

D.T1.3.1 SETTING UP OF THE TML INDEX

Deliverable D.T1.3.1

Explanation how to compute the TML and the
different dimensions

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0. Overall TML Calculation

The TML is a composite index made up of 6 dimensions. All of these 6 dimensions are measured as percentages thus the overall TML will be expressed in percentages as well, being it a simple average of 6 dimensions expressed in percentages.

TML values will thus span between 0 and 100.

Its formula can be summarized as follows:

$$\text{TML} = \frac{\sum_{i=1}^6 D_i}{6}$$

Where the numerator represents the summatory of all the 6 dimensions (D) and the denominator is the total number of dimensions (6).

How to compute the individual dimensions:

1. RELATED VARIETY

Question number 4 in the 4steps questionnaire lists 27 sectors of economic activity and asks respondents to mark down all the sectors in which their firm is operating along with all the sectors in which its customers and suppliers are operating as well. As a result, we have 3 figures:

- a. the number of sectors in which the respondent's firm is operating;
- b. the number of sectors in which its customers are operating;
- c. the number of sectors in which its suppliers are operating.

We compute the "Related variety" dimension in 2 steps:

1. We compute the average number of sectors in which customers and suppliers are operating:

$$\text{AVERAGE} = (b + c)/2$$

2. We subtract this average from the sectors of the respondent's firm:



$$\text{RELATED VARIETY} = (\text{AVERAGE} - a)/a$$

In this way, we obtain a percentage number that can be either positive or negative.

NOTE:

In case the results is negative, count with 0%

In case the result is between 0 and 1, the percentage is the following: e.g: 0.35 → 35%

In case the result is 1 it is 100%

In case the result is more than 1, count with 100%

2. HUMAN CAPITAL

Question number 7 in the questionnaire asks respondents to state how many employees are currently employed in R&D offices and technical offices and, among them, how many have a tertiary education background. We have 6 distinct figures as a result:

2. Total Staff in R&D office
3. Staff in R&D office with University degree (BA as minimum)
4. Staff in R&D office with PhD
5. Total Staff in in technical office
6. Staff in technical office with University degree (BA as minimum)
7. Staff in technical office with PhD

We now want to know what is the share of people working in these offices with a HE background. Once again, the process is articulated in 2 steps:

We compute the share of graduates in R&D and technical offices

$$HE_{RD} = \frac{b + c}{a} ; HE_{TO} = \frac{e + f}{d}$$



We compute the average share of graduates between the two offices:

$$HC = \frac{HE_{RD} + HE_{TO}}{2}$$

In this way, we obtain the overall percentage of people with at least a bachelor degree in these offices and the percentage will be positive.

NOTE:

In case the results is negative, count with 0%

In case the result is between 0 and 1, the percentage is the following: e.g: 0.35 → 35%

In case the result is 1 it is 100%

In case the result is more than 1, count with 100%

3. PROJECT MANAGEMENT

Question number 8 in the questionnaire asks responder whether their firm has participated in funded research projects. It is based on multiple choice answer so that the firm can participate in no projects at all or in EU, national and/or regional projects. We have to count how many types of projects the firm has participated into and then divide this figure by 3 (that is the maximum number of different types of projects one respondent can achieve). As a result, we will have positive percentage that equals either 0%, 33.3%, 66.6% or 100%.

NOTE:

If a company chooses 'NO' answer, then their DIMENSION3 value is 0%



4. RESEARCH AND DEVELOPMENT

Question number 5 is conceptually similar to question 8 as it is based on a multiple choice answer as well. In this case what is under scrutiny is how many different types of R&D activities/collaboration the firm has undertaken, with the possibility to mark down up to 9 alternatives. In this case, we have to mark down how many types of R&D the respondent has selected and divide them by 9. That simple, a positive percentage that equals 0%, 11.1%, 22.2%, 33.3%, ... or 100%.

If a company has chosen 'OTHER' do not count it as a value.

If a company has chosen 'NO DEVELOPMENT IMPLEMENTED' their value to this dimension is 0%.

5 and 6. BREADTH & DEPTH of INDUSTRY 4.0

NOTE:

If a company was an end user, analyse Q13 answers

If a company was a supplier, analyse Q18 answers

If a company was a supplier, analyse only „range of offers“ section, but for all nine technologies

If a company was both end user and supplier, analyse Q13 and Q18, and keep the higher value

In this case, both BREADTH and DEPTH dimension are retrieved from the same questions in the questionnaire BUT these are in turn differentiated based on the type of firm interviewed. Basically we use:

Q13 for users;

Q18 for suppliers.



Question no. 13 (18) asks respondents whether their firm is currently using (offering) products or services that fall within the definition of Industry 4.0; what we want to assess is the extent to which our firms are users (producers) of industry 4.0 technologies and/or solutions and in this case we want to know the width of their use (offer) (i.e. how many different technologies they're dealing with) and the depth of their use (offer) (i.e. are they using/offering a little bit of everything or are they specializing? Basically, how many solutions they use/have for each technology?).

Given that question no. 13 (18) is a two-way matrix with solutions in columns and technologies in row. BREADTH is given by the number of rows in which the firm scores at least 1 solution and DEPTH is average number of solutions for all the technologies the firm is currently offering.

So, given that we have 9 technologies:

$$\text{BREADTH} = \frac{\sum \text{TECH}_{4.0} > 1}{9}$$

BREADTH NOTE:

NOTE:

count all technologies which is not NOT USAGE and divide it with 9 (all technologies)

$$\text{DEPTH} = \frac{\sum \text{SOLUTIONS}_{\text{TECH}}}{9}$$

DEPTH NOTE:

Categorise the possible answers

- No usage : 0
- Few usage: 1
- Good extent: 2
- Very intense use: 3



Step 1: Count the average of the results which is not 0

Step 2: Divide the average with 3