THE EXCELLENCE IN METROLOGY

Carlos Sousa, Polytechnic Institute of Porto, Portugal, psa@isep.ipp.pt
Paulo Ávila, Polytechnic Institute of Porto, Portugal, psa@isep.ipp.pt

Abstract: The excellence in Quality is possible… but only if theirs supports are excellences also. A Portuguese legal definition of Quality (in Decreto-Lei 142/2007) is: «Quality is the set of attributes and characteristics of an entity or product that determine their suitability to meet reach needs and expectations of society». It is important to note that what we want, it is no more to please the client or the customer, but to please the entire society. But, if the society needs Quality, an important item for the society satisfaction, so the society needs good supports of Quality. These supports are: Qualification; Standardization; and Metrology.

We believe that Metrology is the special one support! Why we say that? Because the Metrology is the support of Quality with the complete structure and better international organization! In this paper we make to note the importance of the traceability concept and postulate that without good traceability it is not possible excellence in Metrology. And, without excellence in Metrology, there we will never have excellence in Quality. By this path – Quality, Qualification, Standardization and Metrology – we, the society, could expect the excellence!

Keywords: quality; metrology; qualification, standardization, traceability, pillars of the traceability.

1. INTRODUCTION

The excellence is something that we search, but that we never achieve. It can be assumed that this is a perfect target - always searching. Indeed excellence is a way to perfection and therefore unattainable.

In the field of quality, the quest for perfection needs also a quest for perfection in all three pillars of quality: the qualification, the standardization and the metrology. These three pillars are presented in Portugal, by a law which, in the definition of quality, pointed a goal - to satisfy the society and not just the client.

It is made clear that quality only can be done if, in organizations, there is a credible and robust Metrological process. So, it is necessary that the metrology ensures a complete traceability and to be evidenced by a set of four pillars that ensure the six items of the traceability. By this, measurements will be reliable and internationally comparable.

Finally, due to the definition of traceability and complete expression of the result of a measurement, shows that there is not complete measuring without the estimation of uncertainty.

By the proposed work we want to clarify that the items and the pillars of traceability as well as the uncertainty of measurement, are absolutely essential in order the way to the excellence. Consequently the quality and the society can trust in metrology.

2. WHAT EXCELLENCE MEANS

In the Sermon on the Mount, Jesus encouraged the people to be perfect. He did not say «give your best» or «try to be the best», nor said «demand the perfection». He said «be perfect as your Father which is in heaven is perfect». At first we can think that this doesn't make sense! Nobody can expect be perfect like God! If Jesus is a God, He could not say that! But, precisely because Jesus was a very sapient person, he knew very well what the excellence means, and today, it means the same than 2000 years ago. Yes, it was excellence that Jesus talked about!

Jesus pointed a perfect goal! It is not possible to achieve it! So it is a Path...The Excellence is not a PLACE; it is a WAY! The excellence is continual improvement! Like in everything appended, in Metrology it is not possible to be achieved the Excellence, but looking for it is desirable.

3. THE QUALITY SUPPORTS

Several authors have defined the term quality, however, in Portugal we have a legal definition of Quality that we should fellow because is quite complete and actual. «Quality» is the set of attributes and characteristics of an entity or product that determine their suitability to meet needs and expectations of society [1]. This is an interesting definition: Who we want to please is no more the client, but the society!

According to the Portuguese law [1], that specify the Portuguese Quality System the quality supports are the following:

- qualification
- standardization and
- metrology

We can say that the Metrology is the main pillar because all of the others appeal to the metrology. Moreover, the metrology is strongly structured. It is constituted by people, equipment, places and systems, and it have a very good international organization.

About measurement, Abbagnano, an Italian philosopher said: "Galileu reduced the nature to the measurable objectivity and he have conduced the actual science to the maturity". And Lord Kelvin, about measurement, said "When you can measure what you are speaking about and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind."

After that, we have no doubts that the measurement is an important Quality support subject.

However, It is usual to say that measuring is a simple matter... because the Metrology is so logic! So, to manage a measuring system should be common-sense only! This is a danger affirmation, because the common-sense is very unstable - it changes from person to person...We will see in next chapter that Metrology is a complex system and needs special cares.

4. BETTER METROLOGY IMPLIES BETTER TRACEABILITY

Metrological traceability is defined by [2] as "property of a measurement result whereby the result can be related to a reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty". As an important note, metrological traceability requires an established calibration hierarchy [2].

In a classical view of traceability we can see a pyramid linking the current measurement to the top of International System of the Unities (figure 1).

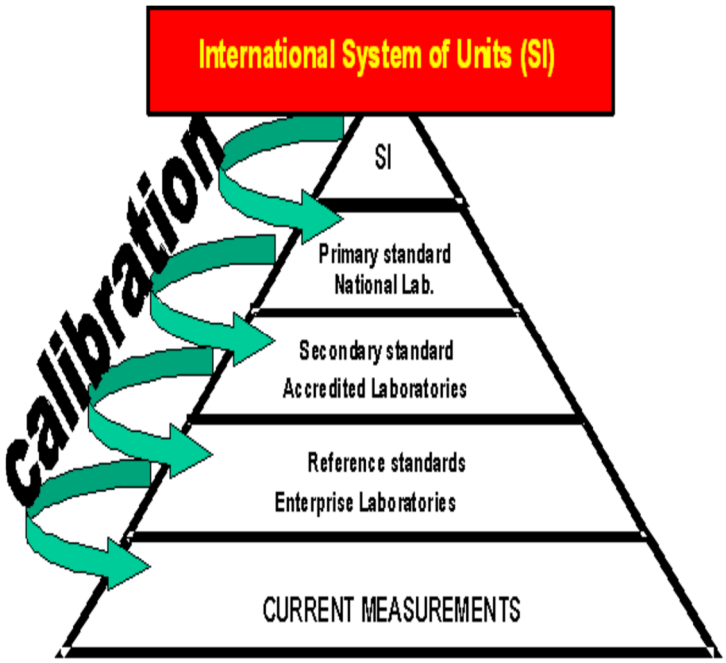

Fig. 1. Conventional pyramid of traceability.

Sometimes industrial technicians say that it is not necessary that calibrations can be held in not accreditation laboratories. Indeed analyzing what is said on ISO 9001 [3] and ISO 17025 [4], nowhere is said that the calibrations can only be made in accreditation laboratories. The common requirement for all standards is that it must be ensured the traceability.

It is here that enter the concept of excellence in metrology - is that traceability is not something that can be defined as white or black, or an on-off system. This subject has been widely discussed in international organizations that are concerned with issues of quality.

Among others, there is a document published by EA in 1995 [5] where are clearly mentioned the minimum requirements to achieve the completeness traceability.

We must remember the six items referred in [5] for the complete traceability (figure 2).

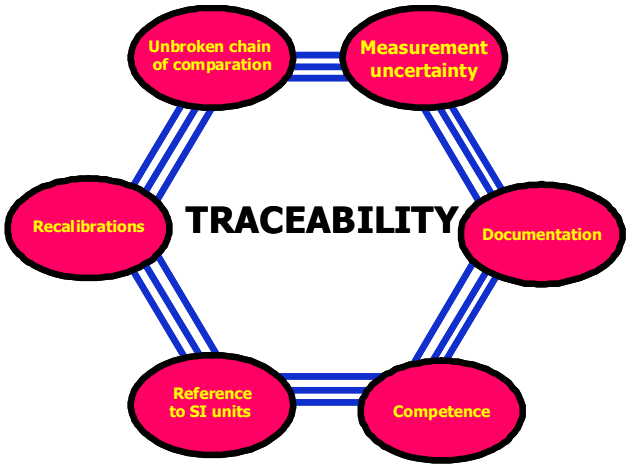

Fig. 2. The six items for complete traceability.

Linking the items referred in the figure 2 with the pyramid of traceability, we obtain the concept of the traceability pillars (see figure 3):

- Human resources;
- Material resources;
- Places and;
- Quality systems.

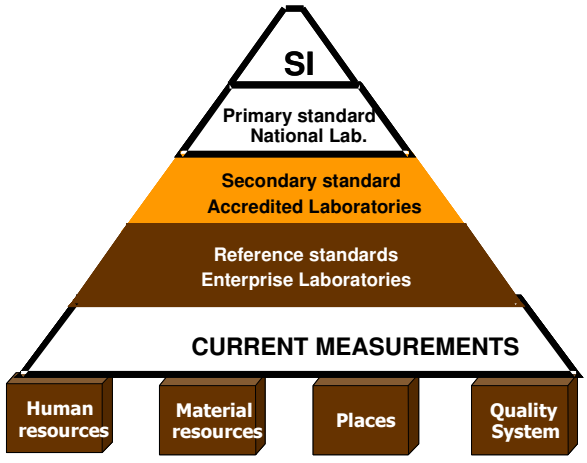

Fig. 3. The four pillars of the traceability.

If one of these pillars fails, we have not performed a complete measurement and we are not leading de Control improvements. The same pillars are necessary to link two consecutive steps of our pyramid (see figure 4).

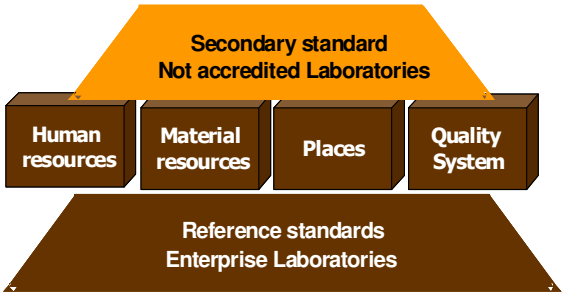

Fig. 4. The four pillars between two steps of the traceability.

The complete statement result of measurement (y') it is represented by the following expression:

$$y' = y \pm U$$

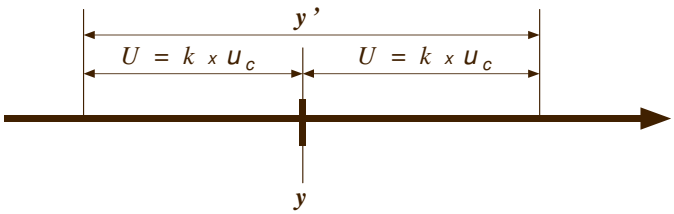

Fig. 5 Complete expression of the result of a measurement, y' [6,7].

Where [8]:

U – expanded measurement uncertainty

uc – combined standard uncertainty

k – coverage factor

y - complete statement result of measurement

y – result of measurement

So, for a general concept for good measurements is need: uncertainty! This statement is supported as a logical analysis but is mainly supported by the traceability definition, as we referred before. Through this manner we can affirm that we are in the way of Excellence and not using the common sense.

The two steps for a good way are:

First step is ensuring that the complete traceability is performed;

Second step is ensuring a total measurement management system.

How to ensure the complete Traceability?

To perform calibrations in accredited laboratories calibration (better) or auditing the Laboratories if they are not accredited by National Body of Accreditation, that means, second part audit (doubtful).

And how to ensure the total measurement management system?

The ISO 9001:2000 [3] recommends the implementation of this measurement system, suggesting ISO 10012:2003 Measurement Management Systems - Requirements for Measurement Processes and Measuring Equipment [9], like guidance.

Applying the ISO 10012, an effective measurement management system ensures that measuring equipment and measurement processes are fit for their intended use and is important in achieved product quality objectives and managing the risk of incorrect measurement results. The objective of a measurement management system is to manage the risk that measuring equipment and measurement processes could produce incorrect [9].

5. CONCLUSION

The main requirements to attend a quality assurance in measurement are considered in this standard:

1 – Good measuring instruments are need;

2 – Skill technician is necessary;

3 – Places (environmental conditions);

4 – Management of measurement systems with rules of quality is essential.

As a final conclusion we can say that there are no real measurements without estimation of uncertainty, and so the quality can trust the metrology and the society also!

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