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Abstract

Purpose – In previous studies, historical information of customer had been used for determining customer lifetime value (CLV). The purpose of this paper is to modify CLV estimation to be applied before producing a new product.

Design/methodology/approach – In this study, the CLV estimation has been modified using Kano satisfaction coefficient. The Kano satisfaction coefficient has been assumed as loyalty indicator in estimating CLV and related equations have been developed for allocating Kano requirements to various phases of product life cycle. The proposed approach has been examined in two new product options of the automobile industry. Finally, by using customers' purchase records during three years, CLV has been calculated for both product development options.

Findings – Findings indicate that CLV of the first development option is equal to 407 million and 500,000 toumans and of the second option is equal to 392 million toumans, this difference is related to different requirements of the Kano model, and as a result, to different satisfaction coefficients. Therefore, the first option has been suggested for investing in developing new product.

Research limitations/implications – Application of the proposed approach is limited to short time periods. The findings are limited to the automobile industry.

Originality/value – The modified approach of estimating CLV can be applied for prospective new product development in addition to traditional approaches in which, only the historical data of sold products are used. In addition, using Kano satisfaction coefficient in estimation of CLV in short periods, seems an appropriate approach for competitive industries that focus on dynamic needs of customers.

Keywords Satisfaction, Product design, Quality, Kano model, Customer lifetime value, New product development

Paper type Research paper

1. Introduction

Today, organizations recognize the commercial advantage of relationship with customers and calculating customer lifetime value (CLV). CLV is usually measured in a period of time from the first transaction till present or in a future time. CLV indicates the difference between incomes and costs created by one customer (Chang, 2011). Mudie and Cottam (1999) believed that CLV is dependent on purchase frequency, customer life expectancy, and average of transaction value. Hoekstra and Huizingh (1999) proposed a perceptual CLV model in which, most of the CLV equations were derived from an original equation, in which the income obtained from customer is subtracted from the cost of income generation, and regarding interest rate of company, its present value is calculated. Hwang *et al.* (2004) defined an equation for calculating potential and historical customer values which is used as the basis of the proposed approach of this paper.

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Customer loyalty is a basic factor in business survival and improvement. A loyal customer is regarded as a competitive asset for an organization (Chen, 2012). Moreover, meeting customer's needs will gradually create customer's feelings of satisfaction, loyalty, and trusting organization. In general, customer satisfaction is a prerequisite for customer loyalty (Reichheld and Teal, 1996; Abdinnour-Helm *et al.*, 2005). Literature confirms the existence of linear relationship between customer satisfaction and loyalty (Chen, 2012), but different customers have various requirements varying during the time (Chang, 2011). This might influence the relationship between customer satisfaction and loyalty (Shahin *et al.*, 2011).

Companies use new product development (NPD) as a competitive weapon for survival and success in dynamic markets. New profitable products are not only effective in penetrating markets, but also result in keeping relationships with customers and profitability. Therefore, in decisions related to developing a new product, customer requirements, customer satisfaction and product quality should be considered (Chan and Ip, 2011).

In previous researches on CLV, historical information of customer had been used, and none of the statistical estimators of CLV has considered customer's satisfaction ratio prior to selling product/service. In order to fill this gap, in this study, the Kano model is used to determine customers' desired requirements as a pre estimation of customer satisfaction approach (Kano *et al.*, 1984). Then, the computed satisfaction coefficient is regarded as the basis for calculating CLV. In order to measure satisfaction coefficient of new products, the Kano standard questionnaire is used in the automobile industry. Since this industry as a luxury sector plays a significant role in economic growth of Iran, and is continuously developing new products according to customers' requirements, it seems appropriate for examining the proposed approach. By using the information of the Kano questionnaire and interviewing a group of experts, Kano requirements are allocated to various stages of product life cycle (PLC), and thus product is positioned in the life cycle. Then, by using the proposed equations in each phase of the cycle and associated information of customers' purchase records during a specific period of time (i.e. three years), CLV is calculated. Although an accurate evaluation of CLV is used for measuring customer value in his/her lifetime, in many cases a period of three years is considered. Considering this period of time is because of three reasons: PLC value; CLV; and 80 percent profit (Kumar *et al.*, 2009). It is important to note that the CLV equation of Hwang *et al.* (2004) is used for estimating CLV in short time periods.

In the following, the subjects of CLV, customer loyalty, the Kano model, and NPD are demonstrated; then, the proposed conceptual model and its necessary steps are explained; and finally the model is examined in the automobile industry.

2. CLV

The aim of customer relationship management (CRM) is to create a deep relationship with customers and to maximize CLV for organization; therefore CLV is originated from CRM (Swift, 2000).

CLV is an indicator which makes a customer to have value more than one lifetime. Customer lifetime has three stages of obtaining customer, increasing customer lifetime, and maintaining good customers. In fact, CLV gives an intellectual impression about customer in order to allocate resources to specific customer (Shahin and Teimouri, 2008). In the following, various approaches of estimating CLV are addressed, and since the approach of Hwang *et al.* (2004) is the basis of the proposed approach of this paper, it is explained in detail.

Mudie and Cottam (1999) suggested that CLV depends on purchase frequency, customer life expectancy, and average of transaction value. They suggested the following equation:

$$\text{CLV} = \text{Customer life expectancy} \times \text{Purchase frequency} \times \text{Average of transaction value} \quad (1)$$

Hoekstra and Huizingh (1999) proposed a relatively regular CLV approach in which, R_i is the income obtained from customer during i period, C_i is the cost of income generation of R_i, d is interest rate, and n is the number of desired customer lifetime:

$$\text{CLV} = \sum_{i=1}^{n} \left(\frac{R-C}{(i+d)^i} \right) \quad (2)$$

Berger and Nasr (1998) proposed an approach for estimating CLV that reflects costs and selling tolerance in which, t is the customer's role in the i period:

$$\text{CLV} = \sum_{i=1}^{n} \pi(t) \frac{1}{(i+d)^i} \quad (3)$$

Hwang *et al.* (2004) suggested the following equations for estimating potential and historical values in which, purchase probability and profitability of product i indicates the benefit ratio expected from customer for product i:

$$\text{Potential value} = \sum_{i=1}^{n} (\text{Probability} \times \text{Profitability})$$

$$\text{Historical value} = \sum_{i=1}^{n} (R_i - C_i)$$

$$\text{CLV} = \text{Historical value} - \text{Potential value} \quad (4)$$

Since the customer long-term value in industries with intensive competition and rapid market environment change is not appropriate, and the focus of the above values is on customers' long-term value, Hwang *et al.* (2004) concentrated on present value of previous benefits, potential value and customer loyalty and proposed a new method for estimating CLV in short time in which, P_i is the present value of benefit obtained from customer, p_i/n is the average of annual present value and λ is the purchase probability. It is assumed that if few days have been passed from the last date of customer purchase, the probability of repurchase is higher and is a value between zero and one.

δ is customer loyalty coefficient which is determined based on the frequency of purchase and is a value between zero and one. Determination of λ and δ in each company is different and should be performed by an expert who is familiar with the concept:

$$P_i = \sum_{i=1}^{m} \sum_{j=1}^{n} \frac{(R_{ij} - C_{ij})}{(i+d)^j}$$

$$\mathrm{CLV} = P_i + \frac{P_i}{n}(\lambda + \delta) \tag{5}$$

3. Customer loyalty and NPD

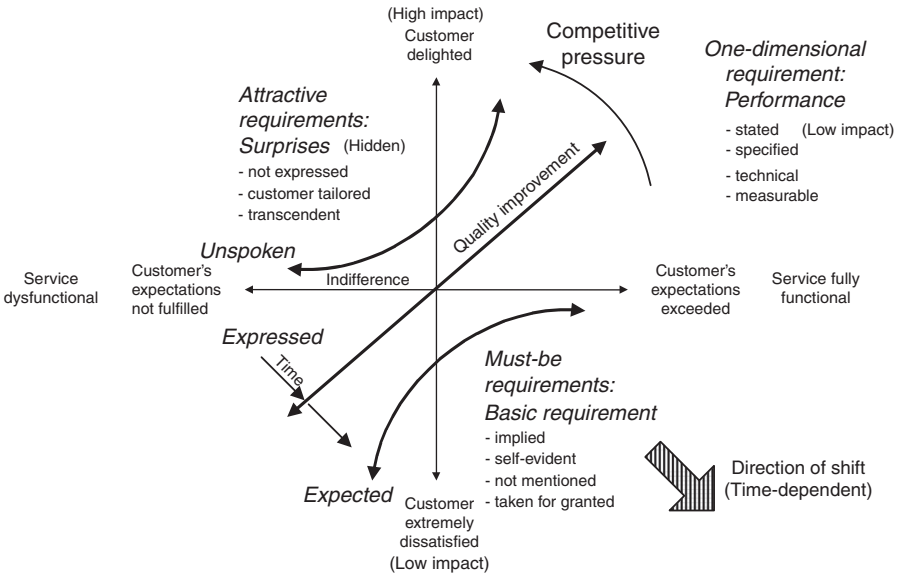
Customer loyalty can be defined as an indicator that people tend to remain a customer for an organization (Shahin and Dehghan, 2011). Customer loyalty is a basic factor in business survival and improvement. A loyal customer is regarded as a competitive asset for an organization (Chen, 2012). Customer loyalty is a vital factor in predicting profit levels (Reichheld and Teal, 1996) and market share (Baldinger and Rubinson, 1998). In general, customer satisfaction is the prerequisite of customer loyalty (Reichheld and Teal, 1996; Abdinnour-Helm *et al.*, 2005; Christodoulides and Michaelidou, 2011). In the literature of marketing management, using behavioral, attitudinal, and compound measures for assessing loyalty are generally accepted (Bowen and Chen, 2001). Behavioral measures focus on customer purchase history including transposition, repeat, and value for money.

Attitudinal measures are used to understand psychological elements which result in purchase motivation, because attitudinal measures reflect feeling and psychological dependency on loyalty (Bowen and Chen, 2001). Customer's attitude is specified by asking questions such as how they feel committed to the organization and if they recommend it to others (Uncles, 1994). Loyalty should be measured by attitudinal and behavioral measures; this is often performed by most of researchers (Bowen and Chen, 2001; Fournier and Yao, 1997; Kumar and Shah, 2004; Macintosh and Lockshin, 1997; Wong and Sohal, 2003) and is promoted by Rundle-Thiele (2005). He suggested that loyalty requires becoming conceptual by a wide range of emotional and psychological expressions like attitudinal loyalty, resistance to competitive proposals, behavioral intentions, propensity to remain loyal, complaining behavior and behavioral loyalty.

Deciding on product development is vital, but very complex. NPD is considered as a competitive weapon, and assists companies in survival and success in dynamic markets and in maintaining relationship with customer. In marketing decisions, subjects such as NPD, customer requirements, customer satisfaction, market demand, product quality, product designing, and pricing should be considered (Chan and Ip, 2011). It is completely obvious that new products are very important stimuli of customer satisfaction, and customer satisfaction plays a major role in maintaining business (Cronroos, 2000). In order to gain success in today's business environments, companies usually emphasize on various aspects such as product requirements specified by designers (Kahraman *et al.*, 2006; Xu *et al.*, 2007; Solomon *et al.*, 2010); customer's requirement and satisfaction (Liu *et al.*, 2008); and marketing competency (Lin and Chen, 2004; Peter and Olston, 2008).

4. Kano model

Since product requirements do not play equal role in customer satisfaction, identifying factors which determine satisfaction is essential for success of any organization (Tontini and Silverira, 2007; Chen and Su, 2006). Figure 1 has been used for recognizing specific requirements which potentially create customer satisfaction or dissatisfaction (Mikulic and Prebezac, 2011). Classified quality requirements of the Kano model are located in five groups including must-be, one dimensional, indifferent, attractive, and reverse, and they have different impacts on customer satisfaction considering different



Source: Shahin and Zairi (2009)

Figure 1.
The Kano model

quality requirements (Shahin, 2004; Shahin and Zairi, 2009; Shahin and Nekuie, 2011; Shahin *et al.*, 2013).

Must-be requirements are customer's expected or "must" requirements. Increasing performance of these requirements decreases customer dissatisfaction and decreasing it causes customer intensive dissatisfaction. One-dimensional requirements are referred to as functional requirements. Their increase or decrease has equal influence on satisfaction or dissatisfaction. Attractive requirements are unexpected requirements of customer, but might result in increasing customer excessive satisfaction. However, absence of these requirements does not result in customer dissatisfaction. These requirements usually meet hidden needs of customers. After a while, these requirements usually change into one-dimensional requirements and then into basic (i.e. must-be) requirements. In addition, indifferent requirements are those which are not considered by customers. Offering or not offering them is not important. Reverse requirements are those requirements that their provision has reverse influence on customer satisfaction (Chen, 2012). Another group of requirements is questionable requirements from suspected and contradictory responses which need more investigation and are not entered into calculation and analysis.

After data are collected from customers using the dual Kano questionnaire, the Kano category of requirements is determined by Table I, and ultimately satisfaction and dissatisfaction coefficients are calculated according to Equations (6) and (7).

Satisfaction indicator (SI) shows to what extent a requirement influences on customer satisfaction, and dissatisfaction indicator (DI) shows to what extent the lack of a requirement results in dissatisfaction. These indicators are calculated as:

$$\mathrm{SI} = \frac{A+O}{A+O+M+I} \tag{6}$$

Customer needs		Dysfunctional form of the question: 1. I like this feature omitted	2. I need this feature omitted	3. I am neutral about this feature	4. I can live with omitting this feature	5. I dislike omitting this feature
Functional form of the question	1. I like this feature included	Q	A	A	A	O
	2. I need this feature included	R	I	I	I	M
	3. I am neutral about this feature	R	I	I	I	M
	4. I can live with including this feature	R	I	I	I	M
	5. I dislike including this feature	R	R	R	R	Q

Table I. Kano evaluation table

Notes: A, Attractive need; O, one-dimensional need; M, must-be need; I, indifferent; R, reverse; Q, questionable
Source: Kano *et al.* (1984)

$$\mathrm{DI} = -\frac{O+M}{A+O+M+I} \tag{7}$$

Classifying customer needs based on the Kano model in product design has been widely practiced among industries (Jiao and Chen, 2006; Xu *et al.*, 2009; Yu and Ko, 2012). In applying the Kano model in NPD, researchers like Rejeb *et al.* (2011) have tried to develop the computation of functional, dysfunctional and reverse requirements. They proposed a matrix modeling based on the Kano model, which resulted in an analytic approach of the attractive quality theory, which enables the selection of innovative concepts and new ideas through the evaluation of their impact on needs satisfaction. Wang and Ji (2010) proposed a new approach for measuring and quantifying the relationships between customer satisfaction and the fulfillment of customer requirements (S-CR). In their proposed approach, the computation of SI and DI formulas was developed considering exponential slop of the curves of the Kano model.

5. Research methodology

As it was mentioned earlier, Hwang *et al.* (2004) considered present value of previous profits, potential value, and customer loyalty, and suggested an approach for calculating CLV (Equation (5)), where, P_i is the customer present profit value in Touman (Iranian currency). It is computed based on revenues and costs (particularly the costs of customer attraction such as advertising) of a particular product in a certain period of time, e.g. three years, and based on the inflation rate of business; its current value is computed. P_i/n represents the average annual present value in which, P_i is divided by number of years in the period of computing CLV. λ indicates the purchasing probability of those customers whose purchasing records are available in the company and based on the records, the revenues and costs of their attraction are considered in

computing CLV. Its value is represented by percentage and is computed by company experts regarding total days after the last purchase. ∂ denotes customer loyalty coefficient and addresses the percentage of customer purchases.

However, in this approach and in other approaches of determining CLV, customers' expectation of product requirements and their satisfaction ratio have not been considered, and only after producing and selling product, based on historical information, it has been calculated. In this paper, an attempt has been made to estimate CLV prior to producing a new product. It is assumed that customer repurchase (loyalty indicator) depends on his/her satisfaction ratio, hence the Kano SI can be used for calculating CLV, and in each phase of customer lifetime, special requirements should be studied. Regarding shortages stated in other equations, the following equation is developed in which, the Kano SI is used instead of loyalty indicator:

$$\mathrm{CLV} = P_i + \frac{P_i}{n}\left(\lambda + \frac{A+O}{A+O+M+I}\right) \tag{8}$$

Since for calculating the proposed CLV, some data are related to customer's records and some data are related to the results of the Kano questionnaire, which should be asked from existing customers, the statistical population includes existing customers of the automobile industry who has purchased in a certain period of time at least once from the company, and their records and purchasing behavior exist in the documents of the company. Research sample includes customers introduced by the company who purchased in the last three years from January 2010 to January 2013. The steps flowchart of this study is illustrated in Figure 2.

According to the flowchart, and based on steps one to four, the Kano questionnaire should be developed and regarded as the basis for determining Kano satisfaction coefficient. In the seventh step, based on experts' viewpoint and considering marketing strategies in each phase of PLC, the Kano requirements are allocated to various phases of product and customer lifetime. In Figure 3, the PLC, and customer lifetime are separated and labeled by Kano requirements and entered into various phases; and for each phase, the proposed equation (Equation (8)) is applied.

Figure 3 illustrates allocating Kano requirements to various phases of customer lifetime which has been obtained by interviewing 20 industry and university experts. Based on the results obtained from interview, 90 percent of interviewees believe that must-be requirements should be considered in all phases, but they should be paid more attention in the phases of design, introduction, and growth. This is because they are necessary features of a product and their lack will result in customer dissatisfaction and exit. The results of a binomial test on the responses of the 20 experts indicate that the hypothesis of allocating must-be requirements to all phases is confirmed at 71 percent level of confidence.

In all, 80 percent of interviewees believe that attractive requirements should be considered in the phase of growth, so that they result in attracted customer. This is due to the fact that when a new product enters the growth phase, more competitors enter market with the aim of gaining new opportunities. Therefore, the objective of marketing would be increasing company's market share, and for this purpose, investing in attractive requirements provides a great advantage to the company. The result of a binomial test on the responses of the 20 experts indicates that the hypothesis of allocating attractive requirements to the growth phase is confirmed at 59 percent level of confidence.

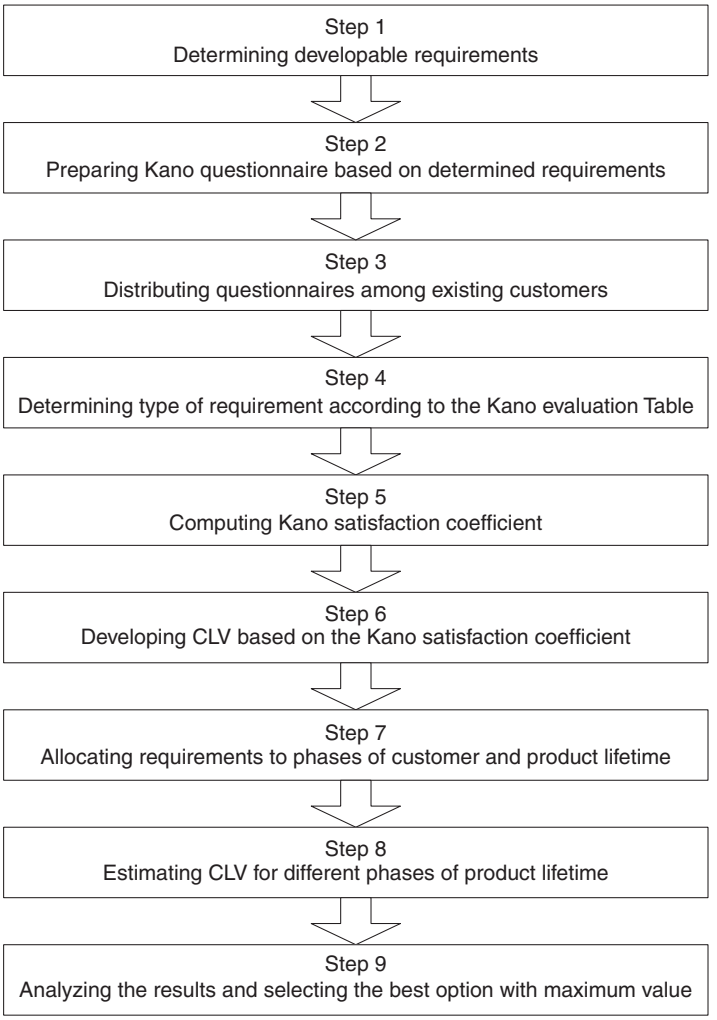


Figure 2.
Steps flowchart of study

In total, 95 percent of respondents believe that the one-dimensional requirements should be considered in the introduction and maturity phases. In the introduction phase, there are innovative customers and the objective of marketing would be developing of customer awareness about product, introducing products to potential customers and attracting them. On the other hand, customers think about those of their needs, which can be expressed, i.e. one-dimensional requirements. Since at these phases, the cost and competition are relatively high, focussing on attractive and costly requirements is not reasonable. By introducing the new product, initial adopters are attracted and new customers try to purchase it until the phase of maturity. In the maturity phase, the number of competitors is stabilized. In this phase, the aim of marketing function is to gain maximum profit, while keeping market share. Therefore, those requirements should be more focussed, of which their associated costs do not increase and existing customers could be kept. Hence, focussing on one-dimensional

requirements seems reasonable. The results of a binomial test on the responses of the 20 experts indicate that the hypothesis of allocating one-dimensional requirements to the introduction and maturity phases is confirmed at 78 percent level of confidence.

In all, 85 percent of respondents believe that in the decline phase, those indifferent requirements can be focussed which have less cost, since at the decline phase, competitors will gradually move out from the market. At this phase, the objective of marketing function is to minimize costs and maximize utilization of product advantages. Therefore, it would be reasonable to focus merely on must-be requirements; and if there is any chance of reducing costs by including indifferent requirements, they should be included, since their existence/none existence makes no difference to customer. The results of a binomial test on the responses of the 20 experts indicate that the hypothesis of allocating indifferent requirements to the decline phase is confirmed at 65 percent level of confidence.

According to the proposed model (Figure 3), the position of product in lifetime cycle is specified and the proposed equations in each phase are used for estimating CLV; thus, satisfaction coefficient based on the Kano model is used instead of loyalty coefficient (Equation (5)). For example, if most of the requirements from customer's viewpoint are attractive, it means that the product is in the growth phase and the corresponding equations should be used.

The proposed approach compared to other approaches introduced in Section 2 provides a comprehensive perspective due to the fact that it can not only be used for early estimation of CLV, but also provides a basis for product development regarding the position of product in its life cycle. In fact, the new approach integrates PLC with CLV, in a way that if the company under study fulfills a customer's need (in the associated phase of PLC), CLV will be increased. In the approach of Mudie and Cottam (1999), merely customer purchase and intangibles were concentrated and customer satisfaction, which leads to customer loyalty, was not considered. Also, in the approaches of Hoekstra and Huizingh (1999), Berger and Nasr (1998), and Hwang *et al.* (2004), only customer costs and revenues were counted. However, the approach of Hwang *et al.* (2004) seems more complete compared to other approaches, because they considered customer loyalty in their estimation; but it is important to note that even in their approach, loyalty was computed regarding frequency of purchase, which is based

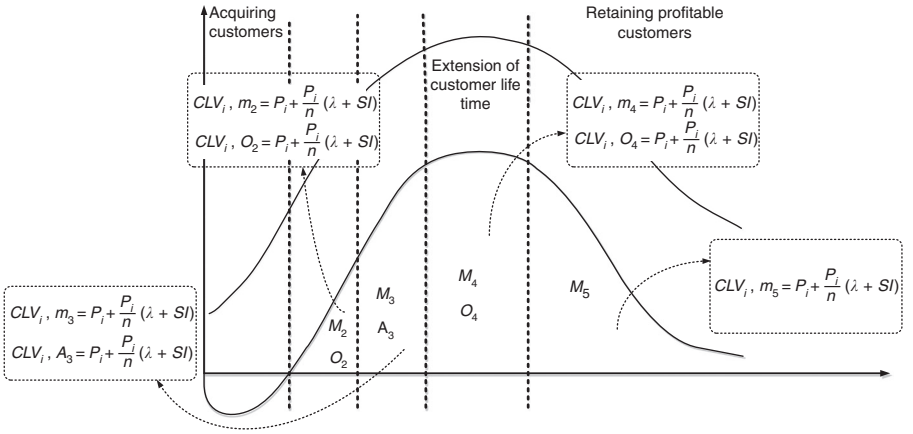


Figure 3.
Proposed model for allocating Kano requirements to various phases of customer lifetime and product life cycle

on the past records of customer purchase and therefore, the advantage of the proposed approach of this paper over the literature is apparent in incorporating prospecting customer behavior in the estimation of CLV.

6. Case study

Since automobile industry is a luxury and competitive sector and is looking for maximizing customer satisfaction, it requires developing and producing varied products. The proposed approach can be appropriate in determining desired requirements for development of products in the automobile industry. Apart from the advantages of integrating the Kano model and CLV, due to the dynamic nature of requirements in the Kano model, the proposed approach is only capable of solving short time periods. Therefore, the automobile industry as a relatively luxury sector is selected for investigation. The proposed approach is examined in Iran Khodro Company as the largest car making company in Iran. Two separate sets of options of Soren and Samand (Iranian car brands) are determined by the department of research and development of the company for product development. Regarding the position of product in the life cycle, it is found that the product is at the growth phase. Hence, the appropriate formula for estimation of CLV is used according to Figure 3. Ultimately, by comparing the ratio of CLV, management can decide on what type of requirements to invest in. It is important to note that the authors could examine the proposed approach only on one option, but due to the NPD processes and also with respect to the role of value engineering in desirable selection of product design options, two options are considered for investigation in order to show how the proposed approach can contribute to NPD and value engineering subjects.

Developable requirements in the first option, i.e. Soren, include installing turbo charger engine EF7 TC, developing gasoline engine EF7, and optimal gearbox. Developable requirements in the second option, i.e. Samand include designing and manufacturing dashboard collection equipped with front passenger safety air bag, installing micro hybrid system, and designing and manufacturing rear axle. The Kano questionnaire is designed and filled based on mentioned requirements and viewpoints of 100 existing customers whose records exist in the company in a three years period.

7. Findings

The results obtained from collecting filled questionnaires are presented in Tables II and III. The first row of Tables shows the types of Kano requirements. The second row of these tables belongs to frequency of responses to the Kano questionnaire; for example, according to Table III, 62 customers have answered "M" in respect of having front passenger safety air bag; implying that front passenger safety air bag is a must-be requirement. In all, 14 customers believe this requirement as an "O" type, meaning that existence of front passenger safety air bag is a one-dimensional requirement; 15 customers feel that this requirement is attractive; seven customers consider it as

Table II.
Results of the analysis of Kano model for the first product development option

Requirement	M	O	A	I	Q	R	Total	Classification
Installing turbo charger engine EF7 TC	10	15	50	5	8	2	100	A
Developing gasoline engine EF7	10	70	16	2	2	0	100	O
Optimal gearbox	5	10	80	5	0	0	100	A

indifferent; two customers have answered suspicious responses; and no one believe it to be reverse.

Since it is assumed that the requirement category can be determined regarding the highest frequency, finally, existence of front passenger safety air bag in automobile is elected as a must-be requirement. Similarly, installing micro hybrid system is an attractive requirement, and designing and manufacturing rear axle is an indifferent requirement.

In the next stage, considering the results of Tables II and III, satisfaction and dissatisfaction coefficients of two various options of product development in the Samand product are calculated and addressed in Tables IV and V.

Table V indicates that if the company invests in the requirement of front passenger safety air bag, it would result in 29 percent customer satisfaction, and if not, would result in 76 percent dissatisfaction.

The satisfaction coefficients obtained from the analysis of the Kano model, regarding the position of requirement in the life cycle, are entered into the proposed Equation (8), and the CLV is calculated for both options.

With respect to Figure 3, it is apparent that the product is at the growth phase; thus the CLV should be calculated for the first development option based on satisfaction

Table III. Results of the analysis of Kano model for the second product development option

Requirement	M	O	A	I	Q	R	Total	Classification
Front passenger safety air bag	62	14	15	7	2	0	100	M
Installing micro hybrid system	1	25	70	2	2	0	100	A
Designing and manufacturing rear axle	5	1	0	89	5	0	100	I

Table IV. Satisfaction and dissatisfaction coefficients of the Kano model for the first option

Requirement	M	O	A	I	Total	Classification	Customer's Satisfaction $\frac{A+O}{A+O+M+I}$ (%)	Customer's Dissatisfaction $\frac{M+O}{(A+O+M+I)\times(-1)}$ (%)
Installing turbo charger Engine EF7 TC	10	15	50	5	100	A	65	−25
Developing gasoline Engine EF7	10	70	13	2	100	O	86	−80
Optimal gearbox	5	10	80	5	100	A	90	−15

Table V. Satisfaction and dissatisfaction coefficients of the Kano model for the second option

Requirement	M	O	A	I	Total	Classification	Customer's Satisfaction $\frac{A+O}{A+O+M+I}$ (%)	Customer's Dissatisfaction $\frac{M+O}{(A+O+M+I)\times(-1)}$ (%)
Front passenger safety air bag	62	14	15	7	100	M	29	−76
Installing micro hybrid system	1	25	70	2	100	A	95	−26
Designing and manufacturing rear axle	5	1	0	89	100	I	1	−6

coefficients of attractive requirements, i.e. 0.65 and 0.90. Consequently, the following equation is used:

$$CLV_i, A_3 = P_i + \frac{P_i}{n}\left(\lambda + \frac{A+O}{A+O+M+I}\right)$$

$P_i = 150{,}000{,}000$ toumans: the present value is the subtraction of costs from incomes obtained from 100 customers during three years. $P_i/n = 50{,}000{,}000$ toumans: the average of present value is the subtraction of costs from incomes obtained from 100 customers during three years.$\lambda = 0.3$: repurchase probability determined by experts of each company and is unique for that company.

The CLV for the first development option is computed as follows:
CLV_i, $A_3 = 150{,}000{,}000 + 50{,}000{,}000(0.3 + 0.65) = 197{,}500{,}000$ toumans
CLV_i, $A_3 = 150{,}000{,}000 + 50{,}000{,}000(0.3 + 0.90) = 210{,}000{,}000$ toumans
$CLV_i = 197{,}500{,}000 + 210{,}000{,}000 = 407{,}500{,}000$ toumans

The CLV for the second development option with regard to Figure 3 in the phase of growth is calculated based on satisfaction coefficient of attractive (0.95) and must-be (0.29) requirements. Thus, the following equations are used:

$$CLV_i, M_3 = P_i + \frac{P_i}{n}\left(\lambda + \frac{A+O}{A+O+M+I}\right)$$

$$CLV_i, A_3 = P_i + \frac{P_i}{n}\left(\lambda + \frac{A+O}{A+O+M+I}\right)$$

The CLV for the second option is computed as follows:

CLV_i, $M_3 = 150{,}000{,}000 + 50{,}000{,}000(0.3 + 0.29) = 179{,}500{,}000$ toumans
CLV_i, $A_3 = 150{,}000{,}000 + 50{,}000{,}000(0.3 + 0.95) = 212{,}500{,}000$ toumans
$CLV_i = 179{,}500{,}000 + 212{,}500{,}000 = 392{,}000{,}000$ toumans

8. Discussion

Findings indicate that if the company invests in the first option, CLV would increase. Therefore, the first option is on priority. This is due to the fact that the product is at the growth phase, and based on the comments of experts, if at this phase the attractive and must-be requirements are emphasized, customer satisfaction would be higher. At the growth phase, the product share in the market is growing; therefore, it is necessary to focus on must-be requirements so that the company remains in the competition arena. Moreover, the attractive requirements should also be concentrated.

For the first option, developing and installing turbo charger engine EF7 TC is determined as attractive requirement, which means that its presence results in satisfaction and its lack does not create dissatisfaction. Developing gasoline engine EF7 and optimal gearbox are determined as one-dimensional and attractive requirements and have 86 and 90 percent satisfaction coefficients. It means that when the gasoline engine is presented, customer would be as satisfied as when it is not presented and the customer will become 80 percent dissatisfied. Moreover, optimal gearbox is an attractive requirement and if it is not presented, it would result in only 15 percent dissatisfaction. Considering the point that the product is at the growth

phase, in calculating CLV, satisfaction coefficients of attractive requirements are regarded, and in this case, CLV will be equal to 407 million and 5,000 toumans.

For the second option, a similar analysis can be performed, with this difference that in the second option, installing micro hybrid system is an attractive requirement with 95 percent satisfaction coefficient, meaning that if this requirement is considered in the product, it would result in high customer satisfaction, but its lack would not create a significant dissatisfaction. Designing and manufacturing rear axle requirement is also an indifferent requirement with 1 percent satisfaction coefficient. In this case, CLV in the second option will be equal to 392 million toumans. The reason of increasing CLV in for first option is because of existence of two attractive requirements among requirements which results in high satisfaction coefficient.

Actually, in this study it is assumed that at the growth phase, the company should concentrate on attractive requirements after must-be requirements, so that more customer value is created, and mutually, customer creates more value for the company. Therefore, company can compare CLV in two development options and decide on investing in the option with more lifetime value, which in this study is the first option.

Findings are compatible with the results of researches performed by Hwang *et al.* (2004), because in this study, CLV is estimated in short time and is appropriate for industries with changing and dynamic customer needs. The advantage of this study compared to literature and also to the approach of Hwang *et al.* is that in other approaches for determining CLV, customer's historical information has been used, and none of the CLV estimators consider customer satisfaction prior to production. Therefore, it seems that the proposed approach can be an effective method for appropriate allocation of resources and value engineering, because it prevents worthless allocation of resources to requirements which do not add value and do not create customer satisfaction.

It is important to note that for companies to succeed in applying the new approach it is necessary to create customer-oriented culture and trusted relationships; also, to hold justification meetings among personnel and continuous sessions with long stay customers in order to utilize and incorporate their viewpoints into the proposed approach of estimating CLV. The findings of this study can benefit different industries including the automobile industry in the following ways:

- estimating CLV of new products prior to production and entering products to the market, particularly in the industries of automobile, appliances, clothes manufacturing, and banking services;
- ensuring presence or lack of competitive advantage before investing in new products/services;
- predicting market share by estimating customer satisfaction ratio and loyalty of new products;
- selecting the best option(s) for developing new products with regard to customer satisfaction ratio and lifetime value;
- engineering value in producing new product and reducing unnecessary costs which will add value will not result in customer satisfaction;
- appropriate allocation of resources with regard to classified requirements of the Kano model in various phases of PLC; and
- supporting marketing activities and market studies.

9. Conclusions

In this study, satisfaction coefficient of new product requirements was calculated based on the Kano approach in the automobile industry, and considering the relationship between satisfaction and loyalty in Equation (8) instead of loyalty indicator, the SI of Kano was used, and then by interviewing a group of experts, Kano requirements were allocated to various phases of PLC. It was determined that the studied product was at the growth phase of the cycle. Ultimately, by using the data related to customers' purchase records during a three years period, CLV was calculated.

The proposed equation in the automobile industry was examined on two various options of product development and after calculating Kano satisfaction coefficients in both options, and considering the position of studied product in its life cycle, appropriate equations were used at the growth phase. CLV was estimated for the first option as 407 million and 500,000 toumans, and for the second option as 392 million toumans. By comparing these two values, the first option was targeted with higher priority.

Findings indicate that the proposed approach compared to other approaches of estimating CLV is prospective and can be an effective method for appropriate allocation of resources and value engineering, because it prevents worthless allocation of resources to the requirements which do not add value and do not create satisfaction. Since in the proposed approach, CLV is estimated in a short time, it seems appropriate for industries with high competition and changing needs of customer. Moreover, using the Kano model in calculating CLV, results in reverencing clients, understanding community requirements, respecting consumers' rights, and increasing corporate social responsibility.

Since the Kano model is a dynamic model, customer requirements change over time. For example, in the past producing an instrument for long distance communication (i.e. telephone) was regarded as an attractive requirement, but later when mobile phones entered the markets, telephones were no longer attractive and nowadays they are recognized as must-be requirements. Therefore, since the model of Hwang *et al.* (2004) is able to only calculate CLV in short time, the proposed approach can only solve short-term periods. Also the findings are limited to the automobile industry, while the methodology can be generalized to other industries. Another limitation is related to the allocation of Kano requirements to various phases of PLC, which is also restricted to evaluating marketing strategies and interview techniques. In this paper, computation of SI and DI was conducted based on the basic approaches of the Kano model. Also, allocation of customer requirements to different phases of PLC was performed merely based on experts' viewpoints. While this can be considered as a limitation, it should be noted that different companies and products have different life cycles and therefore, such allocation should be rechecked for new products when the new approach is applied.

Other researchers can develop the proposed approach in future investigations in a way that in addition to existing customers, potential customers can be studied and, respectively, customers' potential value can be calculated. Also, other indicators instead of Kano SI can be determined which confronts with less limitation in asking customers to fill dual Kano questionnaires. In this regard, particularly the study of Wang and Ji (2010), the proposed equation of estimating CLV can be developed further and the findings could be compared with the results of this study. For allocating Kano requirements to various phases of PLC, other group decision making methods can be applied in addition to interview.

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Further reading

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