This article on **The structural analysis** is a **stub**. You can help the Foresight Wiki by expanding it with new sections on the usage of this method in foresight exercises.

The structural analysis method seeks to represent the 'system' by highlighting key variables, which (potentially) influence the problem under study.

Contents

The FOR-LEARN Guide to Structural Analysis

This is a summary of the article on the Scenario Building method from the FOR-LEARN guide. To read the full article go here.

Overall description

The structural analysis method seeks to represent the 'system' by highlighting key variables, which (potentially) influence the problem under study, with the help of a cross-impact matrix (also called a structural analysis matrix). In the cross-impact matrix, the variables are placed in rows and columns, in order to work out systematically whether there are any causal relationships between them.

When is this method appropriate?

Structural analysis can be used when a problem is so complex that it is important to ensure no key variables (either internal variables, external variables or major actors) are overlooked or to create a common culture when the working committee is heterogeneous or lacks in-depth knowledge of the problem. It is also a useful tool when you want the foresight exercise to last a long time for whatever reason (common reflection, communication, etc.).

It ensures a certain level of quality in the results stemming from the matrix once it has been processed. For each variable it gives:

- an influence index, which measures the intensity with which a variable acts upon the system;
- a dependency index, which measures the intensity with which each variable is affected by the system.

Who is this approach appropriate for?

The structural analysis method can be used in a Foresight working committee to create a common culture and to reach a consensus on the variables driving the problem under study. It allows the working committee to build a solid basis to move on to the next stage of the scenario method. Structural analysis is a tool to pool ideas by reducing the influenced of biased opinions and to structure collective ideas.

Sometimes structural analysis is an end in itself. It can give decision makers as much information about how the working committee perceives reality, and therefore about the committee itself, as about the system under observation. However, it may be not necessary if people have an in-depth knowledge of the subject.

Approach (Step-by-step Guide)

Listing variables

The first step consists of identifying all kinds of variables, which do or may influence the problem under study and its environment (internal as well as external variables). A list should then be drawn up of the internal and external variables noted, with some consistency (e.g. do not mix up run-of-the-mill variables with highly specific ones, and with as accurate a definition as possible).

Experience shows that the list of all variables does not generally exceed 70 or 80 variables, often classified in different thematic groups within the internal and external categories. For variables that are not well known, one can use variable 'index cards', defined by the members of the working group and then validated collectively.
Template of a variable 'index card'
Variable 'Index card'
Name of the variable:
Category (Internal/External, Technical Variable/Environmental Variable?):
Short Definition:
Long Definition:
Indicators:
References/Experts interviewed:

Description of the relationships between variables

The second step consists of analysing the relationships between variables, often with the help of a cross-impact matrix in which the variables are placed in rows and columns, in order to work out systematically whether there are any causal relationships between them.

The matrix is completed with qualitative information. For each pair of variables, the following questions are asked: Is there a relationship of direct influence between variable 1 and variable 2? If there is not, it scores 0. If

there is a low direct influence, it scores 1; if there is a medium direct influence, it scores 2; if there is a high direct influence, it scores 3; and possibly if there is a potential direct influence, it scores 4.

The filling-in phase helps to pose n X n-1 questions for n variables (approximately 5000 questions if there is 70 variables), some of which would have been evaded if such a systematic and thorough investigation had not been made. This questioning procedure not only enables the group to create a common language within the group; it also allows to redefine the variables and so tends to make analysis of the system more accurate.

A group of about ten people who have previously taken part in listing and defining the variables, fills in the cross-impact matrix over a period of two to three days. The matrix is filled in on the basis of consensus between the members of the group. Sometimes, it is necessary to use interviews with experts, documentary research or even specialised studies to fill in the matrix.

Identification of the key variables

Once the matrix has been filled in and processed, for each variable it gives:

- an influence index, which measures the intensity with which a variable acts upon the system (by adding rows);
- a dependency index, which measures the intensity with which each variable is affected by the system (by adding columns).

The variables can then be represented in an 'influence-dependency' graph, which is a quick way of telling which variables are the driving variables in the system being studied.

At the end of this stage, we have a fairly good idea of the key variables and main actors that determine how the system develops. If structural analysis is integrated in the scenario method, we can now move on to the next stage.

Resources

Structural analysis is a time-consuming process and several months will be needed (about 6 months). It is carried out by a working committee made up of actors and experts from the field under study, but this does not preclude calling on external advisers. A technical committee of only 2 or 3 persons designs the work of the working committee. A group of about ten people who have previously taken part in listing and defining the variables, fills in the cross-impact matrix over a period of two to three days. It is sometimes necessary to draw upon interviews with experts, documentary research or even specialised studies to fill in this type of matrix.

To help use this tool and avoid drawing up the matrix and computing the scores, programs called "MICMAC" and "MACTOR" can be downloaded from the LIPSOR (Laboratory for Investigation in Prospective Strategy and Organization) website [www.cnam.fr/lipsor/].

Pros and cons

Structural analysis is a structured method which gives a working committee a common culture and approach to the problem being studied. Its main advantage is that it stimulates thought and generates ideas among group members, thus encouraging them to think about counter-intuitive aspects of system behaviour. Participants should not be taken literally but should be made to think. Obviously, there is no single official reading of the

influence-dependency graph and it would be preferable that the group forms its own opinion.

On the downside, its limitations relate to the subjective nature of the list of variables drawn up during the first phase, similar to that of the relationship between the variables. This subjectivity comes from the well-known fact that structural analysis is not a reality in itself but a means of looking at reality.

Possible variations of the approach

A second classification of variables can be obtained after increasing the power of the matrix and recalculating influence and dependency indexes. These new indexes uncover certain variables which, because of their indirect actions, had remained hidden (see the works by M. Godet).

Sea also

Environmental Scanning & Monitoring
System Dynamics
Agent Modelling
SWOT Analysis
Trend Intra & Extrapolation
Modelling & Simulation
Gaming
Creativity Methods
Expert Panels
Delphi survey
Backcasting
S&T Roadmapping
Critical & Key Technology Study
Scenario Building
Morphological Analysis & Relevance Trees
Cross-Impact Analysis
Multi-Criteria Analysis