Calculating Ethelo

Definitions

Ethelo Score "∈" is the strength of a collective decision. Range ∈ = [-1, 1]
Support "I" is the average support for an option or outcome across all participants. Range I = [-1, 1]
Dissonance "DS" is standard deviation of support. Range = [0,1]
Unity "U" is the coherence of a group based on fairness. Range = [-1, 1]
Fairness "F" is the importance of Unity on a decision. Range = [0, 1]

Option Scores

People are able to score options in the range of [-1 , 1]. Note the platform tools may use a range of [-100, 100] but this is translated. This range indicates a spectrum of full opposition to full support. In some projects, the scoring range may only dwell in the positive range eg, [0 , 1]. This is done in configuration.

There is a substantive difference in these two ranges, because the Ethelo score (below) operates differently on negative numbers than positive numbers.

Outcome Scores

An outcome (AKA Scenario) is a combination of options that satisfy the constraints. An outcome score is determined by the option scores (which may be a combination of weighted criteria scores applied to options) and weights given to different option groups (issues). When we are weighting issues as well as scoring options, the engine undertakes an adjustment in order to fix a standard upper and lower bound, so that the Support scores fall neatly in the range [-1 , 1]

Support ≈ Influence = "I"

Support is the AVERAGE of the score that people give an option or outcome. It has the same range as whatever the option scoring range was. For a project where opposition as well as support was expressed for options, this would be a [-1, 1] range.

One of the key aspects of Ethelo theory is that support is analogous to influence. Ethelo looks at the scoring process as a way for participants to distribute their political power across the spectrum of possible outcomes. For this reason, Support is referred to as "I" in the equations.

In presentation, the extent of Support is expressed as degree, like a temperature on a scale of 100, Example: Support = 75°

Approval

Approval is the percentage of people in a group who scored an option or outcome with a positive value. This percentage excludes those to gave a neutral or negative value to an option or outcome. In other words, number of people to the right of neutral.

It is expressed in percentage. Example: 75% means 75% of people gave the option or outcome a net positive score

Dissonance = DS

Dissonance refers to the *standard deviation of the distribution of support* for an option or outcome. It is referred to as "DS" in the equations.

Dissonance falls in the range of [0 ,1]

If everyone has the same Support for an option or outcome, Dissonance = 0. If a group is completely polarized, Dissonance = 1.

t = "tipping point"

Framed in mathematical terms, as DS for an outcome decreases from 1 to 0, there will be a "tipping point" when people will cease to resist the outcome because of inequality aversion, and begin to support it due to fairness and the unity it creates. Where this neutral tipping point is found will depend on the type of decision process and group dynamics, and can be determined empirically or by mutual agreement.

A priori, we can take t as the dissonance of the distribution in which there are an equal number of participants at each possible level of support, that is, where someone lands on the distribution graph is completely random. This distribution curve of support will be **flat** over all possible supports. In that case, we can take t = (1/3)^.5 = 0.577.

U = Unity

Unity is a measure of the internal cohesion of a group wrt an option or outcome, due to agreement or fairness in the distribution of support. Unity is referred to as U in the equations.

U can range from negative, when a group is polarized in its support, to positive when a group is unified. We take the tipping point "t" as the neutral mid-point where a group is neither polarized nor unified; U = 0.

Define U: some function mapping DS onto a range {-1, 1}, where U(1) = -1, U(0) = 1, and U(t) = 0, t is the "tipping point"

We can define U as follows:
If DS <= t then U = (t-DS) / t, U falls in [0,1]
If DS >= t then U = (t-DS) / (1-t), U falls in [-1,0]

F = Fairness

Unity has a different relevance in different decision contexts because the phenomenon in which a decision becomes more powerful through unity is a social phenomenon; it doesn't appear if there is only one participant. For example, in a process where participants do not have relationships or the sense of reciprocity that arises in community, it may not be important that participants experience similar levels of support for an outcome, or feel that influence in shaping the outcomes was distributed fairly. However, in a stakeholder process where there are entitlements resting on a collective identity, then fairness in support distribution can be quite important. F represents the importance of fairness in a specific decision context.

F determines the importance of Unity in a decision. Range = [0,1]

$\in$ = "strength of decision" = Ethelo score

Strength refers to the collective intentional energy available for execution of a decision. In a collective decision context, the support of individuals alone is not sufficient to determine the strength of a outcome, because of the

impact of unity or the lack thereof. Conversely, unity alone is not sufficient to determine the strength of a decision, because people can be highly unified in opposition as well as support.

Ethelo means “will” or “intention” in ancient Greek. The Ethelo Score measures the level of “intentional energy” that a group will bring to an option or outcome. The level of energy determines the strength of a decision; its capacity to harness the aligned intentions of participants towards action.

The Ethelo Score combines the factors of support, fairness, and unity into a single function that observes the following Axioms, which are abstracted from empirical studies.

Ethelo Axioms

1. If I is constant, $|\in|$ will increase as U increases, and decrease as U decreases
2. If U is constant, $|\in|$ will increase as $|I|$ increases, and decrease as $|I|$ decreases
3. $\in$ must carry the same sign (positive or negative) as I
4. if $U = 0$ then $\in = I$,
5. if $U > 0$ and $\equiv > 0$ then $|\in| > |I|$
6. if $U < 0$ and $\equiv > 0$ then $|\in| < |I|$
7. if $U = -1$ and $\equiv = 1$ then $|\in| = 0$
8. If $U = 1$ and $\equiv = 1$ and $|I| \neq 0$ then $|\in| = 1$
9. If $I = 0$ then $\in = 0$
10. increasing $\equiv$ increases impact of U on $\in$

Taking the above Axioms, we can define the Ethelo Score as follows:

If $I > 0$ and $DS < t$, then depending on the strength of $\equiv$, $\in$ will fall somewhere in range of [I,1]

We can define $\in = I + F * U * (1-I)$
$\in = I + F * (t-DS) * (1-I) / t$

If $I > 0$ and $DS > t$, then depending on strength of $\equiv$, $\in$ will fall somewhere in range of [0,I]

We can define $\in = I + F * U * I$
$\in = I + F * (t-DS) * I / (1-t)$

If $I < 0$ and $DS < t$ then depending on the strength of $\equiv$, $\in$ will fall somewhere in range of [I,-1]

We can define $\in = I + F * U * (-1-I)$
$\in = I + F * (t-DS) * (-1-I) / t$

If $I < 0$ and $DS > t$ then depending on the strength of $\equiv$, $\in$ will fall somewhere in range of [0,I]

We can define $\in = I + F * U * I$
$\in = I + F * (t-DS) * I / (1-t)$

Simplifying Ethelo

We can define $\in$ generally:

$$\in = \mathbf{I} + \mathbf{F}\cdot\mathbf{K}\cdot(\mathbf{t}-\mathbf{DS})$$

Where	if I > 0 and DS < t	then	K = (1-I) / t
Where	if I > 0 and DS > t	then	K = I / (1-t)
Where	if I < 0 and DS < t	then	K = (-1-I) / t
Where	if I < 0 and DS > t	then	K = I / (1-t)

Expressing K as a spreadsheet function:

K = if (DS > t ,I / (1-t), if (I > 0, (1-I) / t, (-1-I) / t))

Note that this definition of $\in$ is not continuous at U=0, which might be expected from an equation defining a real phenomenon. The discontinuity is justified here by its mild impact and the simplicity of calculating linear equations.

TESTING

Calculating Ethelo Tests (spreadsheet)

IMPORTANT FURTHER NOTE

It can be seen here that $\in$ works differently when I < 0 than it does when I > 0. This is the idea that consensus strengthens the extent of support OR opposition.

Therefore, from the perspective of the Ethelo score, we need to distinguish between voting scales that span the spectrum from “oppose” to “support” from voting scales that are just gradations of support.

This must be done at the level of the voting tool. The influent scores that it sends to the engine should be sensitive to the sign of the score. Negative scores must actually signify opposition. So, if the voting scale is just gradations of support, then the corresponding influent values must be positive.