of re-running the algorithm. The criterion to evaluate this issue is the resulting lower costs. In the event tree model, the factor with lower mean time required for attracting loyal customers is deemed more reliable for the purpose of identifying negative factors and preventing them from developing with a greater probability. We have decided the lower mean time for attracting customers as the basis for crossover operator: if we assume that one given system has 7 parameters for creating customer loyalty, it means that each chromosome of the population has 7 genes, and if the order of genes in the parent chromosome are the same as what figure-2 depicts, the genes of parent

chromosome are in fact compared with one another. In other words, those parameters in the first position are compared with each other so as to clarify which of them has a lower mean time of attracting customers. The gene that has the least mean of all is transferred to the initial parent and the MTAC is calculated for the next genes as well (figure-2).

Assume that the two chromosomes from image 2 are selected for the crossover operation. As seen in the picture, we begin with the first genes of the chromosomes and carry out the comparison until we reach the gene in which the mean time of attracting customers in the second chromosome is less than the first. Here, it is parameter 7 in the third gene of the second parent chromosome with a lower mean time for attracting loyal customers as compared to parameter 6 in the third chromosome of the first parent. So, the third genes of the two chromosomes are replaced. As parameter 7 is in the third chromosome, the system will search and find the repeated parameter (7), its equivalent gene in the next gene is identified, and another replacement takes place. In fact, genes of chromosomes are moved and replaced when the genes and their equivalent parameters are moved; this is how repeated parameters are prevented.

Thus, genes, or those parameters with higher cost means are led to the initial genes of selected chromosomes, the result of which is obtaining lower costs considering the effect of time on the loss of loyal customers. This will increase the probability of identifying the factor that causes customer loss by the first genes (parameters), which would in turn lead to the cut in costs, and production of a better generation and population than the first generation.

Mutation: After crossover stage, it comes to mutation operation which is marked by the mutation rate in the number of chromosomes on which mutation should be carried out. Then, chromosomes are randomly selected and the mutation is done, and two genes from the chromosome are selected and replaced (figure-3).

End of Algorithm: The algorithm is continued until we reach the best possible reply in the response space as well as the end condition. The end condition can be defined according to the problem. In the present one, the end condition is to obtain the same response after a specified number of repetitions.

Conclusion

A model has been introduced in this paper for rating of factors and parameters affecting loyalty, taking into consideration the significance of having loyal customers in the competitive market, the costs of attracting customers and making them into loyal ones, and the costs of losing current customers. The devised model focuses on home appliances of grade C fabricated in Iran. This section covers those products which lack the wide range of features, but are affordable and are meant for the middle and lower class of the society. The major part of products made in Iran and in other third world countries are of the same type. This model has been an attempt to provide the senior executive managers and CR managers of domestic companies with the best possible combination of factors affecting customer maintenance. To this end, genetic algorithm and event tree have been employed. The criterion for selecting the best combination is the costs incurred because of loyal customers and those caused by losing loyal ones and attracting new customers. In order to obtain the best combination of effective parameters and to lead the GA model to better population and chromosome, the crossover operator proposed for this problem was based on the mean time required for attracting new customers. In the end, it was observed that the order of factors mentioned earlier in this article on the attracting and maintaining of customers who are loyal to a given brand (home appliances of grade C) is as listed in the table-10.

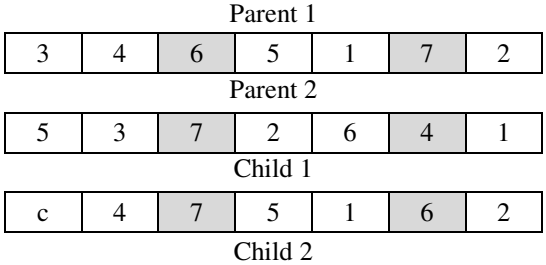

Figure-2
Parent chromosomes and children of Parent 1

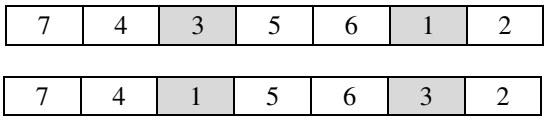

Figure-3
Mutation operation

Table-10
Rating factors affecting customers' loyalty

Rating	Factors affecting customers' loyalty	Adjusted collective correlation	Suggestions
1	Lowering product prices	0.319	- lowering prices while considering the company costs - compensating for the lowered prices by production planning and greater sales - bringing greater variety into the products in order to make the market prices justifiable
2	Product quality	0.498	- improving the quality of goods in similar production level - creating competitive market - Adding particular features to the design without significant increase of prices
3	After sales services	0.525	- establishing active agencies in the market to deliver service - establishing strong communication system for the customers to communicate with the organization - compiling data bank of the customers' opinions and references and wiring them to the production line
4	Advertising rate	0.566	- environmental ads in the target community - considering lower-income class in ads Establishing showrooms and outlets in lower-income areas
5	Level of customers' education	0.598	- sellers' attention to the education of buyers, providing products to match their expectations
6	Customers' profession	0.615	- distributing goods with certain features such as non-cash payment - distributing goods in cooperative stores for employees and workers - delivering goods in government organizations considering the level of income
7	Customers' loyalty to the seller	0.626	- employing well-experienced sales teams - establishing training teams for sales staff - introducing the sellers to the target market (lower-income class and their requirements)

Recommendations: As seen in table 10, the highest rank among the factors affecting customer loyalty belongs to lowering of prices. Considering the products under discussion which were of grade C, it is proposed that producers at *Barfab* can lower their prices, and to compensate, they can plan their production, sell more, and make a greater variety in their products so they can enjoy the benefits of price justifiability and the consequent customer loyalty. The second factor is the quality of products, which can be achieved through improving the quality of products, creating competition in the market of products of similar grading, and adding particular features to their designs without significant increase in the prices. The third rate belongs to the after sales services: the organization can establish active dealerships and agencies in the market in order to deliver services, create a very strong information system to facilitate the relation between the company and its customers, and compile data banks from the customers' opinions and references and to wire them to the product line so as to further their customer loyalty. The fourth factor is the advertising rate, which can be achieved by environmental advertisements in the target community, targeting and considering middle or lower classes in ads, and establishing show rooms and stores in areas with lower mean income. The fifth factor is the education of customers which has to deal with the sellers taking into

consideration the customers' level of education, and providing products to cater to their expectations. In the sixth rank stands the customers' profession. In order to improve customer loyalty, allowing non-cash payments, distributing goods among workers and employees in cooperative stores and government organizations considering the mean income of the employees can be considered. The last factor on the list is customers' loyalty to the seller. It is proposed that factors such as employing well experienced sales teams, establishing training teams for sales staff, and familiarizing the sellers with the target market (lower-income class and their requirements) are taken into account.

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References

1. Mohd Khalaf Ahmad A. and Al-Zu'bi H., E-banking Functionality and Outcomes of Customer Satisfaction: An Empirical Investigation, *International Journal of Marketing Studies*, **3(1),** 50-65 **(2011)**

2. Beerli A., Martin J. and Quintana A., A Model of Customer Loyalty in the Retail Banking Market, *European Journal of Marketing*, **38, 253**-275 **(2004)**

3. Zhaohua D., Yaobin L., Kwok K.W. and Jinlong Z. ,Understanding Customer Satisfaction and Loyalty : An Empirical Study of Mobile Instant Messages in China, *International Journal of Information Management*, **30**, 289–300 **(2010)**

4. Rageh Ismail A., An Investigation into the Relationship between Customer Experience and Brand Loyalty: A Study in the Service Sector, paper presented at Brunel Business School, Doctoral Symposium, and Brunel University, (**2008)**

5. Trasorras R., Weinstein A. and Abratt A., Value, Satisfaction, Loyalty and Retention in Professional services, *Journal of Marketing Intelligence and Planning*, **27(5),** 615-632 **(2009)**

6. Meller J.J andHansan T., An Empirical examination of brand loyalty, *Journal of Product and Brand Management*, **15(7),** 442-44 **(2006)**

7. Stephen L., Sondoh Jr., Wan Omar M., Abdul Wahid N., Ismail I. and Harun A., The Effect of Brand Image on Overall Satisfaction and Loyalty Intention in the Context of Color Cosmetic, *Asian Academy of Management Journal* , **12(1),** 83–107 **(2007)**

8. Kerr G., from destination brand to location brand, *Journal of Brand Management*, **13(4/5),** 276–283 **(2006)**

9. Kotler P., Nebenzahl ID., Lebedenko V., Rainisto S., Gertner D. and Clifton R. and Van Ham P., Opinion pieces: Where is place branding heading, *Nature Publishing Group,* **1**, 12–35 **(2004)**

10. Wood L., Brands and brand equity: Definition and management, *Management Decision journal*, **38(9),** 662 –669 **(2000)**

11. Yoo B., Cross-national invariance of the effect of personal collectivistic orientation on brand loyalty and equity, *Asia Pacific Journal of Marketing and Logistics,* **21(1),** 41-57 **(2008)**

12. Sousa R., The Effects of Service Failures and Recovery on Customer Loyalty in E-services: An Empirical Investigation, *International Journal of Operations and Production Management*, **29**, 834- 864 **(2009)**

13. Gómez B.G., Arranz A.G. and Cillán J.G., The role of loyalty programs in behavioural and affective loyalty, *Journal of Consumer Marketing*, **23(7)**, 387–396 **(2006)**

14. McMullan R. and Gilmore A., Customer loyalty: an empirical study, *European Journal of Marketing*, **42(9/10),** 1084-1094 **(2007)**

15. James Heskett L., beyond customer Loyalty, *Managing Service Quality*, **12(6),** 355-357 **(2002)**

16. Gee R., Coates G. and Nicholson M., Understanding and Profitably Managing Customer Loyalty, *Marketing Intelligence and Planning,* **26(4)**, 359-374 **(2008)**

17. Jackie L. and Tam M., Brand familiarity: its effects on satisfaction evaluations, *Journal of Services Marketing*, **22(1)**, 3-12 **(2008)**

18. Peng Lin C., Hui Tsai Y. and Kang Chiu C., Modeling Customer Loyalty from an Integrative Perspective of Self Determination Theory and Expectation–Confirmation Theory, *Journal of Business and Psychology,* **24**, 315-326 **(2009)**

19. Clifton A., Ericson, Hazard Analysis Techniques for System Safety, *John Wiley and Sons*, Inc., 223-234 **(2005)**

20. Goldberg D.E., Genetic Algorithms in Search, Optimization and Machine Learning, *Addison-Wesley Longman Publishing Co.* Inc. Boston, MA, USA **(1989)**

21. Saunders M., Lewis P., Thornhill A. Research methods for Business Students, 5th. Ed. Financial Times Press, **(2009)**