

# **Feedback from MU trainees in Belgium - an informal interview approach**

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MathMet MU training – Skills workshop  
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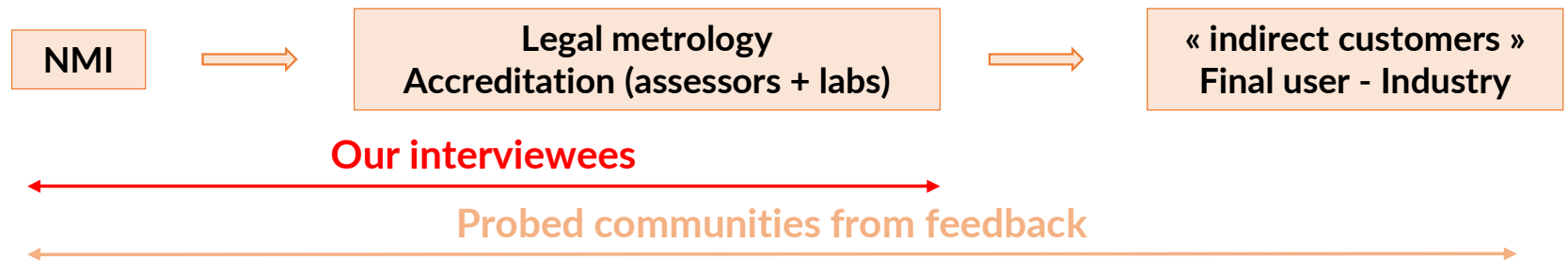
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# Interviews

# Interviews

- Why ?
  - Collect more information : probing approach
  - Confidence mood
  - More informal, richer information although not always representative
- How ?
  - Persons who already showed open to discussion, constructive+critic minded : trainees with shown reaction or acquaintances of ours
  - Physical or Teams interviews (from 0:30 to 1:30 each to cover the most)
  - Allow the discussion to « float around »
- Who ?



# Interviews

- About what ?
  - If trainee : ask for opinion about their actual training
    - (material) Mathematical level, complexity level
    - (teaching) Duration, type of material, onsite vs. distant
    - Curriculum approach: splitting into several lectures, frequency, refresh courses
    - Suggestions ...
  - What are their overall needs (needs for their objectives in work) ?
  - Identified problems around them (their work or their customers' work)  
→ always target the end of the measurement chain
  - Ask for the diversity of their stakeholders
  - What is the MU aspect the most important ? (--> purpose ...)



# Feedback and context from SMD's trainings

# Lab responsible (big accredited lab)

- Role : trainee
- Needs
  - Detailed level training for MU calculation for a specific calibration process
- Content
  - Identification and evaluation of each U source (theory & practice in the lab)
  - Calculation of the overall MU + discussion (only possible in small groups)
- What is it useful for ?
  - Improving their calibration process
  - Risk analysis (identification of factors having high impact on the MU)
- Training itself, skills
  - **Tailored in-depth** training on a **specific process** (measurement principle, U sources and MU calculation)
  - Training on-site with practical examples and **hands-on exercises**

# Training responsible (big accredited lab)

- Role : trainer
- Needs : Depends on the trainee profile (several trainings available)
- Content
  - For all employees and customer/user: **basic** training in metrology (Concept – limited math/stat)
    - How to read/use a certificate ?
    - Ambient conditions : why it is important?
  - For **technical** profiles: basic training in MU / specific training, with practical case in the area of expertise (taking specific standards into account)
    - To apprehend the complexity of MU
    - To be able evaluate if a product/process is adapted/precise enough for a specific need
  - For **MU experts** : in-depth training on a specific process (measurement principle, U sources and MU calculation)
- What is it useful for ?
  - Risk analysis (identification of factors having high impact on the MU)
  - Decision/support information for new instrument
  - **Assisting customers** in their needs
- Training itself, skills
  - Trainee must have « **field** » **experience** before training
  - Refresh course (2-3 years)



# Secretary (NMI)

- Role : trainee
- Needs
  - no technical knowledge needed, only have an overall picture (« **make things real** »)
- Content
  - ((No mathematics))
- What is it useful for ?
  - Contact with customer and correct bookkeeping (writing certificates, some proofreading, directing to correct staff member, etc.)
  - **Better understanding of ins and outs** → improved autonomy
- Training itself, skills
  - Real case with pictures of the device and measurement + sketches
  - 1 day is far too long
  - Questions and quizzes would help in understanding+keeping attention

# Metrology field inspectors

- Role : trainee
- Needs
  - The maximum permissible error (MPE) used as criteria on-site are high → MU not critical ( $U < MPE$ ) BUT general knowledge on MU, identification of U sources,... is needed
  - Understand what's behind the automatic calculator sheet used on the field
- Content
  - Basic concept of MU calculation with a **real example**
- What is it useful for ?
  - Needed to check the adequacy of control equipment/environment and perform correctly the control measurement, anticipating drift, adjusting instrument (@MPE/3)
  - Explaining why an inspection result is negative
- Training itself, skills
  - Field inspectors : measurement process experts BUT field measurements = « less than ideal conditions » (not highly controlled environment like in NMI or calibration labs) → Regular « refresh » training in U sources and MU allows for perspective from their daily practice, helps **highlight critical factors** in the measurements and therefore the decision making
  - Training with a concrete example/exercises in the area of expertise



# Feedback and context from other trainings

# Accreditation body

- Role : organizer of the overall trainings for assessors
- Needs
  - For all ISO/IEC 17025 **lead assessors: raise awareness**
  - For ISO/IEC 17025 **technical assessors: high knowledge** of MU (and measurement process)
- Content
  - In the generic training for ISO/IEC 17025 assessors, a session is dedicated to MU (concept and basic math)
- What is it useful for ?
  - MU is a mandatory parameter for assessors to evaluate regarding ISO/IEC 17025  
➔ Accreditation body must ensure that technical assessors have deep knowledge of MU
- Training itself, skills
  - Basic training is provided by the accreditation body to all assessors
  - Technical experts are not trained by the accreditation body but recruited for a specific audit depending on the scope of the audit and the expert's CV/recognized area of expertise

# Quality advisor (support unit, network of food- feed-product analysis labs)

- Role : trainee
- Needs
  - **Tools for method validation** and MU evaluation
- Content
  - Followed the basic training on MU provided by the Belgian accreditation body
  - Consequently followed a higher level (more math but still generic) training
- What is it useful for ?
  - Improving knowledge on MU
  - Ensure MU of their lab measurement **comply** to the quality requirements of ISO/IEC 17025
- Training itself, skills
  - Accredited lab staff have a background in method validation and MU evaluation  
➔ ponctual need for a deeper training for a specific process
  - MU training adapted to **analytic measurement** (vs metrological measurement)

# ISO/IEC 17025 assessor (dimensional metrology)

- Role : consultant (assessor/trainer)
- Needs :
  - Mostly related to ISO/IEC 17025, metrology needs
  - Auditees (=direct customers): 2 profiles: employee does **all the steps** or (bigger comp.) **operator+analyst** (some knowledge separation issue can occur)
  - Final customers (very diverse level) : want to end up in MPE's, caring for **cost/benefit ratio**
  - Teaching vs. advising
- Content :
  - Basic math level (complex model not needed: just fall into MPEs)
- What is it useful for ?
  - MU evaluation is a requirement of ISO/IEC 17025
  - **Support** in instrument using/buying decisions for **customers** (to fulfill their requirements or goals)
- Training itself, skills
  - Curriculum: from common bases to topical (metrology)
  - Math level: very basic (complex is only useful for NMIs)
  - Frequency: ISO/IEC 17025 periodicity forces it a bit; budget-limited for SMEs.
  - Field related: almost always a **measurement model**; control chart not much used, sometimes for drift monitoring

# Summary

- Good training should be fit to users' needs (direct but also indirect)
- Good/bad practice :  
good : real example, with picture, with real data, real Excel sheet  
bad : too long, too theoretic, oversimplistic examples
- Low mathematical level: the **concept of uncertainty** is the most important
- Reading/understanding a certificate + introduction to metrology (ambient conditions)
- Most prefer face-to-face trainings (vs. online trainings)
- Periodicity – refresh courses: 2-3 years and/or forced by ISO/IEC 17025 periodicity
- **End-of-chain needs** (indirect customers):
  - MPE, support a decision, orient customer
  - Not only technical profiles, also their support staff

