Two Research Programmes on Disaster Abatement at Lund University Centre for Risk Analysis and Management (LUCRAM)

Akselsson, Roland; Johansson, Curt R; Magnusson, Sven Erik; Petersen, Kurt

2005

LUND UNIVERSITY

Department of Design Sciences
Ergonomics and Aerosol Technology

Two Research Programmes on Disaster Abatement at Lund University Centre for Risk Analysis and Management (LUCRAM)

Roland Akselsson

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Seminar on Disaster Abatement, Arnhem, NL, May 25-26, 2005

Two research programmes on disaster abatement at Lund University Centre for Risk Analysis and Management (LUCRAM)

Roland Akselsson, Ergonomics
Curt R Johansson, Psychology
Sven Erik Magnusson, Fire Safety Engineering
Kurt Petersen, Fire Safety Engineering

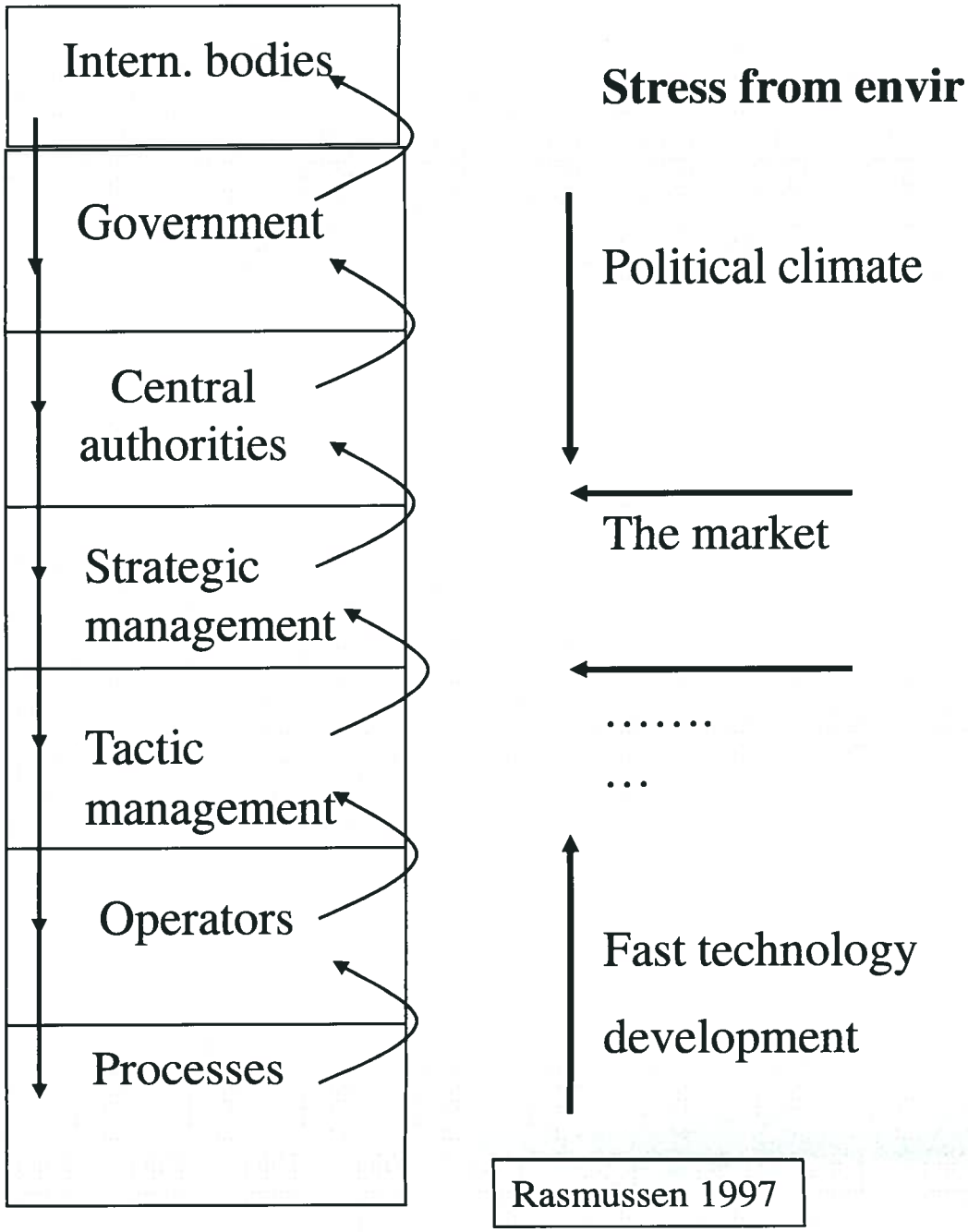
LUCRAM at Lund university
Lund
SWEDEN

A systems view

The system has to be adaptive in order to react on time to stress from the society

Goal control with feedback instead of detail control

Cont learning



Rasmussen 1997

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Plan for my talk

- Present Lund University and LUCRAM
- Present myself
- FRIVA Framework programme: Risk and Vulnerability Analysis
- HOFRIM (Human and Organisational Factors in RIsk Management)

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Lund University

- Eight faculties
- The largest unit for research and higher education in Sweden
- Founded in 1666
- More than 40,000 students and about 6,000 employees
- www.lu.se

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Lund University 2
relevant centres

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LUCRAM Lund University Centre for Risk Analysis and Mangement

Change@Work Lund University Centre for R&D on Man, Technology, Organisation and Change at Work

Flygforsk – Swedish Centre for Aviation Research and Development SCAR&D

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LUCRAM I

Lund University Centre for Risk Analysis and Risk Management

- multi-disciplinary centre
- formally established 1998
- close connection to a Master's programme in risk management and safety engineering

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LUCRAM II

Research

- A major programme, FRIVA, involving about 12 PhD students and about 15 senior researchers. Focus is on risk and vulnerability management in technological and social systems.
- Another programme concerns human and organizational factors in risk management, HOFRIM
- Other projects
- Together with university departments LUCRAM is running a school of doctoral studies.
- http://www.lucram.lu.se

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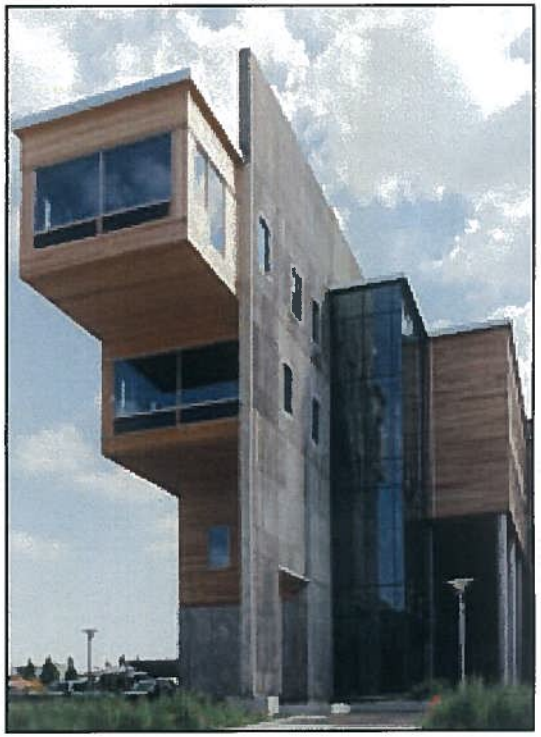
- Professor in Ergonomics
- PhD, MB. Basic training in Nuclear Physics, Medicine and Teaching
- Deputy director LUCRAM
- Director Change@Work
- Board member SCAR&D
- Board member LU School of Aviation



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Framework programme: RIsk and Vulnerability Analysis in technological and social systems (FRIVA)

Objectives

Extend and improve the national competence on risk and vulnerability modeling and on assessment and management of social systems and interdependent technological infrastructures.

Project leader: Kurt Petersen

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FRIVA

Multidisciplinary including engineering and behavioural sciences

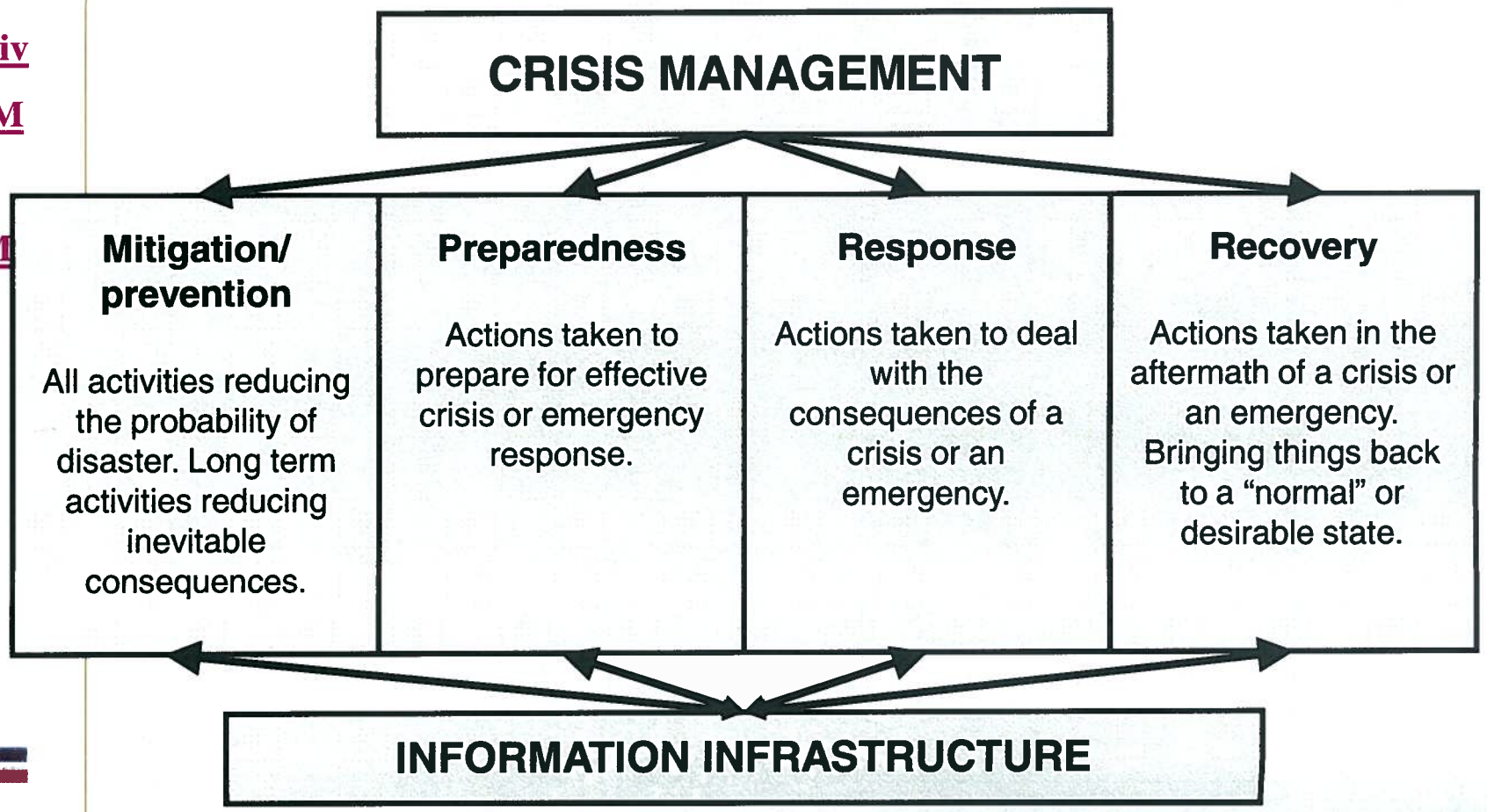
Around 10 professors and 10 PhD students
More students and professors from other LUCRAM projects take part in FRIVA activites

Common FRIVA activities in addition to co-operations in subprojects

- Seminars
- Common PhD courses
- 'FRIVA days', twice a year

Supported by the Swedish Emergency Management Authority (SEMA. In Swedish: KBM)

The Phases of Crisis Management



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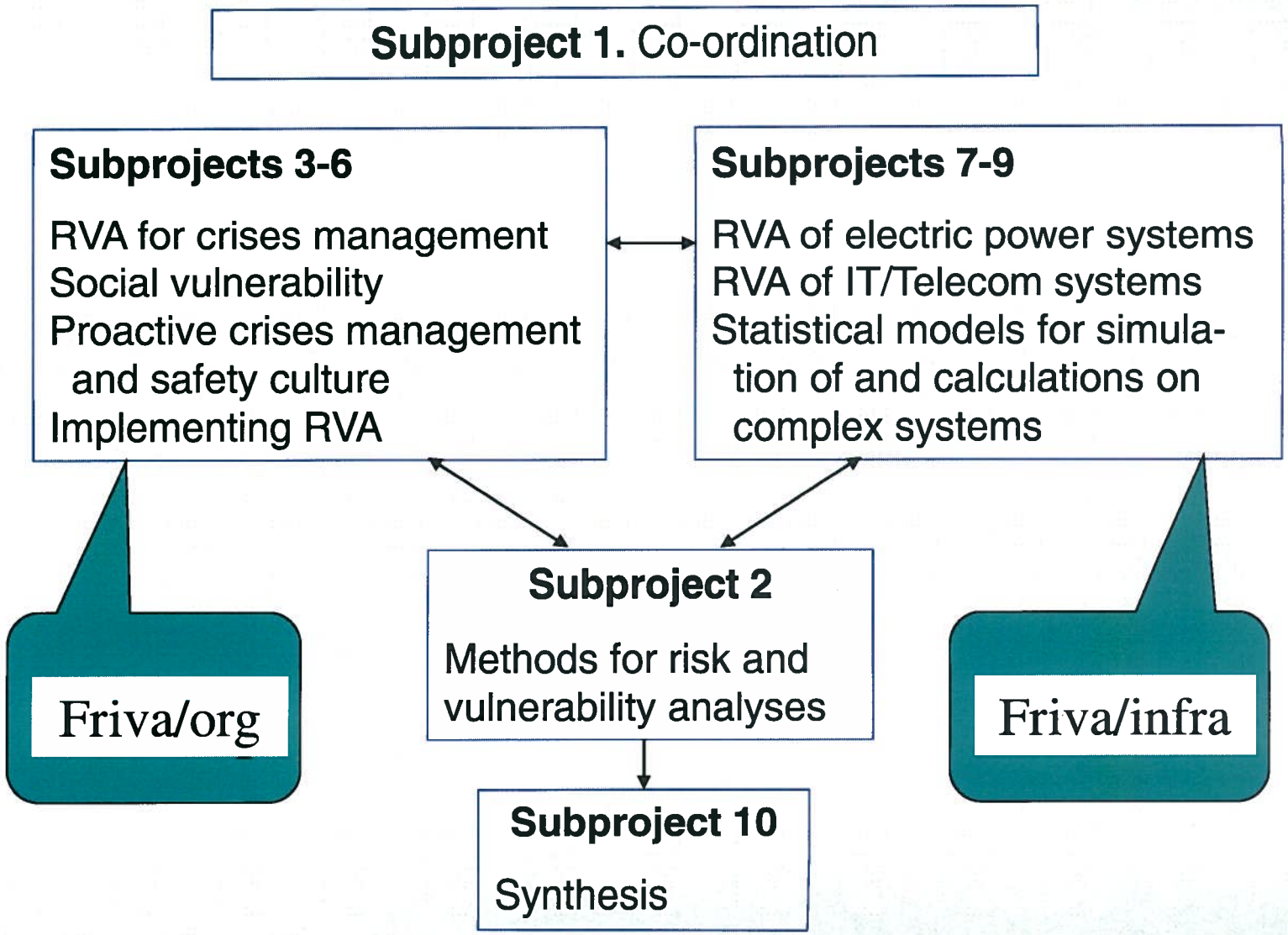
FRIVA overview – structure



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SP 3: The use of risk and vulnerability analysis to contribute to improved preparedness, response, and recovery in crises management 1

- Kerstin Eriksson, PhD-student, Fire Safety Engineering
- Lars Fredholm, professor, Fire Safety Engineering
- Master's students, Fire Engineering

RVA today in Sweden is mostly used for improving the mitigation phase of crises management.

The objective of SP 3 is to improve RVA and the use of it for improving preparedness, response and recovery in crises management.

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SP 3: The use of RVA as contributions to improved preparedness, response, and recovery in crises management 2

An investigation is going on in three municipalities stroken by flooding jn the summer 2004 about how risk and vulnerability analyses are used for improving preparedness for extraordinary events.

Two questions are

1. Have risk and vulnerability analyses been used in the affected municipalities?
2. Could risk and vulnerability analyses have been used more efficiently by the affected municipalities? How?

Interviews are performed and documents are studied.

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SP 3: The use of RVA as contributions to improved preparedness, response, and recovery in crises management 2

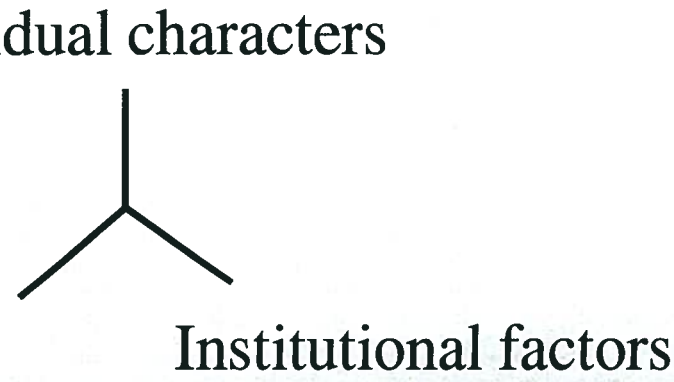
Jan 8-9, 2005 a storm, named Gudrun, demolated 75 000 000 m^3 forest in southern Sweden. The electricity distribution as well as the telephone network was hurt for days, for many even for weeks, with big stress on the society.

These crises will be studied in co-operation between different subprojects. Question:
What could be learnt from them concerning the use of RVA for improved preparedness, response and recovery?

SP 4: Crises management and social vulnerability analysis

Working definition:
Social vulnerability is an individual's, a group's or a population's inability to resist and recover after different kinds of stress.

Social vulnerability is dependent on an interplay between



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SP 4.1: Crises management and social vulnerability analysis 1

Social and economic geography
- Nicklas Olofsson, PhD-student
- Per-Olof Hallin, professor

GOALS

4.1
- Identify and analyse **structural factors that influence social vulnerability**
- Identify and analyse **strategies used** by municipalities, other key actors and affected individuals, groups or populations to cope with catastrophes

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Mitigation | Preparedness | Response | Recovery

SP 4.2: Crises management and social vulnerability analysis 1

Social and economic geography
- Tuija Nieminen Kristofersson, senior lecturer
- Per-Olof Hallin, professor

GOALS

4.2 Develop a method to estimate the **crises management capacity** of municipalities concerning social vulnerability.
Analyse **municipalities' ability** to give psychological and social support to vulnerable groups.

Mitigation	Preparedness	Response	Recovery

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SP 4: Crises management and social vulnerability analysis

Methods

Interviews and the MVA method – a computer-based scenario method developed by Hallin et al. – are used

4.2 A number of concrete catastrophic events will be analysed with focus on the actual crises management process and the responsiveness to those affected.

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SP 6: Municipal and regional vulnerability analysis

Social and economic geography
- Jerry Nilsson, PhD-student
- Benny Jonsson, PhD-student
- Per-Olof Hallin, professor

Strategies for implementing methods for municipal vulnerability analysis, especially the PC-based MVA-method, in municipal crises management, will be developed and tested.

Develop and test methods for **regional vulnerability analysis**

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SP 5: Proactive crisis management and safety culture on authority levels 1

Ergonomics
- Jonas Borell, PhD student
- Åsa Ek, PhD student
- Roland Akselsson, professor

Goals

Develop usable, cost-effective methods for proactive crises management including safety culture and mindfulness (partly)

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Mitigation	Preparedness	Response	Recovery

SP 5: Proactive crisis management and safety culture on authority levels 2

Start model

Proactive crises management includes:

a safety management system$_{crises}$ with different tools for organisational learning

a safety culture$_{crises}$ and mindfulness$_{crises}$ comprising all levels in the organisation

Motivation to focus on low probability risks (for disasters) is identified as a problem.

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SP 5: Proactive crisis management and safety culture on authority levels 3

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Methods

A number of municipalities and regional authorities will be studied and has started in order to

identify and analyse learning processes

analyse the safety culture including culture for good crises management

use the results as a base for the development of usable, cost-effective methods for proactive crises management

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SP 7: Risk analysis in large scale infrastructures. Electric power

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Industrial automation (IEA)
- Jonas Johansson, PhD-student
- Christian Rosén, Res. Assoc.
- Gustaf Olsson, professor

Vision: Robust technological infrastructures also considering interdependencies. In the first phase: electric power systems and interdependencies with telecom

GOALS

Develop methods for preventing, assessing and managing serious fault states in technological infrastructures

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SP 7: Risk analysis in large scale infrastructures. Electric power

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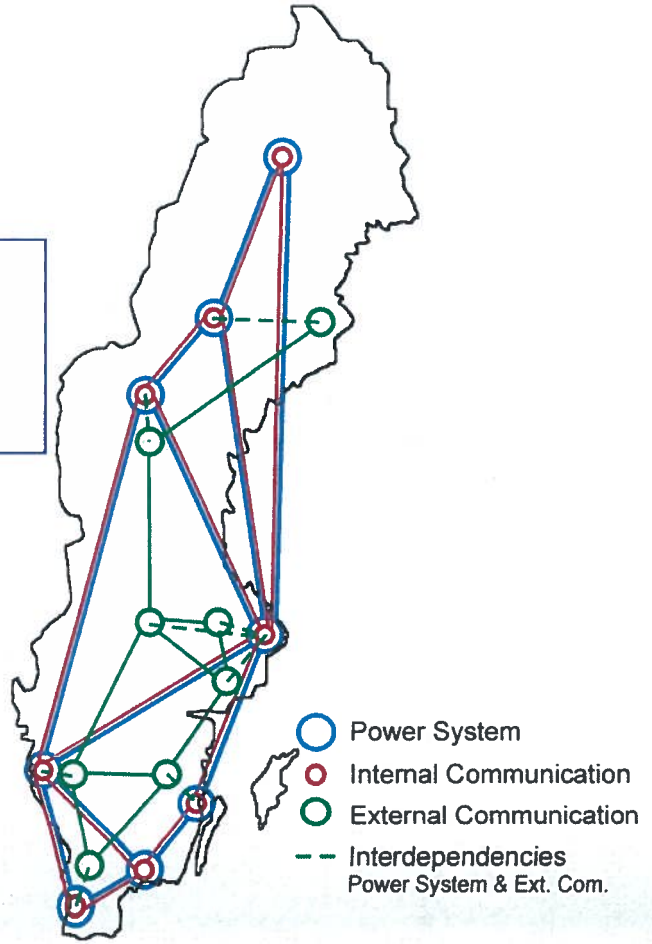
A simulation model is built. It maps the Swedish HV network. It also maps …

With this and other models the response, recovery and control of the infrastructure systems are studied.

Tools and methods for regional electric networks to become ”self healing” after major disturbances – the concept of islanding operations will be developed and tested.



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SP 8 Risk analysis in large scale infrastructures. Telecommunication and IT systems

Professor Per Runeson
Dr. Martin Höst
Mikael Andersson, PhD-student
Kim Weyns, PhD-student

Dept of communication systems

Tele and IT systems may

1. Constitute or create a crisis
2. Play an important role in the information flow in a crises
3. Play an important role in resolving a crisis

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[030911, 11:10]

Anna Lindh död – industriledare visar deltagande

Utrikesminister Anna Lindh avled i morse av de skador hon fick vid ett knivöverfall i Stockholm under gårdagen. Företrädare för svensk industri uttrycker sitt deltagande.

Anna Lindh

"Anna Lindhs död är en tragedi, säger Göran Tunhammar, vd för industriorganisationen Svenskt Näringsliv.

"Vårt djupaste deltagande går i denna stund till hennes familj och anhöriga. Anna Lindhs politiska arbete handlade om att värna mänskligheten, demokratin och ett öppet samhälle; att se till att det som vi tar för självklart kan komma alla till del. Mordet på henne är ett övergrepp på allt vad hon stått och arbetat för," säger Tunhammar i ett uttalande.

Ericssons vd Carl-Henric Svanberg säger till Dagens Industri att Anna Lindh var

"Anna

Efter

webbp

överbe

Text:

URL:

After the news about the death of Anna Lindh was made public, most Swedish web-sites publishing news of the day was overloaded. Also the web-site for the government was overloaded.

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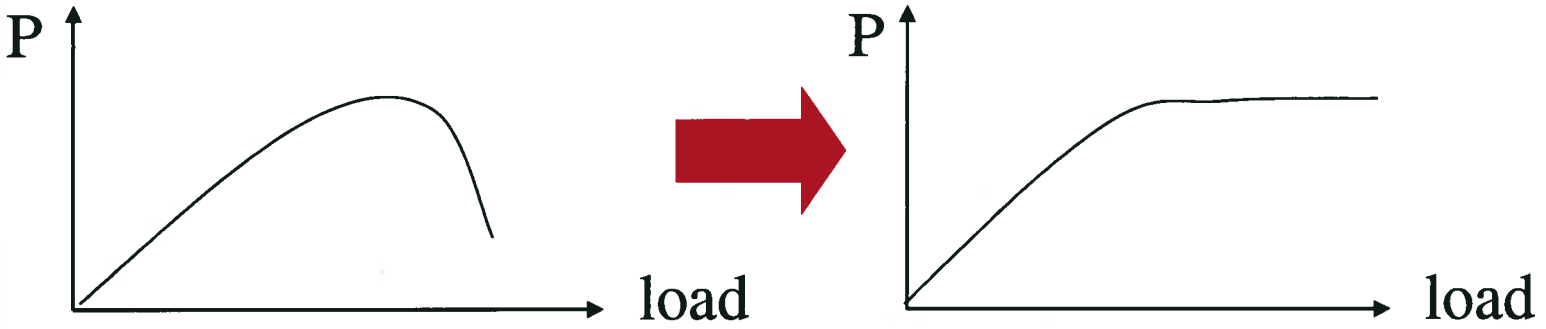
SP 8 Risk analysis in large scale infrastructures. Telecommunication and IT systems



Goal 1. (Performance)

- Apply load control
- Predicting and certifying of capacity during crises

Research methods

- Simulation
- Case studies - applications

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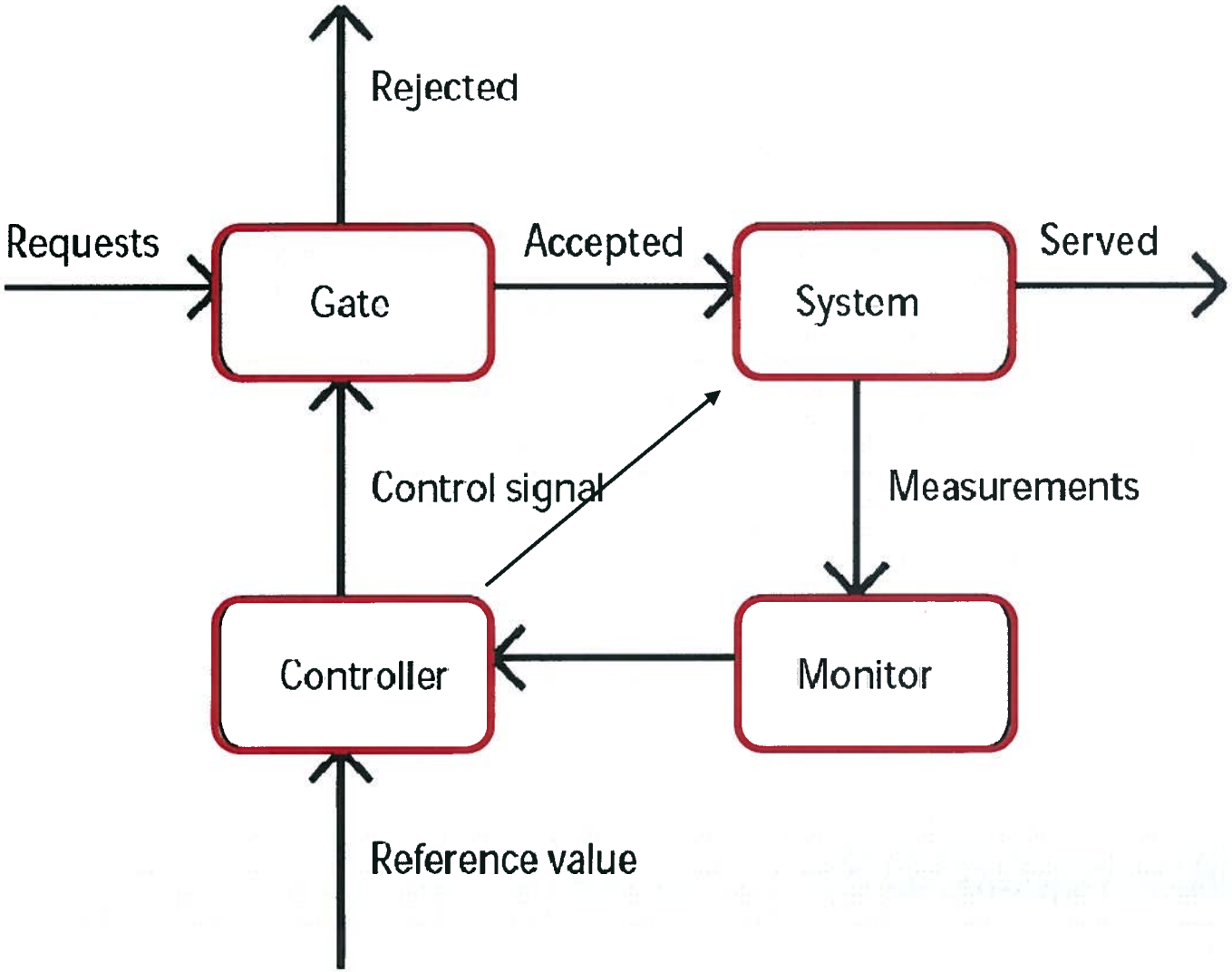
Principal model



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SP 9: Statistical simulation and deterministic models for complex systems

Georg Lindgren, professor
Igor Rychlik, professor
Jan Holst, professor
Anders Bengtsson, PhD-student

} Statistics

Goals

- Development of tools for analysis of extreme events and methods for warning systems
- Development of tools for simulation of large, complex and interdependent systems

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SP 2: Risk and vulnerability assessment methods

Dept of Fire Safety Engineering

Kurt Petersen, professor
Henrik Johansson, PhD
Anders Jacobsson, Assoc prof (ind)
Marcus Abrahamsson, PhD-student
Henrik Jönsson, PhD-student

- Integration between subprojects/co-ordinate co-operation between subprojects around case studies. A couple are in planning phase.
- Collect/develop methods for RVA for practical use
- Network analysis of complex infrastructures
- Investigation on how people assess different catastrophes
- Case studies on RVA

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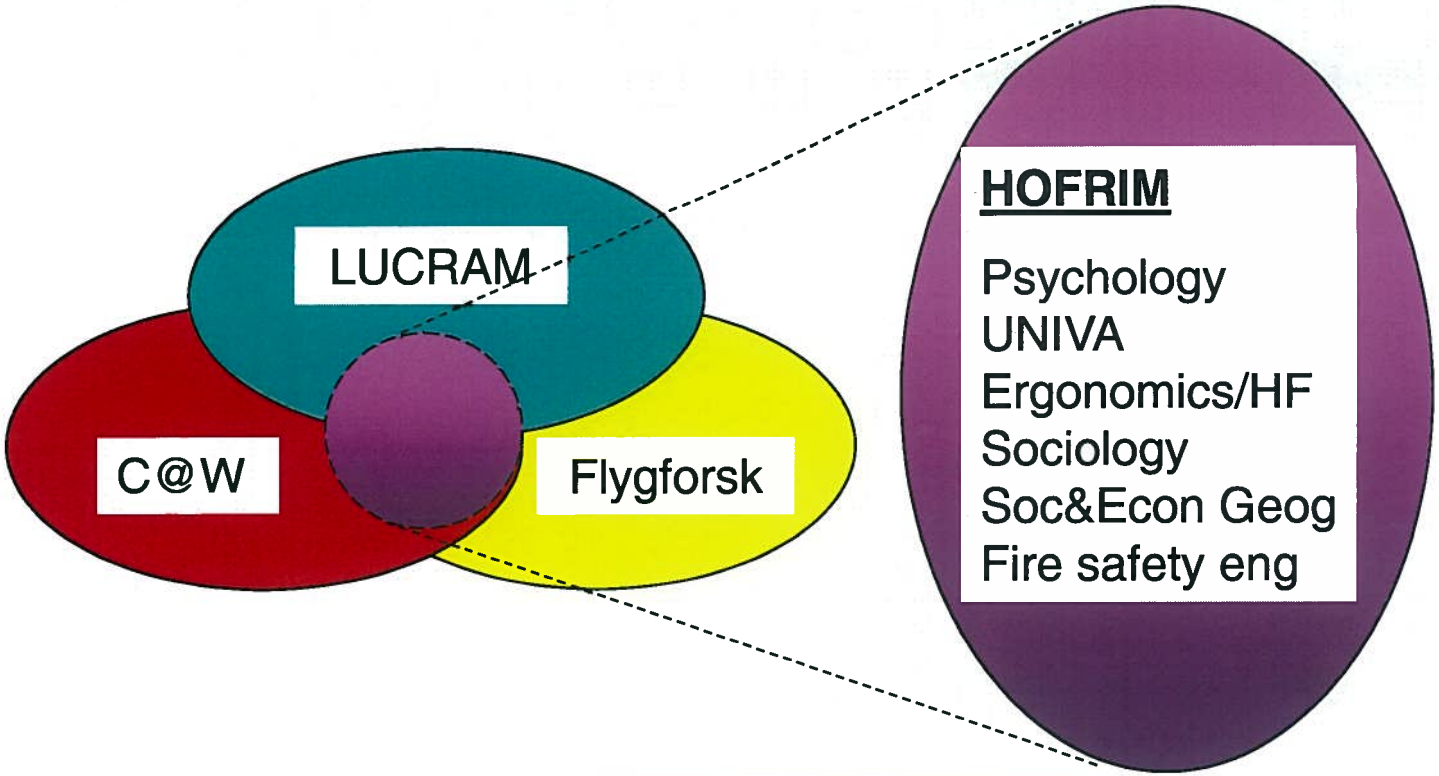
The HOFRIM[1] group is part of three centra at LU



HOFRIM – a nucleus within C@W, Flygforsk and LUCRAM, focusing on human factors and organisational factors in risk management

[1] Human and organisational factors in risk management

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Basic ideas in HOFRIM:s R&D

1. a. A systems view (Rasmussen) including
   b. Organisational learning
2. a. Safety culture – continuous learning
   b. Mindfulness (learning from HRO:s)
3. It is human to err -- identify and fight system weaknesses
4. Management and participation in changes and in normal operation
5. Human factors in the life-cycle of systems and products – stressing the importance of design
6. Safety and efficiency
7. Change processes
8. Domain knowledge

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HOFRIM projects 1

- Human factors in air navigation services
- Maritime safety
- Proactive crisis manage-ment and safety culture on authority levels FRIVA-SP
- Improving emergency and crisis management
- Human integration into the life-cycle of aviation systems. Part in EC-IP

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HOFRIM projects 2

- Pilot training and mental load
- System weaknesses in health care
- Safety in drug handling
- Safety culture
- Natural disasters – a literature review

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HOFRIM projects 3

- Co-operative decision-making.
  Case: A Swedish airport
- Safety in airport ground-handling Feasibility study
- Change and transition. Feasibility study for Eurocontrol

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HOFRIM projects 4

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- Retrospective study of incident and accident reports in process industries. Could reporting and analyses be improved? Feasibility study.

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Examples on ongoing master thesis work

In starting phase (titles are tentative):

- A model for proactive risk management for the City Tunnel Project in Malmö (CTP)
- Assessment of frequent threats on aviation safety (airport) (LFV)
- Risk management at Oskarshamn nuclear power plant (OKG)
- Management of fire risks at sawing industries. Influence of training on attitudes. (SCA)

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Thank you!

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