System Dynamics Methodology to Customer Loyalty

(Case Study: Internet Service Provider Company)

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Abstract

Due to the complexity of the customer loyalty, we tried to provide a conceptual model to explain it in an Internet service provider company with system dynamics approach. To do so, the customer's loyalty for statistical population was analyzed according to Sterman's modeling methodology. First of all, the reference modes (historical behavior of customer loyalty) were evaluated. Then, dynamics hypotheses were developed by means of causal-loop cyclic diagrams and stock-and-flow charts, based on theoretical literature. In the third step, initial conditions of variables, parameters, and mathematical functions between them were estimated. The model was tested and finally, advertising, quality of service improvements and maintaining the status quo scenarios were evaluated. Results suggested improving the quality of service scenario is more effective in comparison to others.

Keywords: System Dynamics, Customer Loyalty, Internet Service, Simulation

1. Introduction

One of the important concepts in marketing is customer loyalty to specific trademarks and brands. This concept plays an important role in long-term benefits of the company since loyal customers do not need any promoting actions; they are willing to pay more for obtaining advantages and qualities of their favorite brand. Furthermore, since in online markets, loyalty of customers to the brand can guarantee the life of the company or its destruction, customer loyalty has a competitive aspect as well. Customer loyalty plays a significant role when businesses are done in a competitive market. In these markets, customers have the right to choose and their second purchase won't be the result of lack of other choices. High speed Internet services work in such competitive markets that customer loyalty modeling turns to be a remarkable element for them. Like most disciplines in human sciences, customer loyalty is complex and multi-dimensional ,too. Some of the reasons of complexity in these fields are reciprocal interactions

between different elements such as advertisement which is performed in different approaches by spending money, the oral advertisement performed by customers, satisfaction or dissatisfaction of customers with the quality of the product and service before and after sale, customers who depart from the system that refused to extend their subscription, customers attracted to the system, etc. Furthermore, these interactions are done dynamically, not statically. Over time, these elements interact influencing each other and being influenced by other elements. Nearly all researches done on customer loyalty and satisfaction, focus only on some of the related elements on loyalty. Also, these researches are done statically and in the absence of time element; being measured in mono-dimensional linear static measurement, these results are unable to predict the results correctly. Reciprocal and dynamic interactions need appropriate tools. System dynamic approach gives us the opportunity to model these complex problems more realistically, as a result with respect to the mentioned limitations in researches on customer loyalty on the one hand, and the ability to overcome these limitations by the use of system dynamic approach on the other. In this article, we attempt to model the customer loyalty with this methodology.

2. Review of Literature

Between 1920 and 1950, a sales-based approach became dominant in the market. This approach emphasizes the fact that a customer may not be willing to buy something and things could get so hard that the organization may be forced to take special action in order to sell its products and services. From the viewpoint of this approach, there are two important focuses: focus on product, and focus on customer, and the conditions are in favor of customer (Harvey, 2002). Sales-based approach was recognized for the first time by production and industrial organizations in the early 1980s. This approach emphasizes the fact that the more an organization is aware of its customers and their needs, the less problems it will encounter in its sales processes (Jay, 2001). Since 1980, academic researches and activities have made it clear that those institutions and organizations which have been successful in terms of keeping their loyal customers satisfied, have made considerable profits. In this regard, in the early 1990s, there was an exponential increase in the use of customer loyalty programs for different subject areas (Margarita, 2001). In the final years of the twentieth century, with the increase of competition and emergence of higher technologies especially in the realm of communications, organizations realized that the only way to survive in the market is not only to know but also be in touch with their customers (Johnson et al., 2001). Considering its multi-dimensional and complicated nature, there are various acceptable definitions for customer loyalty (Soderlund, 2006). Therefore, it is not easy to agree on a general and comprehensive definition of loyalty. Jacooby and Keener define customer loyalty as brand prejudice in which a person prefers a certain brand over others and decides on it based on a psychological commitment (McMullan & Gilmore, 2008). In another place, loyalty is defined as keeping a deep commitment to repurchasing the same product or service again and again (Chen et al., 2002). Although repurchasing can be a sign of customer loyalty, Day & Jacooby's research reveals that sheer repurchasing of a product does not equal to loyalty. In some cases, people are forced to purchase and repurchase a product from the same source because there are no other options available. This kind of loyalty is defined as false loyalty. Loyalty can be real only when

customers are attracted to the same product or company with a higher priority and based on having a clear understanding of a product's difference with other alternatives. In response to such criticisms, researchers have suggested that analysis and measurement of loyalty should be done not only based on behavioral but also attitudinal aspects. Figure 1 illustrates a customer loyalty model in which both behavioral and attitudinal aspects have been taken into consideration.

Figure 1: A dynamic model of customer loyalty in both behavioral and attitudinal aspects (Donio, 2006)

Generally, three different approaches have been offered for measuring customer loyalty: behavioral approach, attitudinal approach, and the mixed approach. In behavioral approach, number of purchases is emphasized as an indicator of loyalty. According to Chen and Bowen (2001), in the attitudinal approach, the use of attitudinal information reflects a customer's feelings and psychological dependencies. In the third approach, according to Lovelock et al. (1998), loyalty is measured based on customer presenter's performance, brand prejudice, frequency of purchase, the amount of purchase, and the most recent purchase. In the mixed approach, in addition to a customer's behavior and attitude, the effect of attitude on behavior is also emphasized. Figure 2 illustrates this relationship.

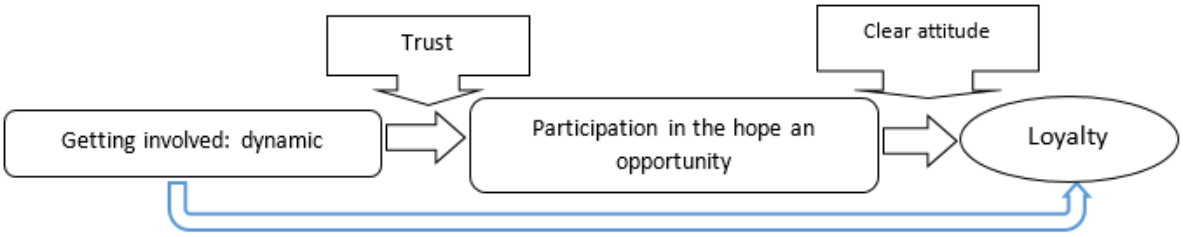

Figure 2: The effect of attitudinal loyalty on behavioral loyalty (Shang, 2006)

Griffin believes with an initial purchase, a customer should go through 5 stages (Griffin, 2002). These five stages are: 1. becomes aware of the product; 2. makes an initial investment; 3. post-purchase evaluation; 4. decision to repurchase; and 5. Repurchase. If the customer has the freedom to choose and access to other alternatives, repurchasing the same product will be an

indicator of a true customer loyalty. Otherwise, repurchase is an indicator of false loyalty and not repurchasing is product is a sign that customer is not loyal. Robinson and Baldinger (2000) showed that a customer's positive perception has a good influence on customer loyalty. In addition, the positive effect of high quality service on customer loyalty was proved in this research. Momeni (1389) showed that a perceived value can have a direct effect on customer loyalty and satisfaction. Wolfinger and Gili (2004) studied the factors which influence customer loyalty in bigger companies. In their research, the role of service quality and customer satisfaction on loyalty was proved. Lusiano (2006) studied customer loyalty in the Internet services. In his research, an appropriate customer support system and Internet speed were very important factors and influenced customer loyalty.

Among other variables that may influence customer loyalty is advertising. Although there are various ways to introduce and advertise products, it seems that mouth-to-mouth advertising can have a lot of positive influence on customers' consuming-related behaviors. Mousavi's research (1389) proved the effect of advertising on customer loyalty. Mirzaei-far (1390) showed that recommendation given by others and customer satisfaction directly influences repurchase. One of the important stages in producing and introducing a product is the time that it takes for the product information to be spread among people and social networks. The key to this way of introduction is mouth-to-mouth communication between the members of a social network. Several researches have been conducted on the importance of mouth-to-mouth advertising to buy products by Chevalier and Mayzlin (2006) and Mobius et al. (2006). In addition, Bughin et al. (2010) showed that 20 to 50 percent of initial purchases were the result of moth-to-mouth advertising and recommendation by others. Emotional commitment, related to the concept of loyalty we are discussing here, is a positive emotional obligation which reflects a psychological dependency on the other party (i.e. the provider of a product) (Sweeney 2008). The results of Yen's research show that most customers before repurchasing an item, search for retailers that are selling the same product for a lower price, and they can easily change the website from which they want to purchase (Yen, 2010). In the model they developed for explaining long-term customer loyalty in electronic (Internet) purchasing, Mohd Kassim, N., & Ismail have mentioned service quality, satisfaction and trust as factors influencing customer loyalty (Mohd Kassim, 2009). Also, Ramanathan's research offers a model based on pre-purchase factors such as access to services, e-pay details, comparing prices and post-purchase factors such as punctual delivery, the way customer complaints are dealt with, and availability of customer support (Ramanathan, 2011). Park et al. conducted a research entitled "Social Perspectives of E-Care Centers and the Creation of Customer Loyalty" in which the final model, the effect of service quality on social values, and satisfaction with, and commitment to, e-care center are proved (Park, 2011). The FRO model (Fast-Response Organizations) recognizes the six factors of price, quality, service, time, trust, and flexibility as the factors leading to satisfaction and customer loyalty (Starr, 1990). Figure 3 illustrates this model. Based on the theoretical principles of stable loyalty in e-retails, and making use of models offered by Srinivasan et al. and Chang and Chen (Chang, 2009), the proposed model for customer loyalty is elaborated in Figure 4.

Figure 3: Fast-response organizations and customer loyalty

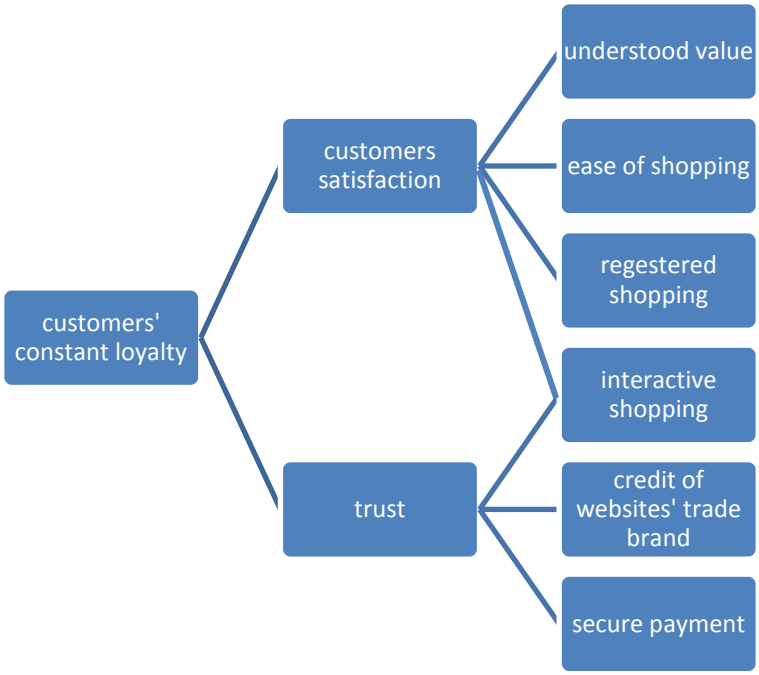

Figure 4: Conceptual model of customer loyalty (Srinivasan, 2002)

Figure 5 shows another model of customer loyalty. This mode takes into account various factors such as competence, commitment, ability to communicate and resolve issues and also mediating factors such as trust and quality of communication and considers them as elements related to customer loyalty (Ndubisi, 2007). In addition, Figure 6 shows a model without any mediator and takes into account four independent variables of trust, commitment, communications, conflict management and the only dependent variable of loyalty (Ndubisi, 2007).

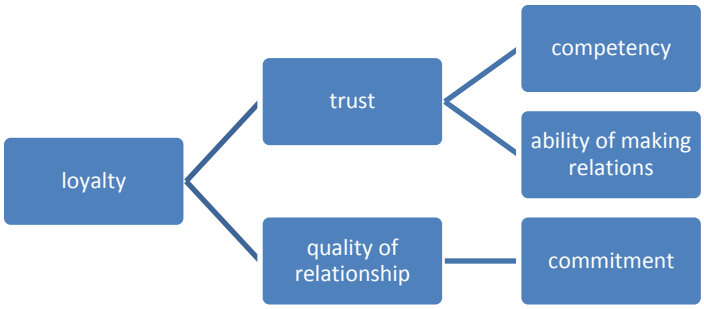

Figure 5: Customer loyalty model with mediation of Bank of Malaysia

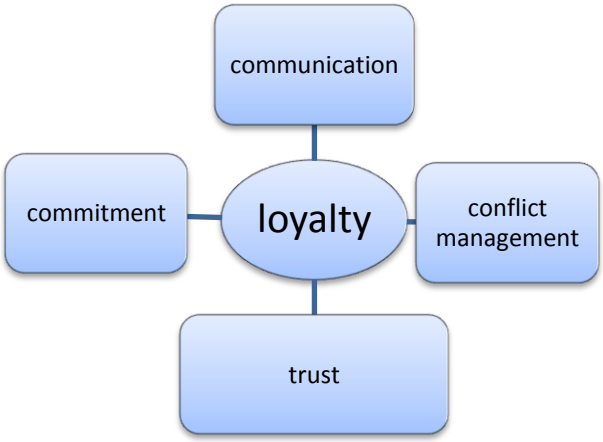

Figure 6: A model without mediation

One of the important indicators of loyalty is American Customer Satisfaction Index (ACSI). This model in addition to offering average and dispersion values for the variable of customer satisfaction, evaluates the effect of variables on one another. ACSI includes hidden variables and is calculated based on some measurable criteria and also customer surveys. This model's credibility is high because of calculating the cause-effect relationship between variables. In this model, customer satisfaction is one of variables which are calculated using certain measurable criteria. This approach has multiple criteria and these include overall satisfaction, customer's treatment of a product or service's quality compared to his expectations, and product or service's quality compared to the ideal that customers have in mind. Figure 7 illustrates this model. Europe's Customer Satisfaction Index which includes expectations, quality and appreciated value, satisfaction and loyalty, is one of other appropriate models that can be used to evaluate customer loyalty. Figure 8 illustrates this model.

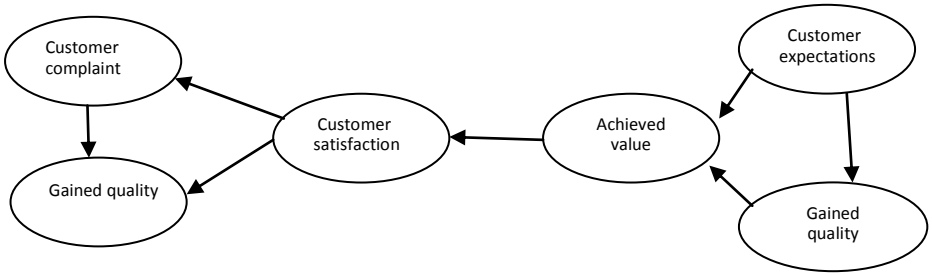

Figure 7: ACSI (Donio 29, 2006)

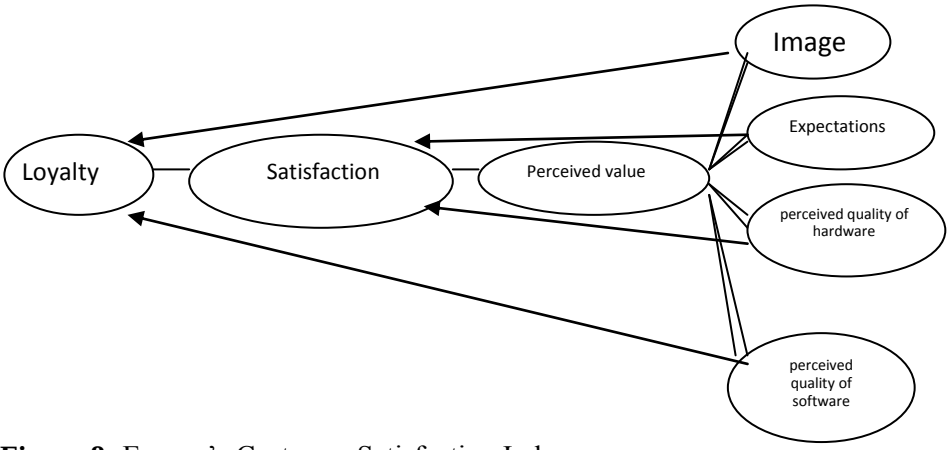

Figure 8: Europe's Customer Satisfaction Index

Like most topics related to humanities, customer loyalty is complicated and multi-dimensional. In this research, modeling customer loyalty using system dynamics methodology is discussed and is one of the important and modern non-linear theories based on systemic thinking in a complicated world (Sterman, 2002). In system dynamics, implementation of system behavior, analysis of results, testing of the simulated model, and information on the way system behaves based on the considered conditions are offered to the system analyst (Hasret, 2007). Modeling based on system dynamics, as a part of learning process, is repetitive and it is also a constant process of formulating hypotheses, testing and controlling structured and mental models (Kahzadi, 1382). In this research, according to a methodology offered by Sterman, five stages have been considered for modeling. In the first stage, the problem was identified and defined as follows: with regard to the data available in Hamara System Co.'s database, the company's activity during the past was studied (time horizon analysis). Then, in regard to the past time horizon (history) analysis, problem and research literature, the key variables were identified. In the second stage, the dynamic hypothesis was planned. In this stage, based on research literature and a comprehensive analysis of previous research, and also based on expert views, a theory is formed to explain the problem. This theory is described in the form of causal-cyclic and stock and flow charts. Then, in the formulation stage, with mathematical estimations between

variables, dynamic hypothesis was changed into a simulated model. The simulated model is evaluated in stage four, and finally, system behavior is studied according to various policies and scenarios and the best scenario is suggested for improving customer loyalty.

The first two steps in the methodology proposed by Sterman are qualitative and the following two stages are quantitative. Therefore, the methodology of this research is the mixed type. The statistical population being studied is Hamara System Co.'s customers in the years between 1389 and 1391. The variables connected with customer loyalty and the relations between them were identified using library-based methods and based on the results of previous researches. The information archive of Hamara System Co. was used in order to measure the relations between variables. In addition, in some cases where documented information was not available, field methods and interviews were used to estimate the mathematical relations between variables. Finally, the model was implemented by VENSIM (software) and the information is (are) analyzed.

3. Research findings

Considering the methodology used for this research, research findings are classified and offered based on the five stages proposed by Sterman.

3.1. Identification and definition of the problem

The first step to be discussed in terms of framework is the time horizon. If we want to go back in terms of time, the historical behavior of the number of high-speed Internet users in this company can be explained using a chart like Chart 1.

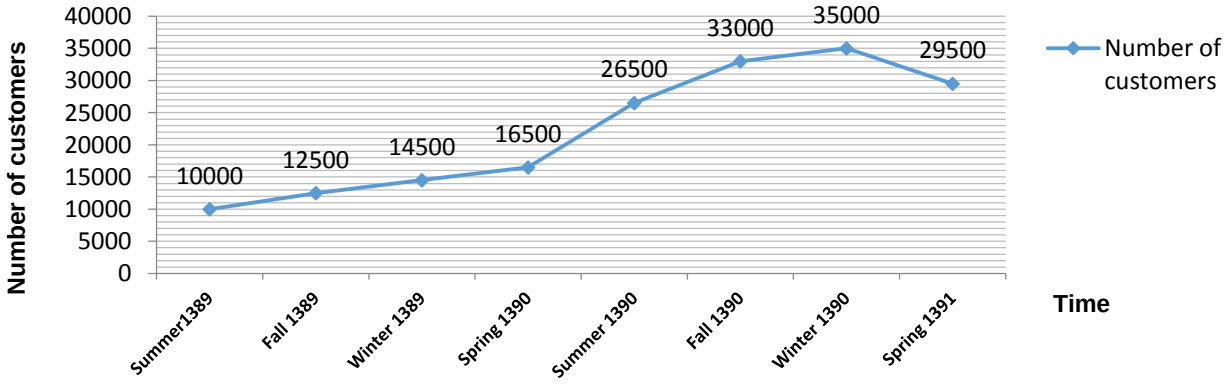

Figure 9: number of customers in time horizon

The chart above shows the curve by which the number of customers has grown. As it can be seen, in the beginning years because of lack of sufficient capacity and lack of competitors, number of users is relatively high. As the capacity grows, the number of users grows as well but from the first half of 1390 on, with the growth of awareness and number of competitors, the number of customers descended to 29500. The company's capacity is 52,000 users. The gap between capacity and the number of users indicates a problem in the company's relationship with its users. The variable behavior in the number of customers shows that the organization is in the regression state. The reason for this could be connected with various variables such as customer satisfaction, system performance, the perceived values of customers, and services offered by competitors.

3.2.Planning a dynamic hypothesis

In planning a dynamic hypothesis, two approaches can be used to identify the variables and the relations between them. Literature review is a valuable resource that can be used to identify these variables. In addition, experts, customers, and suppliers can be potential sources of information to help identify the variables. Considering the literature review, the variables inside the system that can influence the target variable (i.e. customer loyalty) are as follows: 1. the main functions of the system; 2. the values perceived by the customer; 3. mouth-to-mouth advertising; and 4. advertising.

The main functions of the system which are the main reason why customers interact with the company, are connected to the company's human resources and physical facilities. What is meant by the value received is the customers' idea of a comparison between the paid money and the received service. The value received by customers, in addition to the service offered by the organization, is a result of comparing this service with the price and service delivered by competing companies. Customers transfer their positive and negative experiences regarding the company to other people. Of course the intensity of this type of communication will be different for positive and negative feedbacks. According to theories, in order to measure these communications, this intensity has to be evaluated. Due to the above, negative experiences will have more effect and intensity. This is known as mouth-to-mouth advertising. In order to reduce the company's vacant capacity, advertising plans and promotions are very important. Customer satisfaction is a variable which is affected by system performance and the value received by the customers. This variable has a great effect on mouth-to-mouth advertising done by customers. Measuring loyalty is not an easy job due to its qualitative and mental nature and also problems such as false and hidden loyalty that were discussed in the theoretical literature. To solve this problem, loyalty is measured based on continuous extension of the contract with the company. In this research, customers who have extended their subscription more than three times were considered as loyal customers. Customers renew their subscription once every three months. Customers initially enter the company through advertising or other customers and then, renew their subscription according to their degree of satisfaction with the service. The dynamic theory was provided based on an evaluation of literature review and interviews with managers of

Hamara System Co., and also by studying the company's database, making use of causal-cyclic charts, and stock and flow chart. Figure 10 illustrates the dynamic theory in the form of a stock and flow chart. As it is seen in this chart, customers purchase products and services according to advertising or recommendations by existing customers. After three months, based on his satisfaction with the system, the customer decides to renew or opt out of his subscription. This level of system is known as the customers at first level of loyalty. As time passes, customers will evaluate their satisfaction with the system and after their subscription is over, will decide to either renew or terminate their subscription. This is known as customers at second level of loyalty. Based on the circles created, customers are divided into three levels of zero, one, and two, and customers with a higher level of loyalty are at level two.

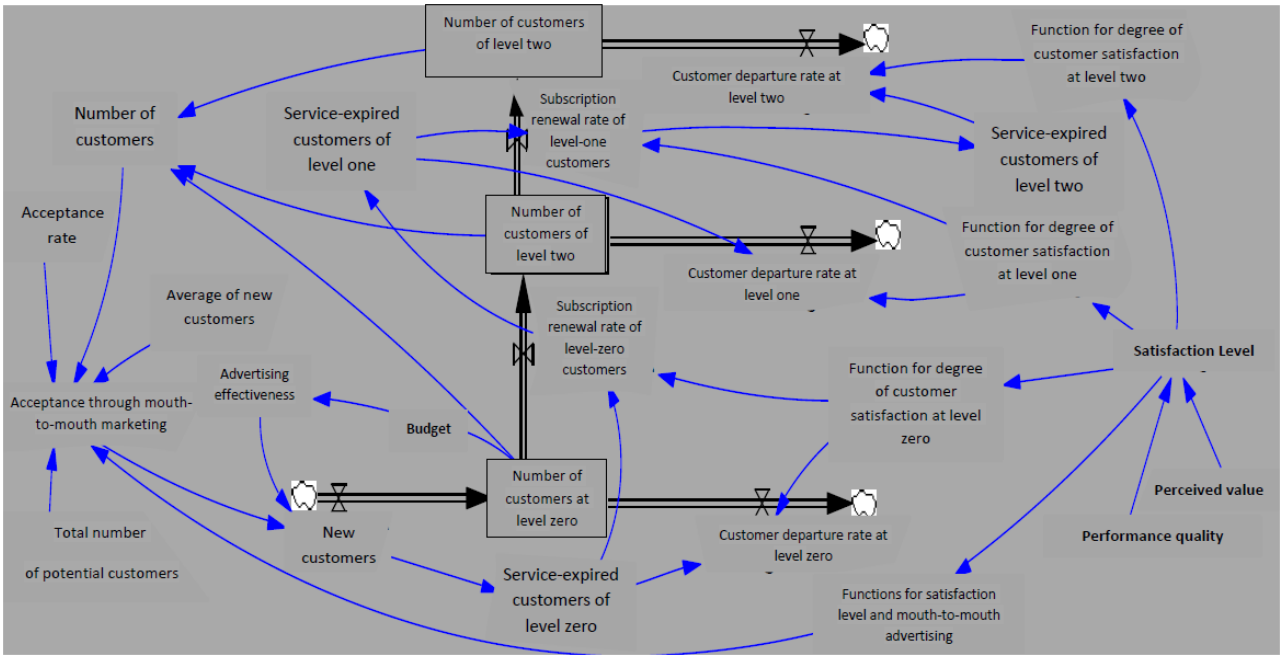

Figure 10: dynamic hypothesis of customer loyalty

3.3.Formulating and simulating the model

In this step, the formulas and the relations between them were gathered through documents and interviews listed in Table 1.

Table 1: Estimating functions

Number of customers = acceptance rate – customer leaving rate (with an initial amount of N)
Satisfaction level = (quality) * 0.574 + (perceived value) * 0.424 + 0.25
Entrance rate = advertising + mouth-to-mouth advertising
Performance quality = Random uniform (0/7, 0/9, 99)
Perceived value = Random uniform (0/8,0/92,99)

Function for level of customer satisfaction at level zero = ((satisfaction level) * 0.868) + 1/3

Customers leaving at level zero = Delay fixed (entrance rate, 3, 0)

Customer departure rate at level zero= exp(0) * (1 - gh(0))

Subscription renewal rate of level-one customers = subscription renewal of level-zero customers – subscription renewal rate of level-two customers – leaving rate of level-one customers

Functions for satisfaction level and mouth-to-mouth advertising = ((satisfaction level) * 1.02) +0.13

Acceptance rate = Random uniform (0/65, 0/99, 99)

Total number of potential customers = 10,000

Acceptance through mouth-to-mouth marketing = acceptance level * satisfaction rate and mouth-to-mouth marketing * average of new customers

If then else (total possible customers/number of customers < 1, 1, 1/ total possible customers/number of customers)

Advertising budget =

lookup ([(0,0)-(6000,1000)],(0,1000),(3500,1000),(4000,550),(4500,500),(5000,400))

Advertising effectiveness = look up (([(0,0)-(4000,1000)],(1500,350),(1800,500),(2000,550),(3000,1000))

Total number of customers = level-zero customers + level-one customers + level-two customers

Potential attracted customers = Random uniform (6000, 8000, 99)

Function for degree of customer satisfaction at level one = ((degree of customer satisfaction) * 0.906) +1.25

Customers at level one = Delay fixed (entrance rate, 3, 0)

Customer departure rate at level one = exp(1) * (1- gh (1))

Level-one customers = renewal rate of level-one customers – renewal rate of level-two customers – departure rate of level-one customers

Function for customer satisfaction degree at level two = ((degree of customer satisfaction) * 0.641) +1

Customers at level two = Delay fixed (entrance rate 2, 3, 0)

Customer departure rate at level two = exp(2) * (1- gh (2))

Level-two customers = renewal rate of level-two customers – departure rate of level-two customers

Subscription renewal rate of level-two customers = exp(2) * gh(2)

Subscription renewal rate of level-one customers = exp(1) * gh(1)

Subscription renewal rate of level-zero customers = exp(0) * gh(0)

Then, having equations and the necessary information, the suggested model was simulated in VENSIM software.

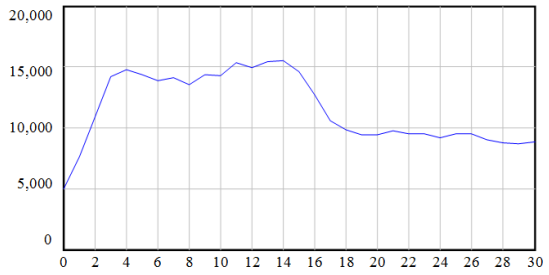

Figure 11: number of customers entering the company

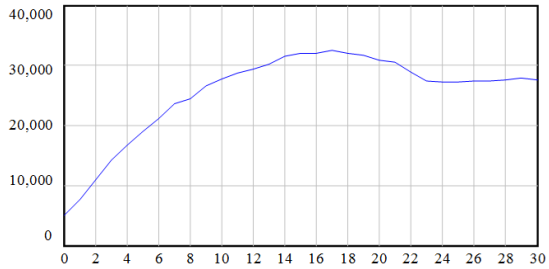

Figure 12: total number of customers

As it can be seen, up to month 14 in the time horizon, number of customers is increasing, but it is decreasing after month 18. We should look for the reason among influential variables. Satisfaction rate is shown in the following chart.

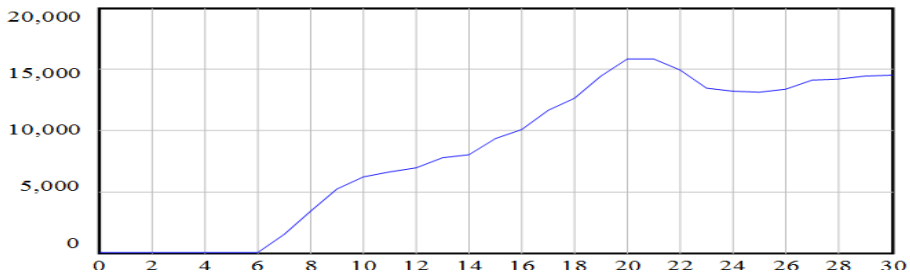

Figure 13: number of level-three customers

3.4.Testing the model

Before testing different scenarios, we should be sure of the model's validity. One of the appropriate ways of validating a model is to compare the simulated behavior with the real behavior. Figure 14 shows an example of these two behaviors. As it can be seen in the chart, the simulated and real behaviors are almost the same.

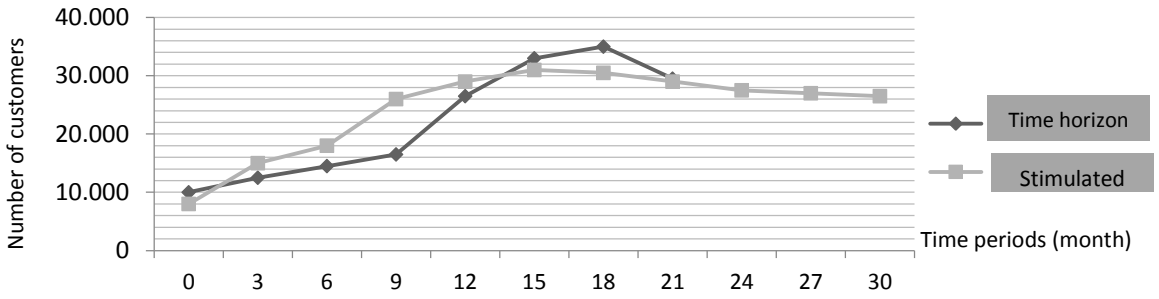

Figure 14: comparing the number of customerS in the time horizon (real behavior) with the simulated behavior

3.5.Evaluating the scenarios
3.6.

At the end, considering the validity of the test, the scenarios are implemented on the model.

First scenario: "maintaining the status quo"

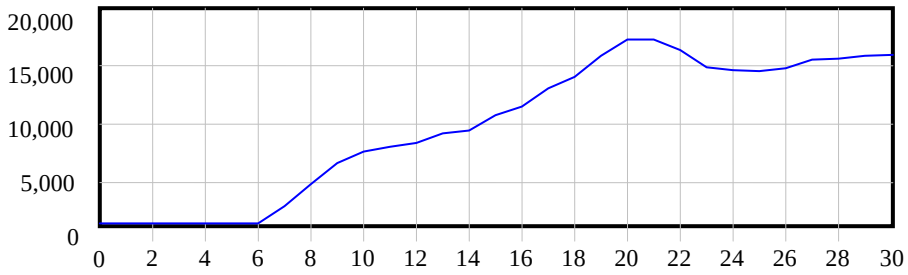

Figure 15: number of level-three loyal customers in first scenario

By maintaining the status quo, the number of new customers may increase or decrease and also, the number of departing customers at various levels will change due to low satisfaction rate, the growing power of competing companies, availability of incentive plans, and loyalty.

Second scenario: "growth in the number of incentive plans"

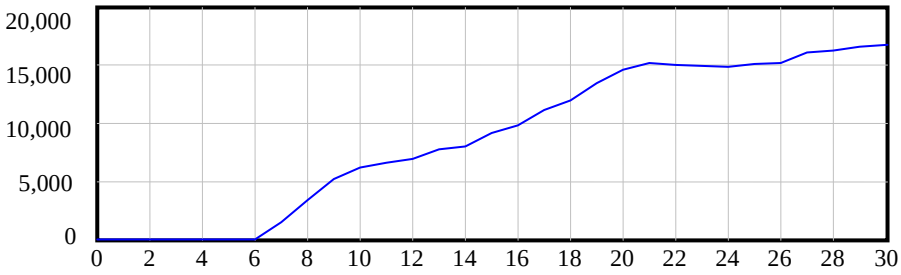

Figure 16: number of level-three loyal customers in second scenario

As this variable increases, it is possible that advertising and values perceived by customers about the existing performances of the system in comparison to competitors, will increase the number

of customers and satisfaction rate as well. Both of these variables will directly influence the arrival of new customers and keeping the existing oneS in the system. The number of customers will raise in the long run.

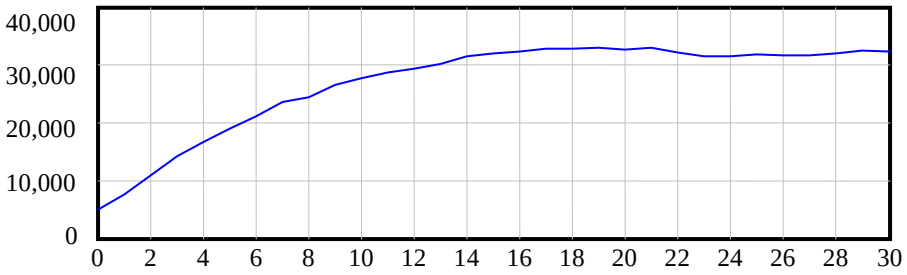

Figure 17: total number of customers in second scenario

Third scenario: "hiring more staff and increasing the quality within the system"

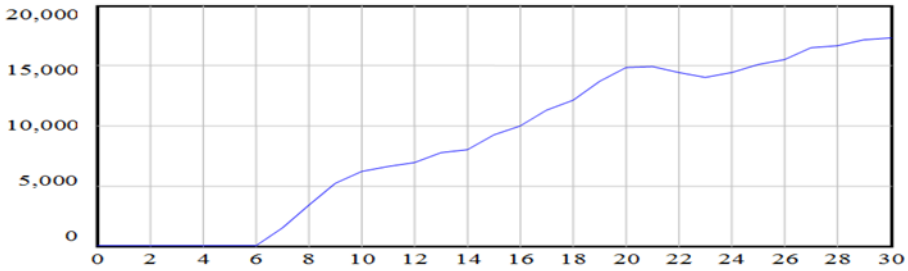

Figure 18: number of level-three loyal customers in third scenario

In the variable aspects of system performance, one of the influential factors is the increase in working quality of staff in the system. Customers will be loyal to the system if they perceive this value. This variable will also affect satisfaction rate even more (it will increase the satisfaction rate) and satisfaction rate, in its own turn, will influence loyalty at various levels. As it can be seen, in this scenario the system will have an ascending trend in terms of total number of customers. But it is worth mentioning that the growth rate of customers has decreased and this can be a result of increase in the number of competitors, decrease in the company's share of the market, and market saturation.

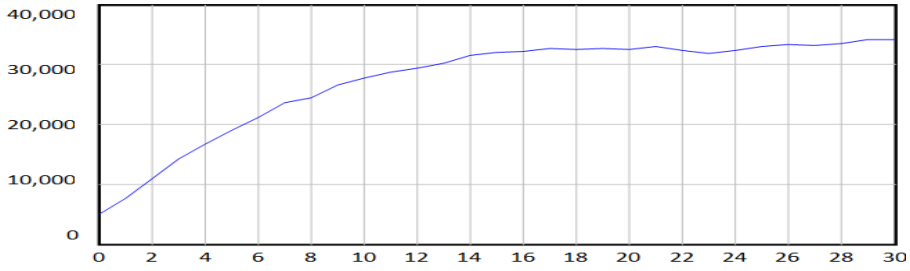

Figure 19: total number of customers in third scenario

4. Summary and conclusion

In this paper, using a dynamic approach, the factors affecting customers were studied in Hamara System Co. The analysis of the data revealed that all the aspects of a model influence customer loyalty and the impact intensity of these factors are different from one another. All in all, the results of the study show that customer satisfaction is influenced by two variables namely the value perceived by the customer and service quality. With an increase or decrease in any of these variables, satisfaction rate will change accordingly and affect the organization in two ways: 1. as satisfaction rate drops, mouth-to-mouth advertising rate will drop as well and less people will enter the system; or 2. as satisfaction rate increases or decreases, departure rate will change as well. Of course, satisfaction rate depends on subscription timespan or departure time, but people with a high level of loyalty and a low level of satisfaction do not depart easily.

Based on analyses of these scenarios, and considering the fact that service quality is one of the important factors in creating customer loyalty, paying attention to service quality in organization plans and approaches are recommended. Informing others about the service quality in marketing and advertising activities could be helpful. In order to increase the rate of customer loyalty and decrease the rate of customer departure, it is necessary to pay attention to the value perceived indicator as well. Therefore, it is recommended that an appropriate organizational culture should be promoted so that tolerance and customer-orientation approach would be within the organization. The next important factor is time. An organization should appreciate people's time and arrange its plans in order to consume a fair amount of time of customers for their desired services. The results of validity test show that delivering promises and earning customers' trust is very influential on satisfaction and the changing customers into zealous supporters and lifelong loyal members.

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