

With 8D method to excellent quality

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Abstract:

RQ: The research aims to establish the suitability of the 8D methodology for complaint settlement, and to identify any resulting improvement in quality.

Purpose: Studies that have researched the 8D method are scarce in international literature. Consequently, we decided to assess, based on theoretical premises, the suitability of the 8D method used by an organization, and the efficiency of quality performance directly associated with the 8D method. We will establish whether the use of the 8D method results in quality improvement.

Method: The research will be carried out using qualitative analysis in the form of a case study of the 8D method used in an organization. I will discuss, based on real and relevant data, the approaches implemented by individual 8D method steps, indicating the integrated supplemental tools. In the quantitative part, I will identify the defective product trends (PPM) and the trends of costs related to defective products.

Results: The 8D method used for complaint settlement contributes to improved quality and company performance.

Organization: The results can be used by the management in continuous improvement as additional motivation for more consistent and effective use, and for additional support to problem-solving coordinators and teams.

Society: The findings can also be applied by society at large, mostly companies and public services.

Originality: Research on this topic or combination has not yet been conducted

Limitations: The sample studied is small, limited to one large company. It includes only the data obtained through the use of the 8D method.

Keywords: Quality assurance, quality tools, problem solving method, 8D method, complaints.

COBISS typology: 1.04 professional article.

1 Introduction

Every company that wants to be successful and to maintain its market position strives to have happy and loyal customers. Customer wishes and needs are subject to instant change, either because of technological development or as a result of impulsive economic, political and cultural movements in the uncertain and chaotic global environment. Meeting customer needs and requirements constitutes the basic challenge for every company, leading it towards the profit creation, its main goal.

For a sustainable, customer- and market-oriented company, a complaint is a "gift". Imagine your reaction when a life-long friend you have not seen for ages brings you a birthday present. The facial expressions immediately following the hug will certainly reveal happiness, gratitude and joy. "Thanks. Thank you for coming. Thank you for the beautiful present". With all of your verbal and non-verbal communication you express your joy and happiness you experience when meeting your friend and receiving the present. As unusual as it may appear,

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Received on: September 29, 2012; revised on: October 8, 2012; accepted: October 10, 2012.

this is the way we should act when receiving a complaint – "a gift" - from a customer. (Barlow & Moeller, 1996, pp. 9–10)

Complaints are significant due to the fact that customer satisfaction can only be improved if the dissatisfaction with a specific product is clearly identified. Dissatisfaction identification is just the initial step in solving the underlying problem. In the car industry, and, to an increasing extent, in other industries as well, a systematic method named 8D is used for this purpose. The 8D method, being simultaneously a tool, stands for eight disciplines problem solving. Its original purpose was to eliminate the reason for the defect causing the relevant problem, thus restoring customer satisfaction and raising the quality level for the company.

The purpose and the objective of the research is to present the problem-solving method used by a successful company while acquiring an invaluable "gift" - a complaint. Using the method presented in this paper, we wish to determine the actual achievement of quality level expressed in PPM (*parts per million*). On the other hand, our interest is focused on the trend, i.e., whether the use of the method systematically improves the level of product quality. In this respect, we also want to know whether the use of the 8D method curbs complaint-related costs.

2 Theoretical platform

2.1 Theory of problem solving

Regardless of their overall success, every individual and every organization still occasionally faces problems. In the Dictionary of Standard Slovenian Language (SSKJ, 2000), the term "problem" is explained as something that is unclear, unknown with regard to a certain fact, and needs clarification or solving. According to Marolt and Gomišček (2005, p. 84), the gap between the optimum state and the actual state presents the problem in terms of organization. The Business Dictionary (2012) interprets the problem as a gap identified between the actual state and the optimum state, or a deviation from a norm, plan, or standard.

According to Marolt and Gomišček, the problem-solving process in an organization is strongly connected with the process of continuous improvement, whereas continuous improvement is essentially an on-going problem-solving process. In this respect, they state the following (2005, p. 85):

- Reactive improvement: solving a problem after its identification, e.g. when a defective product or process implementation has been discovered.
- Proactive improvement: prevention of problems before they occur, using appropriate methods and techniques to identify and remedy defects as early as in the product and process planning stage, before the product manufacture.

According to Anand (1999, p. 166), solvers of identified problems usually "step into the limelight" and are highly compensated. On the other hand, employees preventing a problem often remain unknown and without any recognition. In a case study, Crosby (1989, p. 85)

claims that each defect, particularly a recurrent one, should be thoroughly investigated to identify the root reason, to define the control method, and to introduce the measures to permanently prevent recurrence.

2.2 Description of 8D method

2.2.1. Introduction to 8D methodology

As early as in World War II, the US government was using a process similar to the current 8D method, and in 1974, it was first described by the US Defence Department in a military standard. A widely-spread false opinion prevails that the 8D method was created at the Ford Company. It is true, however, that it was first mentioned in a manual used for a training program called *Team Oriented Problem Solving* (Doane, 1987).

The 8D method is a procedure for systematic introduction of improvements and elimination of problems and errors. It can be used on a product, but also on a system and process level. On the system and process level, the 8D method is used as a tool for continuous improvement / as corrective measures to remedy minor or major non-conformities. The use of the method on a product is focused on solving the problem identified on the product (customer complaints as well as internal/inter-plant complaints). It goes without saying that input materials are associated with the product as well. Deviations from the input material requirements are also subject to complaints issued to the supplier. Problem solving is requested on an 8D form. The 8D procedure is a team-oriented process coordinated by the 8D problem-solving coordinator.

Many authors (Fauzi, 2011; 8D Report, 2012; Adaptive, 2011; Elsmar, 2012; Jung, Schweißer, & Wappis, 2011; Kokol & Gladež, 2011, pp. 36–38; Siliconfareast, 2003; Ubani, 2011, p. 186; Wikipedia, 2012) describe the eight disciplines of systematic problem solving. Their theoretical description and practical experience on the use of the 8D method (eight steps) are collected in the following sub-sections.

2.2.2. Step I: Identification

A problem, a deviation from requirements / non-compliance, a defect (hereafter referred to as "Problem") can be associated with a product, service or operation/system. To ensure an optimum and well-organized approach, information support is usually used. Under the first item, the key data on the problem are entered, such as 8D sequence number, date, product identification number, product name, reference to plan, quantity, team appointed to solve the problem. The 8D team should include individuals considered to be capable of performing the 8D procedure. The 8D team should be provided with all the available documentation and relevant information.

2.2.3. Step II: Problem description

To clearly identify the problem, the 8D problem-solving coordinator endeavours to obtain (from the customer or the person reporting the problem within the organization) as much concrete information as possible, which constitutes the first analysis performed in the

problem-solving process. The nature and location of the problem have to be provided along with its impacts. Another important piece of information is whether the problem involved is recurrent or whether it could occur on similar products or processes. When describing the problem, the 5W+2H method should be used, where the following questions have to be answered thoroughly and systematically: WHO, WHAT, WHERE, WHEN, HOW, HOW MANY/MUCH, and WHY for each question. The answers to these questions help us clarify the background and connections.

2.2.4. Step III: Immediate action

In this step, correction / so-called "stop" action should be carried out in the shortest time possible. In the car industry, the usual time for this action to be taken is 24 hours:

- additional checking of stocks in the factory and in the consignment warehouse;
- checking if any parts are currently being transported to the customer;
- labelling – blocking and eliminating risk parts in an uncompleted manufacturing cycle; and
- defining measures to remedy defects at the customer's premises.

With regard to the stop action, the following will be agreed with the customer:

- that our internal personnel addresses the problem at the customer's premises;
- that the customer removes at our cost the parts found inadequate during processing; or
- outsources the problem solving process.

Selection of any of the above alternatives should be based on (1) customer's wish, (2) quality of service rendered, (3) costs, and (4) time limits.

2.2.5. Step IV: Identification of causes

The central and core section of the 8D procedure is to identify the causes. Identification of the actual cause constitutes the basis and the prerequisite for determination of appropriate corrective measures aimed at permanently solving the problem. The causes are identified and verified. To obtain the root cause, all the causes found inappropriate are eliminated. By testing or experimenting, the remaining cause is either confirmed or rejected. In the process of problem identification, tools such as BRAINSTORMING, 5-WHYS and ISHIKAWA DIAGRAM can be used. To ensure an appropriate systematic approach, the use of one of the above tools is mandatory.

2.2.6. Step V: Corrective action

The 8D team proposes improvements, enters them in the 8D procedure, and prepares an 8D plan. As its implementation usually requires financial resources, its preparation should also be based on costs perspective. The person responsible confirms or rejects the proposed improvements. If the improvements are not appropriate, they are submitted for further discussion. The 8D procedure is repeated by the extended 8D team and on the basis of an additionally elaborated platform.

The corrective action taken in Step V of the 8D procedure is basically a preventive measure used to permanently solve the problem. Corrective actions ensure effective improvements and elimination of causes for the occurrence of an identical or similar problem. In targeting the root cause of the problem, they prevent its recurrence.

To verify whether the goal has been achieved, the results of the corrective action implemented are measured both on a short-term basis, immediately after the implementation, or on a long-term basis over a longer period of time. According to Marolt and Gomišček, measurements are an important source of information needed to identify and verify the actual state, and is used as a guidance (2005, p. 89). In this respect, we follow the principle that no measurements are performed when no analysis is intended, and no analysis is carried out when no action is planned. Measuring and monitoring is performed by using various statistical methods. If measurements are carried out by means of control devices having digital data outputs and being connected to a computer, analyses are performed by means of statistical process control, a shorter statistical method. Typical statistical methods named SPC (*Statistical Process Control*) include process capability index (cp), process centricity index (cpk), histograms, Pareto diagrams. If no digital data outputs are available, control and supervision charts are used. If the verification reveals that the objective has not been achieved, new preventive action should be considered. Any evidence related to the verification and analysis processes is an integral part of the problem case.

A mandatory action to be activated in the problem solving process is checking whether the customer complaint causes any change to the contents in the FMEA (*Failure Mode and Effects Analysis*) / to the problem solving method, control documentation or other related documents. If the change has been identified, it is mandatory to include it in the above-noted documents.

2.2.7. Step VI: Measuring of effectiveness

Step VI consists of measuring the long-term effectiveness of the corrective action. In the car industry, the default time period for this measurement has been set to 90 days. If necessary, it can be adjusted to meet customer requirements. The measuring method used in this step is identical to that used in Step V. A shift is made from 100 % control to frequency control, which, however, is still higher than before the time the problem occurred. The effectiveness of the implemented corrective action is measured by statistical tools (process capability, histograms, control charts...). When the period of time agreed for measuring the effectiveness of the corrective action has expired, the customer is informed about the result achieved. If the process capability complies with the requirement, the customer confirms (validates) the corrective measure applied. If, however, the customer does not request a limit associated with the process capability, the 8D team verifies whether the capability complies with internal requirements. If the process capability complies, the team validates the corrective action. Depending on the achieved level of process capability after the corrective action, the team adjusts the frequency of control within control procedures. The higher the process capability, the lower the control frequency.

2.2.8. Step VII: Expansion

In this step, the team analyses whether the corrective action implemented would prevent or improve the quality of similar products and processes.

2.2.9. Step VIII: Conclusion

In this step, process and system improvements are usually proposed. Based on previously conducted and validated steps of the 8D procedure, the complaint-solving coordinator proposes its conclusion. Team recognition follows when the problem has been solved and the documents have been completed and archived. This helps us gain experience, whereas appropriate incentive to individual team members is also beneficial.

Finally, analysis is performed to identify the strengths of the team's effort in the problem-solving process, and the problems encountered. If a need occurs for the team to be reunited, positive activities are repeated, and an attempt is made to avoid the negative experience.

2.3 Assumption – qualitative method

Based on the survey of the relevant international literature, the findings and research objectives, the following assumption has been defined for a qualitative study:

T1: Implemented 8D method is a suitable problem-solving tool.

2.4 Hypotheses-quantitative method

When formulating the hypotheses, we took as a starting point the paradigm set in qualitative methodology. If the organization dealt with makes use of a suitable problem-solving method, the following hypotheses can be set:

H1: The use of the 8D method in the process of problem solving results in an increased quality level.

H2: The use of the 8D method in the process of problem solving results in lower non-quality costs.

3 Method

3.1 Historical background

The research was conducted during the first three months of 2011 and was mainly carried out in a large-size organization operating in the field of metal processing. In the remaining text, the expression "organization" will be used. The origins of the use of the 8D method in the above mentioned organization go back more than two decades into the past. Throughout this time, the organization has continuously upgraded the 8D method both in terms of methodology and information technology. The company has had the 8D method integrated in its business information system since 2005. After that year, neither the method nor the information support has undergone any further changes.

3.2 Qualitative method

The method selected for data collection was a partly structured interview. Interviews were held with representatives of senior and operative management at least 3 times for more than an hour. In all the cases, the interview was conducted in the form of a conversation in a relaxed atmosphere. During the interviews, we obtained all the documentation related to the research topic. The method of data analysis is a case study. Compared to the international literature, we dealt with the problem-solving method used in the organization, presenting it in great detail.

3.3 Quantitative method

The data discussed in the quantitative part were obtained in the same organization as the qualitative ones. The method of data collection is the 8D method presented in the present paper. During the use of the 8D method, data were collected into the information system integrated into the business system. All the data dealt with in this paper have been obtained from the information system from the competent personnel responsible for this area. We will analyse and present the data obtained in the 2008 – 2011 period. For the requirements of this article, the data were further processed in Microsoft Excel.

4 Results

The qualitative analysis results in a presentation of the complaint-solving model with integrated quality tools used by the organization. The model is used for non-compliances related to business operations (system audits, process audits), on customer complaints, complaints filed against suppliers, and internal complaints.

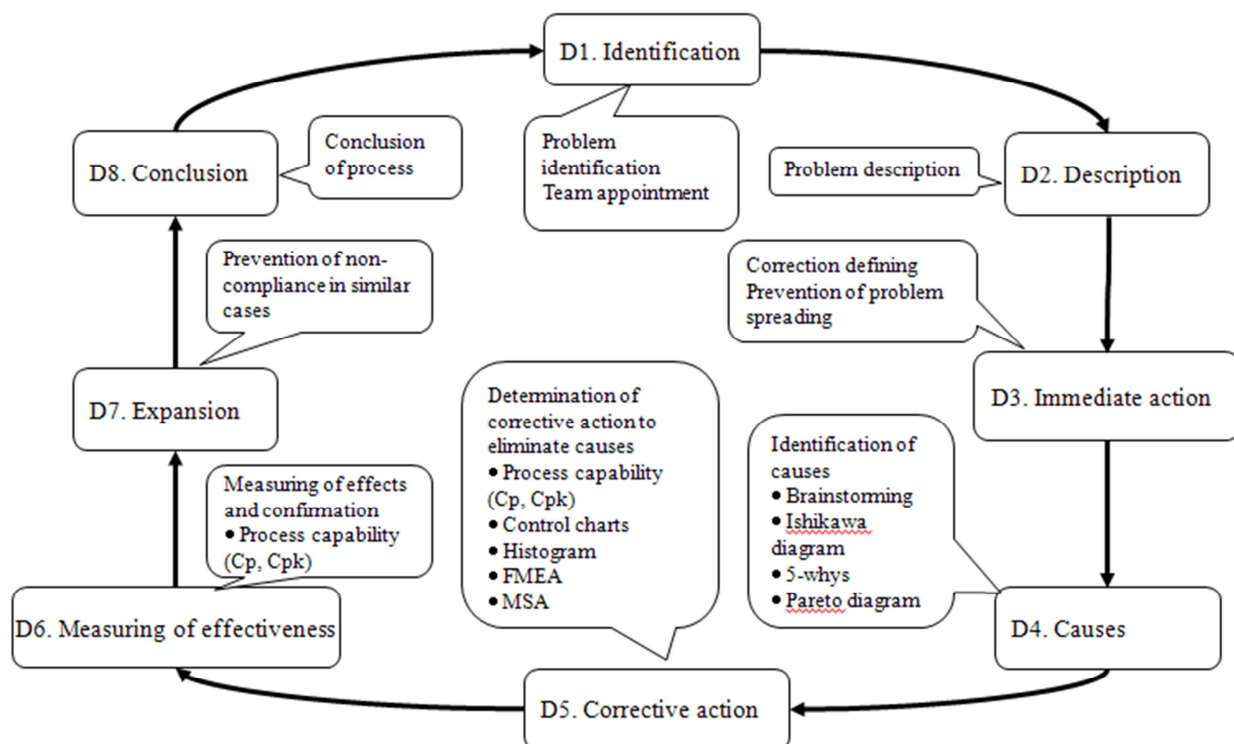


Figure 1: Graphic presentation of 8D method

The use of the 8D method raises the level of quality by reducing the number of defective pieces per million. The result is shown in Fig. 2.

The use of the 8D method also reduces the costs of non-quality. Details are provided in Fig. 3.

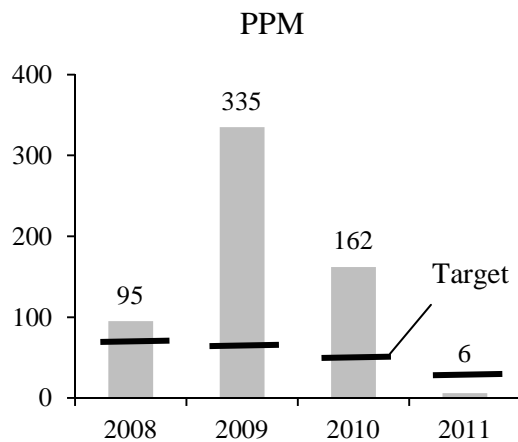


Figure 2: Defective pieces per million status

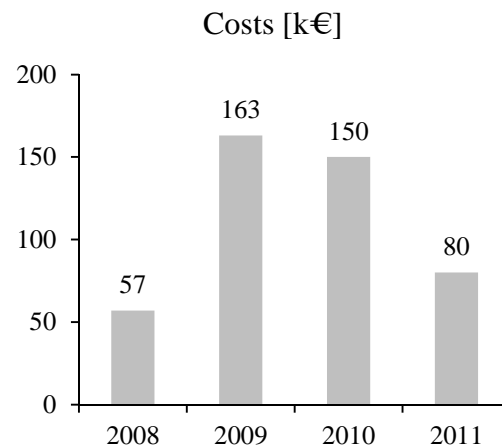


Figure 3: Costs of non-quality related to complaints

5 Discussion

5.1 Discussion on qualitative analysis

Based on the survey of the relevant international literature and of the 8D form used in practice, it can be concluded that the company has appropriate problem-solving steps in place. The method has all the eight steps integrated, included in the PDCA cycle as follows:

- I. Plan: Step 1: identification, Step 2: description, and Step 4: causes.
- II. Do: Step 3: immediate action, and Step 5: corrective action.
- III. Check: Step 6: measuring of effectiveness.
- IV. Act: Step 7: expansion, and Step 8: conclusion.

It seems highly important to point out that the organization included into Step 4 / Plan various tools for identification of causes, such as brainstorming, 5 Whys, Ishikawa diagram and Pareto diagram. In addition, the use of various statistical tools is included in the 8D method for checking Step 5 where corrective measures are introduced, and Step 6 where long-term effectiveness of the implemented action is measured.

In its documents, discussions and in general, the organization emphasizes the significance of team approach to problem solving. In all of the randomly verified 8D cases, the team is multidisciplinary, consisting of employees of various professions having different competencies, being familiar with the organization's operations and/or manufacturing process, product functionality, customer requirements and expectations regarding the defective product.

The team members are familiar not only with their field of expertise but also with problem-solving techniques. Team members are appointed by the complaint-solving coordinator working in the quality service of a specific business unit. The coordinator has highly developed soft competencies and a good mastery of various meeting conduct techniques, and is capable of managing team members in all their versatility. The coordinator has good organizing and motivating skills which are of vital importance since he/she has to negotiate the areas of team meetings, gain the participants' interest, create a relaxed atmosphere, and help the participants understand the criticality of the problem. The coordinator has high awareness about the significance of appropriate, amicable and professional communication with the customer and other participants.

The organization emphasizes the significance of both the team approach and detection of the cause for the problem. We find this ever so important for the following reason: if the root cause of the problem has not been defined appropriately, this could lead to the implementation of measures that do not bring a desired effect, which, in turn, can cause the problem to reoccur. It is on the basis of the root cause definition that corrective action is determined to prevent the problem recurrence.

Immediate action is taken after the identification of non-compliance to prevent it from spreading further. Corrective measures aim at preventing further damage and costs related to the non-compliance for the organization and its business partners.

The organization maintains strict quality control until an appropriate level of capability has been achieved ($cpk > 1.67$). Awareness of the significance of achieving an appropriate level of capability among the employees is high, which is a guarantee for the implemented measures to be validated appropriately.

To conduct all kinds of 8D procedures (customer complaints, internal complaints, complaints filed against suppliers, and for solving process and system non-compliances), the organization dealt with in this research makes use of top-notch technological and information support which is an excellent basis for various reviews and analyses.

The organization verifies the effectiveness of the implemented corrective measures at various levels of hierarchy within the organization, e.g. at business unit's board meetings and at management reviews where appropriate improvement measures are adopted.

Based on the 8D method presentation, it can be concluded that the method is effective in problem solving, and, consequently, that the T1 assumption is correct.

5.2 Discussion on quantitative analysis

5.2.1. Results of achieving PPM

Since 2009, the trend of pieces per million (hereafter referred to as PPM) has been downward as shown in Fig. 2. At the end of 2008, both the organization and the global environment were

caught by recession. Financial distress resulted in shrinking of order volumes. The issue of time shortage in everyday activities of both the customer's and manufacturer's employees has been mitigated. This, together with austerity measures, was strongly reflected in the car industry, and could be observed in the complaints received by the organization from its customers. In 2009, the organization received complaints from customers with whom we had a partnership agreement at the operative level that defective products should be eliminated from the process and returned to the organization where they were replaced by conforming products. This type of replacement caused no complaints, PPMs or costs. Responding to the newly occurred situation, the organization concluded that it was necessary to change the approach and to additionally improve the quality to achieve the target PPM agreed by the respective contracts. Achieving the target PPM is important in order to win new deals and projects as well. If the supplier does not achieve the agreed target PPM, he is eliminated from competition the moment a new deal occurs with the customer.

As the use of the 8D method in the process of problem solving contributes to higher quality, the H1 hypothesis is adopted.

5.2.2. *Non-quality costs*

Similarly to PPM, non-quality costs have been dropping as well (Fig. 3) which is a logical consequence. In the struggle to achieve the agreed target PPM (horizontal line in the graph in Fig. 2), the quality level has been improving as well, and this resulted in lower costs related to customer complaints. After 2009, the organization has encouraged employees to achieve the target PPM by means of the motto "By discovering a defect, I retain a customer". To resolve internal problems, improve the quality and prevent customer complaints, several measures have been introduced that have contributed to cost cutting.

In the process of problem solving, the use of the 8D method helps cut the costs related to non-quality. The H2 hypothesis can therefore be accepted.

6 Conclusion

The 8D method used in the organization and presented in this research is an excellent tool for preventing defects from recurring. This observation is supported not only by the PPM results but also by related costs. By implementing the PDCA cycle (plan – do – check – act) and through continuous improvement "trapped" within the 8D method presented in this paper, the focus is gradually shifted from defect identification to elimination of the causes which ensures constant and rising quality, and cuts the costs. Continuous improvement has become the only true path to success, appropriate handling of problems such as complaints and non-compliances of processes being one of its key elements.

Due to its original approach, the present work is undoubtedly a contribution to the discipline and to universal excellence. So far there has been no research dealing with the data obtained and additionally analysed by means of the methodology presented in this text, and confirming its suitability and effectiveness. The present paper confirms that an appropriate problem-

solving method mitigates problems reliably and systematically, thus raising the quality level, which will certainly impact decisions by managers, management teams, organizations and society at large on the use of the method.

We all know that in developed economies and, in particular, in the car industry, achievement of excellent quality (expressed with the PPM indicator) constitutes a strong sales argument. In this respect, it would be interesting to find out the impact of quality on the ability to win new deals and customers, and which level of quality provides an optimum ratio between profit, volume of operations and level of quality in a specific organization.

As far as limitations of the research are concerned, it should be pointed out that we focused on one organization only. We did not make a comparison with multiple organizations, including those outside Slovenia. It would also be interesting to study other industries that also achieve excellent results in the field of quality.

In his article, Boshoff states that (1997, p. 110): "Avoiding mistakes in the management of a large-size organization completely is an objective beyond human ability. But once the mistake has been committed, a brave and sensible man will learn from it and move on".

With market globalization, competition between organizations increases on a daily basis, and in this battle only the best survive. What distinguishes the best from the rest is their ability to turn their mistakes into opportunities, using them for their own development. And the use of the 8D method certainly contributes to this goal.

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Povzetek:

Z 8D metodo do odlične kakovosti

RV: V raziskavi želim ugotoviti primernost v organizaciji uporabljene 8D metode za reševanje reklamacij ter ali se z uporabo le-te učinkovito zvišujemo kakovost.

Namen: Pri pregledu mednarodne literature smo ugotovili, da je o 8D metodi, premalo zapisanega in raziskanega, zato smo se odločili, da na podlagi teoretičnih izhodišč ocenimo primernost v organizaciji uporabljene 8D metode. Prav tako nas zanima učinkovitost doseganja rezultatov kakovosti, ki so v neposredni povezavi z 8D metodo. V prispevku želimo ugotoviti ali se z uporabo 8D metode zvišuje nivo kakovosti.

Metoda: Uporabili bomo kvalitativno analizo v obliki študije primera v organizaciji uporabljene 8D metode. Podrobneje bomo obravnavali pristope posameznih korakov 8D metode z navedbo v metodi integriranih dodatnih orodij. V kvantitativnem delu bomo na podlagi realnih in relevantnih podatkov pridobljenih z uporabo 8D metode z enostavno analizo ugotavljali trend števila slabih proizvodov (PPM) in trend stroškov povezanih s številom slabih proizvodov.

Rezultati: Ugotovimo, da je v organizaciji uporabljena 8D metoda reševanja problemov primerna ter da uporaba 8D metode dviguje nivo kakovosti in uspešnosti podjetja.

Organizacija: Izsledke raziskave lahko menedžment upošteva v procesu nenehnega izboljševanja, kot dodatno motivacijo za še bolj dosledno in učinkovito uporabo, kot tudi za dodatno podporo koordinatorjem in timom reševanja problemov.

Družba: Z enakim, vendar širšim namenom lahko izsledke raziskave upošteva tudi širše družbeno okolje, predvsem gospodarska podjetja kot tudi javne službe.

Originalnost: Raziskava na to temo in s to kombinacijo še ni bilo izvedena.

Omejitve: Vzorec je majhen in omejen le na eno večje slovensko in uspešno podjetje. Upošteva samo podatke pridobljene z uporabo 8D metode.

Ključne besede: zagotavljanje kakovosti, orodja kakovosti, metoda reševanja problemov, 8D metoda, reklamacije.