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ASSESSMENT APPROACHES AND STRATEGIES FOR THE QUALITY SYSTEM IMPROVEMENT

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Abstract

The study deals with the problems and features of the quality system improvement. There will be determined a general system improvement model based on the consideration of three well-known improvement approaches. With the help of the created model the problems of the quality system improvement and the possible improvement strategies will be discussed. Finally the current state of the concerning researches will be shown.

Keywords: quality, system, improvement

1. Introduction

The methods of assurance of the required quality have passed through significant changes in the previous century. The primary purpose of the quality-related activities was always to guarantee the goodness of the company output (product or service). The definition of goodness and the methods for the assurance of it varied from age to age.

The transformation of the expression ‘quality’ and the changes of meaning of the word show very well the different levels of the requirements for quality management. There is an overall globalization phenomenon in the world market and that has sharpened the competition. As a result of it the striving for catching and keeping the customers turned into the basic condition of the survival. It has become soon obvious for the companies that only the satisfied customers may form a stable custom. Nowadays the realization of the profit-orientation through the customer satisfaction is an essential element of any efficient organization management. Getting from the inspection of conformity with the specifications (as an approach of Quality Management) to the purpose of the customer enthusiasm (as another approach of Quality Management) was a long and complex way.

It follows from the foregoing that the necessity of fulfilment of the market-driven requirements has changed the way and methods of the company management. It is especially true for the quality management that is mainly responsible for the assurance of the ‘quality level’ of any organization.

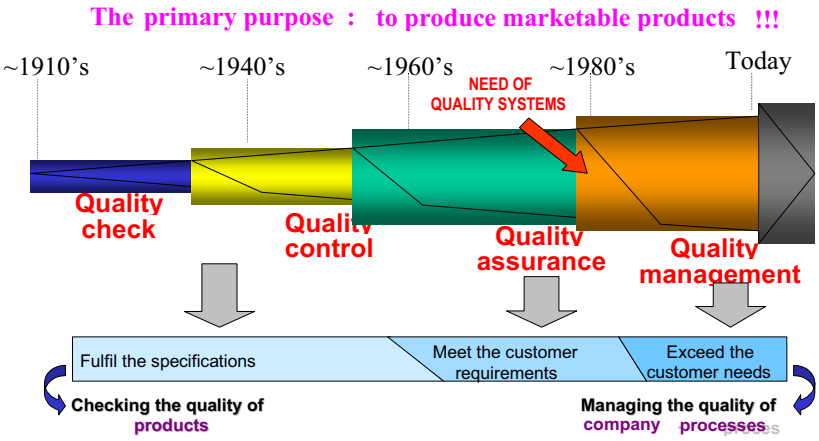

Fig. 1. Guiding approaches of quality management

In line with the improvement of quality-related activities we can define several quality approaches ([11][12]) . Based on a study ([1]) the most important ones are: (1) quality check, (2) quality control, (3) quality assurance, (4) TQM. Each of these approaches represents a certain quality level. The levels coming after each other lead to more and more perfect products and services.

There are great differences within the method-toolbox belonging to the approaches. The quality management improvement process has led to the expansion of the toolbox. In the early phase of 'Quality check' some simple inspection tasks were used to ensure the product conformity, then in the later phases the increasing number of the methods and their widening were apparent. This trend of the improvement guides to the application of more and more methods in a more and more extended way for a common goal. If the mass of methods is not harmonized properly, the required impact will not be got. We can say that it is necessary to put these methods, techniques, tools and approaches into a structurised system. Therefore the need for the quality system was shaped up by the purpose of efficiency of quality-related activities within the company.

The above written chain of thought is presented by *Fig. 1* ([4]).

2. The Role of Quality System

When a company as the result of improvement of its quality-related activities gets to a certain point, formalising of a system becomes necessary in order to co-ordinate and hold together these activities.

According to the classical definition of Miller ([8]): 'The system is a complex entirety of things being in contact with each other.'

Of course, the system is not just 'entirety of things' because the main goal is

to get an output which could not be achieved without the system-based operation ([5]). Rubinstein writes in an article published in the era of early application of the quality systems that 'the 'task' of the quality system is to co-ordinate the functions and operation of complex organizations' ([1]).

Why is system improvement so important? Because of the market changes; usually in the most industrial and service sectors it is not enough to fulfil the defined customer requirements but exceeding their needs is necessary to the stable market position. These features of customer behaviour make the organizations to continuously improve their processes and the quality system.

The reason for the existence of quality system improvement is indisputable but the way of its realization is not evident. Any improvement should have a 'forward direction' so it has to be taken into consideration also in the case of quality system improvement. I would draw up the goal as 'modification of the current system resulting in another system that, representing a higher quality level, is able to ensure a better company output'.

It means that the original narrow-focused quality assurance system widens and moves toward a total company management system. Every system is a subsystem of an other system – as the general system theories state ([3]). The quality system improvement (in line with the process shown in *Fig. 1*) is special because it results in raising of a sub-system to a higher level.

3. System Improvement Models

Based on the previously explained thoughts the principal features a system improvement model has to contain are:

1. the improvement should be continuous,
2. the improvement should be directed toward TQM,
3. the model should be applicable in the practice.

Therefore in this meaning we do not consider the 'model-like' concepts which are widely used by the companies (e.g.General Motors – Quality Network; Philips Centurion Program; Herendi Porcelánmanufaktúra TQM-house, etc.) and aim to realize a certain quality concept (e.g. TQM) as a system improvement model.

3.1. Improvement Models in the Literature

The improvement model which is accepted as the simplest, the most principal and the most general one is the Deming-circle or with other name PDCA-cycle ([6]) as shown in *Fig. 2*.

This model was developed in theory by Shewart before the 2nd world war but it was refined by Deming in the 50's and became widely applied this time. The PDCA-cycle was not created for system improvements, however, the principle of it is the basis of any improvement.

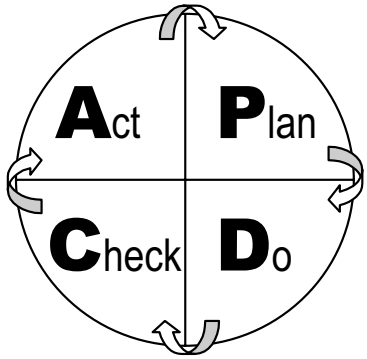

Fig. 2. PDCA-cycle

Juran's Quality Spiral (*Fig. 3*) also represents the strive for the higher and higher level ([7]).

According to Juran the spiral shows that performing of several activities coming after each other is needed to the appropriate quality of the output. So, these activities have a direct impact on the quality. Juran has already mentioned that the spiral may be considered as a system and it has sub-systems or a network of sub-activities.

Another well-known model was published by BROCKA-BROCKA (1992)([2]) and is shown in *Fig. 4*.

The spiral contains the concepts and principles of quality management. According to Brocka–Brocka the four parts of the figure denote the four basic principles which are: vision, empowerment, continuous evaluation, customer orientation. If we start from the center of the spiral, the first layer contains further important principles, the second one contains the necessary management activities and the third one contains the tools to be used.

3.2. Difficulties of the Showed Models

Table 1 compars the three models in three aspects.

The main advantages of the PDCA-cycle are the easy application in the practice and the clear expression of continuous improvement, however, this model does not contain the system-level element. Juran's Quality Spiral also refers to the continuous improvement but is not so practical and the principles of the TQM are not visible. Model of Brocka–Brocka is practical enough and strives for the TQM but stressing of continuous improvement is less visible than at the other two models.

Summarizing the comparison we can state that none of the three models fulfil the expressed three requirements. Another significant problem is that using of these models for system improvement is quite difficult.

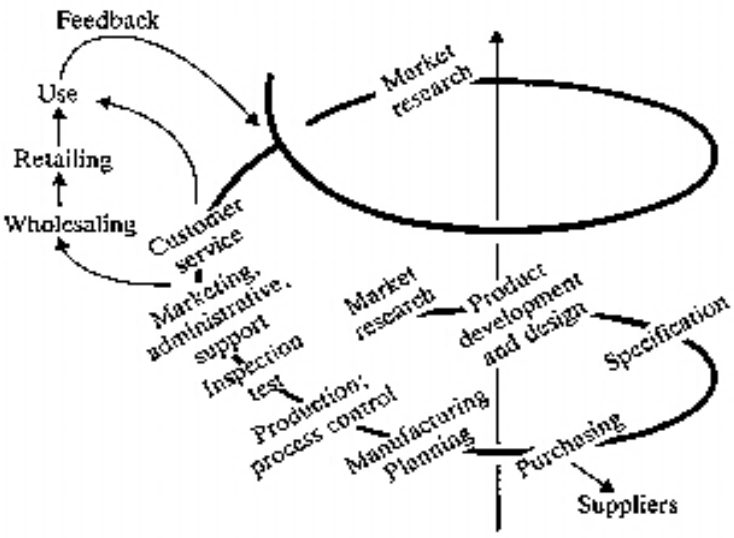

Fig. 3. Juran's quality spiral

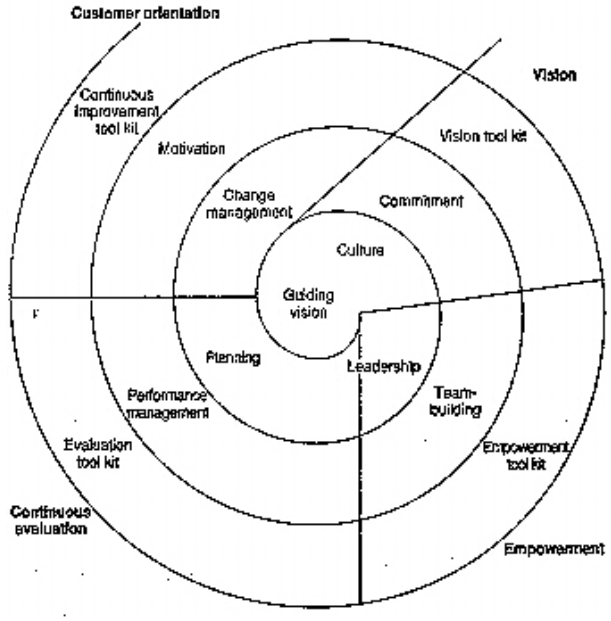

Fig. 4. Spiral quality management model

Table 1. Comparison of the improvement models

	Practicality	Reflection of continuous improvement	Striving for Total Quality Management
PDCA	●	●	○
Juran's Quality Spiral	○	●	◐
Spiral Quality management model	●	◐	●

Is characteristic ● *Partly characteristic* ◐ *Not characteristic* ○

3.3. The Developed Model

Based on the above conclusions our purpose was to develop such a system improvement model that involves the advantages of the showen models and eliminates their deficiencies. When creating the model the already written three requirements were kept in view:

a) Striving for TQM: We have accepted as starting point the quality management improvement process in accordance with *Fig. 1*. For the sake of it in the course of quality system improvement higher and higher level quality principles should be integrated.

b) Continuity of improvement is a central element; The task of the company quality management is to take the system on a sustainable improvement path, to ensure the moving up on the 'spiral'.

c) Practicality: The model should be applied in the practice so it has to have elements which support the realization of the continuous improvement.

The model developed in line with these requirements can be seen in *Fig. 5*.

All approaches of quality management have their own guidelines and principles that form the quality concept of the company (see *Fig. 6*). Putting these principles into the practice is helped by various quality management methods, techniques and tools. The different approaches use different toolboxes.

There are many opportunities for the company to evaluate the efficiency and the effectiveness of the quality management. The most frequently used method for that is the comparison of the current system to a system standard (e.g. ISO 9001 standard) or requirements (e.g. EFQM model). Based on the comparison result the right decision can be made. If necessary, the toolbox, the application of the methods will be modified. When the concept is changed (to be expected toward the TQM) the system gets to a higher level.

Following the above statements the system management ensures that the quality system is able to perform on an increasing level.

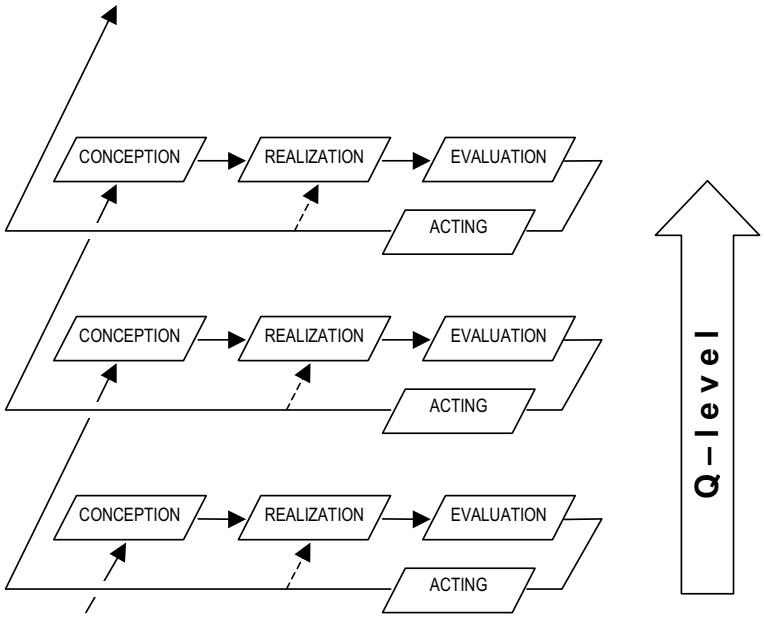

Fig. 5. Quality system improvement model

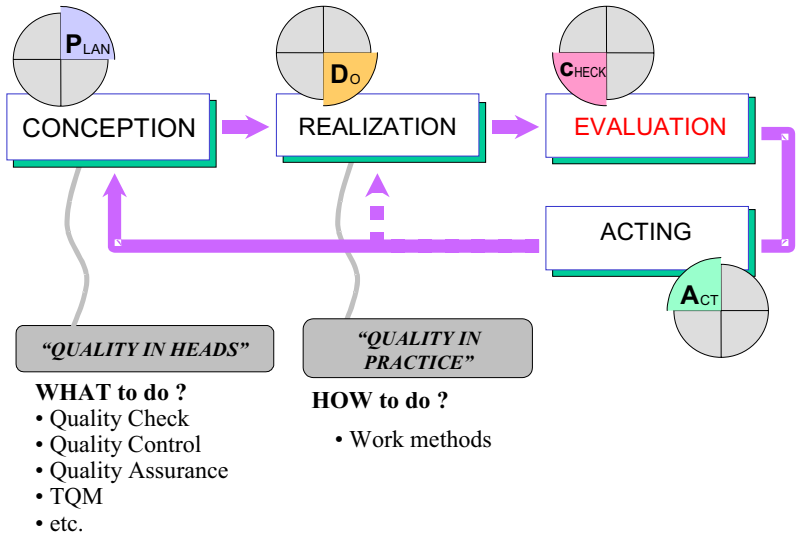

Fig. 6. A layer of the model

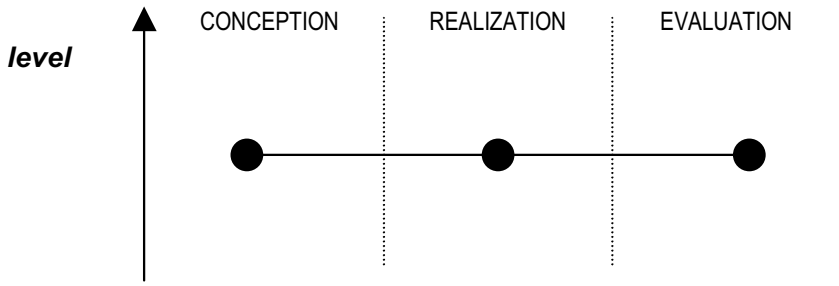

Fig. 7. Balanced system improvement

4. Problems of the Quality System Improvement

In the followings we assess the problems of the quality system improvement through the established model.

According to the model the continuous improvement of the system is based on:

- the concept: the complex entirety of the quality management principles which forms the basis of the system operation;
- the realization: the methods which are used to realize the conception;
- the evaluation: the way the system operation and performance is evaluated in.

'Acting' (the fourth element of PDCA-cycle) is not stressed because we believe that it is a simple decision based on the evaluation results and is not an independent system improvement element.

4.1. Ideal Case

The main work in the course of the system improvement is to harmonize the conception, the realization and the evaluation. These three elements are perfectly harmonised in ideal case. It means that a concept reflecting the principles of the current system level should be realized through the methods which belong to these principles. The way of evaluation also should be suited to the system level and should be on the same level as the principles and the toolbox (*Fig. 7*).

Fig. 7 shows the so-called 'balanced system improvement'. It means that the concept, the methods and the evaluation suit each other and the current system level. When we get around the PDCA loop, the new concept will show a movement toward TQM, so the system level will rise. This new concept requires new methods and the old way of evaluation also should be modified because it was exceeded by the system. This mechanism results in higher and higher level of the quality system.

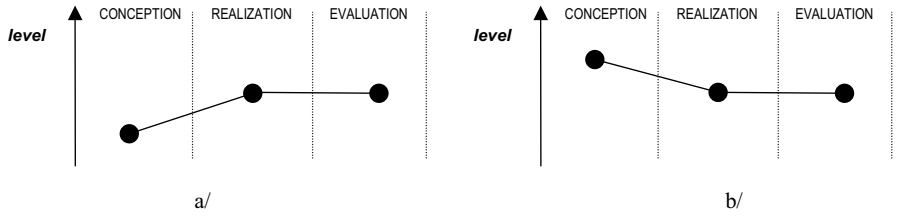

Fig. 8. Not proper conception

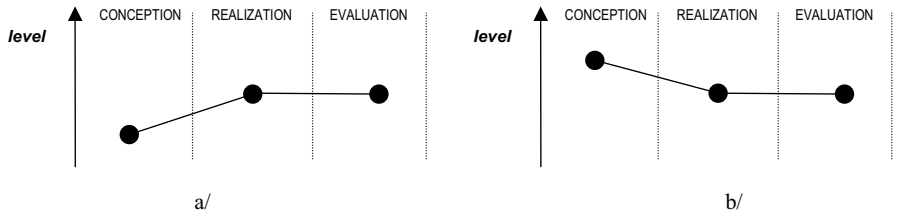

Fig. 9. Not proper methods

4.2. Cases differing from the Ideal One

A) Not proper conception

Fig. 8 illustrates a frequently happening case when a company tries to improve its quality system concentrating on such principles which do not fit to the applied methods and to the way of evaluation. This strategy may be disadvantageous because:

- there is no commitment to the applied methods *Fig. 8a*
- there may be no actions behind the principles *Fig. 8b*

B) Not proper methods: In the cases shown in *Fig. 9* the applied methods do not fit to the level of conception and evaluation. It may refer to that: – there is no cultural background for and committment to the application of the methods (*Fig. 9a*) – the principles may not be put into the practice (*Fig. 9b*).

C) Not proper evaluation criteria: As it can be seen in *Fig. 10* also the not appropriate method of evaluation is an essential problem. It may mean that: – the criteria system of the evaluation is quite low-level so it does not show the areas of improvement and is not challenging for the people (*Fig. 10a*) – the level of the criteria system is very high so the requirements are unrealistic and cannot be fulfilled (*Fig. 10b*).

D) Combined problems: The showen problems may appear in a combined way if the company does those repeatedly as reflected by *Fig. 11*. These problems can be broken down to the basic situations discussed in points A), B) and C).

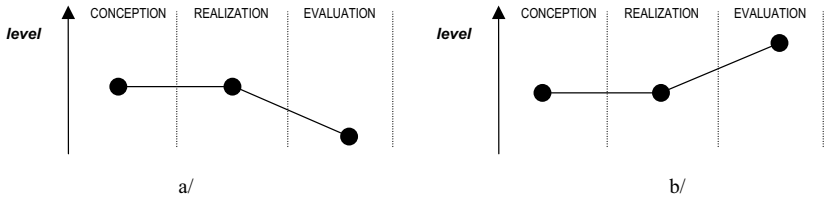

Fig. 10. Not proper evaluation requirements

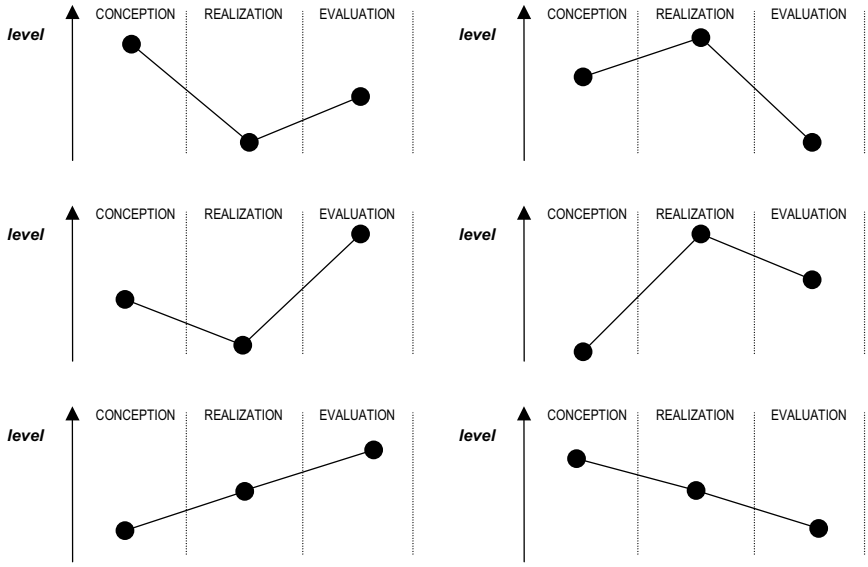

Fig. 11. Combined system improvement problems

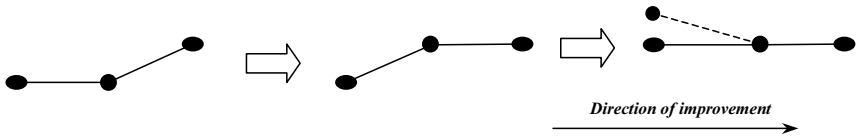

Fig. 12. Hypothesis on the quality system improvement strategy to be applied

5. System Improvement Strategies

The basic question is still open: how to determine the quality system improvement strategy? It seems to be evident that the 'balanced system improvement strategy' is the right way. However, there is a hypothesis stating that the current level of the system has an influence on the strategy efficiency (*Fig.12*). When a company starts to implement the quality assurance system, the people probably have no deeper quality knowledge, therefore the 'evaluation-driven' strategy can be efficient. The cause of it is that the evaluation criteria give guidelines for the company what to do. Later in the course of the continuous improvement the methods come into the foreground because usually the purpose of achieving quick results becomes stressed. People can be motivated through practical actions therefore, first of all, the methods help the system improvement. On a high level of the quality system the quality culture is well-established so the focus may be directed to the finest principles which make the management system really total. On this level 'quality is not in question', employees participation in the continuous improvement is evident. The conception can exceed the methods and the evaluation, so the strategy can be turned into a 'conception-driven' phase. The researches to prove these thoughts are in progress.

Of course, the company features may also have a great impact on the quality system improvement. Since the system improvement is an organizational change (change of work, methods, approaches, etc.) these issues also influence the system improvement strategy to be applied. We have organized a wide-range research among the Hungarian ISO certified industrial companies about the impediment factors of the system improvement. The company managers evaluated to what extent the listed factors (based on the change theory of NADLER–PATAKI, 1999) hinder the further improvement of the quality system. *Fig.13* shows a partial result after assessment of 49 company answers.

The results of this research are under evaluation but there are some visible trends. It is expected that, in general, the Hungarian companies have a relatively low-level quality system and this was confirmed by the high scores relating to the motivation, the financial resources and the overloaded work. This result also seems to prove the supposition that on lower level of the system the external 'pressure', namely the evaluation criteria (e.g. ISO 9001:2000) can be able to ensure the real improvement of the system. So it is not evident that the 'balanced system

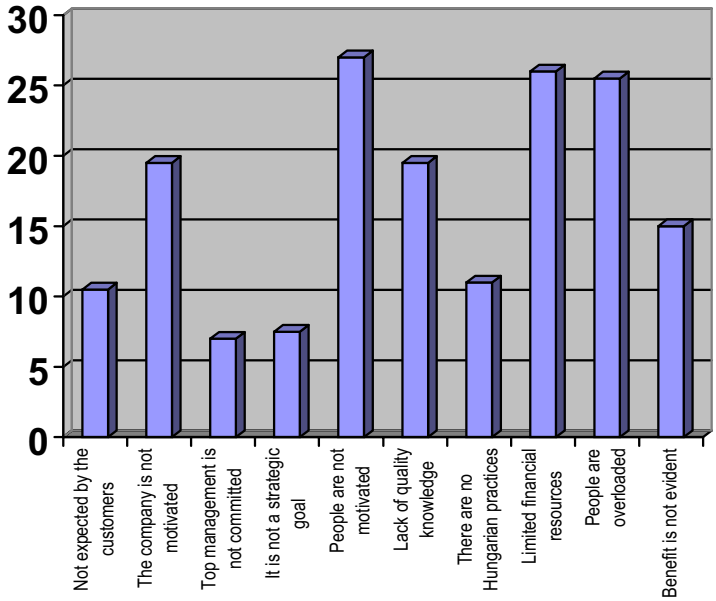

Fig. 13. Impediment factors of the quality system improvement

improvement strategy' is always the best way. The present assumption is that the balance should be modified according to the system level (strategy creation) and should be refined based on the company features (strategy adaptation).

6. Conclusions

In our study we dealt with the quality system improvement models, the problems of the improvement and the improvement strategies. We have accepted as a starting point the quality management improvement process and its approaches. We placed the 'quality system' into this process touching upon some thoughts of the system theory and we detailed the reasons of the system improvement. Three well-known improvement models were presented, then their problems were shown. The model we have developed based on these problems was discussed and we used this model during the assessment of the system improvement strategies. We described the 'balanced system improvement strategy' and the strategies differing from this one including the problems of the various strategies. Finally we summarized the hypotheses on the quality system improvement strategies.

Summarizing the conclusions:

- the improvement of the company quality-related activities is directed toward the Total Quality Management,
- this improvement is motivated by the market,
- on a certain quality-level the need for quality systems becomes evident,
- the quality system improvement should be carried out based on a general model,
- the system improvement strategy primarily depends on the current level of the company quality system,
- the system improvement strategy is influenced by definite company features.

References

[1] BALOGH, A., A minőségügy helyzetének és fejlődési irányainak elemzése. I. rész. Minőség és Megbízhatóság, Vol. 1999, No. 5, pp. 214–219
[2] BROCKA, B.– BROCKA M. S., Quality Management, Irwine Professional Publishing, (1992) p. 50.
[3] CUSINS, P. , Understanding Quality through Systems Thinking, The TQM Magazine, **6**, (1994) No.5, pp. 19–27
[4] HÁRY, A., A vállalati minőségügyi rendszer fejlesztésének sajátosságai és alapkérdései. Gazdaság- Vállalkozás-Vezetés, Vol. 1999, No. 4, pp. 17–27.
[5] HARRINGTON, H. J. – CARR, J. J. – REID, R. P., What is this 'systems' stuff, anyhow?, *The TQM Magazine*, **11**,(1999) No. 1, pp. 54–57.
[6] IMAI, M., KAIZEN. The Key to Japan's Competetive Success. McGraw Hill, p. 10., 1991.
[7] JURAN, J. M.– GRYNA, F. M., Quality Planning and Analysis, McGraw Hill, pp. 5–6, 1993.
[8] KINDLER, J.– PAPP, O., Komplex rendszerek vizsgálata, Műszaki Könyvkiadó, Budapest, p. 11, 1977.
[9] PATAKI, B., Változásmenedzsment, Budapest, Műszaki Könyvkiadó, pp. 38–40, 1997.
[10] RUBINSTEIN, S. P., The Evolution of U.S. Quality Systems, Quality Progress, May, pp. 46-49, 1991.
[11] SZABÓ, G. CS., Merre induljunk? A TQM és a minőségáttörés, Minőség és Megbízhatóság, Vol. 1994, No. 4, pp. 5–6
[12] TOPÁR, J., Minőségmenedzsment alapjai I. (Oktatási segédanyag), BME, pp. 3–5, 1999.