Identification of Critical Points
in the Quality Management System

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Abstract. *Creating a quality management system can help organizations and other stakeholders in satisfying customer needs and expectations. Moreover, a well-implemented quality management ensures the organization a capable structure to make continuous improvement actions. Thus, after the evaluation of the quality management system elements, the identification of critical points is a very important element. There are several ways of assessing and identifying these critical points; in this case, identification will be done by questionnaire survey carried out at the Székely National Museum in Saint George. The questionnaire aimed to assess the whole system of management and staff attitudes towards some considerations established by international standard ISO 9001:2008.*

Keywords: quality management system; visitor satisfaction; management responsibility; resource management; social-economic development.

JEL Codes: C12, M31, L83.
REL Codes: 14B, 14K.

Introduction

Quality management system is a broad concept and can be defined as a systemic set of management procedures used to monitor, check and improve the organization of financial and operational actions in order to provide the best products/services at reduced costs.

Management procedures which constitute the quality management system include subsets of activities listed as follows: quality assurance, quality control and quality improvement. Quality assurance activities aim to assure that all exchanges of this process are clearly identified and evaluated. Quality control is a process also known as "statistical quality control" – which allows the evaluation of current organizational achievements individualizes and does the necessary actions to eliminate unwanted operations. Improving quality is a continuous and systemic activity, which includes all company processes, aimed at performance. In this case standard sets out some key points related aspects of quality objectives such as management responsibility, resource management, product realization, measurement analysis and improvement.

Methodological framework

Descriptive research and causal research, based on probability representative samples, require knowledge of research variables in the studied population. This knowledge requires achieving inference or extrapolation of the achieved results from the descriptive statistics on the population from which the sample came. Inferential statistics allows the estimation of population parameters with some error and a confidence level or probability. It also allows statistical hypothesis testing research, measuring the intensity of the relationship between variables, comparing the differences between parameters from different groups or populations. The logic of statistical inference is based on statistical tests.

Statistical hypothesis does not concern the survey statistics, but the real values of the parameters involved and the characteristic forms of the considered distributions. Operation of the assumption is made by the data sample that represents the element of knowledge, which through the procedures provided by the theory of estimation, brings more or less closer to the true value of a parameter.

Hypothesis testing is closely related to the theory of estimation. It is a procedure that, according to certain rules of decision, can reject a hypothesis or not allowed on a parameter or distribution. The problem of the outcome of an experiment appears, if the values recorded are indeed distributed according to the proposed theoretical law. The hypothesis which is formulated on the parameters of distributions or distribution law which the variable statistics

follows is called statistical hypothesis. For a statistical hypothesis to be verified the term null hypothesis H_0 is used. H_0 hypothesis expresses the situation that researcher would have to discredit after the testing. Hypothesis that the researcher starts with and wants to confirm is called alternative hypothesis, denoted by H1. Null hypothesis H_0 is formulated so that its denial would lead automatically to the acceptance of alternative hypothesis. Alternative hypothesis is always expressed as an inequality, whose meaning can be known or unknown.

The research that I conducted measures the employees attitudes, preferences and behaviors towards the activities of the Székely National Museum. So we took our sampling from the museum staff, both from external and internal divisions. The questionnaire was structured into four major "chapters" that structure the questions such as public policy formulation, civil service, expenditure management system, public procurement, public internal audit, information regarding to the management system and in the final part general identification data of the respondents.

The identification of critical points was performed using the statistical assumptions.

⮥ **Management responsibility**

Top management must provide evidence of engagement (involvement) in developing and implementing the quality management system and improving its effectiveness through: communication to the organization the importance of customer requirements to meet statutory requirements with a regulator role, setting quality strategy, ensuring the establishing of quality objectives, leadership of management reviews, ensuring the availability of resources

Hypothesis 1

H_0: media for the degree of knowledge of the organization's goals is four points

H_1: media for the degree of knowledge of the organization's goals is different from the four points

H_0: $\pi_0 = 4$ points

H_1: $\pi_0 \neq 4$ points.

Table 1

One-sample statistics - degree of knowledge - goals

	N	Mean	Std. Deviation	Std. Error Mean
Degree of knowledge - goals	48	3.21	.967	.140

Source: according to the study carried out during the doctorate.

The media obtained on this aspect of degree of knowledge of the organization's goals is 3.21 points with a standard deviation of 0.97 (Table 1).

Table 2

One-sample test - degree of knowledge – goals

	Test Value = 4					
	t	df	Sig.(2-tailed)	Mean difference	95% Confidence interval of the difference	
					Lower	Upper
Degree of knowledge – goals	-5.674	47	.000	-.792	-1.07	-.51

Source: according to the study carried out during the doctorate.

The value of t_{obs} is -5.674 which will be compared with the value of t for 47 degrees of freedom and $\alpha = 0.05$. For a test unilateral to right $t_{0,05,47} = 2.01$ (Table 2), $t_{obs} < t_{0,05,47}$ results that the null hypothesis is accepted. This can also be seen in the value of Sig. (2-tailed) which is less than 0.05 (the value of α), so we can guarantee 100% that the media for the degree knowledge of the organization's goals is not different from four points - and that the confidence interval contains the value 0, indicating the acceptance of the null hypothesis.

Hypothesis 2
H_0: media for the degree of information on the needs and expectations beneficiaries is 3.4 points
H_1: for the degree of information on the needs and expectations beneficiaries is different from 3.4
H0: $\pi_0 = 3.4$
H1: $\pi_0 \neq 3.4$

Table 3

One-sample statistics - informing the staff

	N	Mean	Std. Deviation	Std. Error Mean
informing the staff	48	3.23	.805	.116

Source: according to the study carried out during the doctorate.

For the 48 subjects who answered this question the obtained media is 3.23 points with a standard deviation of 0.805 points (Table 3).

Table 4

One-sample test - informing the staff

	Test Value = 3.4					
	t	df	Sig.(2-tailed)	Mean difference	95% Confidence interval of the difference	
					Lower	Upper
informing the staff	-1.470	47	.148	-.171	-.40	-.06

Source: according to the study carried out during the doctorate.

The value t = -1.470 (Table 4) represents the value of the critical report t_{obs}, with a number of 47 degrees of freedom. This value is compared to the value from distribution law table Student $t_{0,05;47}$ = 2.01. It is noted that t_{obs} <$t_{0,05;47}$ and then H_1 is rejected and H_0 is accepted. Thus subjects surveyed believe that informing the staff is acceptable tilting towards better information.

Next the relationship between two variables will be tested, and with χ^2 test will try to highlight the link between respondents' opinion on the staff information about their needs and their activity impact on customer satisfaction.

χ^2 test is a non-parametric test used to analyze the links between two variables measured with nominal scale. As in the case of such variables the average can not be calculated, the test will be applied based on absolute and relative frequencies, as with all non-parametric tests. With this test it is aimed to highlight the significance of differences between observed frequencies and some frequencies based on an assumed distribution of the population, called the expected frequencies.

For the test application, based on observed frequencies are presented in contingency table expected theoretical frequencies are calculated assuming that null hypothesis were true. Expected frequencies, denoted with E_{ij}, are determined from the observed frequencies as follows:

$$Eij = \frac{(total\ line\ i) \times (total\ line\ j)}{grand\ total} \tag{1}$$

A size $\chi2_{calc}$ is calculated necessary for the test application:

$$\chi^2_{calc} = \sum_{i=1}^{r}\sum_{j=1}^{c}\frac{\left(O_{ij} - E_{ij}\right)^2}{E_{ij}} \tag{2}$$

To make the decision, the size χ^2_{calc} is compared to the theoretical value $\chi^2_{\alpha,df}$ from the χ^2 distribution table given the level of significance chosen and the number of degrees of freedom.

The decision rule is:

☞ H_0 is accepted if $\chi^2_{calc} \leq \chi^2_{\alpha,df}$

☞ H_0 is rejected and H_1 is accepted if $\chi^2_{calc} > \chi^2_{\alpha;df}$.

Hypothesis 3:
H_0: there is no relationship between staff informing and impact of information on customer satisfaction

H_1: there is link between staff informing and impact of information on customer satisfaction

H_0: $O_{ij} \neq E_{ij}$

H_1: $O_{ij} = E_{ij.}$

Observed absolute frequencies are shown in the table below (Table 5).

Table 5

Crosstabulation - staff informing × the impact of customer satisfaction

		business impact on customer satisfaction						Total
		+1 medium important	+2 important	+3 very important	-1 less important	-2 insignifi cant	-3 very less important	
staff informing	poor	0	0	0	8	1	0	9
	acceptable	2	0	1	12	6	0	21
	good	4	1	2	8	0	1	16
	very good	0	1	0	1	0	0	2
Total		6	2	3	29	7	1	48

Source: according to the study carried out during the doctorate.

Table 6

Chi-square tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	25.871	15	.039
Likelihood Ratio	23.625	15	.072
Linear-by-Linear Association	5.130	1	.024
N of Valid Cases	48		

Source: according to the study carried out during the doctorate.

The value of χ^2_{calc} is 25.871 (Table 6) it will be compared with $\chi^2_{0,05;15} = 24.99$. How $\chi^2_{calc} > \chi^2_{0,05;15,}$ hypothesis H_1 is accepted in the sense that we can guarantee with a probability of 95% in the total population that there are significant deferens regarding impact assessment work on customer satisfaction and staff information on the beneficiaries expectations.

The same conclusion can be made based on minimum level of significance for what H_1 can be accepted. It has a value of 0.039 (Asymp. Sig. (2-sided)) which is less than $\alpha = 0.05$, therefore the hypothesis H_1 is accepted.

Regarding to periodic tests to ensure service quality, the formulated hypothesis is:

H_0: Up to 40% of employees say that controls/regular review of quality assurance are performed

H_1: More than 40% of employees say that controls/regular review of quality assurance are performed

Table 7

One-sample statistics - quality assurance

	N	Mean	Std. Deviation	Std. Error Mean
Are periodic tests made on quality assurance?	48	.92	.279	.040

Source: according to the study carried out during the doctorate.

At the level of the 48 respondents, the average binary feature is 0.92, which means that 92% of respondents claim to be made inspections to ensure the quality of services (Table 7).

Table 8

One-sample test - quality assurance

	Test Value = 0.4					
	t	df	Sig.(2-tailed)	Mean difference	95% Confidence interval of the difference	
					Lower	Upper
There are performed periodic tests on quality assurance	12.816	47	.000	.517	.44	.60

Source: according to the study carried out during the doctorate.

The value of t_{obs} is 12.816, which will be compared with the value of t for 47 degrees of freedom and $\alpha=0.05$. For an unilateral test to right $t_{0,05;47} = 2.01$ (Table 8).

$t_{obs} > t_{0,05;47}$ results that the alternative hypothesis is accepted. This can be seen in the value of Sig. (2-tailed), is less than 0.05 (the value of α), so we can guarantee 100% that more than 40% of the staff claims that controls/regular reviews of quality assurance are made.

➲ **Resource management**

ISO 9001:2008 standard requires the organization to identify the necessary resources to support and improve the quality system processes, and fulfill customer requirements. Resources include human resources, infrastructure and working environment.

Regarding human resources, the standard requires that before the organization appoints the staff to a task, it must first define the minimum requirement of competences for that activity in terms of education, training, skills and experience. This can be solved for example in the job description, although there are no specific documentation requirements. Furthermore, the

standard requires that, if there are gaps of competence, the organization has to provide training or take other measures to fill those gaps. Standard argues that staff should be aware of the relevance and importance of its activities and how they contribute to the completion of quality objectives. Special importance is acknowledged to costumer needs. Briefings and meetings are some possible ways to ensure this awareness. Effectiveness of actions taken should be evaluated, for example, performance monitoring process.

Regarding infrastructure, the organization must identify the needs of areas, to provide necessary facilities and to maintain, perform these actions on two levels: as part of senior management consideration and based on individual contract. ISO 9000:2008 standard defines infrastructure as "a system of buildings, equipment and services required to run an organization." Infrastructure includes, as appropriate, buildings, workspace and associated utilities, process equipment (hardware and software) and support services as transport and communication. Accordingly, the same standard defines the work environment as "set of conditions in which the work is carried out" (conditions that include physical, social, psychological and environmental factors, physical conditions include factors such as temperature, humidity, vibration, air quality light and cleanliness). The organization must determine the effects of physical factors on the quality and ensure that appropriate conditions exist.

Regarding the working environment of the Székely National Museum, the respondents' opinion on this is presented in the table below. Respondents who answered affirmatively in the sense that there are 35 people out of 48 respondents which in percentage is 72.9% and the remaining 27.1% responded negatively.

Table 9

Descriptive statistics

			Statistic	Std. Error
Do you believe that the environment is appropriate for achieving service?	Mean		.73	.065
	95% Confidence Interval for Mean	Lower Bound	.60	
		Upper Bound	.86	
	Median		1.00	
	Std. Deviation		.449	
	Skewness		-1.065	.343
	Kurtosis		-.905	.674

Source: according to the study carried out during the doctorate.

The same aspect is confirmed by the data in the table above, where we can guarantee with a 95% probability that the media for the work environment appreciation is adequate, the confidence interval is [0.60, 0.86], 0.6 meaning the

lower limit and 0.86 the upper limit (Table 9). The sampling error is ±0.065, a value that is subtracted from and gathered with the sample average to obtain the confidence interval. The average for this criterion is 0.73 points with a standard deviation of 0.449 points.

In the management of financial resources, the data is as follows (Table 10):

Table 10

Descriptive Statistics – Budget performance

		Financial resources of the institution	Development programs are respected	The existence of a strategic planning document	activity orientation towards efficiency and effectiveness
N	Valid	48	48	48	48
	Missing	0	0	0	0
Mean		3.52	3.92	4.19	3.96
Std. Deviation		1.010	.871	1.142	1.202

Source: according to the study carried out during the doctorate.

The media of the responses to assess the institution's financial resources is 3.52 points on a scale of 1-5 with 1 being unsatisfactory and 5 if the respondent does not know how to evaluate the criterion.

Table 11

Existence of a strategic planning document

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	satisfactory	6	12.5	12.5	12.5
	good	9	18.8	18.8	31.3
	very good	3	6.3	6.3	37.5
	i don't know	30	62.5	62.5	100.0
Total		48	100.0	100.0	

Source: according to the study carried out during the doctorate.

A key element in activity orientation towards efficiency and effectiveness is the existence of a strategic planning document. In connection with this most of the respondents were unaware of the existence of such a document in percentage meaning 62.5% (Table 11) and regarding the activities targeting efficiency and effectiveness 47.9% (Table 12) of them said they do not know if the activities are oriented towards efficiency and effectiveness. These two issues are defining in the normal ongoing of the quality management system processes so that the management representative is required to give importance to staff information, regarding these issues, using existing instruments.

Table 12
Activity orientation towards efficiency and effectiveness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	satisfactory	10	20.8	20.8	20.8
	good	5	10.4	10.4	31.3
	very good	10	20.8	20.8	52.1
	i don't know	23	47.9	47.9	100.0
Total		48	100.0	100.0	

Source: according to the study carried out during the doctorate.

⮑ **Product achievement**

This chapter of product achievement includes the planning of product achievement, processes related to the customer, design and development, production and service assurance, control of the monitoring and measuring instruments. Usually, all these activities are part of the process, namely jobs and activities within an organization with an effort to produce something for internal and external customers, and therefore they will be taken into account when the processes will be identified. When the standard is presented separately, they may seem illogical.

To understand better product achievement and quality management system as a whole, typical processes that consist the quality management system are: 1) management processes including strategic decisions, the strategy of quality determination, quality objectives and other management tasks; 2) product achievement processes that describe the organization, including activities that are necessary to produce products and services for internal and external customers; 3) resource management processes including the determination and allocation of human resources, infrastructure and environment; 4) measurement, analysis and improvement processes that ensures that product and quality management system fulfill the requirements and the system is continuously improved.

Regarding the management system there are few records at the Szekely National Museum on the integrated management system but they do not constitute a formal management system.

About quality management programs only 4 people said they knew about these programs at a rate of 8.3%. 66.7% said that there weren't such programs and 25%, respectively 12 people, said they did not know if there are such programs at the institution.

Regarding the environmental management programs, 62.5% of the respondents knew of the existence of these programs, and 37.5% said they did

not know about these programs or that there weren't such environmental management programs. For programs related to occupational health and safety management 70.8% said they know about this type of program.

The service control means for you….

	Frequency	Percent	Valid percent
Availability of information describing the characteristics of the service	11	22.9	22.9
Appropriate equipment usage	9	18.8	18.8
Availability of work instructions	12	25.0	25.0
Implementation of monitoring and measuring activities	16	33.3	33.3
TOTAL	48	100.0	100.0

Source: according to the study carried out during the doctorate.

There is planning regarding the service achievement and this can be observed in the employees answers who in a percentage of 85.4% said there existed planning on service achievement.

As it can be seen in the table above (Table 13), service control means for each employee something else due to the specifics of each job and the activities within them.
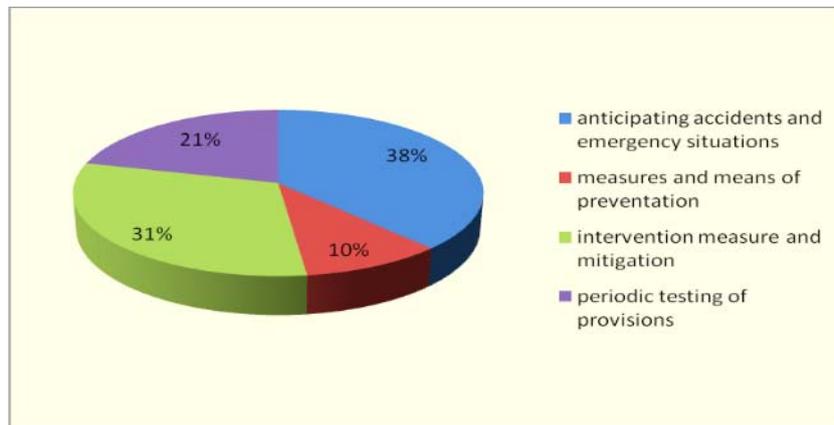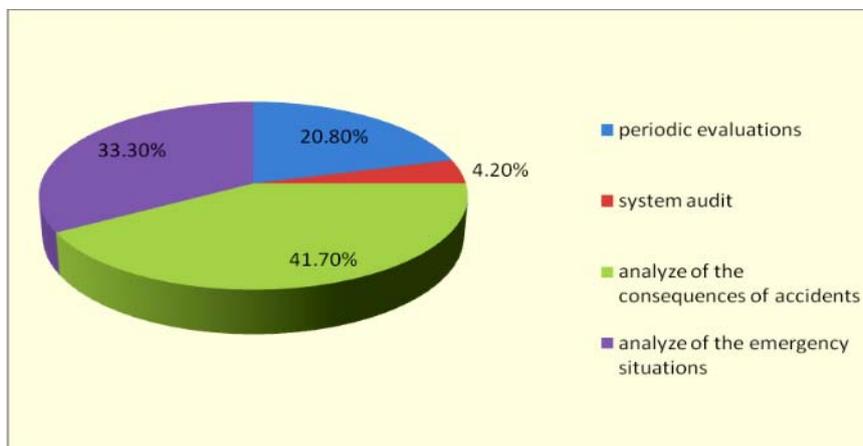

Source: according to the study carried out during the doctorate.

Figure 1. *Preparations for emergency situations*

Preparations for emergency situations is reflected in most respondents' opinions in anticipation of accidents for 38% of respondents, while 31% opted for intervention measures and to reduce the impact, as can be seen from the data presented in Figure 1.

Any nonconformities occurred in most cases are identified by analyzing the consequences of accidents, followed by analysis of the emergency rate which in percentage means 33.3% of respondents opted for this. Data are presented in Figure 2.

Source: according to the study carried out during the doctorate.

Figure 2. *Identifying nonconformities occurred*

The following hypothesis tries to identify the existence of the connection between the activity orientation towards efficiency and effectiveness within the institution and the socio - professional category of the respondents. Thus, the formulated hypothesis is:

H_0: *there is no connection between the activity orientation towards efficiency and effectiveness within the institution and the socio - professional category of the respondents*

H_1: *there is a connection between the activity orientation towards efficiency and effectiveness within the institution and the socio - professional category of the respondents*

Table 14

**Crosstabulation - activity orientation towards efficiency
and effectiveness × category of staff**

Activity orientation towards efficiency and effectiveness		specify the category of the staff you fit in					Total
		executive director	specialist in museography	res-torer	conser-vator	adminis-trative staff	
	satisfactory	1	8	1	0	0	10
	good	1	2	0	1	1	5
	very good	0	1	1	5	3	10
	i don't know	0	9	2	2	10	23
Total		2	20	4	8	14	48

Source: according to the study carried out during the doctorate.

The value of χ^2_{calc} is 25.581 (Table 14), this will be compared with $\chi^2_{0,05;\ 12} = 21.02$. As $\chi^2_{calc} > \chi^2_{0,\ 05;\ 12,}$ hypothesis H1 is accepted in the sense that we can guarantee with a probability of 95% of the total population that there are significant differences in the connection between the activity orientation towards efficiency and effectiveness within the institution and the socio-professional category of the respondents.

The same conclusion can be made also based on the minimum level of significance when H_1 can be accepted. It has a value of 0.012 (Asymp. Sig. (2-sided)) which is less than $\alpha = 0.05$, therefore the hypothesis H_1 is accepted.

Table 15

Chi-square tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	25.581	12	.012
Likelihood Ratio	28.225	12	.005
Linear-by-Linear Association	9.818	1	.002
N of Valid Cases	48		

Source: according to the study carried out during the doctorate.

Table 16

Symmetric measures

		Value	Asymp. Std. Error(a)	Approx. T(b)	Approx. Sig.
Nominal by Nominal	Phi	.730			.012
	Cramer's V	.421			.012
	Contingency Coefficient	.590			.012
Interval by Interval	Pearson's R	.457	.097	3.485	.001(c)
Ordinal by Ordinal	Spearman orrelation	.391	.126	2.882	.006(c)
N of Valid Cases		48			

(a) Not assuming the null hypothesis of.
(b) Using the standard error assuming the null Asymptote hypothesis.
(c) Based on normal Approximation.
Source: according to the study carried out during the doctorate.

From the above table we can comment on the following coefficients (Tables 15 and 16):

Contingency coefficient 0.590, confirming that there is correlation between the two variables, and the connection is an average one.

Cramer's V coefficient has a value of 0.421, which, like other indicators, shows an average connection between the two variables.

Ciuprov's T coefficient is calculated using the following formula:

$$T = \sqrt{\frac{\chi^2}{n \times \sqrt{df}}} \ ,$$

where substituting known values we get the result: T = 0.3922, which shows a medium connection between the variables.

➲ Monitoring and measuring

This clause includes four main chapters: monitoring and measurement control of nonconforming product, data analysis and continuous improvement.

The monitoring and measurement clause requires the organization to prove that a system that provides information on 1) customer satisfaction, 2) internal audits, 3) making process 4) product compliance has been established, to "demonstrate the product the compliance, to ensure quality management system compliance and continuously improve effectiveness of the quality management system." The idea is to prove that there is a systematic way to monitor processes and products (eg. by inspection and test), information about the customer, product, process, and based on these information to take relevant measures for improvement. When the standard sets as a requirement, it may sound complicated and difficult, but in practice there are normal flows of information, inspections and checks to tolerances during production, reserves and other so-called self-recorded reserves in daily operations. When processes are documented, proves the existence of all the relevant requirements.

Conclusions

Management processes are specifically required by ISO 9001:2008, all used by top management and applied to the entire organization. Resource management can also be understood as a part of the management process, while providing resources is one of the top leadership debts. Product realization processes are different within every organization although some processes exist generally in any organization: event coordination, the evaluation of customer

satisfaction etc. Customizing these issues at the Szekely National Museum in Sfântu George, after the performed tests the following can be established:

    ☞ the degree of staff information by the management of the institution is relatively high;

    ☞ controls are performed to improve service;

    ☞ there is a connection between the appreciation of activity the impact on the satisfaction of customer needs and the staff information on the beneficiaries expectations, so constant communication is required within the organization and at all of its levels;

    ☞ the main problem found is not including the entire staff in implementing an advanced management system. Based on the premise that "quality is everyone's business" - it must be the key element;

    ☞ the training level of personnel, especially the administrative staff training has only secondary training, most of the staff attended training courses, employment is based on the competitors knowledge, the specialized staff is highly trained, with training level and doctorate in the field.

The standard emphasizes the importance of customer satisfaction. ISO 9001:2008 standard states: "As one of the measurements of the quality management system performance, the organization shall monitor information concerning the to customer perception that the organization has fulfilled customer requirements." It is essential that the organization's staff to be aware of the satisfaction and dissatisfaction of the customer. Information should be gathered about both. Ways of obtaining feedback from customers are, for instance, the direct communication with them, resolving complaints, customer satisfaction questionnaires. To achieve these aimes and for creating an advanced quality management system those critical points that require attention must be known, resolved, to build a system that would lead the organization towards excellence.

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