Implementing Procedural Interoperabiliy to Cope with Information Complexity in Participatory Modeling for Societal Resilience

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Resilience (1)

(concerning „Situations of Exceptional Need“)

Institutional definitions converge on a **shared understanding**:

resilience is the capacity

to **absorb a shock**,
adapt to a changing environment,
and **recover within an acceptable timeframe**,
all **while maintaining essential functions**.

This applies equally to

organizations,
territories,
and society as a whole.

IMdR 2025 Guide sur la démarche de résilience, 17 p. (transl.)
https://www.imdr.eu/offres/gestion/actus_818_46810-2312/guide-sur-la-demarche-de-resilience.html

Resilience (2)

(concerning „Situations of Exceptional Need“)

Multidisciplinarity: mobilizing diverse fields such as

- risk management,
- security,
- crisis management,
- business continuity,
- information systems,
- human resources,
- communication,
- urban planning, spatial development, etc.

This diversity necessitates permanent coordination that goes far beyond the measures activated traditionally during natural/technical emergencies.

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Participation in Complexity and High Dynamics (1)

(in Case of Disaster, „Situations of Exceptional Need“)

individuals - organizations

mandates - volunteers

management/responsibilities/embedding

anticipated, prepared - ad hoc / in situ

opinions and alternatives (voting, acting)

defined reason, roles, ressources

organised effort

knowledge sharing

availability

goals / sub-goals definition

time-frame and scheduling

change-management

consequences

documentation

revision

Participation in Complexity and High Dynamics (2)

(in Case of Disaster, „Situations of Exceptional Need“)

The paradigm shift from ad hoc volunteers assistance support
towards complex multi-domain data space information provision

and towards consistent modeling of societal stakeholders needs-based information use
(data, analyses, visualizations, alternatives, decisions, measures, documentation)

with the challenges of rapidly increasing complexity and a growing dynamic of change

leads to structural problem areas of adequate (holistic) ontologies, which include not only semantics but also procedural requirements (pragmatics).

Stakeholders / Existing Pillars of Societal Resilience in all Phases of the Disaster Management Cycle

(beyond First Response, First Aid, Critical Infrastructures)

Organizations that stand up for people
Parliamentarians
Lawyers
Insurance companies
Local and national charities
Organizations for family caregivers
Technical and material assistance for reconstruction
Professional Support in the search for financial aid
Sociologists, psychotherapists, psychologists and behavioral consultants
Nursing (practitioners, professional organizations, etc.)
Ambulatory care midwifery
Advocacy for patients
Children in care homes
Medical associations
Chambers of pharmacists
Chambers of nursing
Chambers of psychotherapists
Chambers of industry and commerce
Chambers of engineers
Health insurance companies
Health and care providers Organizations and Associations (public and private services)
Statutory accident insurance institutions (german: Berufsgenossenschaften)
Surveillance
Refugee-migrant organizations of people with disabilities (OPDs)
Organizations run by deaf people
Standardization organizations
Promoting policies that benefit children
Faith-based organizations and communities (local, regional, national)
Salvation Army, missions
School services/parent-teacher associations
Medical care organizations
Community research and service centers
Amateur radio associations
Media (radio, TV, newspapers, magazines, etc.)
Social media
Food industry, nutrition logistics, transportation and distribution
Animals (zoo, pets, farm animals)
Consumer protection organizations
Auditors (public and private)
Legislators

... and others

Participation in Complexity and High Dynamics (3)

(in Case of Disaster, „Situations of Exceptional Need“)

Information Management supports the concepts of situations and processes (including Standard Operational Procedures SOPs) in highly dynamic environments where automated availability and time-specific procedural merging with specific service qualities of all information details is required.

Information management needs to support skills for use case and actor-specific multiple representation (generalization).

Information management takes into account the potential of up-to-date methods and techniques, to be extended to procedural domains when, in situations of exceptional need, task-specific representations must be derived according to the requirements of different actors.

Just-in-Time Information Management

Application Fields in Disaster Management (Selection)

Logistics, transport (land, water, air), supply and production chains (local, regional, national, global)

Health (diseases): resilience, spread, capacities, vaccines

Natech events, disasters, crises, situations of extraordinary need

Internal / external security

Civil-military cooperation

Situational awareness visualization / dashboards / rapid mapping

Foresighting, alternatives, predictions, impacts

Support for decision-making and action

Periodic documentation

Longbing Cao

Elements of Behavior Informatics (1)

behavior representation,

behavioral data construction,

behavior impact analysis,

behavior pattern analysis,

behavior simulation,

and behavior presentation and behavior use.

source: Longbing Cao: Information Sciences (Elsevier), Vol.180 (17), 2010, p. 3067-3085

Elements of Behavior Informatics (2)

- data sources on individual stress in **Disaster Management** mainly from IoT (sensors)
- current: measurements (health related parameters) and analytics for actors in situations of (extreme) danger (rescue forces)
- together with situative facts dynamics
- processes:
  sampling, recording, storing, cleansing, analysing, making of diagnoses, visualizing, predicting, deciding, acting, achievement of goal-reaching, archiving

Elements of Behavior Informatics (3)

Immersive technologies like Virtual Reality (VR) and Augmented Reality (AR) are revolutionizing psychology by offering highly controlled, ecologically valid environments for research, diagnosis, and treatment.

They allow scientists to simulate complex psychological scenarios, measure real-time behavioral responses,

and thus overcome historical trade-offs in experimental control and extended realism.

Participative Collaboration Enabled and Implemented by Solutions for Workplace Support for Distributed Organizations and Teams

Principles:

- Transparency
- Traceability
- Expandability
- Non-discrimination principle
- Fairness / Openness

Basic Methods / Techniques:

- Synchronous and asynchronous communication
- shared Information Space
  (data, workflows, processes, triggers, sheduling, compliance, obligations, exceptions, alternatives, analytics, visualizations, boundary conditions)
- shared Brainstorming
- joint Documentation
- Voting for Amendments / Agreements / Extensions/ Recommendations / Decisions

Towards a structured approach

1. Establishing a cross-sector governance structure
2. Understanding complex interdependencies and vulnerabilities
3. Jointly understanding gaps, synergies, risks, and vulnerabilities
4. From Resilience Strategies (local, national, international) towards participative implementation of achievable resilience goals
5. Prioritizing measures across the entire lifecycle of appropriate information infrastructure
6. Ensuring accountability and monitoring the implementation of resilience measures
7. Taking into account the cross-border / cross-culture / behavioral dimensions of information infrastructure systems that enable participative societal resilience

Principality of Liechtenstein Strategy

A strong sense of democracy and a high degree of social cohesion are key components of Liechtenstein's internal stability. In light of an increasingly complex information environment and processes of social change, the promotion of resilience, media literacy, and participatory engagement is gaining in importance.

This area of action supports the maintenance of social trust, strengthens resilience against disinformation and polarization, and fosters an environment in which the population, institutions, and the state work together to contribute to the country's stability.

Regierung des Fürstentums Liechtenstein, Sicherheitspolitische Strategie Liechtenstein, Vaduz, Mai 2026 S. 24 (transl.)
https://cms-lp.extravirgin.workers.dev/api/media/file/ikr_sicherheitspolstrategie_paper_a4_55b3f47255.pdf

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Our Common Goals:

- Informatics innovation in Participatory Modeling for Societal Resilience
- Speed and Efficiency gains
- Cross-organizational procedural and behavioral coherence
- In line with professional state-of-the-art and “all-of-society” expectations

Thank You for Your Attention !

For further information, communication and cooperation please contact:

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