Abstract. The paper presents the results of a study concerning the use of the Ishikawa diagram in analyzing the causes that determine the improvement of the quality of education in a university. All the possible, main and secondary causes that could generate the studied problem were identified. We determined six possible main causes: Man-professor, Man-student, Methods, Materials, Environment for Teaching and Learning, Quality Management. All main causes and secondary causes described a new Ishikawa diagram, a new model with 4M + 1E + 1Q.

Keywords: quality management, diagram, Ishikawa, quality of education

1. Introduction

Improving the quality of manufacturing processes can be performed by using some specific methods and techniques of analysis (Pareto Analysis, Ishikawa Diagram, Histograms, etc.). The diagram is considered one of the seven basic tools of quality control [6]. Ishikawa Diagram is a simple graphical instrument to understand the causes that produce quality defects and is used to analyze the relation between a problem and all possible causes. All categories of causes start with the letter M (machines, methods, men, materials, maintenance, milieu-environment, management) for the productive domains. 4M, 5M, 6M, 7M Ishikawa diagram were performed like this.

The cause-effect diagram – fishbone or Ishikawa - was developed by Kaoru Ishikawa in order to determine and divide the causes of a given problem on main fields of causes. It is recommended to use it only when there is only one problem, and possible causes can be classified based on several criteria.

Ishikawa diagram is being defined as a graphic representation that schematically illustrates the relations between a specific result and its causes, [1], [6]. The studied effect or negative problem is “the fish head” and the potential causes and sub-causes define the “fish bone structure”.

The Ishikawa diagram can be applied for the analysis and evaluation of a quality problem in different production activities as well as in the field of services rendered to the beneficiaries.

An interesting model of Ishikawa diagram was developed in the case of a defect occurred after a service car repairing [8]. In [13] it is shown that obtaining a correct diagram is possible only through working in a team with experience. Ishikawa diagram application areas are continuously expanding. For example, nowadays the method is also being applied in the medical field [7]. A study on Identification and Classification of Causes which Generate Welds Defects it is presented in [12]. Studies of Applying a Quality

The paper presents the results of a study concerning the use of the Ishikawa diagram in analyzing the causes that determine an issue in the field of education - "improving the quality of education in a university". Improving the quality of educational services must be a permanent concern so that educational services in universities respond to the requirements and needs of students and employers. Universities must set up and implement actions to fully meet the requirements of stakeholders (internal and external customers). In order to establish measures for the continuous improvement of educational processes, all the potential causes that influence them must be identified.

For the full satisfaction of stakeholders, universities need to design and implement efficient and effective quality management systems.

2. Method and results

The research method used to determine Ishikawa diagram is based on work steps proposed by Dale [3], namely the following:
- It is defined very clearly the effect of the problem considered,
- It is written the effect in the right and it is drawn a line from right to left,
- It is checked if each team member has understood well the problem,
- They are determined the main categories of causes which are the main branches of the diagram,
- It is organized a brainstorming session to determine possible secondary causes,
- It is organized another brainstorming session in order to discuss in detail the causes and to determine those who have the major degree of probability for producing the studied effect,
- They are traced and recorded the appropriate sub-branches.

The above steps have been taken and were identified several potential causes that were grouped into 6 main categories and 6 families respectively (table 1).

<table>
<thead>
<tr>
<th>The studied problem</th>
<th>Main causes</th>
<th>Secondary causes</th>
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<tbody>
<tr>
<td>1. Man- Professor</td>
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<td></td>
<td>- Professional training</td>
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<td></td>
<td>- Pedagogical abilities</td>
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<td>- Pedagogical talent</td>
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<td>- Human qualities</td>
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<td></td>
<td>- Interactive communication skills</td>
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<td></td>
<td>- Skills to stimulate creativity</td>
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<td>2. Man- Student</td>
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<td></td>
<td>- Active</td>
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<td>- Disciplined</td>
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<td></td>
<td>- Appropriate behavior</td>
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<td>- Interest in assimilating knowledge in the field of training</td>
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<tr>
<td></td>
<td>- Attitude</td>
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<td>- Abilities</td>
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</tbody>
</table>
| Improving the quality of education in a university | 3. Materials | - Appropriate courses and applications  
- Appropriate teaching materials  
- Modern laboratory equipment  
- Internet access  
- Provision of the necessary information on time  
- Very well-equipped library and reading room |
|---|---|---|
| | 4. Methods | - Appropriate teaching strategies  
- Teaching methods appropriate to the type of discipline  
- New teaching technologies  
- Classic evaluation methods replaced by modern methods  
- Appropriate teaching and assessment methods for the development of teamwork and communication skills  
- Appropriate teaching and assessment methods for developing computer skills  
- Appropriate teaching and assessment methods to develop practical skills specific to the future profession  
- Attracting students to extracurricular activities  
- Advice and permanent orientation of students  
- Developing activities coordinated by the student's year manager |
| | 5. Environment for Teaching and Learning | - Aesthetic and functional teaching spaces  
- Modern teaching and stimulating learning spaces  
- Modern libraries with flexible program  
- Functional and stimulating reading rooms  
- Accommodation in modern homes  
- Modern sports base  
- Proper medical office |
| | 6. Quality Management | - Improvement of the periodic internal evaluation of study programs  
- Improving the periodic evaluation of teachers |
3. The Ishikawa Diagram based on the study

Based on the study, a new model for the ISHIKAWA diagram is proposed, with the following 6 main causes: Man – Professor, Man- Student, Materials, Methods, Environment for Teaching and Learning, Quality Management. Given the names of the main causes, the diagram can be called: The Ishikawa diagram - model 4M + 1E + 1Q.

The diagram of the Dale stages in [3] is presented in figure 1. The obtained diagram gives an overview of the objective and subjective causes that lead to the improvement of the quality of education in a university. Once the causes determined it can be adopted and applied the necessary measures to improve the studied problem.

4. Conclusions

The external environment of universities is subject to complex shaping actions and forces, so students and employers will increase their demand for the quality of educational processes. The quality of education will be a permanent requirement for universities wishing to remain in national or international academic space characterized by fierce competition between universities.

To improve the quality of education, the best decisions and the most appropriate measures that influence the educational process should be taken. In this regard, all causes that determine the effect called: Improving the quality of education in a university. The Ishikawa method by which the cause-effect diagram is done is a good way to find the best solutions for improving the quality of education.

The Ishikawa diagram has the advantage that it offers the possibility to identify and analyze all factors of an objective and subjective nature, which relate to the studied problem.

The use of Ishikawa diagram leads to a graphical illustration of the existing relationships between a problem appeared in the educational process and the potential causes (factors) that influence this result, which helps to better understand the relations between a studied problem (Improving the quality of education in a university) and the causes that determine it.
Fig. 1. The Ishikawa diagram - model 4M + 1E + 1Q

Improving the quality of education in a university
References


