Czech-German Cross-Border Situational Awareness for Critical Infrastructures

Results of the Czech team

Jan Voráček

Department of Technical Studies
College of Polytechnics Jihlava, CZ

This research was supported by the Ministry of Education, Youth and Sports of the Czech Republic within the INTER-EXCELLENCE program under the project LTAB19021 *Czech-German Cross-Border Situational Awareness for Critical Infrastructures*.

Features and goal

Czech-German	→	International
Cross-Border	→	Networking, sharing of resources
Situational Awareness	→	Decision making
Critical Infrastructures	→	Specific requirements

Goal	→	Methodological integration of all features

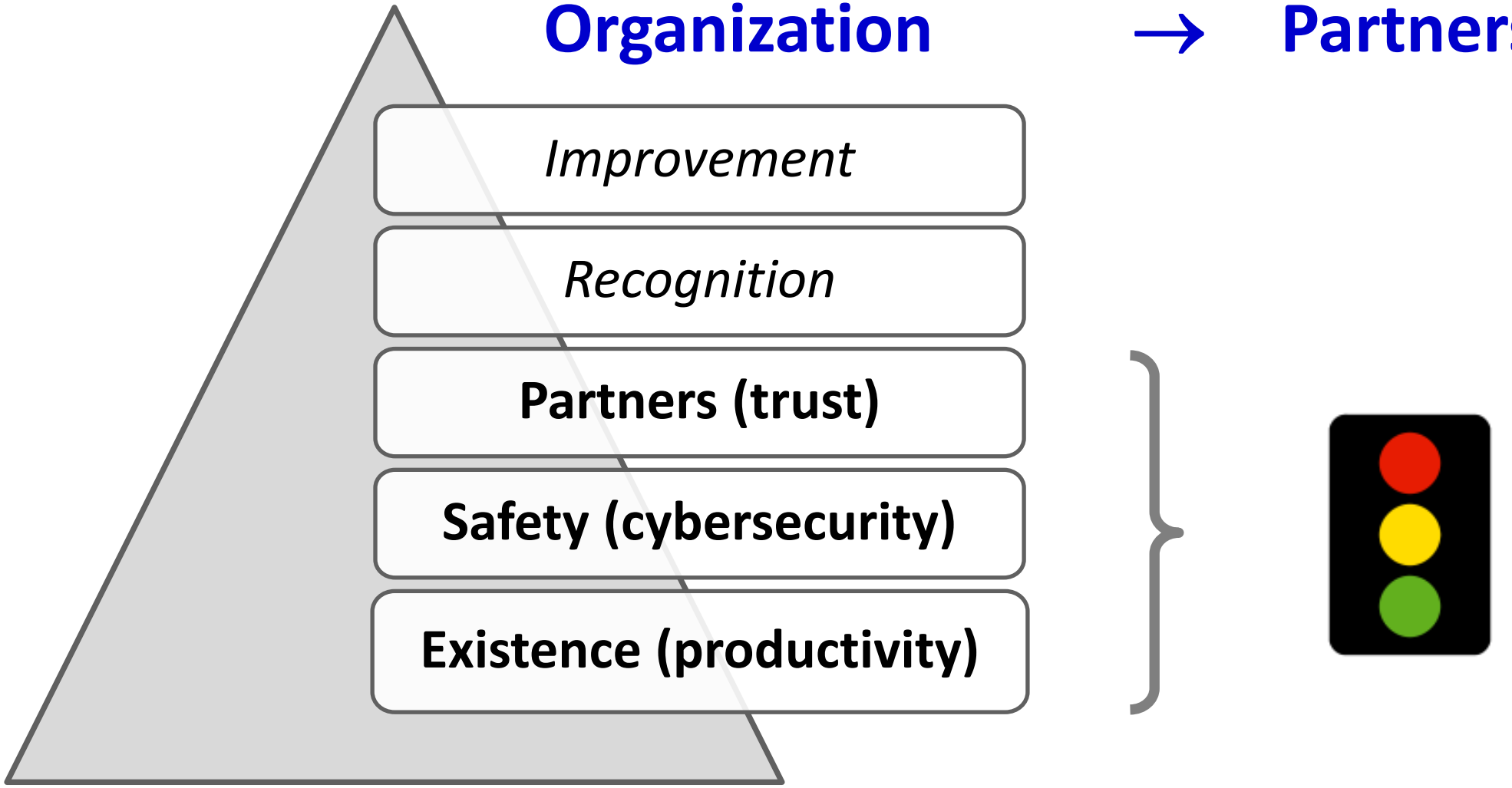
Threats/challenges of sustainable collaboration

- **Quality and quantity of processed information**
  - Cybersecurity
  - Smooth conversion to internal form of situation awareness
- **Partnerships with a lower level of cohesion**
  - Necessary for sharing of resources on regular or ad-hoc (event-driven) basis
- **Cross-border differences**

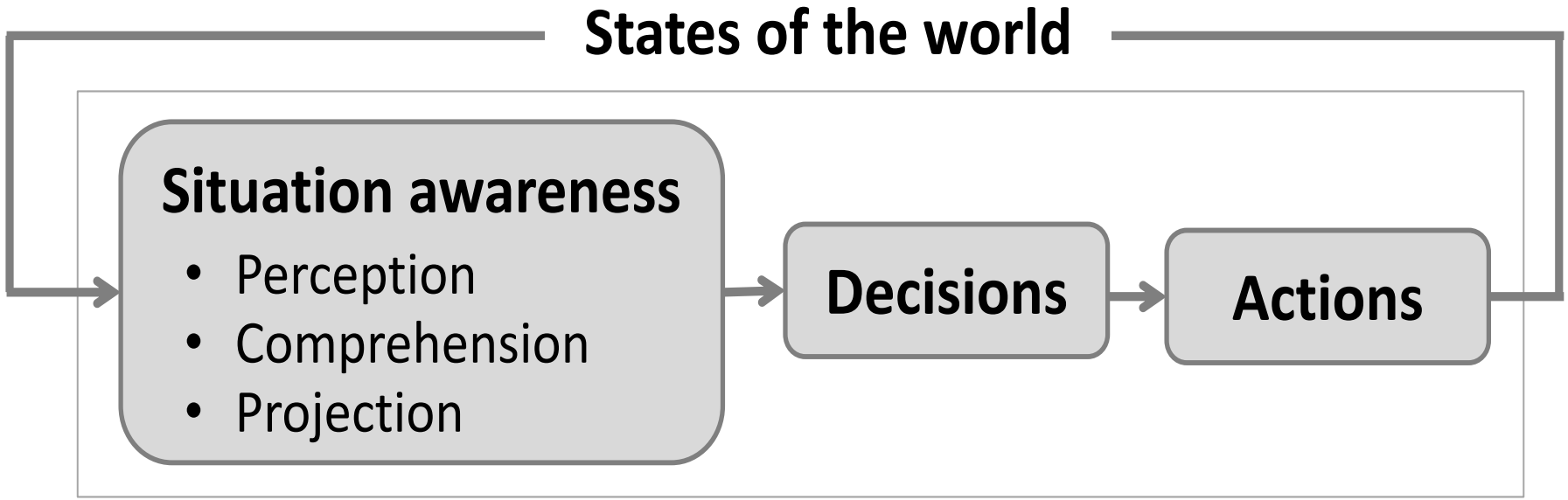
Applicable solution must be:

- Simple
- Sustainable
- Secure
- Profitable
- Understandable
- Systematic
- Standardized
- Shareable
- Configurable
- Maintainable

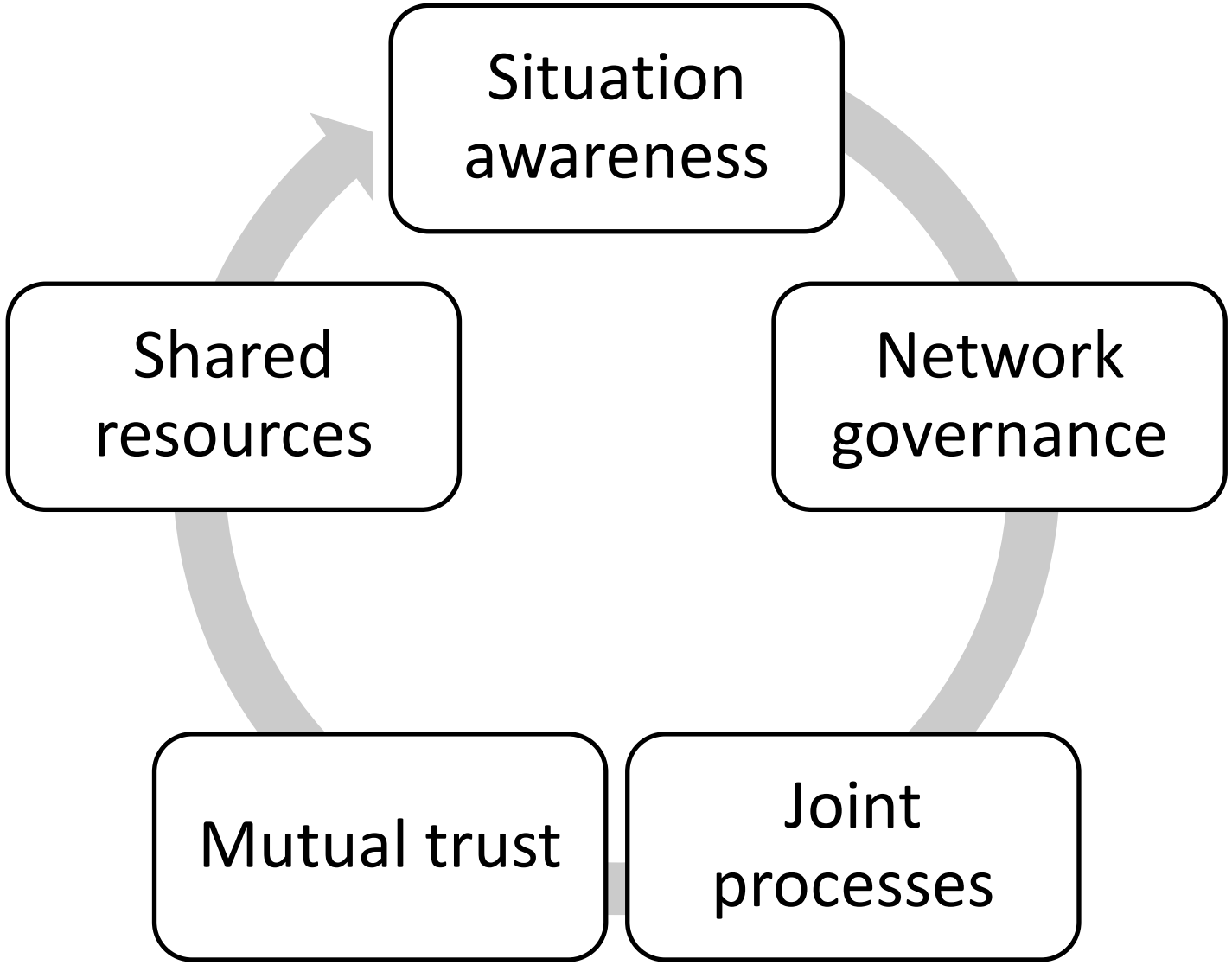
Maslow hierarchy: framework for shared situation awareness



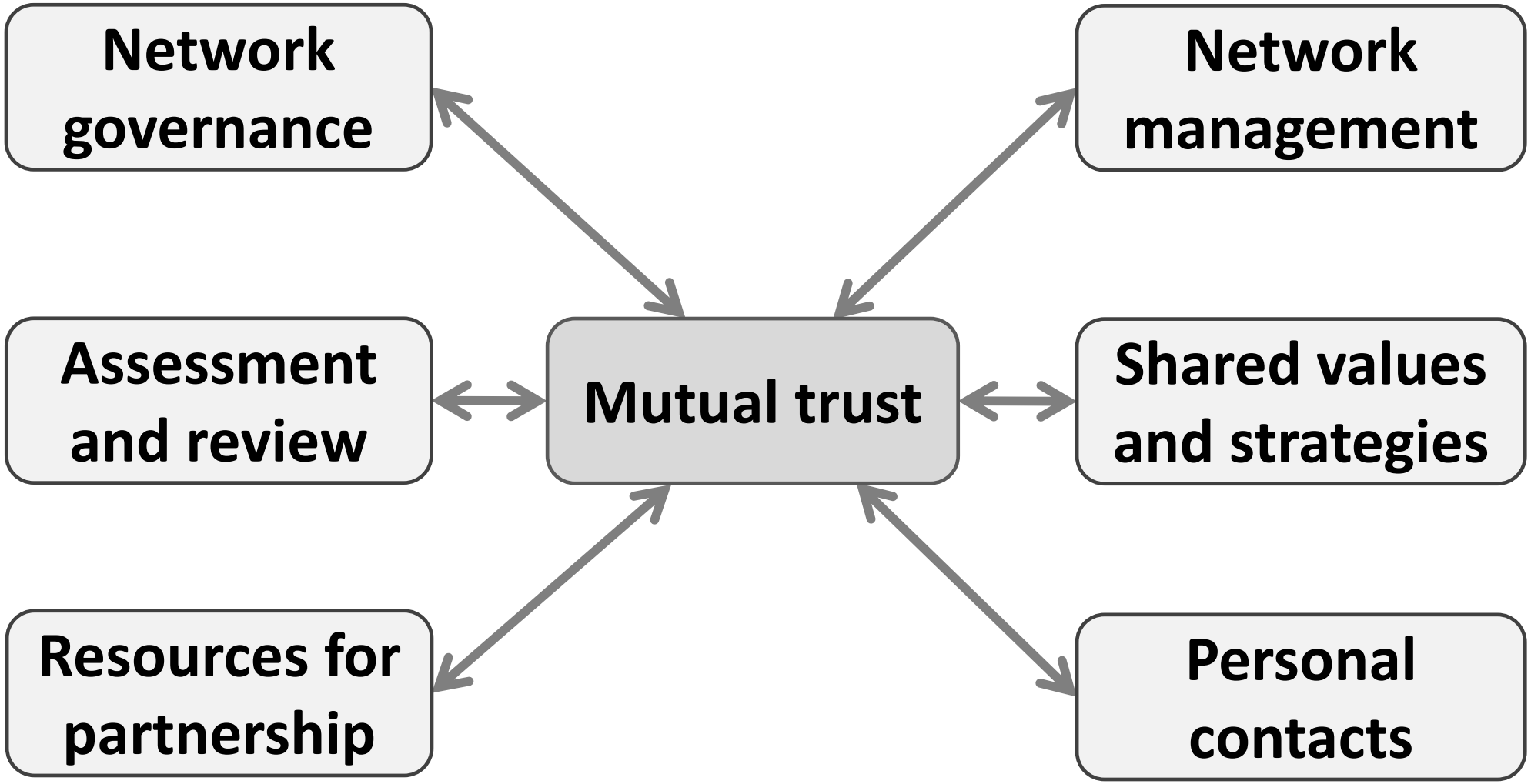
Situation awareness



Suggested methodology



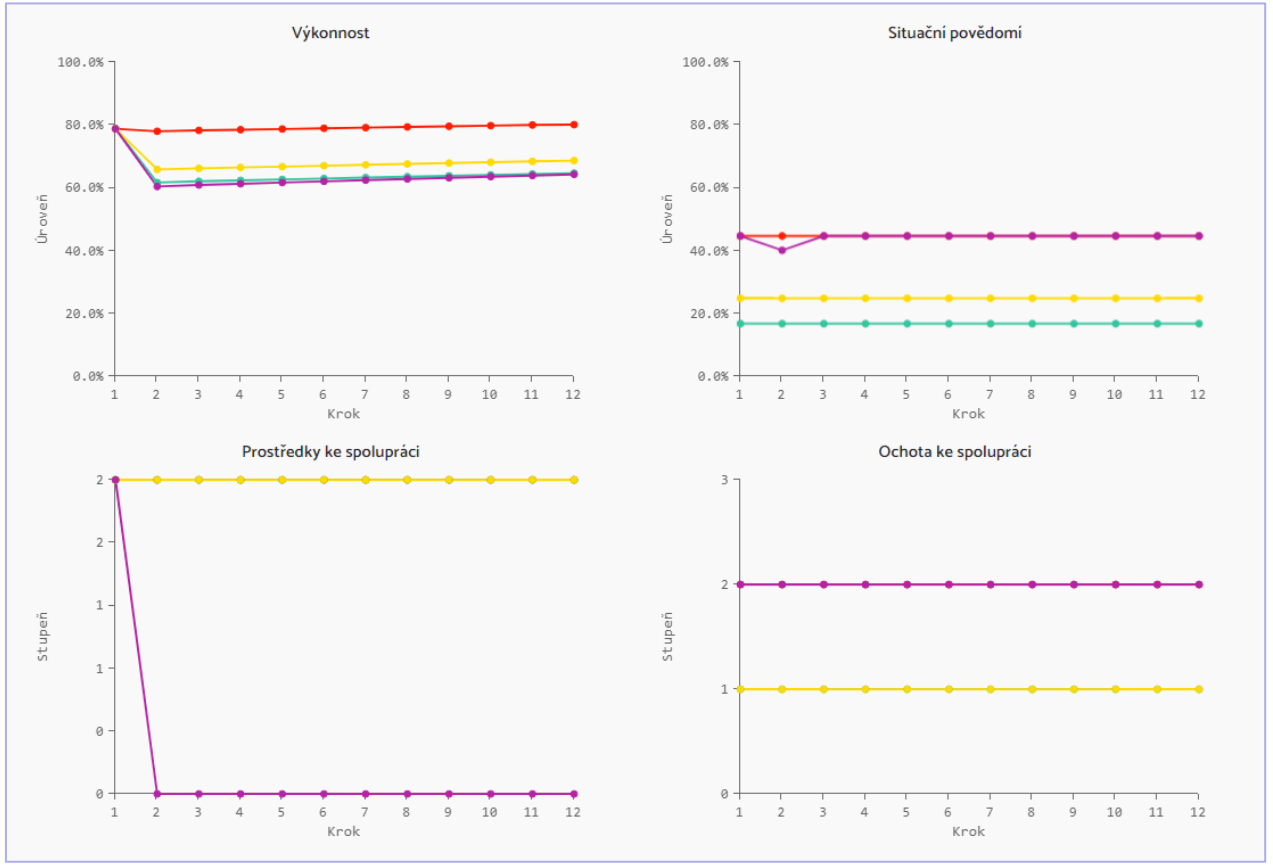
Key role of mutual trust in collaborative networks



Developed tools and techniques

Situation awareness simulator for single organizations

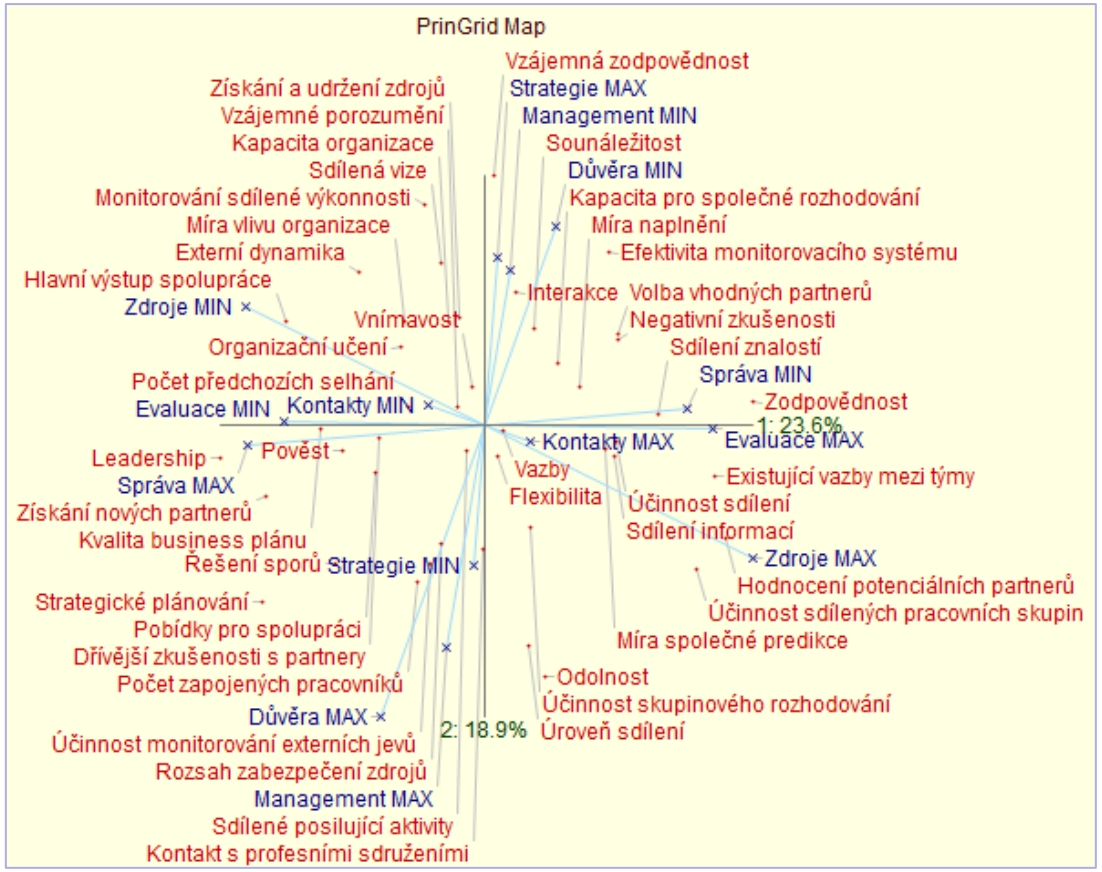
- Structural and parametric adjustment of internal processes and their dynamics
- Prediction of future levels of:
  - Performance
  - Situation awareness
  - Willingness to collaborate
  - Availability for collaboration
- Comparison of scenarios
  - Default setting (red)
  - Low cybersecurity (green)
  - High complexity (yellow)
  - Low performance (purple
- One-shot or step mode

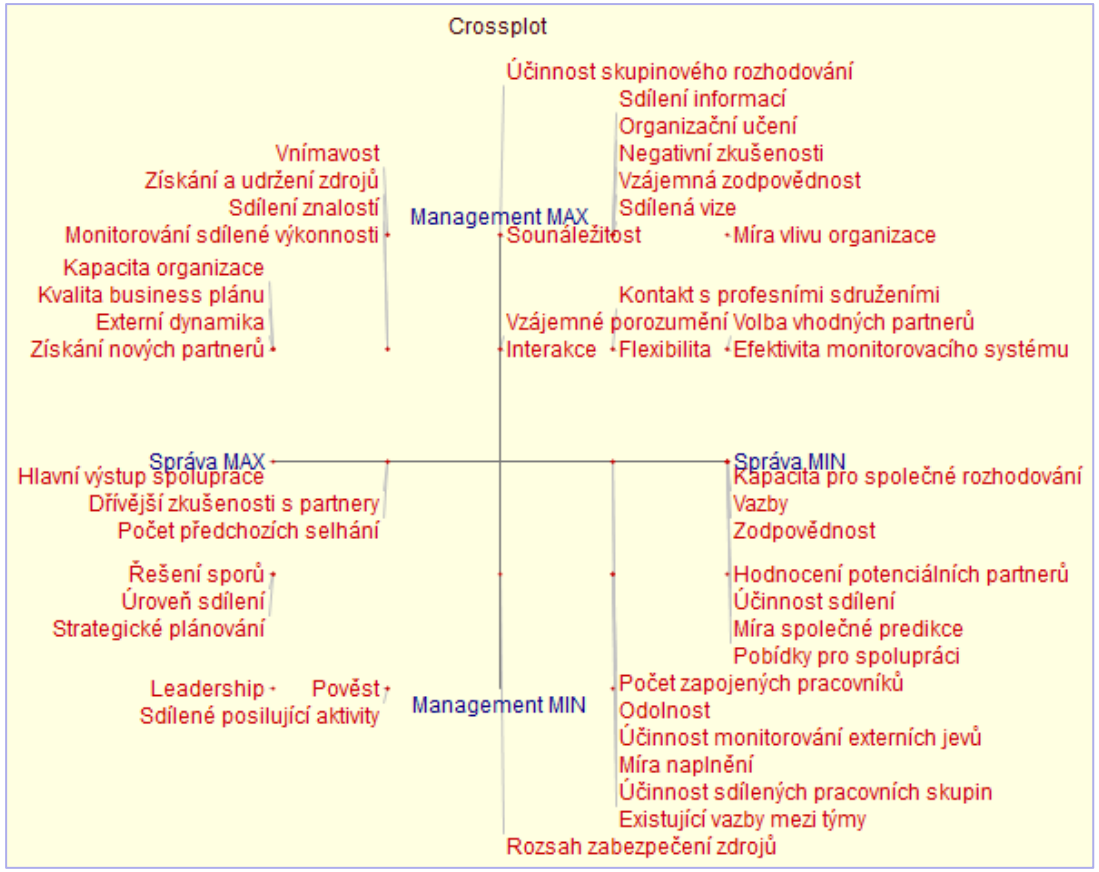


Developed tools and techniques

Tool for technical development of mutual understanding

- Initial problem structuring and terminological standardization

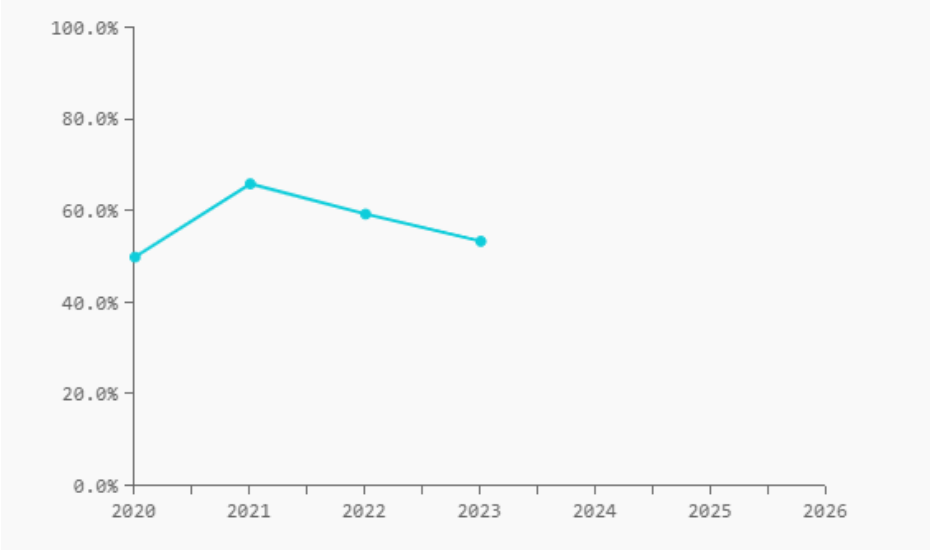


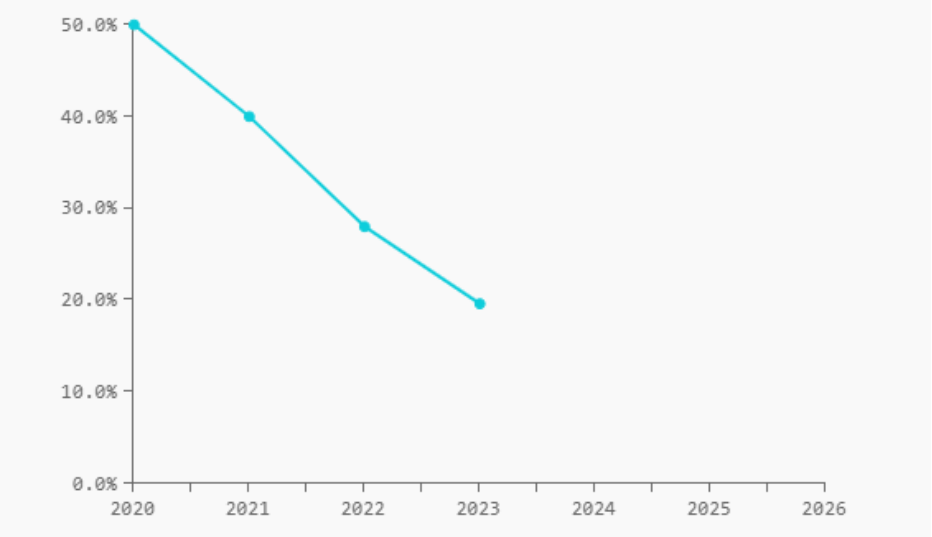


Developed tools and techniques

Network governance simulator

- Uses formerly identified structure and activities
- Is based on model of their joint dynamics
- Predicts development of single sectors
- Distinguishes between network development and maintenance
- Calculates overall network maturity level
- Works in step mode with possibility to complete

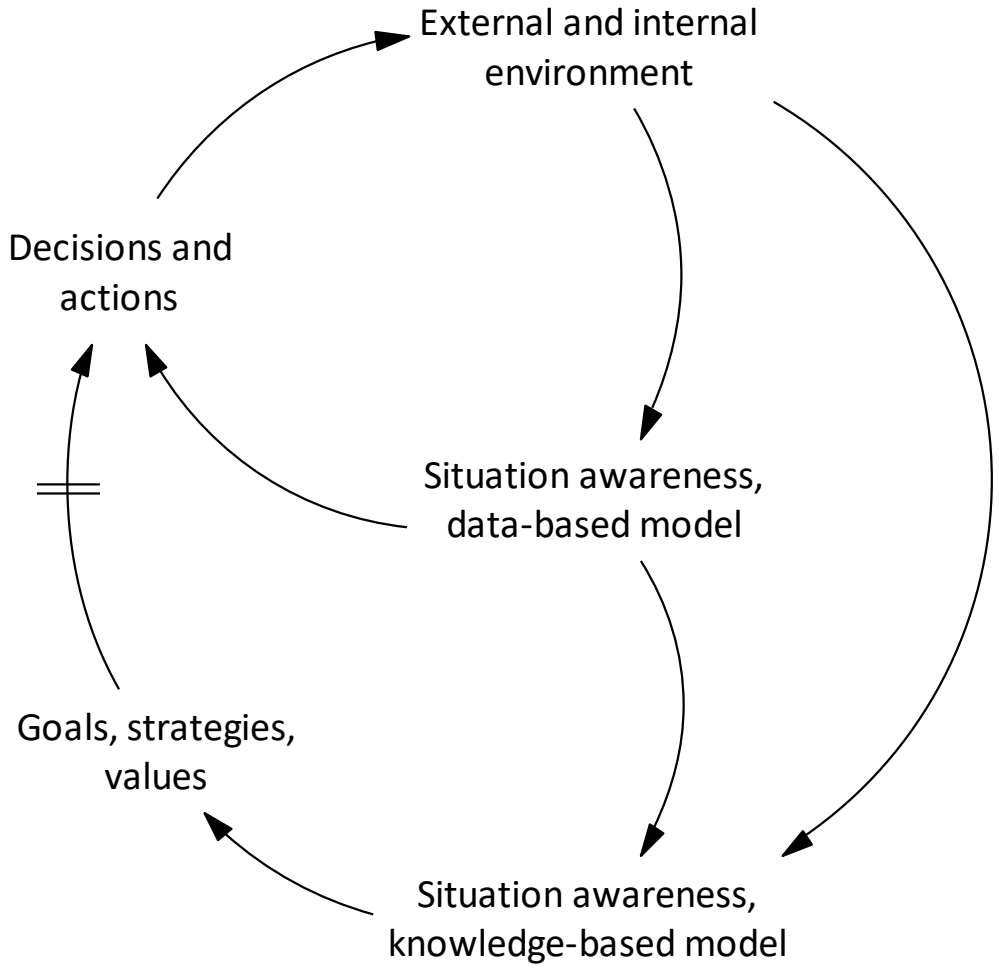




Developed tools and techniques

Two-stage dynamic modeling

- Combines inductive (data mining) and deductive (knowledge-based) modeling
- Uses data mining techniques
  - Supervised and unsupervised
  - Static and dynamics
- Simplifies the rich structure of knowledge-based models with specific data
- Advanced analysis of time-series identifies internal feedback loops
- Supports validation of resultant models



Current applications

- **Digital government** (SmartPart)
  - Methods and tools for direct participation of citizens in annual budget planning and control (participative democracy)
  - As a side effect it strives to develop 3 levels of **trust:**
    - Key individuals (self trust of the main decision makers)
    - Internal teams (cohesion of processes in municipal office)
    - Active citizens (active collaboration with municipal representatives)

- **Digital circular economy** (DiCE)
  - **Informal networking** of small cities, waste disposal organizations and community
  - Current waste management practices extended with two-stage dynamic modeling
    - Predictions and justifications for everyone
  - Realized within the general sustainability framework