

Framework for Coordination Support in Critical Incident Management Systems

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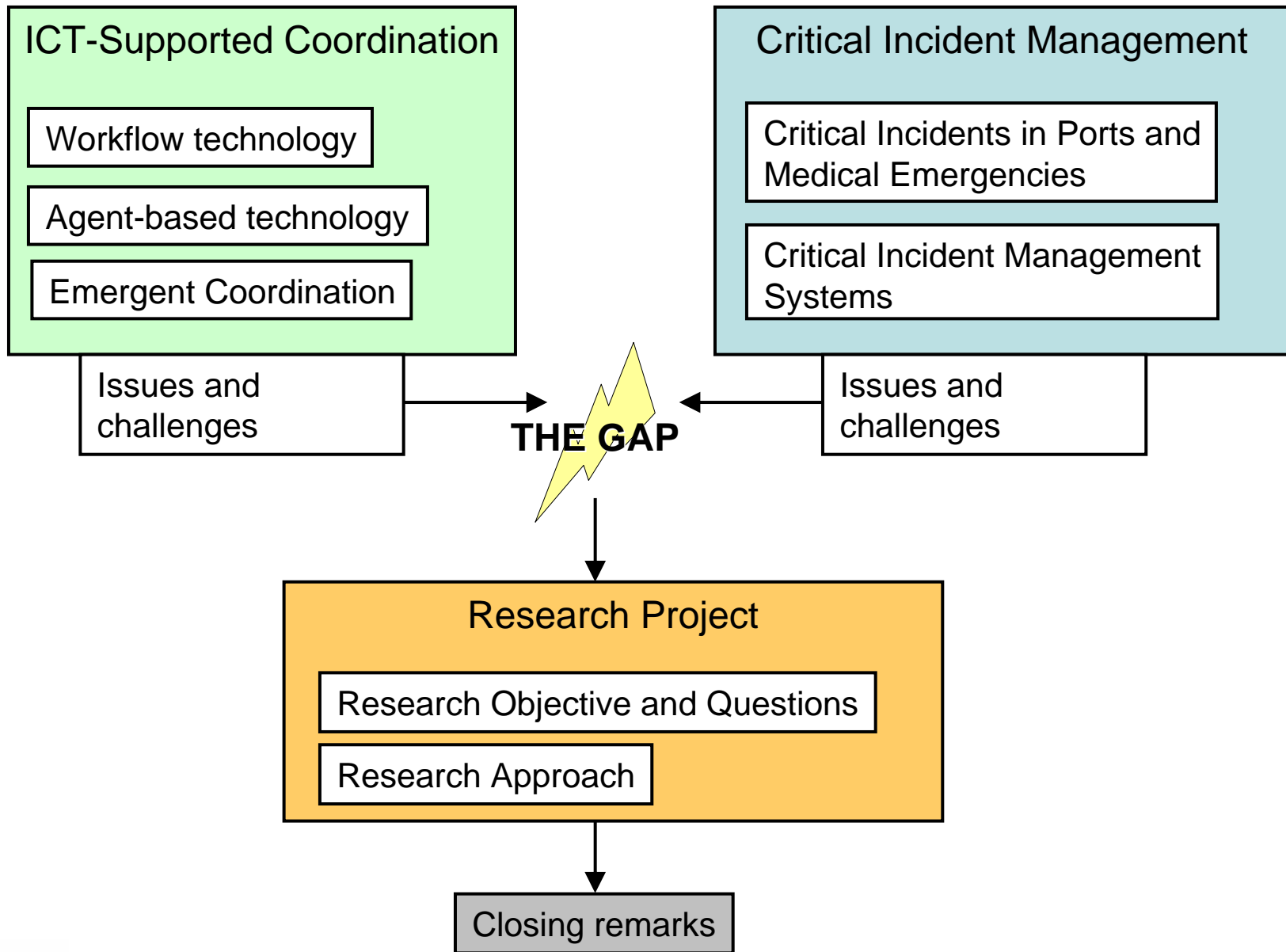
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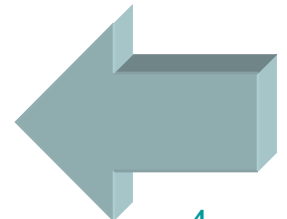
The Problem Situation

- Critical Incident Management is complex and has conflicting requirements
 - Control
 - tractability, discipline, accountability, structure, hierarchy, preparedness
 - Flexibility
 - improvisation, adaptability, agility, autonomy, adhococracy support
- A crucial issue is coordination improvement
 - Related to information problems
 - Heterogeneity, overload, dynamics
 - Supported (inadequately) by ICT



Workflow Technology

- Workflow technology is a classic solution to coordination problems
- Recent attention to flexible, pattern-oriented WfMS with support for ill-defined processes
- Effective for critical incident management?



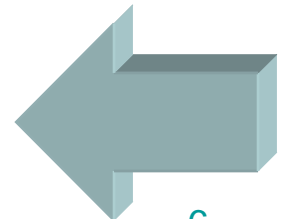
Agent-based Technology

- Convergence of disciplines (mainly DAI)
- Allows knowledge and task distribution (centralized or distributed structure)
- Have been used for coordination (including emergency response); actually coordination is always an issue in MAS
- Partner finding and shared knowledge are a challenge



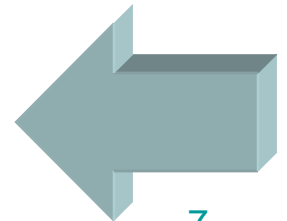
Emergent Coordination

- Emergence has been studied in CAS and social networks
- Emergent cooperation is an example
- Emergence in MAS has also been studied
- Emergent coordination in business networks and emergency management networks is a growing subject



Critical Incidents

- Natural disasters, pandemics, terrorist attacks have generated increasing concern, funding and policy
- Coordination is a major issue: command and control is not always effective
- In ports: vulnerability is high and competitiveness is challenged
- In medical emergencies: altered standards and ICT-support are an issue

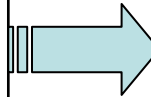


Critical Incident Management Systems

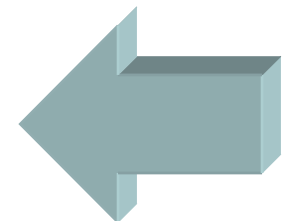
- Examples: COSMOA, EMISARI, DERMIS, ENCOMPASS, SAHANA, EMPROV...
- Technologies: GIS, simulation, WF, agents, Web services, DSS, CSCW
- Issues: potential vs. reality, flexibility, integration, levels of abstraction, patterns
- Coordination typically supported at technological level, as in MAS through scheduling algorithms



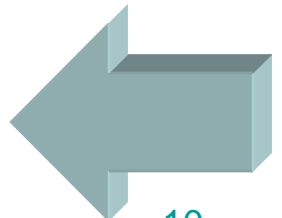
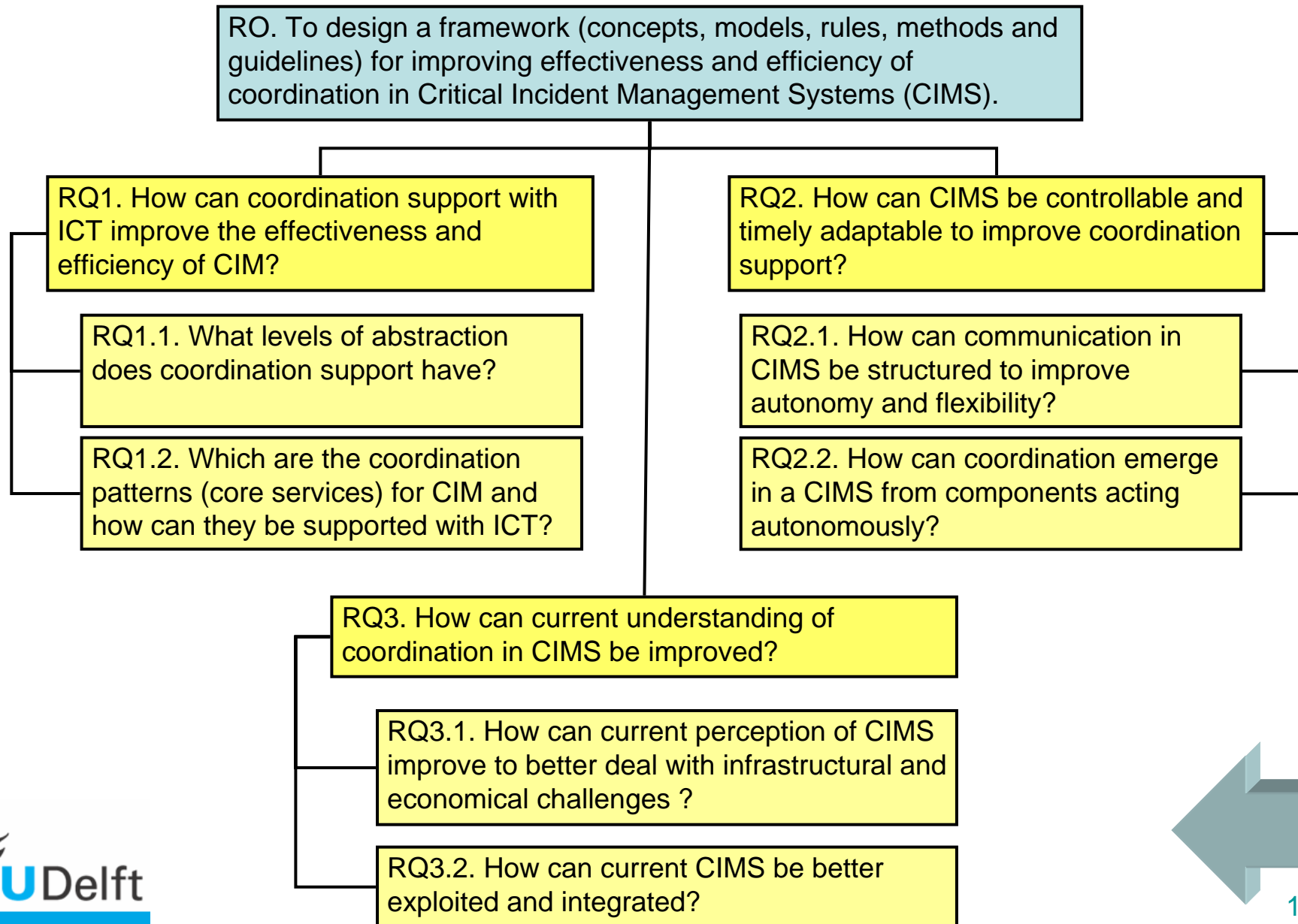
Issues	Solutions
Non-routine	Preparedness
Complexity	Adaptability
Situation awareness	ICT-support (i.e. GIS)
Cognitive limitation	ICT-support (i.e. AI and simulation)
Resource allocation	•Blind, Time-based, Severity-based
Control	•Command and control •Standards and Workflows
Physical-independence	•Centralization •Distribution
Adaptability	•Meta-planning •Flexibility •Improvisation
Coordination problem	•Standard Operating Procedures •Dispatch scheduling •Look-ahead coordination •Reinforcement learning
Information problem	•Information Management (retrieval) •Matchmaking and Personalization •Exploration agents
Autonomy	MAS
Partner finding	•P2P •Broadcasting •Centralized directories
Shared beliefs	Implicit communication
Reusability	•Components •Patterns



Challenges
<ol style="list-style-type: none"> 1. Increasing perception and regulation 2. Insufficient infrastructure 3. Demand-flow (resource allocation) 4. Control vs. adaptability 5. Improving efficiency (time-to-action) 6. Improving effectiveness 7. Changing view from cost to asset 8. Command and control effectiveness 9. Ill-defined processes (in WfMS) 10. Communication reduction 11. Autonomy vs. security 12. Emergent coordination 13. Coordination patterns 14. Level of abstraction of coordination 15. Application Integration

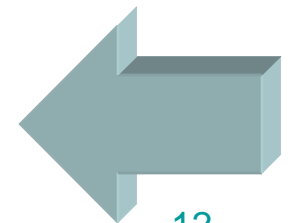
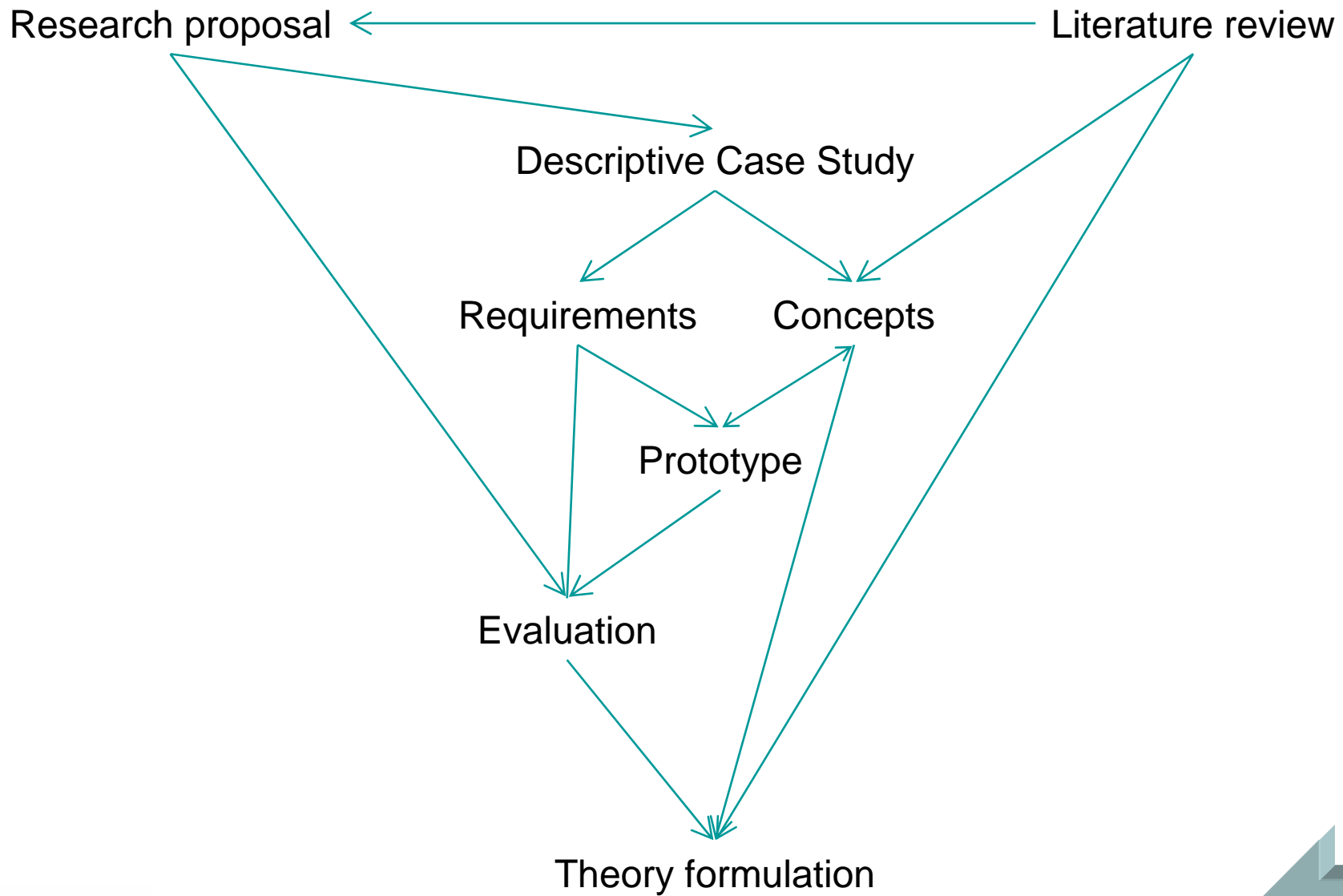


Research Objective and Questions



Research Approach

- Interpretive philosophy
- Qualitative, non-empirical data
- Case study, theory formulation, prototype validation



Closing remarks

- Currently doing case study in Port of Rotterdam
- Questions and propositions to be revised
- Challenges:
 - Broad subject
 - Difficulty in validation and testing

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