



THE WEIGHTED VOTING SYSTEM PROCESS

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The SOLITY project foresees first the development of a common definition of social utility and a common set of indicators, and then the design of a weighted voting system. The aim is to compute a global score of social utility that takes into account:

- the importance of each axis and their indicators,
- the stakeholder's category,
- the stakeholder's country.

1. The weighed voting system

A stakeholder's representative panel¹ will be asked to evaluate the importance of indicators and axes that characterize, for them, the social utility of VET. These evaluations will be used to calculate the weight of each axis and indicators. Finally, these weights will be used in the calculation of the global score of Social Utility of VET providers.

In point a and b, we present the method to weigh the axis and the indicators.

In point c, in order to attribute the same weight to each EU country and each stakeholder's category, we present the method to obtain the **final axis weighting level** and **indicator weighting level**.

a. Measure and calculate the relative importance of the various axes: Weigh the axis

In a first time, each axis will be explicitly defined and presented to participants.

In a second time, the perceived importance of each axis will be measured. For each axis, participants will be asked to allocate 100 points according to the perceived importance in the social utility of VET.

In a third time, the mean of points allocated to each axis will be computed in order to

¹ Entrepreneurs (via professional organization), Managers of VET Centers, Trainers, Policy makers, Accredited fund collecting and distributing agencies, Joint bodies approved to cover individual training leave, VET Policy makers of the State, VET Policy makers of the regions, Job search agencies, Others Policy makers, VET customers (job seekers, workers)...



determinate the weight attributed by participants. This mean represents the **axis weighting level and will be used to compute the global score of social utility.**

Example

Relative importance of the various axes

Axes	Respondant 1	Respondant 2	Respondant 3	Respondant 4	Sum	Mean = axis weighting level
Axis 1	20	15	25	35	95	23.75
Axis 2	10	12	26	10	58	14.50
Axis 3	30	35	34	12	111	27.75
Axis 4	20	25	5	14	64	16.00
Axis 5	20	13	10	29	72	18.00
	100	100	100	100		100,0

b. Measure the perceived importance of indicators: Weigh the indicators

In a first time, for each axis, each indicator will be explicitly defined and presented to participants.

In a second time, for each axis, the perceived importance of each indicator will be measured. For each indicator of an axis, participants will be asked to allocate 100 points according to the perceived importance in the axe.

In a third time, the mean of points allocated to each indicator will be computed in order to determinate the weight attributed by participants. This mean represents the **indicator weighting level and will be used to compute the axis score.**

Example

Relative importance of indicators within an axis

Axis1	Respondant 1	Respondant 2	Respondant 3	Respondant 4	Sum	Mean = indicator weighting level
Indicator 1	10	15	13	18	56	14,00
Indicator 2	12	12	34	20	78	19.50
Indicator 3	15	10	15	12	52	13.00
Indicator 4	20	25	26	36	107	26.75
Indicator 5	43	38	12	14	107	26.75
	100	100	100	100		100,0

c. Take into account the stakeholder's category and their EU country: A same weight for all

In order to attribute the same weight to each EU country and each stakeholder's category, the **final axis weighting level** and **indicator weighting level** will be the result of three steps.

In a first time, the **axis weighting level** and the **indicator weighting level** will be computed for each stakeholder's category of a country.

In a second time, the **axis weighting level** and the **indicator weighting level** will be computed for each EU country.

In a third time, the **axis weighting level** and the **indicator weighting level** will be computed for the overall EU's countries. It will be these **final axis weighting level** and **indicator weighting level** that **will be used to compute the global score of social utility.**

Example

Step 1: compute the axis weighting level and the indicator weighting level for each stakeholder's category of a country.

Country 1 Axis 1	Participants					Sum	Mean = axis 1 weighting level for country 1
	1	2	3	4	5		
Entrepreneurs ²	18	18	24	14	26	100	20,00
Managers of VET Centers	19	20	12	12	12	75	15,00
Trainers, Policy makers	15	18	22	21	24	100	20,00
Accredited fund collecting and distributing agencies	22	23	19	19	17	100	20,00
Joint bodies approved to cover individual training leave	15	28	14	19	24	100	20,00
VET Policy makers of the State	14	14	15	18	14	75	15,00
VET Policy makers of the regions	32	26	29	30	28	145	29,00
Job search agencies	30	26	35	24	35	150	30,00
Others Policy makers	22	28	21	29	25	125	25,00
VET customers (job seekers, workers)	26	20	32	24	28	130	26,00

For each country, the same operation will be made for each axis

For each country, the same operation will be made for each indicator.

² Here is indicated the average of the axis as a result of the opinion expressed by each participant of that category. Example:

Entrepreneurs	Participant n. 1	Participant n. 2	Participant n. 3	Participant n.4	Participant n.5	Sum	Average
Axis n. 1	18	18	24	14	26	100	20
Axis n. 2	14	22	14	22	18	90	18
Axis n. 3	22	23	19	31	23	118	23.6
Axis n. 4	11	17	18	12	17	75	15
Axis n. 5	35	20	25	21	16	117	23.4
Sum	100	100	100	100	100	500	100



Step 2: compute the axis weighting level and the indicator weighting level for each country

Country 1	axis weighting level (mean for each stakeholder's category)					Sum
	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	
Entrepreneurs	20	10	25	30	15	100
Managers of VET Centers	15	22	15	23	25	100
Trainers, Policy makers	20	14	34	12	20	100
Accredited fund collecting and distributing agencies	20	25	16	17	22	100
Joint bodies approved to cover individual training leave	20	27	10	29	14	100
VET Policy makers of the State	15	20	24	15	26	100
VET Policy makers of the regions	29	22	19	17	13	100
Job search agencies	30	23	15	16	16	100
Others Policy makers	25	29	15	16	15	100
VET customers (job seekers, workers)	26	35	12	15	12	100
Sum	220	227	185	190	178	1000
Mean = axis weighting level for country 1	22,00	22,70	18,50	19,00	17,80	100

For each country, the same operation will be made.

For each country, the same operation will be made for each indicator.



Step 3: compute the final axis weighting level and the indicator weighting level

axis weighting level (EU level)	axis weighting level					Sum
	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	
Country 1	22,00	22,70	18,50	19,00	17,80	100
Country 2	22	22,7	18,5	19	17,8	100
Country 3	18,5	22,2	19,4	25	14,9	100
Country 4	21,2	26,5	18,1	16,5	17,7	100
Country 5	19,2	19,5	21,2	19,9	20,2	100
Country 6	24,3	20,1	19,4	18,2	18	100
Country 7	19	14,6	15,2	24,1	27,1	100
Sum	124,2	125,6	111,8	122,7	115,7	600
Mean = final axis weighting level (EU level)	20,7	20,9	18,6	20,5	19,3	100,0

The same operation will be made for each indicator.



2. Calculation of the social utility global score of a VET Provider

On the basis of the axis and indicator weighting level calculated within the weighted voting system, a global score of social utility could be calculated for each VET provider.

Two phases will be used in the calculation of social utility global score.

a. Calculate the axis score

First, for each indicator of an axis, the indicator weighting level (EU level) will weigh the ratio communicated by the VET provider. Accordingly, an axis score will be calculated by the sum of weighted indicators like it is shown in the example below for axis 1. The same calculation will be made for all axes with the weighting of the indicator related to this axis. This calculation will be made automatically on SOLITY On-line Platform.

Example of calculation of Axis 1

Axis 1	Results of the training organization (1)	Indicator weighting at EU level (2)	Weighted score of the training organization (1*2)
ratio indicator 1	56%	14,00	7,84 %
ratio indicator 2	26%	19.50	5,07 %
ratio indicator 3	33%	13.00	4,29 %
ratio indicator 4	25%	26.75	6,69 %
ratio indicator 5	30%	26.75	8,03 %
Total = Calculated score of Axis 1 (0 to 100 scale) =			31,91 %



b. Calculate the global Social Utility (SU) score

Second, the axis weighting level (EU level) will weigh the axis score calculated in the first step. Accordingly, a global social utility score will be calculated by the sum of weighted axis like it is shown in the example. This calculation will be made automatically on SOLITY On-line Platform.

Social Utility	Calculated score of Axis (1)	Axis weighting at EU level (2)	Weighted Axis score of the training organization (1*2)
Axis 1	31,91 %	20,7	6,60%
Axis 2	19.50 %	20,9	5,23%
Axis 3	13.00 %	18,6	3,35%
Axis 4	26.75 %	20,5	4,51%
Axis 5	26.75 %	19,3	2,90%
Total = Calculated score of SU (0 to 100 scale) =			22,58 %

The final SU score for this VET provider is 22,58% on a 0 to 100 scale.



3. Process to vote

The weighed voting system participants will vote from a SOLITY On-line Platform (www.solity.eu). An e-mail list will be defined by Solity team and partners.

Participants will be contacted by e-mail. A link to the survey and a password will be given at this moment. A mission letter will be joined to explain Solity and survey's objectives and process to vote.

Once they will be on the On-line Platform, they will indicate their stakeholder's category, EU country and the perceived importance for each axis and indicators.



4. Proposal for construction of a stakeholder's representative panel for each EU Country: determinate the number of respondents

Four stakeholder's category have been identified:

- ▶ Entrepreneurs (via professional organization)
- ▶ Policy makers and relevant stakeholders (at national or regional level)
 - Accredited fund collecting and distributing agencies,
 - Joint bodies approved to cover individual training leave
 - VET Policy makers of the State,
 - VET Policy makers of the regions
 - Job search agencies ...
 - Others Policy makers
- ▶ Managers of VET Centers or Trainers
- ▶ VET customers (job seekers, workers)

The first two categories have a limited number of stakeholders. We propose to **identify and ask** all these stakeholders in each EU country.

The last two (Managers of VET Centers and VET customers) **have a large number of stakeholders** and need to build a sample of the mother population and **determinate the sample size.**

Before calculate a sample size, we need to determine a few things about the target population and the sample:

1. **Population Size** — How many total people fit our stakeholder's category?



2. **Margin of Error (Confidence Interval)** —The confidence interval determines the reliability that the data collected is generally accurate. A margin of error of +/- 5% is generally used.
3. **Confidence Level** — How confident do we want to be that the actual mean falls within our confidence interval? The most common confidence interval used by researchers is 95%.
4. **Standard of Deviation** — How much variance do we expect in our responses? Since we have not actually administered our survey yet, the safe decision is to use 0.5 – this is the most forgiving number and ensures that our sample will be large enough.

Once we have these elements, a sample size calculator³ can be used to determine how many people we need to interview in order to get results that reflect the target population as precisely as needed.

Example for France:

For managers of VET Centers, Trainers

We propose to use the number of VET centers recorded in France to calculate the sample size.

The official list contains 88 015 VET Centers (2019-02-18).

If we use a margin of error of +/- 5%, a confidence level of 95% and a standard of deviation of 50%, then we need a sample size of **384** VET centers (computed with sample size calculator <http://www.rmpd.ca/calculators.php>).

For VET customers (job seekers, workers)

In 2016, according to the Employment survey (INSEE), the labor force according to

³ <http://www.rmpd.ca/calculators.php> for instance



the International Labor Office (ILO) is estimated at 29.6 million people aged 15 or over in France (excluding Mayotte). It has 26.6 million employed and 3.0 million unemployed people.

If we use a margin of error of +/- 5%, a confidence level of 95% and a standard of deviation of 50%, then we need a sample size of **384** for employed and **384** for unemployed people.

For each EU country and stakeholder's category, the mother population has to be known and a list must be built in order to address the link to the survey by e-mail.



Appendix

General formula to calculate a sample size.

$$\text{Unlimited population: } n = \frac{z^2 \times \hat{p}(1-\hat{p})}{\epsilon^2}$$

$$\text{Finite population: } n' = \frac{n}{1 + \frac{z^2 \times \hat{p}(1-\hat{p})}{\epsilon^2 N}}$$

where

z is the z score

ε is the margin of error

N is population size

ĥ is the population proportion

Comments on the Analytic Hierarchy Process (AHP)

During the project meeting we had in December 2018, where not only project partners but also external experts participated and discussed about the project, Dr Ferenc Kiss, Vice-Rector for Research of Budapest Metropolitan University, suggested to use the AHP method for the weighted voting system. The Analytic Hierarchy Process is an interesting tool for dealing with complex decision-making. However, for our purpose, it seems difficult to use because of the four following reasons:

1. Although partially automated, pairwise comparison is tedious and time consuming for participants. It is more easy to allocate 100 points especially since axes and indicators are few.
2. The AHP doesn't make difference between decision makers => Difficulty for weighting by country and by stakeholder's category.
3. The final score is less comprehensive than a score on a 0 to 100 scale
4. It would be more difficult to implement on the Solity online platform.



Nevertheless, like the AHP, we propose to check consistency by excluding extreme values.

Furthermore, we have to build a rule in the Solity online platform in order to verify that the sum of the points allocated to indicators in an axis (or to axes in the social utility of VET) is really 100.