



Review

Synergistic relationships between Analytical Chemistry and written standards



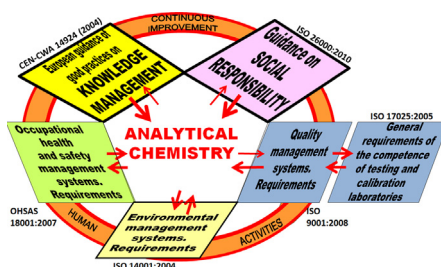
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HIGHLIGHTS

- Analytical Chemistry is influenced by international written standards.
- Different relationships can be established between them.
- Synergies can be generated when these standards are conveniently managed.

GRAPHICAL ABSTRACT



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ABSTRACT

This paper describes the mutual impact of Analytical Chemistry and several international written standards (norms and guides) related to knowledge management (CEN-CWA 14924:2004), social responsibility (ISO 26000:2010), management of occupational health and safety (OHSAS 18001/2), environmental management (ISO 14001:2004), quality management systems (ISO 9001:2008) and requirements of the competence of testing and calibration laboratories (ISO 17025:2004). The intensity of this impact, based on a two-way influence, is quite different depending on the standard considered. In any case, a new and fruitful approach to Analytical Chemistry based on these relationships can be derived.

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Abbreviations: CEN, European Committee for Standardization; CRM, Certified Reference Material; GUM, Guide to the Expression of Uncertainty in Measurement; ISO, International Organization for Standardization; JCGM, Joint Committee for Guides in Metrology; KM, Knowledge Management; OHSAS, Occupational Health and Safety Advisory Services; R&D&I, Research, Development and Innovation; SME, small and medium enterprises; S&T, Science and Technology; SI, International System of units; SR, Social Responsibility; VIM, International Vocabulary of Metrology.

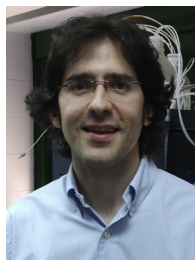
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1. Introduction

There is a tendency among scientists to consider written standards (e.g. norms, guides) far from the daily work in the R&D&I sequence. These standards are viewed as milestones of corporations, industry, society, etc., but not relevant at all among those working in Science and Technology (S&T).

In our opinion, this is a great error for a number of reasons, the most relevant of which are as follows:

- *First*, written standards can help to organize, to plan and to monitor research activities. In fact, the need for a free atmosphere without formal limitations inherent to S&T is a not well founded excuse to circumvent the benefits of standardization.
- *Second*, some written standards (e.g. those related to quality, in general, and occupational health & safety and environmental protection, in particular) might directly influence the developments in S&T.
- *Third*, the final target of S&T is the continuous improvement of human life quality, from both individual and collective points of view, including even that of the people involved in R&D&I activities. Written standards are recognized as cornerstones to achieve this crucial objective of humanity.
- *Fourth*, scientists have a multi-wrong conception of norms and guides, including their inflexibility or the obligation to fulfil all the requirements involved without the possibility of adaptation to peculiar situations. Besides, most scientists are not aware of the existence of a broad variety of topics supported by written standards apart from the classical ones (i.e. those devoted to quality, environment protection and occupational health & safety) such as the standards related to knowledge management and social responsibility.

The main aim of this article is to minimize or to avoid this typical misunderstanding about the relationships between written standards and S&T, in general, and Analytical Chemistry, in particular. With this purpose, the present article demonstrates that these relationships can lead to synergies between the two parts involved as long as they are conveniently exploited and managed. The extension and importance of written standards grows in the sequence of S&T activities: research + development + innovation. In fact, the

last steps are closer to the real world (market, business), where the significance of norms and guides is well recognized by producers and recipients of the “products” derived from innovation. Analytical Chemistry, which involves new paradigms in its present and future basic and practical conceptions, is used as case of study to demonstrate the mutual impact between S&T and written standards.

2. Types of standards of analytical significance and their evolution

In addition to the inclusion of the required (bio)chemical information as the third basic standard in Analytical Chemistry, it is necessary to consider the different significance of the written standards in this discipline along the time. This temporal evolution is depicted in Fig. 1.

In the past, the most relevant standards were those describing in detail analytical processes, which were qualified using adjectives such as “official”, “standard” and recently “validated” in respect to a defined “fitness for purpose” or “traceable” to a CRM or a “SI unit”.

At present, in addition to the use of internationally established methods, it is usual to employ two norms, namely (A) ISO 9001:2008, devoted to the requirements of the management of

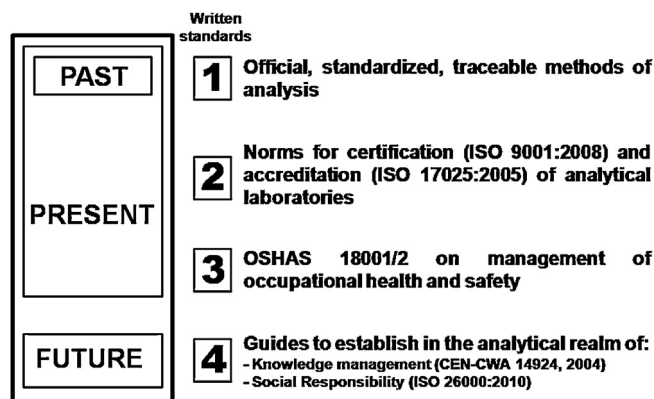


Fig. 1. Evolution of the significance of different written standards in Analytical Chemistry.

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