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AHP ANALYSIS OF THE COMPETENT LABORATORY ACCREDITATION STAFF

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Abstract

One of the criteria for assessment the technical competence of the laboratory is the competent and experienced staff. The paper presents an AHP analysis of competent and experienced laboratory accreditation staff. The following sub-criteria were analyzed: training SPS ISO 17025: 20017, training ISO 9001, training staff to work on a particular machine using a valid method, responsibility, impartiality, confidentiality, authority and interpersonal cooperation of laboratory staff. The criterion as the competent and experienced staff should meet all the requirements for the technical equipment of the laboratory in order to submit applications for accreditation.

***Keywords**: AHP analysis, competent and experienced staff, laboratory accreditation*

1 INTRODUCTION

Laboratory accreditation is a means of confirming the technical competence to perform the testing and calibration of materials. The name of the accreditation laboratory is used all over the world as a means of confirming technical competence. The National accreditation bodies use appropriate criteria and procedures. The analysis and evaluation of criteria and sub-criteria provides information to the managers on the technical competence of the laboratory.

Modern business requires certification of the products and services in accordance with the specific requirements and procedures given in the standards. The ISO 9001 standard requires the quality of products and services from the company. The international standard ISO/IEC 17025: 2017 sets out the competency requirements of a technical laboratory for testing and calibrating of materials. [1] When it is determined that the laboratory is a technically competent company, it submits a request to the Accreditation Body for obtaining an accreditation. The Accreditation Body of Serbia (ATS) evaluates the technical competencies of the laboratory and makes an impartial decision on accreditation.

In this work, the competent and experienced staff that determines the technical competence of the laboratory are analyzed. Criteria competent and experienced staff are evaluated by the following sub-criteria: training SPS ISO 17025: 20017, training ISO 9001, training staff to work on a particular machine using a valid method, responsibility and impartiality, confidentiality, authority and interpersonal cooperation of laboratory staff. The analysis of the criteria of competent and experienced staff was done using the AHP method (Analytical and hierarchical process).

The AHP analysis shows the assessment of each sub-criterion as a criterion evaluator, competent and experienced staff.

2 EXPERIMENTAL

Criteria that determine the competence of technical laboratory are: appropriate management system and procedures, competent and experienced staff, appropriate calibrated equipment, adequate conditions in which tests/calibrations are performed, valid testing/calibration methods, including sampling methods.

The laboratory must have a procedure for determining the staff competence requirements and keep all records.

The sub-criterion C1 - training SPS ISO 17025: 20017; International standard ISO/IEC 17025 sets out general competence requirements for testing and sampling materials. Through ISO/IEC 17025 training, staff gains knowledge for testing/calibration and sampling of materials in the laboratories. Trained staff meets the requirements of the standards and procedures used to use standard and non-standard methods developed in accredited laboratories.

The sub-criterion C2 - training ISO 9001; competent and experienced staff according to the special requirements and specifications given in the accreditation standards must have training of ISO -9001 standards. The ISO - 9001 standard provides staff with quality training on product quality. Respecting the requirements of ISO - 9001, the staff becomes competent to work in the accredited laboratories.

The sub-criterion C3 - training of personnel to work on a certain machine using a valid method; Personnel must be trained by an accredited laboratory to work on a specific machine using an appropriate valid method. According to the requirements of the management system, the laboratory must have a certificate of completed training for the appropriate machine and a valid method. The laboratory must keep records of staff competence, including education, qualifications, technical knowledge, training and experience.

The sub-criterion C4 - responsibility; staff performing any business activities belonging to the accredited laboratories must be held accountable. Responsible business by staff reduces all types of risk (loss of accreditation).

The sub-criterion C5 - impartiality; all laboratory staff and management must be committed to impartiality. They must not allow financial, commercial and other pressures to compromise impartiality. Laboratory risks must be managed to a minimum without the presence of staff bias (SPS ISO 17025: 20017).

The sub-criterion C6 - confidentiality, in the sub-criterion C6, personnel working in any capacity for accredited laboratories must, internally and externally, keep confidential all information about the user, unless otherwise required by law (SPS ISO 17025: 20017). Information between laboratory staff and users must be kept confidential as it is considered property.

The sub-criterion C7 - authorization; the laboratory must have staff who must be authorized to implement a management system and ensure the efficiency of the laboratory.

The sub-criterion C8 - interpersonal cooperation of laboratory staff; cooperation between staff must be in accordance with the laboratory business policy. Staff must work in accordance with the laboratory management system.

The AHP method was used for evaluation the sub-criteria using the AHP method. The AHP method belongs to the group of multicriteria decision making methods (MCDM) so it is

one of the most common used to evaluate criteria and sub-criteria. It is a quantitative method developed by Thomas Saaty [2].

The AHP method serves as an aid to the managers to resolve conflicting the real problems to the decision makers or managers. The evaluation of criteria, i.e. the sub-criteria on the basis of the Saaty scale with grades from 1-9 (Table 1), was determined. The criteria and sub-criteria were compared with each other in relation to the given goal. By ranking the relative influence of each sub-criterion in relation to each sub-criterion, a comparison matrix is performed. The degree of consistency should be less than 0.1 (10%).

The evaluations of the sub-criteria were determined by the authors of the paper and competent staff of the laboratory.

Table1 *Saaty cale for evaluation the criteria and alternatives*

$$S=\left\{\frac{1}{9},\frac{1}{8},\frac{1}{7},\frac{1}{6},\frac{1}{5},\frac{1}{4},\frac{1}{3},\frac{1}{2},1,2,3,4,5,6,7,8,9\right\}$$

Value a_{jk}	Interpretation of results
1	The elements j and k are equally important
3	The element j is somewhat more important than k
5	The element j is more important than k
7	The element j is very important than k
9	The element j is absolutely more important than k
2,4,6,8	Intermediate values between two elements

After entering the scores in the comparison matrix, the result of ranking the influence of sub-criteria was obtained using the Super Decisions software. First, a multidimensional hierarchical structure of influence on the competence and experienced laboratory staff was defined, then the weight coefficients of the sub-criteria were determined (Figure 1). The degree of consistency is 0.03752, less than 0.1.

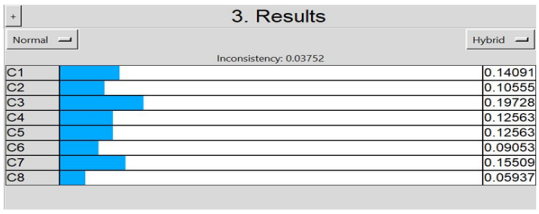

Figure 1 *Ranking results*

3 RESULTS AND DISCUSSION

Considering Figure 1, the following results were obtained:

The most important sub-criterion for evaluating the competency staff for laboratory accreditation is C3 - training staff to work on a particular machine using a valid method because its weighting factor has the highest value of 0.19728. The most important thing is that the staff is well trained to work on a particular machine.

The sub-criterion C7 - authorization takes the second place in importance for the work of staff in the laboratory because its weighting factor is 0.15509. The laboratory must have a person authorized to implement a quality management system (QMS), implement the SPS

ISO 17025:20017 standard and monitor the work of the entire laboratory. An authorized person is working to improve the work of the entire laboratory.

In third place is the sub-criterion C1 - training SPS ISO 17025: 20017; personnel working for accredited laboratories must be trained in the international standard ISO / IEC 17025. Standards ISO / IEC 17025 sets out general competence requirements for performing the laboratory tests.

The sub-criteria C4 responsibility and C5 impartiality take the fourth place because they have the same weight coefficient 0.12563. The ISO/IEC 17025 standards require in its requirements that staff are responsible and impartial in performing the laboratory activities.

The fifth meat occupies the sub-criterion C2 training ISO 9001 because its weight coefficient is 0.10555. Every person working in the laboratory must pass the training ISO - 9001 according to the requirements of ATS.

The sub-criterion C6 - confidentiality ranks sixth with a weighting factor of 0.09053. The SPS ISO 17025: 20017 standard requires that personnel engaged in laboratories must be confidential, both internally and externally.

The sub-criterion C8 - interpersonal cooperation of laboratory staff is in the last place because its weight coefficient is 0.05937. Cooperation between staff must be in accordance with the requirements of the laboratory policy and in accordance with the laboratory management system. The requirements of SPS ISO 17025: 20017 require respect and appreciation between the internal and external staff. Mutual cooperation affects the results of material testing.

4 CONCLUSION

The paper presents the AHP calculation of the assessment of competent and experienced staff for successful accreditation of the laboratory. The following sub-criteria were used for evaluation: SPS ISO 17025: 20017 training, ISO 9001 training, staff training on a specific machine using a valid method, responsibility, impartiality, confidentiality, authority and interpersonal cooperation of laboratory staff.

The most important sub-criterion for the assessment of competent and experienced staff is the sub-criterion C3, training staff to work on a particular machine using a valid method with a weighting factor of 0.19728.

The AHP analysis shows the strength of the sub-criteria weighting coefficients on the assessment the criteria of competent and experienced staff for the purposes of laboratory accreditation.

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