The Scenario Method Application

An Overview with Examples

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The Great Complexity of the World Around Us

Building Context

The Scenario Method

Some Practical Examples

Selected References
The Great Complexity of the World Around Us
Building Context
The Scenario Method

Plausible Future
Security policy and security system capabilities development

Scenario 1
Scenario 2
Scenario n
Brainstorming (initial ideas generation);

Modified Delphi method (filtering process);
Techniques:

- Morphological analysis;
- System analysis;

Working environment:

- MS Office/OpenOffice;
- Intelligent Scenario Computer Interface Program (I-SCIP).
Morphological Analysis

- Complete task consideration;
- Widely used for classification tasks;
- Familiar to the security & social sciences.
Step 1  Dimensions & alternatives definition
Step 2: Alternatives binding
**Conflict (cross-consistency) matrix**

<table>
<thead>
<tr>
<th>World order</th>
<th>EU Security Interests</th>
<th>NATO</th>
<th>Russia</th>
<th>Balkans</th>
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Possible combinations: $3 \times 4 \times 2 \times 2 \times 3 \times 5 = 720$
Step 3  Scenario building, ranging & naming

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<td>80</td>
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<td>6</td>
<td>5</td>
<td>125</td>
<td>Scenario6</td>
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Active scenarios +
Passive scenarios -
Intuitive entity-relationship notation;
Details’ consideration;
Familiar to the military & scientific world.
Step 1

Entities definition
Step 2  Entities binding
Step 3

Entities classification

SENSITIVITY ANALYSIS IN 4D
But can we change the experts’ believes with I-SCIP SD?

Initial Configuration

New Configuration after Q optimization
Directed Weighted Graph \( G = (V,A) \)

\[ A = \{ A_1, A_2, \ldots, q_i, \ldots, A_n \} \text{ with } Q \text{ weights, where } Q = \{ q_1, q_2, \ldots, q_i, \ldots, q_n \}, q \in \mathbb{N}, q \in [1, 100] \]

\[ Z = (\sum q_i - \alpha)^2 + (\sum p_j - \beta)^2, \]

s.t. \( 0 < \sum q_i \leq \alpha, 0 < \sum p_j \leq \beta \)

\( i=1, \ldots, n, j=1, \ldots, m; \alpha, \beta - \text{desired position in the cluster set} \)

Minimize \( \rightarrow Z \)
Minimize the Objective Function $Z$:
$$(x_{12} + x_{32} - 65)^2 + (x_{21} + x_{23} - 80)^2$$

S.t. the following constraints:

$$x_{12} \in [0, \infty)$$
$$x_{13} \in [0, \infty)$$
$$x_{21} \in [0, \infty)$$
$$x_{23} \in [0, \infty)$$
$$x_{31} \in [0, \infty)$$
$$x_{32} \in [0, \infty)$$
$$x_{21} + x_{31} \leq 50$$
$$0 \leq x_{21} + x_{31}$$
$$x_{12} + x_{13} \leq 50$$
$$0 \leq x_{12} + x_{13}$$
$$x_{13} + x_{23} \leq 50$$
$$0 \leq x_{13} + x_{23}$$

Solution:

## The following warning was issued while solving:

necessary conditions met but sufficient conditions not satisfied

Objective value: 0.

$x_{12} = 50$. $x_{13} = 0$. $x_{21} = 50$. $x_{23} = 30$.
$x_{31} = 0$. $x_{32} = 15$. 
Example: $f_t \sim$ Lorenz system
Mathematical Scenario Validation & Uncertainty Dynamics Monitoring
\[ x_{j+p} = \sum_{i=1}^{M+1} \overline{x}_{k_{i+p}} e^{-\alpha \| x_j - x_{k_i} \|} , \]

Where:

\( \| . \| \) is the Euclidean distance in \( M \) dimensional space;

\( x_{k_i} \) - \( k \)th closest neighbour to \( x_i \);

\( i, j > N, k + p < N, N \) is the first half of data points used for forecasting of the second one;

\( \overline{x}_{k_{i+p}} \) - \( k \)th closest neighbour to \( x_i \), \( p \) steps ahead;

\( M \) - work space (embedding in case of single time series reconstruction) dimension;

\( p \) - number of steps ahead; \( \alpha \) - expert-defined constants defined for the different dimensions \( M \). The notation of space dimension \( M \) is used because the real simplex \( \Delta^m \) dimension \( m \) could be initially unknown and \( M < m \).

The error \( \varepsilon \) could be estimated in different ways but what was empirically evident that it is not necessary to consider \( \varepsilon \) of more than integral cubic degree of accuracy:

\[ \varepsilon = | x_{i+p} - x_i | = O (h^3) \]
SOME PRACTICAL EXAMPLES

Tools for Institutional, Political, and Social Analysis of Policy Reform

A Sourcebook for Development Practitioners

Discover Think Tools

THE WORLD BANK
Asia Economy Development

Example

What happens to Japan's economy from 1971-1990?
The Phoenix 2010 Exercise

PHOENIX 2010
Феникс 2010
<table>
<thead>
<tr>
<th>Threat-Enabler</th>
<th>Personal Assets</th>
<th>Societal Assets</th>
<th>Professional Assets</th>
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<tr>
<td>Anonymous</td>
<td>Privacy (Human Rights)</td>
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Asia Opium Control 1987-2007

Diagram showing relationships between GDP Central South Asia, NATO Cooperation, Terrorist Attacks, Neighbouring, Weapons Export, Opium Production, and EU Cooperation.
NATO 2020 New Strategic Concept
Building

NATO ‘Smart Defence’ Initiative

IT Governance

DNBL
The Comprehensive C4ISR Approach

Integrated Security Sector C4ISR Requirements

Life Cycle Cooperative Support

Integrated Funding Model

Complex Crisis Management Operations of the Integrated Security Sector strongly dependent of information
NC3A Bi-Lateral Cooperation Model

New NATO Defense Planning Process
Lisbon Critical Capabilities
Alliance Declaration
Capability Requirement Review
NATO Strategic Concept

National Investment Plan / C4ISR projects

- Software maintenance and enhancement
- Documentation
- Training
- Helpdesk
- Support to industry
- Acquisition, Legal and Finance management services
- Battle Laboratory Services,
- Implementation support
MN Projects Generation with Embedded Interoperability and Security

NATO
- ACT (Transformation Authority)
- ACO (Operational Authority)
- NAMSA (Support Authority)
- Other NATO Entities

NATO & Partner Nations
- NAC / CNAD, NC3B
- NC3O (charter)
- C4ISR MoU Nation-NC3A
- National MODs, etc. (National operational, transformation, support authorities)

FACILITATION
- DNBL

Results Benefiting Both NATO and Nations (incl. Industry)
Minchev, Z. CAX application for simulation and training in support of CIMIC. The Bulgarian academic experience, Amsterdam, the Netherlands, MCC 2011 Conference, October 17-18, 2011, Published in Military Communications and Information Technology: A Comprehensive Approach Enabler, Military University of Technology, Warsaw, Poland, 71-81, 2011.


Thank you for the Attention!

Q & A !?