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The evaluation of activity of Technical Committees of Standardization for Metrology and Measurement on national level

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Abstract. General issues and features are considered in relation to the evaluation of Technical Committees for Standardization (TC) activity is considered. The use of generalized criteria for evaluation of the national TC, which takes into account not only the number of standards developed by TC, but other indicators are proposals. Results comparative analysis evaluation of activities national TCs of Metrology and Measurement Industry is presented.

Introduction
A mutual exchange with experience and information in field of metrology is very important. Many International Organizations is developing of voluntary technical standards in field of metrology (measurement, testing etc.), in particular it International Organization for Standardization (ISO), International Electrotechnical Commission (IEC) and International Organization of Legal Metrology (OIML) [1–4].

1. National TCs activity in the field of Metrology and Measurement Industry
The effectiveness activity of the national TCs at national, regional and international levels remains one of the urgent issues for the needs of governmental and non-governmental organizations. Updating and actualization of standards in different sectors of the economy depend primarily on the performance of national TCs. So important is the revitalization of the TC, analysis and identification of the main factors that influence the effectiveness of their work.

Research to assess the effectiveness of national of TCs and considering only the number of developed National Standards (DSTU), incl. harmonized with International standards (IS) and European standards (ES) (further – harmonized DSTU), and some other parameters, did not gives objective results [1–3].

Priorities for national standardization to develop harmonized DSTU determined the laws of Ukraine and other regulations. Given Ukraine’s preparations for the compiling with the European Union (EU) of the Agreement on Conformity Assessment and Acceptance of Industrial Products (ACAA), the introduction of European standards in Ukraine is top priority, because the use of them is seen as evidence of compliance with the directives of the “new approach” [4–6].
The principles of technical harmonization in Europe are specified by the decisions of the EU, but its directives set out only some main conditions, required for the provision of measurements reliability, but technical requirements are based on standards (IS and ES) and recommendations. Dominating aim harmonization in EU is to ensure free trade relations.

International guidelines and standards should be a priority for national TC in the field of Metrology and Measurement Industry, along with the harmonization of standards of evidence as to European directives. Such standards should be implemented as harmonized DSTU as they are the basis for metrology and laboratory accreditation activities in Ukraine. Without their harmonization cannot even talk about international recognition of product testing at the national level.

It should be borne in mind that not all national TCs is “mirror” with international counterparts in ISO, IEC, OIML or European Organization of Standardization (CEN/CENELEC), has the opportunity to work with them and develop harmonized DSTU. Because of the specific scope of the some TСs develop only national DSTU, industry standards and technical specifications [1].

The results of the comparative analysis of participation of national TCs in field of Metrology and Measurement Industry in the appropriate TCs of International Organization and European Organization are shown in Table. 1.

**Table 1. Participation of national TCs in field of Metrology and Measurement Industry in the TCs of International and European Organization**

| TCs of Ukraine | TCs of International Organizations | TCs of European Organizations |
|----------------|------------------------------------|-------------------------------|
|                | ISO                                | IEC                           | OIML                      | CEN/CENELEC |
| 63 General rules and regulations state system of traceability | 12 Quantities, units, symbols, conversion factors | 25 Quantities and units | 2 Units of measurement | – |
| 65 Devices Industrial Control | 69 Applications of statistical methods | 65 Applications of statistical methods | 4 Measurement standards and calibration and verification devices | – |
| 66 Optical and optomechanical products | 80 Measurement of fluid flow in closed conduits | 65 Industrial-process measurement, control and automation | 8 Measurement of quantities of fluids | – |
| 77 Medical equipment | 172 Optics and photonics | – | 14 Measuring instruments for used for optics | 170 Ophthalmic optics |
| 90 Means of measuring electric and magnetic values | 76, 84, 106, 121, 150, 170, 172, 173, 194, 198 | 62 Electrical equipment in medical practice | 87 Ultrasonics | 85 Eye protected equipment |
| | | 87 Ultrasonics | | 140 in vitro diagnostic medical device |
| | | | | 163 Sanitary appliances |
| | | | | 205 Non-active medical devices |
| | | | | | CLC/TK 38X Instrument transformers |
2. Generalized criterion for assessing the activities of TCs

Evaluation activity of national TCs should be carried out not only by the number of the developed DSTU, harmonized DSTU, but also taking into account the factors that most influence the effectiveness of the TCs.

Evaluation of the effectiveness activity of national TCs considering the number of developed standards and other indicators did not give objective results. Therefore, it is proposed to use the generalized criteria \( \delta_\Sigma \) for evaluation of TCs what containing weight coefficients for different types of standards:

\[
\delta_\Sigma = a \cdot \frac{K_{\text{DSTU}_{h}}}{K_\Sigma} + b \cdot \frac{K_{\text{DSTU}}}{K_\Sigma} + c \cdot \frac{K_{\text{SOU}}}{K_\Sigma},
\]

where \( K_{\text{DSTU}_{h}} \) – the total number of harmonized DSTU developed of national TC; \( K_{\text{DSTU}} \) – the total number of DSTU developed of national TC; \( K_{\text{SOU}} \) – the total number of industry standards and technical specifications (further – no DSTU) developed of national TC; \( K_\Sigma \) – the total number of standards developed of national TC; \( a \) – Given the priority of developing harmonized DSTU, take a weight coefficient \( a = 1 \), and other weight coefficients evaluated by an expert at: \( b = 0,3; c = 0,05. \) of harmonized DSTU for national standardization; \( b \) – weight coefficients of DSTU for national standardization; \( c \) – weight coefficients of no DSTU for national standardization [1].

Given the priorities of national standardization are established three conventional levels of significance criteria \( \delta_\Sigma \) (0 to 1) to develop harmonized DSTU, DSTU and other standards that define the three levels of performance of TCs for any industry or sector of the economy: “high”, “medial”, “low”. Peculiarities of each of the levels and values of generalized criteria shown in Table 2. Given the priority of developing harmonized DSTU, take a weight coefficient \( a = 1 \), and other weight coefficients evaluated by an expert at: \( b = 0,3; c = 0,05. \)

Using the formula (1) and reported data of TC for a certain period, can calculate the value of the generalized criterion \( \delta_\Sigma \) for any TC. Thus, for objective evaluation of TC should take into account all factors that can directly affect the efficiency of its activity.
Table 2. Levels, peculiarities of evaluation and values of the generalized evaluation criteria of TCs

| Level of evaluation of TCs | Peculiarity of evaluation of TCs | The value of the generalized criterion of evaluation of TCs, $\delta_c$ |
|---------------------------|----------------------------------|---------------------------------------------------------------|
| “high”                    | Many number of harmonized DSTU in the field of TCs              | $\delta_c \geq 0.7$                                           |
| “medial”                  | The average number of harmonized DSTU in the field of TCs       | $0.7 > \delta_c > 0.3$                                       |
| “low”                     | Small number of harmonized DSTU in the field of TCs             | $\delta_c \leq 0.3$                                           |

The evaluation values of generalized criteria $\delta_c$ and the level of efficiency of TCs in field of Metrology and Measurement Industry shown in Table 3.

Table 3. The evaluation values of generalized criteria and the level of efficiency of TCs in field of Metrology and Measurement Industry

| TCs designation | The total number of standards developed by TC (in t. h. DSTU / harmonized DSTU / no DSTU) | The value of the generalized criterion, $\delta_c$ | Level of efficiency TC |
|-----------------|--------------------------------------------------------------------------------------------|--------------------------------------------------|------------------------|
| 90              | 9 (0/9/0)                                                                                   | 1.0                                              | “high”                 |
| 99              | 33 (2/31/0)                                                                                 | 0.96                                             |                        |
| 156             | 13 (3/10/0)                                                                                 | 0.84                                             |                        |
| 122             | 41 (10/31/0)                                                                                | 0.83                                             |                        |
| 77              | 23 (8/15/0)                                                                                 | 0.76                                             |                        |
| 63              | 280 (110/170/0)                                                                             | 0.73                                             |                        |
| 65              | 49 (32/17/0)                                                                                | 0.54                                             | “medial”               |

Virtually all TC showed “high” level of efficiency (except TC 65, who showed “medial” level) because his work gave priority to the development of harmonized DSTU and did not develop the no DSTU. Comparing data TC 90, which reopened in 2006, and TC 65, established in 1993, stipulates that TC 90, developing only 9 harmonized DSTU (100%), received the highest value of generalized criterion $\delta_c = 1$. At the same time TC 65, almost 50 developing standards got “medial” level of efficiency, since concentrated its work on developing no DSTU.

Condition of introduction of IS and ES by TCs in Metrology and Measurement Industry shown in Figure 1. As shown in Figure 1, the rate of implementation of IS and ES in the field of Metrology and Measurement Industry at the national level remains quite low despite the commitments of Ukraine under the WTO.

Therefore, the question of harmonization of national standards with IS and ES in the field of Metrology and Measurement Industry is still relevant. Significant number of standards not yet implemented in Ukraine (only 53%). Should bear in mind periodic updating, revision and replacement of standards for the directives of the “new approach” from European authorities in the Official Journal of EC. In such circumstances, national TCs should work vigorously and almost simultaneously with the European TCs [7].
3. Conclusion

The results of TC identify of objective and subjective indicators, traditional of which are based on data on the number of developed standards (t. h. harmonized). But not always take into account other important factors such as participation in the International and European Organizations, the presence of overlapping fields with other TC, financial and technical capabilities and more. Therefore, evaluation of TC is necessary to take into account all influencing factors.

Found that national TC, which have “mirror” international counterparts in ISO, IEC, OIML or European Organization of Standardization have the better opportunity to work with them, to develop harmonized national DSTU, have more domestic demand sectors, have higher levels of performance evaluation.

The proposed general criterion for assessing TC includes weight coefficients for different types of standards and levels of approval, taking into account national priorities. The proposed approach allows us to objectively evaluate the activity of TC, despite the battery life and the absolute value of the number of developed standards.

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