

**The need for an inventory of
the inconsistencies found in
international written standards
concerning measurement:**

the role of IMEKO

(one case being VIM)

Franco Pavese

ISO TC69 “Applications of Statistical Methods”, Member

IUPAC, Commission I-1 “Green Book”, Member

INRIM, Torino, Italy, f.pavese@inrim.it

Multiple sources of guidelines and prescriptive documents

- There are several authorities, worldwide or regional, that include in their aims prescription or guidelines concerning concepts in measurement science and related terminology.
- Example (GUM, VIM): BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML (*JCGM*)
- The set is quite larger (e.g., ILAC, EA, A2LA, CITAC, Regional and National organisations)

Problems arising from multiplicity

- Hierarchy: not strictly outlined, if even accepted
- Links between these authorities and between groups working in each of them not presently ensuring that an entirely consistent international set of written codes is formed

- Difficulties even within each authority

Example: a Working Group, formed by ISO TC69 to promote internal harmonisation, is confronting with difficulties

Need for *inter*-organisation breath ... but

- Difficult because of the extremely wide range of subject matters
- Difficult to reduce the number of sets of codes
- Difficult to create a *super partes* recognised prescriptive body
- Not easy to overcome the sectorial jargons
- Difficult to harmonise the sectorial specificities

Nevertheless, the users are often confused by the present situation and seek help.

Minimal set of goals to proceed toward an improved situation: *what to avoid*

... *from one hand,*

- Ambition to reduce to a single (or to a too few) set of concepts
- To force generality beyond the limits imposed by different intended uses of the concepts

... *on the other hand,*

- To use the same term for different meanings
- To invoke untenable specificities

Minimal set of goals to proceed toward an improved situation: *what to look for*

- To understand the extent of the problem by collating and comparing existing texts
- To bound the set of concepts/terms that most requires cross-document consistency
- To build up a non-prescriptive frame and forum where these cases can be discussed and fixing-solutions proposed
- To supply the relevant prescriptive bodies with consensus solutions, for their corrective actions

A way forward –1

- For the necessary prerequisite, of becoming aware of the extent of the problem:
set-up a repository of the identified inconsistencies, acting as an inventory and a database where accumulate the information
- TC21 has started a Special Interest Group (SIG) on this issue. Liaisons are welcome.

A way forward –2

- **A non-prescriptive frame is needed to overcome the practical and relational difficulties of the prescriptive bodies** to discuss internally –and even more externally– this type of problems
- IMEKO can be the best frame for this purpose, for its independent scientific character and mission and its worldwide breath.

Repository implementation

(as maintained by TC21)

Typical basic structure for each item:

- (a) *Identified problem (term, concept) –source*
- (b) *Contrasting definitions/wordings –sources*
- (c) *Contrasting issues –log of citations*
- (d) *Supporting issues –log of citations*
- (e) *Log of the discussion and of proposals for mitigating the problem*

Example 1: VIM

- **VIM “Systematic measurement error”**
 - a) (2.17) “component of **measurement error** that in replicate **measurements** remains constant or varies in a predictable manner”
 - b) ISO 5725, ISO DIS 21748, ISO 21749, ISO 15725 (from systematic effects through bias definition), ISO 18532, GUM,...: *a random variable*
 - c) From GUM (3.1.5), QUAM2000.1 (2.4.9), ISO 5725-1, ISO 21748 (5.3.1, A.2.1), ...
 - d) From ISO 3534-2 (3.4.7), QUAM2000.1 (2.4.7), ...
 - e) *Log of discussion*

Example 2: GUM

- **GUM “repeated observations”** (measurements)
 - a) (3.1.5) “Variations in repeated observations are assumed to arise from not being able to hold completely constant each influence quantity that can affect the measurement results”
 - b) (through “repeatability (conditions)”) VIM, ISO 3534-2, ISO 5725, ... : *influence factors constant*
 - c) From VIM (2.20), ISO 3534-2 (3.3.6), ISO 5725-1, ...
 - d) From ...
 - e) *Log of discussion*

Example 3: ISO 3534-2

- **ISO 3534-2 “trueness”**
 - a) (3.3.3) “closeness of agreement between the expectation of a test result or a measurement result and a true value”
 - b) VIM, (through “bias”) ISO 5725-1, ISO 21748 (3.11), EA 4/16, A2LA Guide, ... : *a reference value*
 - c) From VIM (2.14), ISO 5725-1, ISO 21748, A2LA, EA 4/16, ...
 - d) From ...
 - e) *Log of discussion*

Example 4: ISO 5725

- **ISO 5725-2 “laboratory bias”**
 - a) (4.1) “ $y = m + B + e$... B is the laboratory component of bias under repeatability conditions”
 - b) ISO 5725-2 (*internal*), ISO 21748, VIM, ...
 - c) From ISO 5725-1, VIM (“measurement” 4.20, “instrumental” 2.18), ISO 21748 (A.2.1), ...
 - d) ?? (*due to the internal inconsistency*)
 - e) *Log of discussion*

Summary

- Inconsistencies are observed with each other between international guidelines and prescriptive documents, some namely in VIM
- Within each prescriptive body it is difficult, and often out-of-scope, to perform studies for promoting harmonisation
- IMEKO is a unique frame, as an independent, scientific, worldwide, well-recognised Organisation, that can help and work toward implementing this goal, starting from a repository of the recognised problems, and being the site where the discussion is promoted and logged.