Product Development Using Quality Function Deployment (QFD)

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Abstract: *The company subsistence on the open market is heavily dependent on its capacity to identify new customer requirements and to develop a new product. The Quality Function Deployment (QFD) is method which can be used in new product development process* □1□*. In research which results are presented here, QFD method was applied for creating soap quality improvement plan. Analysis is based on customer□s evaluation about importance of some characteristics for product quality.*
Keywords: *project, product development, quality improvement plan, QFD.*

1.   INTRODUCTION

Soap is a surfactant used in conjunction with water for washing and cleaning that historically comes in solid bars but also in the form of a thick liquid. Historically, soap has been composed of sodium (soda ash) or potassium (potash) salts of fatty acids derived by reacting fat with lye in a process known as saponification. The fats are hydrolyzed by the base, yielding glycerol and crude soap [2]. Andrew Pears started making a high-quality, transparent soap in 1789 in London.

In this research are considered quality characteristics of soap like a product which is very important for daily life. We are using soap daily, several times of day. He is very important for general health of people because he is defers dirty lodes from skin surface, whether we are talking about dust, dirt or skin products. He is prevents bacteries development [2]. This is some reasons why we select the soap like research object. Therewith, appropriate literature sources about this product was accessible for authors.

The goal of this research is determining relative and absolute importance of particularlly soap characteristics, like a base for quality plan product creating**.** There are many criterions for soap selecting: smell, colour, format, structure, price, etc. [6] It is unlikely that an organization can satisfy all of its customers' requirements. Therefore, it is necessary determining which characteristics are more important than another, and working in the first time on their improvement. In this paper is given importance analysis of some soap characteristics for its quality on the base of evaluation from product customers using Quality Function Deployment (QFD) method. The results of analysis shall to be base for product quality development plan creating.

The QFD method is systematic and analytic method for data collecting about customer′s expectations. QFD represent planning process to translate customer′s requirements (the voice of the customer) into appropriate technical requirements for all phases in product life cycle (marketing, planning, product design, prototype development, research and development production process, production, sale) [1].

The QFD method concept is divided in two basic activities: product quality development and quality function development. Product quality development turn the «voice of customer» into quality management characteristics. For quality function deployment activities the quality defined from customer must be realizable. QFD researching enterprise answer on voice of customer by means of organized team approach [5].

2.   THE QFD MATRIX

The QFD matrix consists of six parts [4]. On picture 1 presented components of vertical and horizontal matrix part.

Phase 1: Customer requirements determining. This is startup and most critical step in QFD process in which we collecting informations about requirements, expectations and   reclamations from customer in relation with   product.   Customers`   requirements validation is realizes with benchmarking, using desk panels, discussion groups, interview, questionaires etc. In this research list of customer requirements was defined   using literature   and   Brainstorming   method   in

enterprise.   After   data   collecting   (using questionnaire with open questions), was created next list of customer requirements [4]:

1)   price,
2)   brand,
3)   fragrance,
4)   vitamins,
5)   naturalness,
6)   eye burn prevention,
7)   softens skin,
8)   skin brightness,
9)   easy to foam,
10)   easy to rinse,
11)   packaging,
12)   ergonomy,
13)   appropriate for skin.
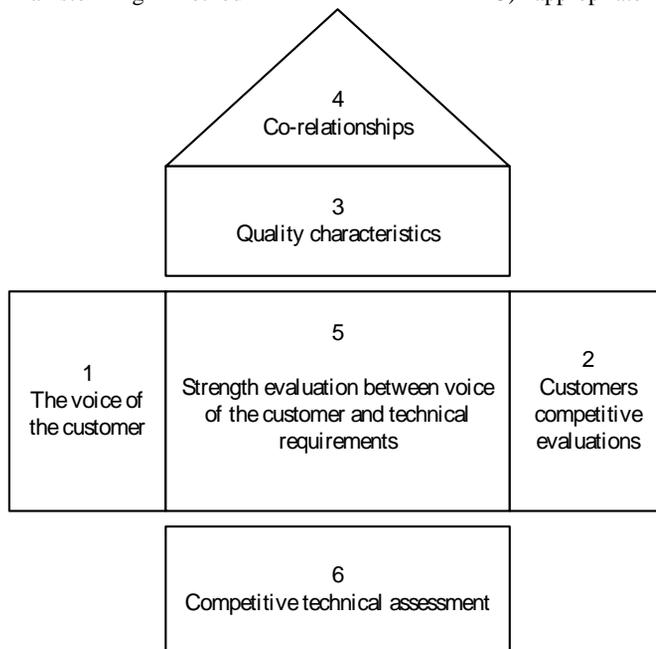
Picture 1. Components of horizontal and vertical matrix part

At any one time it is unlikely that an organization can satisfy all of its customers' requirements. Therefore it is necessary defining which quality characteristics are major than another for customers [6].

Importance evaluation was realized by customers value assignment   on grading sheet from 1 to 5, whereby 5 represent very important requirement, and 1 – requirement with small importance. In table 1 is given median and standard deviation estimations about some product characteristics importance. Most important characteristic is "appropriate

for skin», «skin brightness », «skin softening», etc. Soap packaging is characteristic with least importance. For final estimation about same product   characteristics   importance   it   is necessary realize analysis of factor, which are included into product characteristics.

The   factor   analysis,   like   one multivariety   technique,   linking   three characteristics in factor 1, three characteristics in factor 2 and two characteristics in factor 3, in such a way that consist unique share of 3 factors in each of 8 characteristics.

Table 1. Median and standard deviation of customers estimation about several soap characteristics

Characteristic	Median	Standard deviation
Packaging	2,71	1,25
Price	3,05	1,23
Eye burn prevention	3,09	1,36
Ergonomy	3,09	1,33
Brand	3,70	1,20
Easy to foam	3,85	0,99
Smell	3,90	1,06
Easy to rinse	3,96	1,02
Naturalness	4,05	1,02
Vitamins	4,25	0,97
Skin softening	4,33	0,92
Skin brightness	4,35	0,91
Appropriate for skin	4,50	0,64

Table 2. Importance factors

Characteristics	Factor		
	1	2	3
Skin brightness	0,800		
Skin softening	0,657		
Smell	0,572		
Naturalness		0,851	
Vitamins		0,747	
Appropriate for skin		0,703	
Easy to foam			0,817
Easy to rinse			0,803

Phase 2. Customer competively assessment. In this phase accenting competitively enterprise weaknesses, advantages and identifying areas in which quality improvement is necessary. Customer`s competively estimation was realized on base of results: customer estimation, customer assessment about enterprise performances, customer assessment about competitors performances, improvement coefficient, the sale value, importance range..

Phase 3. Technical requirements determining. In this phase the goal is every „voice of customer" to translate in one or much technical requirements. Every technical requirement must be appreciable and generic and must appropriate to „voice of customer". This phase is indicated like „what" with question for identifiaction appreciable and defined product project characteristics.

In this research eight important quality characteristics defined in [2] is included for customer requirements satisfaction: performances, features, reliability, conformance, durability, serviceability, aesthetics, noticable quality. All characteristics are commented in follow-up.

The performances refers primary operating characteristics of product or service. When we are talking about soap, these characteristics including cleanliness factor, apropos characteristics easy to foam and easy to rinse.

Features are certain characteristics which are increasing product or service suitability for customer. The examples for these characteristics are additions in the soap, brightness for normal skin or vitamins for skin maintenance.

Product reliability is possibility that product do not induce problems in the certain time period. Griffin predicating that is reliability characteristic which relating simply to technical products, but there are many examples which are demonstrating that is reliability the key requirement for services or

goods.

Conformance is compatibility measure between product and appropriate standards.

Durability represent time of product usage. For soap, that is the time in which he can save efficiency of his formula.

Serviceability is quckness of product maintenance, when appear problem in practice, and depending from competency and speciality of person which are maintaining product.

Aesthetics is subjective measure of customer reaction to product. This is the way individual reaction to look, feeling, ton, flatter and smell.

Phase 4: Defining relationships between technical requirements. The roof of „house" is foresaw for linking between technical requirements. Improvement of certain requirement can induce positive or negative effect for another requirements. In literature corrective matrix often presented with four symbols. Double circle represent very positive relationship, single circle – less postitive relationship. Double X represent very negative relationship and single X – negative relationship.

Phase 5: Matrix of relationships between „how" and „what". After identification „what" and „how" the construction of „quality house" are proceeding by identifiaction relationships between voice of customer and technical requirements. For matrix construction relationships between „how" i „what", it is necessary to establish relationship between every „what" and every „how". Relationships can be described like strong, medium and low. The value 9 represent strong relationship, value 3 – medium relationship and value 1 or 0 – low relationship (table 3).

Table 3. Matrix of relationships between "how" and "what" [4]

What		Important of requirement	Performances	Features (formula)	Reliability	Conformance	Durability	Service-ability	Aestetics
First level	Second level								
Manage-ability factor (factor 1)	Skin brightness	16,18	1	9	9	9	1	3	9
	Skin softening	16,65	1	9	9	9	3	3	9
	Smell	8,57		3	3	9	9	3	9
Maintenance factor (factor 2)	Naturalness	12,60	9	9	3	9	1	3	9
	Vitamins	9,31	3	9	3	9		1	1
	Appropriate for skin	16,77	3	9	9	9	1	3	3
Cleanliness factor (factor 3)	Easy to foam	8,47	9	9	9	9	3	3	
	Easy to rinse	11,45	9	9	9	9	3	3	
Importance		100,00%	403,755	848,583	900,001	900,002	232,397	281,386	545,624

Phase 6: Importance determining. Importance was calculated for every technical requirement which represent combination of importnace which is given from customer and relationship strength.

Phase 7: Quality plan. After importance determining, we can see which technical requirement shall first improve [11]. In this case, conformance and reliability are most important technical requirements.

3. CONCLUSION

In open market conditions, just one product characteristic can be critical for

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customer lojality in regard to competitors products. Characteristic which is noticable, have two dimensions: the preferency level and noticable appreciate level. If customer have strong preference for certain product and if there is not noticable differente between that product and others, he can decide for whatever alternative. Strong preference in combination with low difference perception can lead lojalty in regard to many products.

In researched case, in the time defining quality improvement plan for soap,

most attention shall cocentrate in two technical requirements – conformance and reliability (importnace 900,00). Third important quality requirement are features-formula (importance 848,58), fourth- aesthetics (importance 545,62), sixth- performances (importance 403,75), seventh- serviceability (importance 281,38) and in the end durability (importance 232,39).

Quality plan formation according to results of this research, provides competitively item of company in complex and unstedy market conditions.

REFERENCES:

[1] Boucherau V., Rowlands H.: Methods and techniques to help Quality Function Deployment (QFD), Benchmarking: An International Journal, Vol. 7, No. 1, 2000, pp. 8-19.
[2] Bramson A.: Soap: Making it, Enjoying it, Second Edition, Workman Publishing Company, New York, 1975.
[3] Miller Cavitch S.: The Natural Soap Book: Making Herbal and Vegetable-Based Soaps, Storey Publishing, Pownal, Vermont, 1995.
[4] Zaim M., Sevkli M.: The Methodology of Quality Function Deployment with Crisp and Fuzzy Approaches and an Application in the Turkish Shampoo Industry, Journal of Economic and Social Research, Vol. 4, No. 1, Jan. 2002, pp. 27-53
[5] Khoo L. P., Ho N. C.: Framework of a fuzzy quality function deployment system, International Journal of Production Research. Vol. 34, No. 2, 1996, pp. 299-311.
[6] Day R. G.: Quality Function Deployment: Linking a Company with its Customer, ASQC Quality Press.
[7] Darral G. C.: Johnson Wax, Harward Business School Review, August 2, 1999.
[8] Griffin J.: Customer Loyalty: How to earn It How to Keep It, Jossey-Bass Publishers, 2000.
[9] Evans J. R., Lindsay W. M.: The Management and Control of Quality, South-Western College Publishing, 1999.
[10] Bossert, J.L. (1991). Quality Function Deployment: A Practitioner's Approach, ASQC Quality Press, pp.5-6.
[11] Dean Edwin B. "Quality Function Deployment", http://mijuno.larc.nasa.gov/dfc/qfd.html
[12] Moven John C.; Minor Michael S. (2001). Consumer Behavior: A Framework, Prentice – Hall.pp.2001.
[13] Omachonu Vincent K. (1991). Total Quality and Productivity Management in Health Care Organization, ASQC Quality Press and Institute of Industrial Engineering, pp.136-150.