

What do we mean by “Establishes Traceability”?

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Whilst preparing a presentation for the NPL Optical and Radiation Measurement Club Meeting that took place in July at the UK National Physical Laboratory¹ I re-read the definition of a Certified Reference Material. I also looked through a number of Certificates and the catalogue descriptions for a number of CRMs. The presentation was to introduce the concept of certified reference materials to a group of physicists and pharmacists interested in the measurement of colour. So I needed to be certain that I could explain what the words we so regularly use actually mean!

Pondering over all the various documents assembled together caused me to question the terminology we use and wonder if it is sufficiently precise! How did this happen? I first started with the often-quoted definition for a Certified Reference Material from the VIM, as follows.

A RM accompanied with a Certificate one or more of whose property values are Certified by a procedure which establishes its Traceability to an accurate realisation of the Unit in which the property values are expressed and for which each certified value is accompanied by an Uncertainty at a stated level of confidence.

It was the phrase “establishes its Traceability” that set me on this train of thought.

The wording of the Definition is not very neat or elegant. So on many Certificates, product labels and other promotional material that is associated with CRMs the word Traceability is not used, but Traceable, in the style of “Traceable to the Mole”.

Is this statement clear, or does it offer considerable ambiguity? Indeed could it be used to imply something more than the meaning of the words?

To try to answer the question I first looked for a dictionary and found that my 1995 copy of the *Concise Oxford English Dictionary* defines to Establish in four ways:

1. *Set up or consolidate a system on a permanent basis*

2. *Settle in a place or position*
3. *Achieve permanent acceptance for something*
4. *Validate or place beyond dispute a fact or something tangible*

In the context of the VIM Definition of a CRM the fourth definition would seem to fit the best. Establish is a transitive verb, here used in the third person active tense, so it requires something to be done by someone. So far so good.

The definition of Traceability is more difficult. Trace can be a noun or a verb, in our context it is clearly a noun. The same dictionary offers seven definitions for the noun:

- 1a. *A sign or mark or other indication of something having existed*
- 1b. *A very small quantity*
2. *A track or footprint left by a person or animal*
3. *A track left by a moving pen or instrument*
4. *A line on the screen of a cathode ray tube*
5. *A curve's projection or intersection with a plane*
6. *A change in the brain caused by a learning process*

Traceability is a derived noun, the suffix -ability, forms nouns of quality from or corresponding to adjectives in “able”. So we seem to mean an ability to trace, with trace having a meaning that fits with definition 2 or 3.

But in many CRM-related texts we find the word “traceable” has been used. This changes things rather a lot. The suffix -able is conditional: and forms adjectives, not nouns. My dictionary gives the following definitions:

- 1 *that may be*
 - 2 *that can be*
 - 3 *that is relevant to or in accordance with*
- Where do these definitions lead to?

We have determined that in the context of establishing traceability to the Mole the VIM definition is unambiguous.

But when the words are changed and traceable is substituted for traceability we introduce a significant potential for ambiguity. If something is claimed to be traceable all that needs to be done is to demonstrate that traceability to the

Mole could be established, not that it has been established! In summary, “Traceable to the Mole” simply means that something could be traced to the Mole, not that it has been or must be shown to be traced to the Mole.

Now why does this concern me? I am not suggesting for a moment that any CRM producer presently exploits the ambiguity possible in the English Language to claim traceability that has not been established.

But as the use of CRMs expands and develops it does worry me that a definition that was developed by academics for use by metrology professionals is being pushed and twisted to meet the needs of advertising copywriters into a commercial world where metrological exactitude is not always the overriding priority.

It does seem to me that the definition of a CRM needs to be revised to eliminate any potential for ambiguity! So what would be better? We need a clearer phrase that can be used in both a commercial and scientific context and which leaves the user or the reader without any possible doubts as to what has been done.

This scientist thinks that “traced” would be better than “establishes traceability”. Traced is totally unambiguous: it is the active voice of the past tense of the verb to trace and states that something has been done. So the definition of a CRM might then read as follows:

A RM accompanied with a Certificate one or more of whose property values are Certified by a procedure which proves that that it has been traced to an accurate realisation of the Unit in which the property values are expressed and for which each certified value is accompanied by an Uncertainty at a stated level of confidence.

This seems to be clear, unambiguous and gives the advertising or marketing professional no scope for creativity. I'd welcome your views.

Reference

1. The meeting is reported on in full in *RM report* 2(4), August (2003).