

# COMMET project

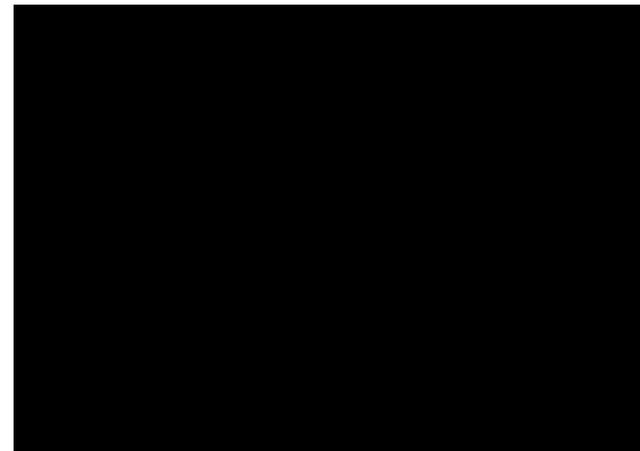
The **electro-mechanical technician** & the **metal-cutting technician**:  
*Proposals for the construction of a qualification grid – WP III*



# Qualification grids for 2 metal-working vocations



1. **Presentation** of the qualification grid for the **electro-mechanical technician**
2. **Presentation** of the qualification grid for the **electro-mechanical technician**
3. **Proposals** & further discussions about the common grid



# Qualification grids for 2 metal-working vocations

First issue...

... who are the metal-cutting & electro-mechanical technician?



12/2008

CEFORALP

# Qualification grids for 2 metal-working vocations

The more we made research on those 2 vocations so more we got confused...

- **2 dimensions** enter in this questioning & **have a strong impact** on competency descriptions:
  - **Dimension 1:** the definition of the vocation itself (what kind of activities are included)
  - **Dimension 2:** the level of the analysed profile (what is a technician in your country?)
  
- Before getting deeper into details, **we need to be sure** that what we chose in France as a basis for European comparison is based on the same dimensions than in all countries

# Qualification grids for 2 metal-working vocations

**Dimension 1:** the definition of the vocation itself (what kind of activities are included)

- If 1 vocation is unique, the **ways to accede** to it are numerous and entail **diverse activities** and thus, **competencies**
  - Example with the metal-cutting technician:
    - 3 qualifications offered by the metallurgical sector (CQPM) incl.:
      - “machining technician in automated systems”
      - “machining and production engineering technician”
      - “metal-cutting and metal-mould tool-maker”
      - “cutting & stamping press operator”...
    - Several qualifications offered by the Ministry of National Education incl.:
      - “machining technician” professional baccalaureate (BAC Pro)
      - “implementation of materials spe. in moulded metallic materials” professional baccalaureate (BAC Pro)
    - Several qualifications offered by the Ministry of Labour incl.:
      - “Machining workshop technician” vocational certificate (titre à finalité professionnelle)
      - And many others...

Different qualifications = different competency descriptions = differences in the grid

Our position: favour the sector-based qualification description, closer to industrial reality

# Qualification grids for 2 metal-working vocations

**Dimension 1:** the definition of the vocation itself (what kind of activities are included)

- Furthermore, the different qualifications offered by the metallurgical sectors for the metal-cutting technicians **include other related activities** such as:
  - Production engineering
  - Automated systems
  - Etc.
  
- Do we want to include these activities in the grids through the competencies that they involve?



# Qualification grids for 2 metal-working vocations

**Dimension 2:** the level of the analysed profile (what is a technician in your country?)

- **Qualification levels** i.e. how much is expected from the person holding the vocation (only implementing or managing people, etc.) are different in the different countries and even within countries
  - What we call “**technician**” in France is a person that can **carry out technical work autonomously** and/or comprise **management and coordination responsibilities**
  - It corresponds to:
    - **Level 4** for the qualifications under the authority of Ministries
    - **Level B** (or sometimes A) for the qualifications under the authority of the metallurgical sector
  - A technician has more responsibilities and technical knowledge than operators (often called “agents”)
  - If we translate literally metal-cutting to FR (“découpe des métaux”), all associated qualifications lead to **operator levels** and **not technicians** (involving more responsibilities)
    - Choice to concentrate on “machining technicians”

# 1. The electro-mechanical technician



# The electro-mechanical technician

## Foreword

- In France, **2 complementary approaches** to job descriptions
  - **Based on vocations:** description of competencies, sphere of activities, possible qualifications, etc. (source: ROME index)
  - **Based on qualifications:** description of the competencies acquired through the qualification to reach one vocation (source: metallurgical qualification index – CQPM database<sup>1</sup>, but could also have been other qualifications under the authority of the Ministries and leading to similar occupations)
- The proposed grid is **drawing on both sources** in order to offer a complete view of the vocation



<sup>1</sup> **Note:** the vocational qualification such as the one from the metallurgical sector are currently being reviewed to integrate the RNCP (= the national qualification index for all French qualifications)

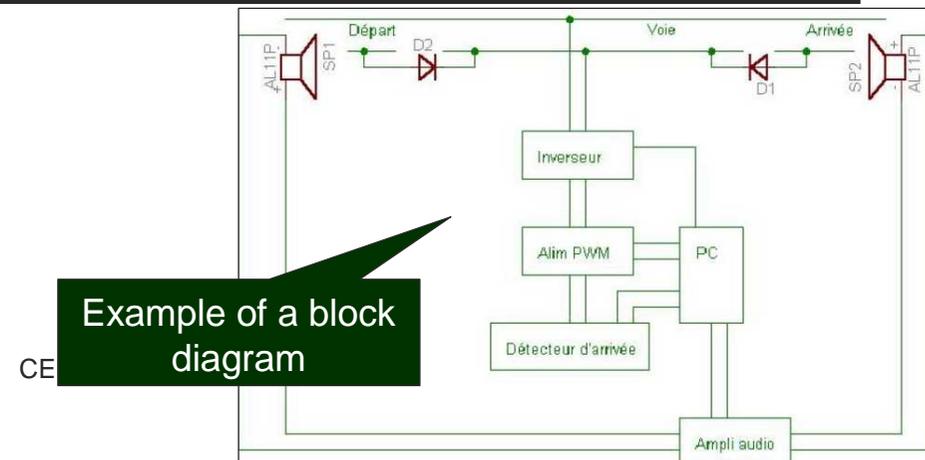
# The electro-mechanical technician

## 1. The sphere of activities of the electro-mechanical technician

Sphere of activity 1	Installation and starting up of the equipment
Sphere of activity 2	Modifying the block diagram
Sphere of activity 3	Draw up a diagram using computing equipment
Sphere of activity 4	Create mechanical mounts / stands
Sphere of activity 5	Provide technical assistance to manufacturing departments
Sphere of activity 6	Repair & ensure the maintenance of equipments
Sphere of activity 7	Participate to the working out of manufacturing methods
Sphere of activity 8	Draw up technical specifications



Example of a mechanical mount



Example of a block diagram

# The electro-mechanical technician

Phases of the complete activity	Competence dimension			
	Specialist competence	Methodological competence	Social competence	Personal competence
Analysing	<p><b>Able to</b> interpret documents related to the implementation of one's work in accordance with the regulations in effect and only referring to the entrusted activities</p> <p><b>Able to</b> draft by hand or with a computer a detailed diagram of electronic circuits or electric cabling</p>	<p><b>Able to</b> participate to the choice of a method using documents and theoretical proposals contained in the specifications</p> <p><b>Able to</b> independently gather information about the elaboration of an equipment or installation, by choosing appropriate documents</p> <p><b>Able to</b> continuously update one's knowledge on technologies</p> <p><b>Able to</b> analyse technical problems and deduce the adapted method and material</p>	<p><b>Able to</b> maintain constant technical and functional relationships inside and outside the enterprise</p>	<p><b>Able to</b> strictly respect the controlling methods, safety procedures, etc.</p> <p><b>Able to</b> understand a foreign language &amp; notably technical English</p> <p><b>Able to</b> use the basis of computer based data processing</p> <p><b>Able to</b> use and understand the basis of automation</p>

Legend:

Dark green: competency which intervenes in several steps of the activity (transversal)

It could be enriched with obvious "team working" social competencies (*tolerance, assistance, critical look, etc.*) – but they do not appear on the descriptions so have not been placed in the column so far

These elements are more related to knowledge than competencies – they could also be placed in specialist or methodological competencies

# The electro-mechanical technician

<i>Phases of the complete activity</i>	<b>Competence dimension</b>			
	<i>Specialist competence</i>	<i>Methodological competence</i>	<i>Social competence</i>	<i>Personal competence</i>
<i>Planning</i>	<p><b>Able to</b> use the documents from a technical file</p> <p><b>Able to</b> represent documents (diagrams, sketches, plans, etc.) in a technical file connected with an equipment or an installation to be implemented starting from the specifications</p> <p><b>Able to</b> implement and adjust the prototype in keeping with the specifications using tests, measurements and different assembling</p>	<p><b>Able to</b> organise one's workstation starting from the tasks to be carried out and respecting the safety rules</p> <p><b>Able to</b> continuously update one's knowledge on technologies</p>	<p><b>Able to</b> maintain constant technical and functional relationships inside and outside the enterprise</p>	<p><b>Able to</b> strictly respect the controlling methods, safety procedures, etc.</p> <p><b>Able to</b> use the basis of computer based data processing</p> <p><b>Able to</b> use and understand the basis of automation</p> <p><b>Able to</b> solve problems autonomously</p>

# The electro-mechanical technician

<i>Phases of the complete activity</i>	<b>Competence dimension</b>			
	<i>Specialist competence</i>	<i>Methodological competence</i>	<i>Social competence</i>	<i>Personal competence</i>
<i>Performance</i>	<p><b>Able to</b> carry out the assembling of equipments or material on different types of mounts, cupboards or boxes respecting the requirement of the specifications (quality, aesthetics) and according to the safety rules</p> <p><b>Able to</b> carry out the cabling and junction of boxes or cupboards with electric equipments or machines, according to the specifications, the diagrams and the regulation in effect</p> <p><b>Able to</b> implement elementary machining operations on pieces from electro-mechanical construction implementing manual activities with portable tools or machines and respecting the safety rules</p> <p><b>Able to</b> participate to the drafting of the technical file</p>	<p><b>Able to</b> continuously update one's knowledge on technologies</p>	<p><b>Able to</b> maintain constant technical and functional relationships inside and outside the enterprise</p>	<p><b>Able to</b> strictly respect the controlling methods, safety procedures, etc.</p> <p><b>Able to</b> use the basis of computer based data processing</p> <p><b>Able to</b> use and understand the basis of automation</p> <p><b>Able to</b> solve problems autonomously</p>

# The electro-mechanical technician

<i>Phases of the complete activity</i>	<b>Competence dimension</b>			
	<i>Specialist competence</i>	<i>Methodological competence</i>	<i>Social competence</i>	<i>Personal competence</i>
<i>Checking</i>	<p><b>Able to</b> read and interpret the configuration and status data from electric equipment and installations that interfere with pneumatic, hydraulic and electric systems and understand their functioning and location</p> <p><b>Able to</b> carry out circuit controls, adjustments, tests and measurements previous to putting into service the achievement and in accordance with the functioning specificities and safety modes</p> <p><b>Able to</b> repair equipments (electric &amp; electronic as well as hydraulic and pneumatic) by identifying and diagnosing the malfunctions and faulty elements</p>	<p><b>Able to</b> propose improvements and, after validation, to apply them</p> <p><b>Able to</b> analyse technical problems and deduce the adapted method and material</p> <p><b>Able to</b> continuously update one's knowledge on technologies</p>	<p><b>Able to</b> maintain constant technical and functional relationships inside and outside the enterprise</p>	<p><b>Able to</b> strictly respect the controlling methods, safety procedures, etc.</p> <p><b>Able to</b> use the basis of computer based data processing</p> <p><b>Able to</b> use and understand the basis of automation</p> <p><b>Able to</b> solve problems autonomously</p>

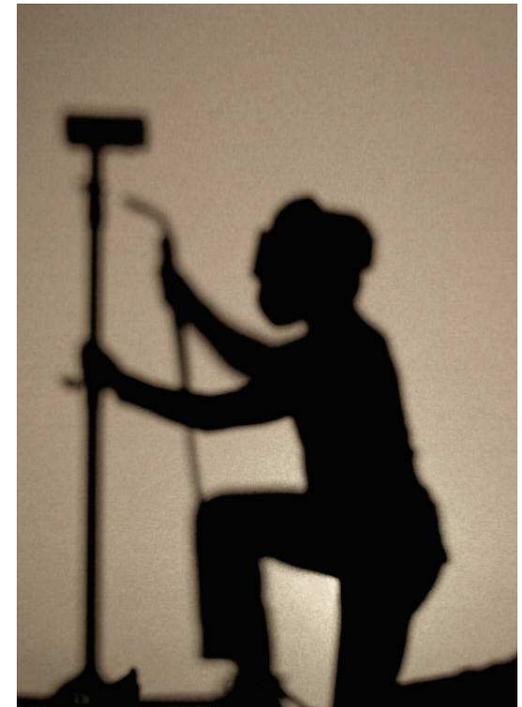
# The electro-mechanical technician

<i>Phases of the complete activity</i>	<b>Competence dimension</b>			
	<i>Specialist competence</i>	<i>Methodological competence</i>	<i>Social competence</i>	<i>Personal competence</i>
<i>Documentation</i>	<p><b>Able to</b> draft intervention minutes or report</p> <p><b>Able to</b> search for the necessary components from technical catalogues</p>	<p><b>Able to</b> continuously update one's knowledge on technologies</p>		<p><b>Able to</b> use the basis of computer based data processing</p> <p><b>Able to</b> use and understand the basis of automation</p> <p><b>Able to</b> understand a foreign language &amp; notably technical English</p>

# The electro-mechanical technician

<i>Phases of the complete activity</i>	<b>Competence dimension</b>			
	<i>Specialist competence</i>	<i>Methodological competence</i>	<i>Social competence</i>	<i>Personal competence</i>
<i>Evaluating</i>	<p><b>Able to</b> check the concordance of the results of the achievement and the objectives set by the technical file when putting it into service</p>	<p><b>Able to</b> propose improvements and, after validation, to apply them</p> <p><b>Able to</b> analyse technical problems and deduce the adapted method and material</p> <p><b>Able to</b> continuously update one's knowledge on technologies</p>	<p><b>Able to</b> maintain constant technical and functional relationships inside and outside the enterprise</p>	<p><b>Able to</b> strictly respect the controlling methods, safety procedures, etc.</p> <p><b>Able to</b> use the basis of computer based data processing</p> <p><b>Able to</b> use and understand the basis of automation</p> <p><b>Able to</b> solve problems autonomously</p>

## 2. The metal-cutting technician



# The metal-cutting technician

## 1. The sphere of activities of the metal-cutting technician

Sphere of activity 1	Tool making
Sphere of activity 2	Creation of manufacturing processes
Sphere of activity 3	Production management
Sphere of activity 4	Computer processing

Operation 1	Assembling
Operation 2	Surface processing
Operation 3	Thermal processing
Operation 4	Machining

# The metal-cutting technician

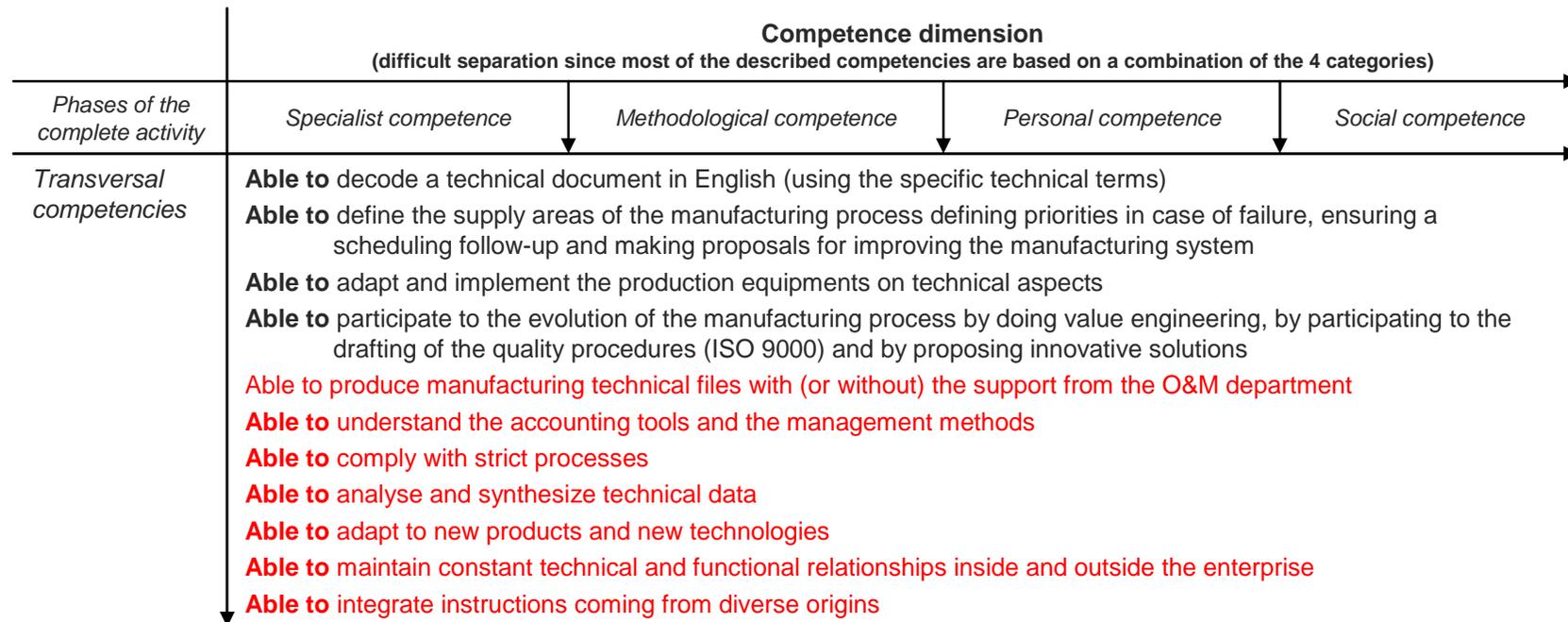
Phases of the complete activity	Competence dimension (difficult separation since most of the described competencies are based on a combination of the 4 categories)			
	Specialist competence	Methodological competence	Personal competence	Social competence
Preparing	<ul style="list-style-type: none"> <li><b>Able to</b> analyse and decode assembly &amp; definition drawings</li> <li><b>Able to study and analyse a technical file</b></li> <li><b>Able to</b> establish modus operandi</li> <li><b>Able to</b> choose the tools to be used</li> <li><b>Able to</b> estimate the durations to be respected</li> <li><b>Able to</b> check the feasibility of the range of products</li> <li><b>Able to</b> program CNC machining systems (turning / milling)</li> <li><b>Able to test different production tools</b></li> </ul>			
Performing	<ul style="list-style-type: none"> <li><b>Able to</b> execute tasks accordingly to the specifications, applying and respecting the manufacturing file</li> <li><b>Able to</b> do machining in the fields of turning &amp; milling, on CNC machining systems</li> <li><b>Able to</b> optimize the existing CNC program</li> </ul>			
Controlling	<ul style="list-style-type: none"> <li><b>Able to</b> use a 3-D measuring equipment</li> <li><b>Able to</b> program a controlling process</li> <li><b>Able to follow-up the quality of the production</b></li> <li><b>Able to remedy the production hazards</b></li> </ul>			

Legend:

Black: from the metallurgical qualification description (CQPM)

Red: from the vocational index description (ROME)

# The metal-cutting technician



Legend:

Black: from the metallurgical qualification description (CQPM)

Red: from the vocational index description (ROME)



### 3. Proposals and further discussions about the grid

# Proposals and further discussions about the grid

As proposed in COMMET, the grid for describing the competencies is based on **2 different segmentation criteria** i.e.:

1. The « phases of the activity spheres »
2. The type of competencies: specialist, methodological, social or personal

## Regarding the phases of the activity spheres



- this is a way of describing activities **as projects**
- the difficulty for us has been to place technicians' activities in this perspective while **some of their activities are**, in our representations, **not based on a project mode** (e.g.: modifying the block diagram for the electro-mechanical technician is only linked to a “documenting” step)
- this is the reason why **we met difficulties** to list the competencies of each sphere of activity in this way
- In the **metallurgical qualification** descriptions, only **3 steps described + 1 transversal**: preparing, implementing, control (as proposed for the metal-cutting technician)

# Proposals and further discussions about the grid

## Regarding the types of competencies

- Also in our representations, the **border between specialist competencies/knowledge and methodological competencies** is very narrow. E.g.:
  - Being able to establish modus operandi: methodological and specialist competency?
  - Being able to choose the most relevant tools: an ability to combine knowledge (i.e. specialist competency) and at the same time, a methodological ability (make use of knowledge)
  - Being able to understand technical English related to electro-mechanical topics: methodological or specialist?

# Proposals and further discussions about the grid

We usually in France make the distinction between:

## Knowledge

Set of practical and theoretical knowledge

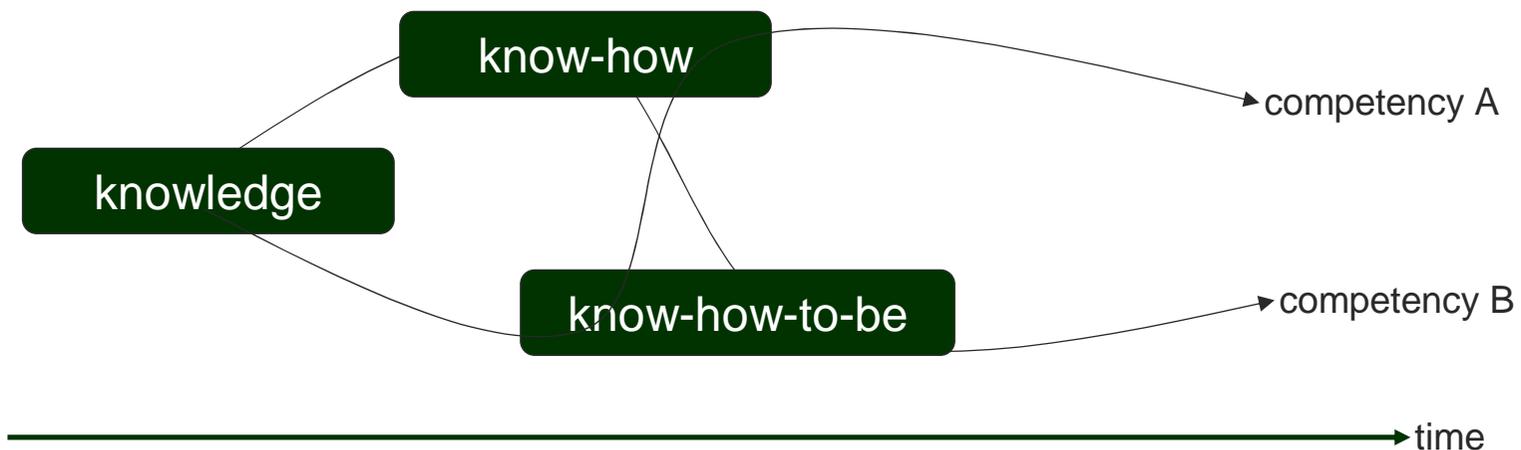
## Know-how

Commonly used term to define a relational know-how that is to say behaviours and attitudes expected in a given situation

## Know-how-to-be

Implementation of a knowledge and a practical ability mastered for a specific realization

The competency is the result of the combination of these 3 dimensions as follows:



# Proposals and further discussions about the grid

We usually in France make the distinction between:

Example of the competency of driving a car on a road:

**Knowledge**

Knowledge of the highway code, the theoretical rules

**Know-how**

Ability to use the gearbox, to engage the clutch, to brake, etc.

**Know-how-to-be**

Be alert, respect the highway code, etc.

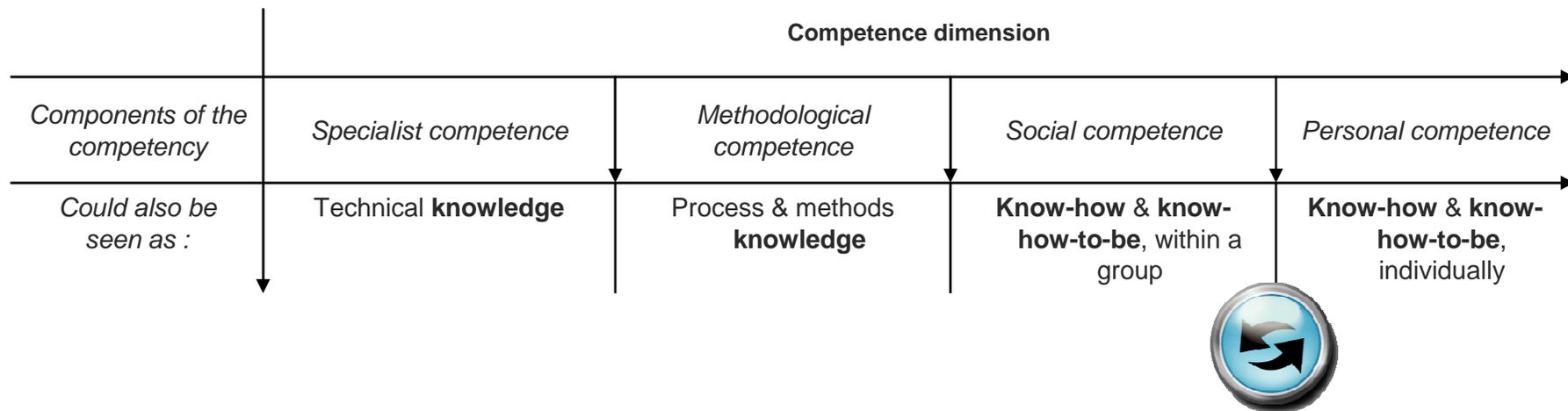


**Other example applying to both vocations:**

- Understanding technical English is a **knowledge**
- Be able to cut a piece of metal thanks to a technical document written in English is a **competency**

# Proposals and further discussions about the grid

Both approaches are quite similar



- In our opinion, the presentation of the grid should take into account **the idea of a progression**, the ultimate goal for the enterprise being the social competency i.e. competencies applied in a group (we could place personal competencies first and as a last column, the social competency)

# Proposals and further discussions about the grid

## Further representation of the competency

- A competency only exists if it is used in a given situation (for instance in a working context)
- In order to exist, a competency implies the judgement of other people in terms of:
  - *Efficiency*: are the expected results achieved?
  - *Conformity*: is the competency implemented respecting the procedure?

“we do not judge a person on his/her qualities but on the way he/she uses them”

La Rochefoucauld



# Proposals and further discussions about the grid

A proposal to present the competencies linked to a vocation using the segmentation knowledge / know-how / know-how-to-be (*chosen competencies from the metal-cutting technician*)

Resources	Description	Competency
Knowledge	<ul style="list-style-type: none"> <li>- Knowledge of supplying processes</li> <li>- Knowledge of scheduling techniques</li> <li>- Knowledge of the tools to analyse failures</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Able to</b> define the supplying areas of the manufacturing process defining priorities in case of failure, ensuring a scheduling follow-up and making proposals for improving the manufacturing system</li> </ul>
Know-how	<ul style="list-style-type: none"> <li>- Analyse failures</li> <li>- Define supplying priorities</li> <li>- Propose corrective actions</li> </ul>	
Know-how-to-be	<ul style="list-style-type: none"> <li>- Take initiatives</li> <li>- Ability to open-up and listen</li> <li>- Respect working and controlling procedures as well as safety rules</li> <li>- Maintain constant technical and functional relationships inside and outside the enterprise</li> </ul>	

# Proposals and further discussions about the grid

A proposal to present the competencies linked to a vocation using the segmentation knowledge / know-how / know-how-to-be (*chosen competencies from the metal-cutting technician*)

Resources	Description	Competencies
Knowledge	<ul style="list-style-type: none"> <li>- Knowledge of assembly and definition drawings (symbols, functioning, codes, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Able to</b> analyse and decode assembly and definition drawings</li> </ul>
Know-how	<ul style="list-style-type: none"> <li>- Understand the meaning</li> <li>- Transcribe drawings into reality</li> <li>- Analyse their feasibility</li> </ul>	
Know-how-to-be	<ul style="list-style-type: none"> <li>- Respect working and controlling procedures as well as safety rules</li> <li>- Maintain constant technical and functional relationships inside and outside the enterprise</li> </ul>	

# Proposals and further discussions about the grid

A proposal to present the competencies linked to a vocation using the segmentation knowledge / know-how / know-how-to-be (*chosen competencies from the metal-cutting technician*)

Resources	Description	Competencies
Knowledge	<ul style="list-style-type: none"> <li>- Knowledge of the range of products</li> <li>- Knowledge of the equipments and their capability</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Able to</b> check the feasibility of the range of products</li> </ul>
Know-how	<ul style="list-style-type: none"> <li>- Know how to link the product ranges with the capability of equipments and deduce the feasibility from it</li> </ul>	
Know-how-to-be	<ul style="list-style-type: none"> <li>- Respect working and controlling procedures as well as safety rules</li> <li>- Maintain constant technical and functional relationships inside and outside the enterprise</li> </ul>	

# Proposals and further discussions about the grid

A proposal to present the competencies linked to a vocation using the segmentation knowledge / know-how / know-how-to-be (*chosen competencies from the metal-cutting technician*)

Resources	Description	Competencies
Knowledge	- Knowledge of CNC machining systems and their programming languages	- <b>Able to</b> program CNC machining systems (turning / milling)
Know-how	- Program CNC machining system	
Know-how-to-be	- Respect working and controlling procedures as well as safety rules - Maintain constant technical and functional relationships inside and outside the enterprise	

# Proposals and further discussions about the grid

A proposal to present the competencies linked to a vocation using the segmentation knowledge / know-how / know-how-to-be (*chosen competencies from the metal-cutting technician*)

Resources	Description	Competencies
Knowledge	<ul style="list-style-type: none"><li>- Knowledge of modus operandi and their creation methods</li><li>- Knowledge of the manufacturing techniques and processes</li></ul>	<ul style="list-style-type: none"><li>- <b>Able to</b> establish modus operandi</li></ul>
Know-how	<ul style="list-style-type: none"><li>- Formalize a modus operandi</li></ul>	
Know-how-to-be	<ul style="list-style-type: none"><li>- Respect working and controlling procedures as well as safety rules</li><li>- Maintain constant technical and functional relationships inside and outside the enterprise</li></ul>	

# Proposals and further discussions about the grid

A proposal to present the competencies linked to a vocation using the segmentation knowledge / know-how / know-how-to-be (*chosen competencies from the metal-cutting technician*)

Resources	Description	Competencies
Knowledge	<ul style="list-style-type: none"><li>- Knowledge of the different existing tools and their use</li></ul>	<ul style="list-style-type: none"><li>- <b>Able to</b> choose the tools to be used</li></ul>
Know-how	<ul style="list-style-type: none"><li>- Make a choice analysing the most adapted tools</li></ul>	
Know-how-to-be	<ul style="list-style-type: none"><li>- Respect working and controlling procedures as well as safety rules</li><li>- Maintain constant technical and functional relationships inside and outside the enterprise</li></ul>	

# Proposals and further discussions about the grid

Possibility to specify a requested level of mastery for each competency of the vocation, for instance (one of many options):

- Level 1: theoretical knowledge with no practical mastery
- Level 2: everyday practice
-  Level 3: mastery and ability to transfer
- Level 4: expertise, ability to make the field evolve

Maybe the electro-mechanical technician or metal-cutting technician doesn't have to be level 4 in all the competencies required for his/her vocation