Multi Agent Simulation (MAS): A Planner's perspective
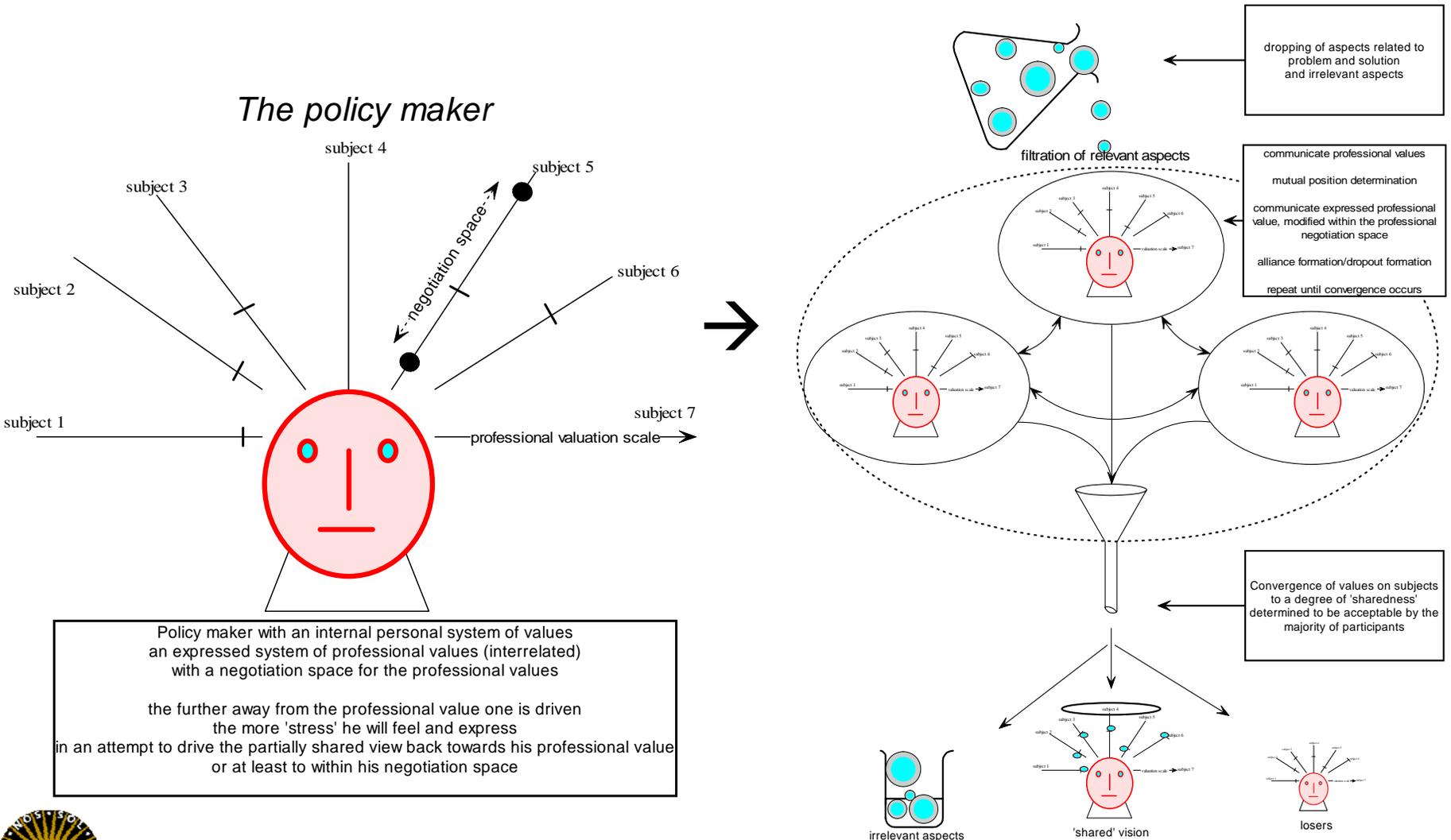
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From Single to Multi Agent System

The policy maker

subject 4
subject 5
subject 3
subject 6
subject 2
subject 1
subject 7
professional valuation scale

negotiation space

Policy maker with an internal personal system of values
an expressed system of professional values (interrelated)
with a negotiation space for the professional values

the further away from the professional value one is driven
the more 'stress' he will feel and express
in an attempt to drive the partially shared view back towards his professional value
or at least to within his negotiation space

filtration of relevant aspects

dropping of aspects related to
problem and solution
and irrelevant aspects

communicate professional values

mutual position determination

communicate expressed professional
value, modified within the professional
negotiation space

alliance formation/dropout formation

repeat until convergence occurs

Convergence of values on subjects
to a degree of 'sharedness'
determined to be acceptable by the
majority of participants

irrelevant aspects

'shared' vision

losers

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Outline

- Introduction
- Definition PSS
- History PSS
- State-of-the-art PSS
- Conceptual framework → MAS confrontation
- PSS/MAS recommendations

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Introduction

- Why bother?
    - Growing complexity planning tasks
    - Growing participation/communication needs of persons/institutions
    - Growing assortment of Planning Support Systems (PSS)

- However!
    - 'The question remains, however, about how such systems [PSS] will enter the planning and public policy arena' (Brail, on citation in Batty 2004, p. 329)

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'Definition' PSS

- PSS: dates back to 1950s (e.g., Britton Harris)

- Planning Support Systems =

  geo-information based instruments, consisting of a unique suite of components that planners can utilize to support their particular planning activities

- Purpose (intended):

  handling complexity, thereby increasing quality of process and/or product and decreasing time and money spent

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History Geo-ICT in planning

- '60/'70:

  Geo-ICT tools for data management, modeling and strategic planning support → no general adoption by planning profession

- 1973:

  Lee's Requiem identified reasons failure large-scale modeling (black box; too comprehensive; too complicated; data-hungriness; etc.)

- '80/'90:

  In reaction Geo-ICT tools turned to more routine activities like data management and visualization

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Some statements in 90s

- The current generation of GIS fails to incorporate the kinds of functions which planning in fact requires, like analytical and design functions (Harris and Batty 1993)

- Instruments for planning support are no better developed now than they were ten years ago (Klosterman 1998)

- Planners and designers have remained at best distrustful, or at worst downright antagonistic, towards computer-based models of support (Harris 1999)

PSS overview (1)

- Two overview studies:
  - From 2000 till 2001: world-wide PSS-inventory (Geertman & Stillwell 2003, Springer)
  - Brail & Klosterman 2001 (ESRI)

- Some results:
  - Growing number of PSS world-wide
  - Most are under construction and experimental
  - Term PSS encompass wide diversity of systems
  - Diversity of aims, goals, capabilities, content, structure, technology, looks and feels, etc.
  - Two main PSS groups: analytical <-> information/communication oriented

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PSS overview (2)

Recommendation:

PSS must be integral part of planning process

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PSS overview (3)

Recommendation:

PSS must meet user- and context requirements
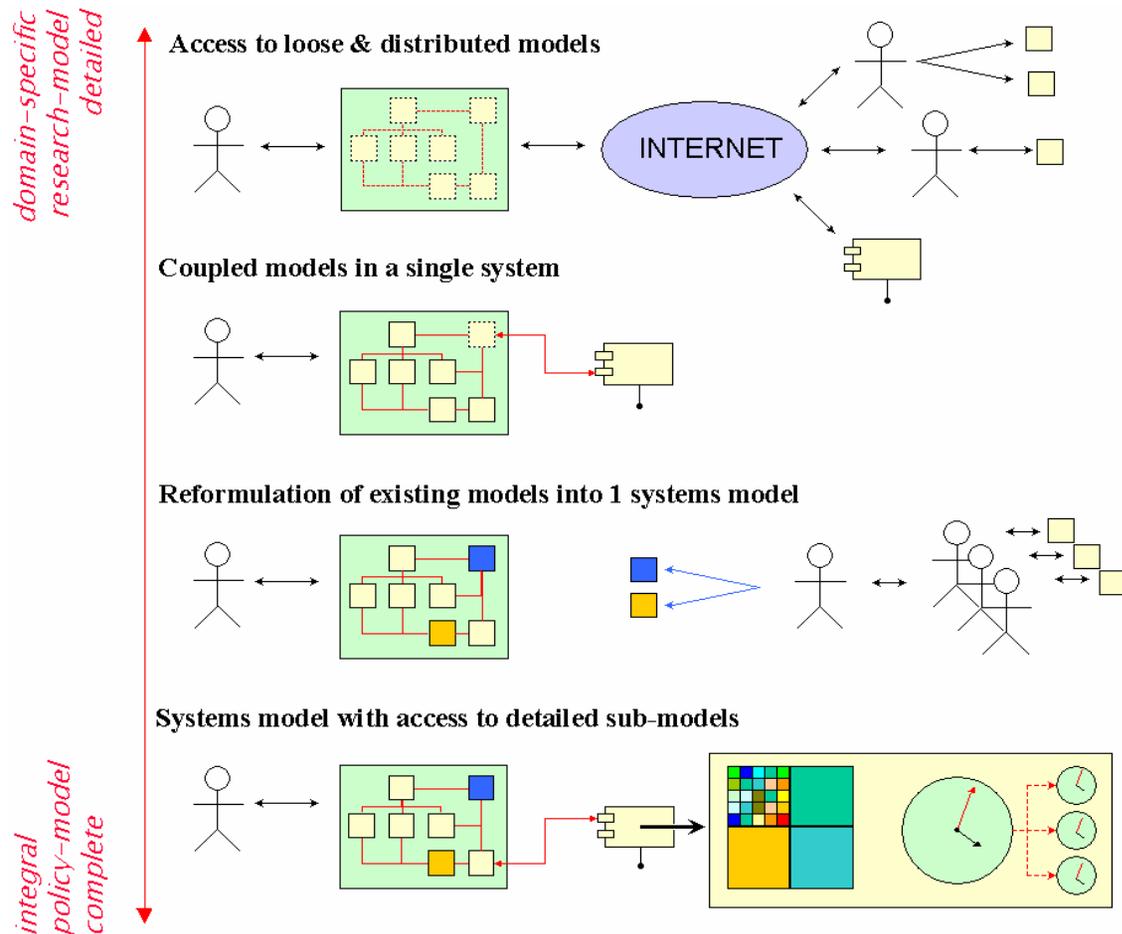
PSS overview (4)

Recommendation:

PSS should address issues at an interdisciplinary level
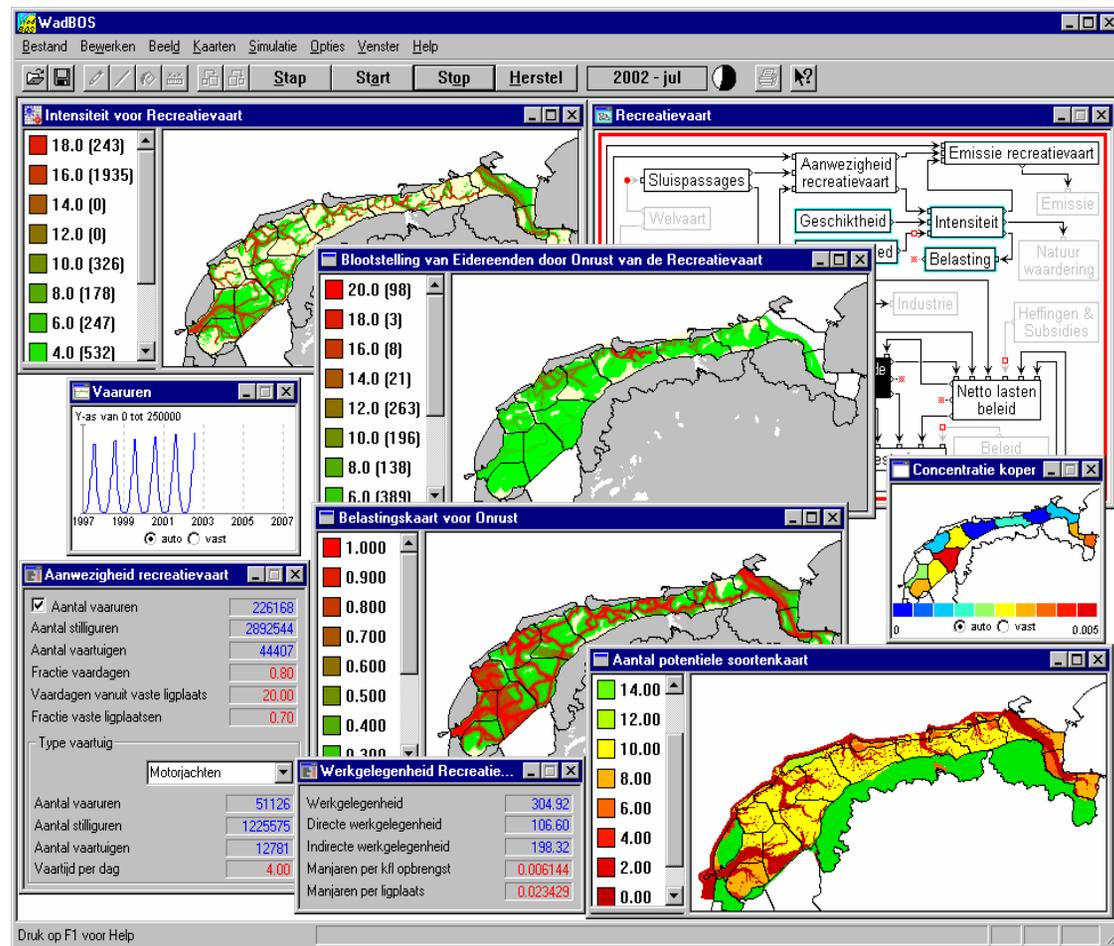
PSS overview (5)

Recommendation:
PSS use should take participants seriously

PSS overview (6)

Recommendation:

PSS should meet visual preferences of participants

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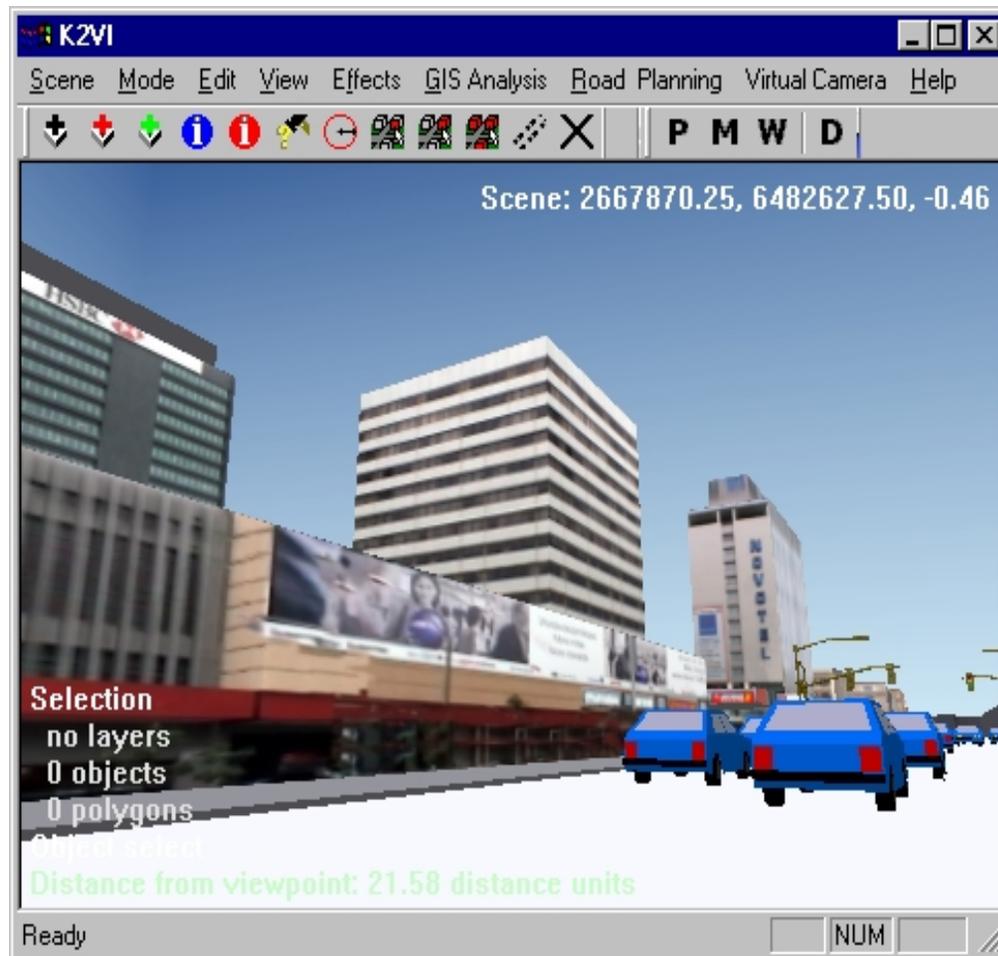
PSS overview (7)

Recommendation:

PSS should include design, modeling and evaluation tools

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PSS overview (8)

Recommendation:

PSS should be appealing too, if we want them to be used

PSS follow up study

Planning Support Systems → Planning practice

Instrument approach → **Instrumental quality**

Transfer approach → **Diffusion**

User approach → **Acceptance**

Instrumental quality bottlenecks:

• Poor fit to planning tasks and users for advanced systems
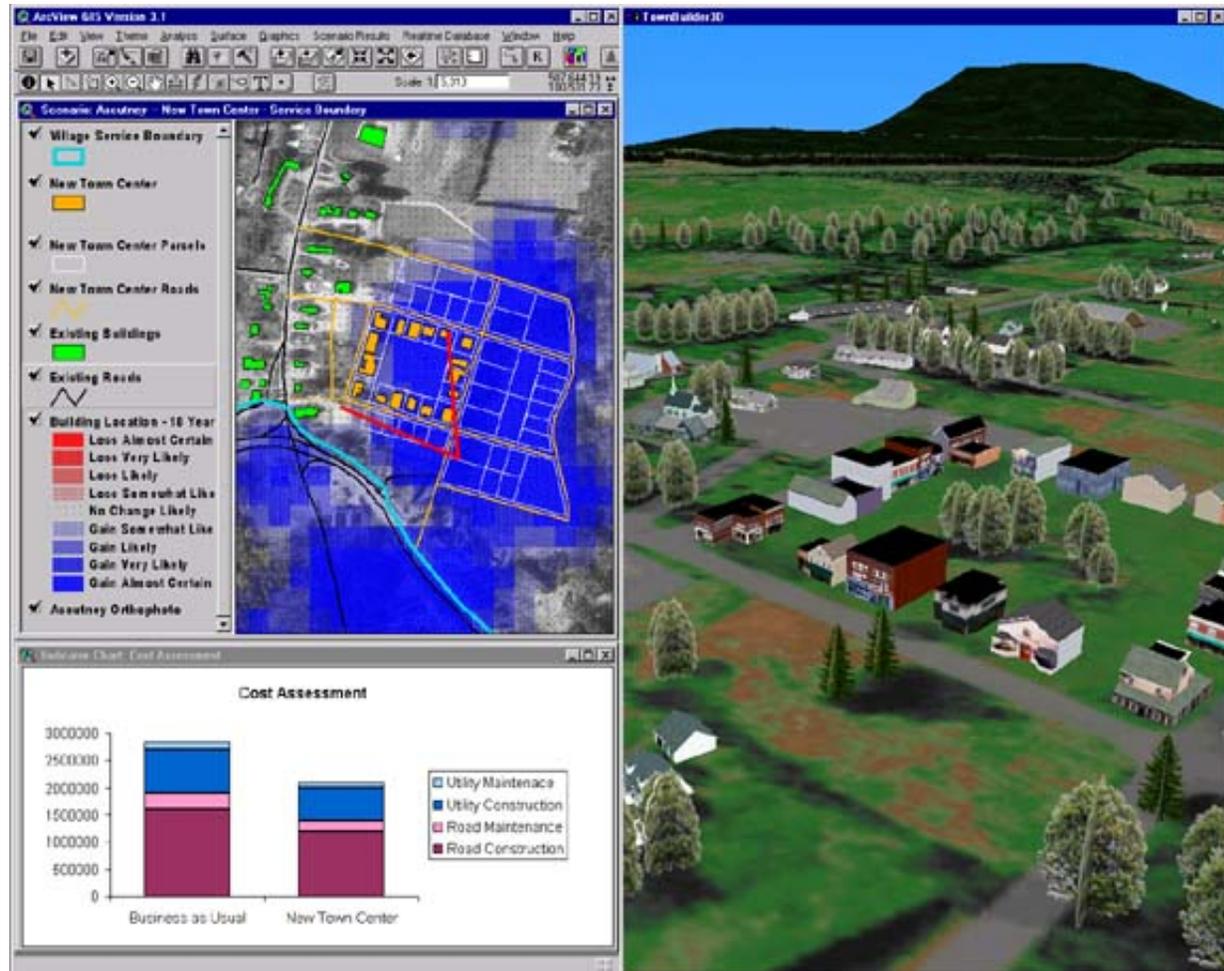• Demand for simple systems, supply of advanced systems
• Poor fit to politician demands

Diffusion bottlenecks:

• Insufficient take up from the organizational environment
• Hampered bottom-up initiation
• Lack of PSS usage decisions
• Top down strategies without PSS
• Lack of cooperation between geo-information specialists and planners
• Implementation control risk

Acceptance bottlenecks:

• A diversity of bottlenecks
• Lack of awareness of PSS
• Lack of experience with PSS
• Lack of intention to use PSS
• Lack of user friendliness
• Insufficient organizational facilitators
• Negative social influences
• Lack of usefulness
• Data related issues

Conceptual framework

Specific characteristics of information, knowledge and instruments

Content of planning issue

Dominant policy model

Dominant planning style

Potential planning support role of dedicated information, knowledge and instruments in planning practice

Characteristics of planning and policy process

Political context

User characteristics

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MAS source

EXPLORING THE USE OF MULTI-AGENT SYSTEMS FOR INTERACTIVE MULTI-ACTOR SPATIAL PLANNING

AREND LIGTENBERG

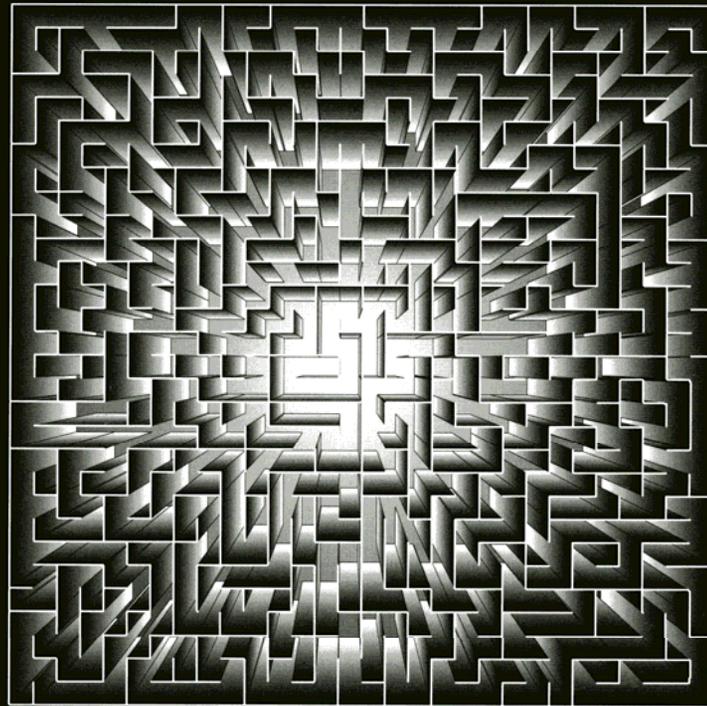Utrecht University

1) Content of planning issue

- Most strategic issues are ill-structured:
  - Prime focus on clarification instead of solving

- Some issues are easier to support:
  - Quantitative versus qualitative
  - Short-term versus long-term
  - Physical processes versus human induced processes

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1) Content of planning issue (MAS)

- MAS explicitly try to unravel and simulate human behavioral processes

- In that, MAS contributes to problem clarification by decomposing influences of various actors

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2) Characteristics of users

- User characteristics:

  - Profession (e.g., researchers/designers)

  - Working habits (analytic ←→ creative)

  - Specific qualities /restrictions

  - Specific instrumental demands

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2) Characteristics of users (MAS)

- MAS is better attuned to analytic research-oriented than to creative design-oriented planners

- As a consequence:
  - Substantial group of planners will consider MAS a kind of a game (Simcity)
  - To get design-oriented planners interested, need for integration of MAS with design tools

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3) Characteristics of planning and policy process & context

- Specific characteristics like:
  - Time-span (pressure)
  - Participation rate
  - Political sensitivity
  - Organization of consultation
  - Political system
  - Differences in orientation:
    - Social
    - Political
    - Research

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3) Characteristics of planning and policy process & context (MAS)

- Potential role of MAS depends on:
  - Characteristics of process and context (political sensitivity, time pressure, etc)

- Experiment with different policy processes:
  - (Non-) cooperation with (un-) equal powers
  - Consultation

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4) Specific characteristics of information, knowledge and instruments

- Supportive role of information/knowledge:
  - Contextual: operational ←→ strategic level
  - Relative: power relations, traditions, tacit knowledge, experiences, etc
  - Problematic: no neutral entity → presumptions, inherent choices and biases, etc

- Supportive role of instruments:
  - Discrepancies between support instrument and planning demands (in concept of space; in nature; in functionality)

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4) Specific characteristics of information, knowledge and instruments (MAS)

- Supportive role of information/knowledge:
  - Still contextual, relative, and problematic
  - Just limited reasoning and group dynamics
  - Hardly any learning from previous experiences

- Supportive role of instruments:
  - Discrepancies still exist, although MAS adds functionality → behavioral component

5) Dominant planning style & policy model

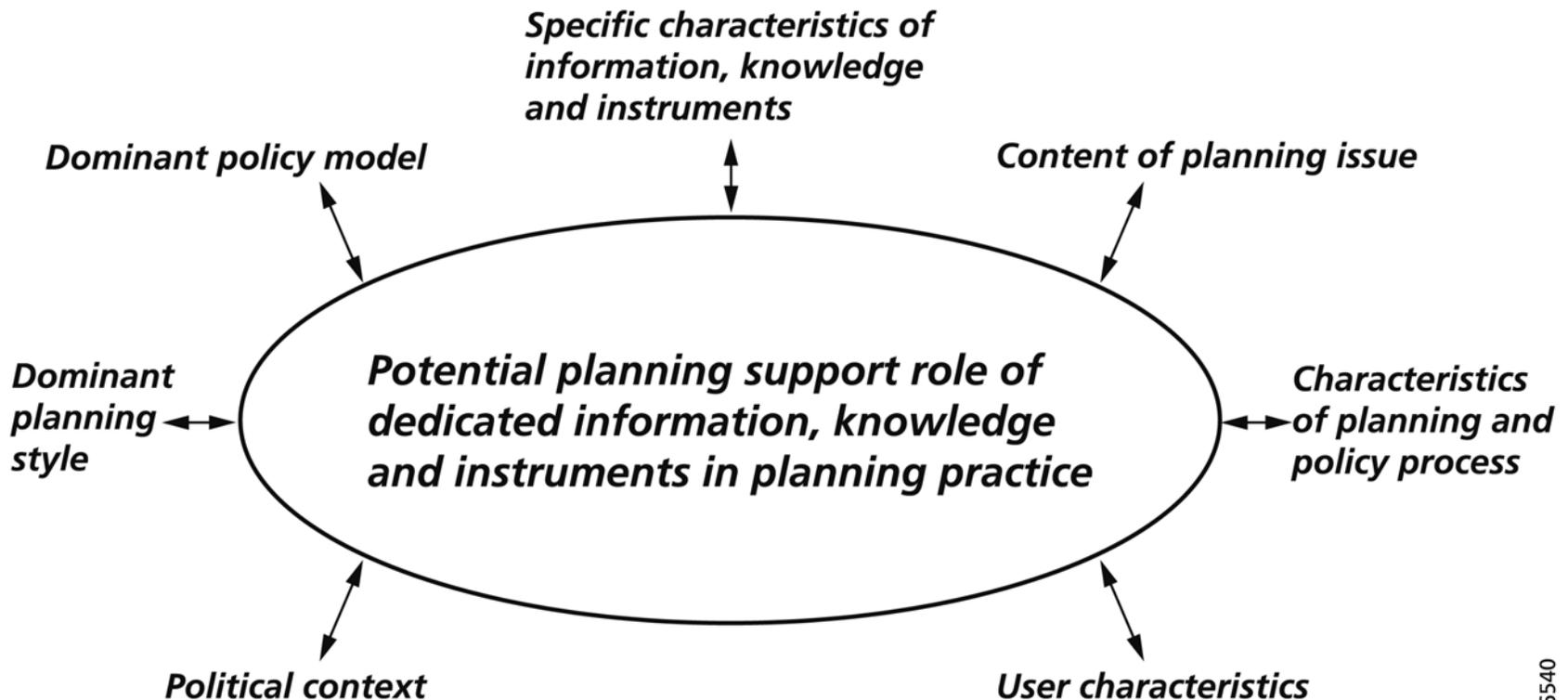| Timeframe of planning traditions	Planning style	Policy model	Characteristics of information and knowledge	Characteristics of planning support instruments
50s/60s and onwards 'Rationality' tradition	Blue-print planning	Comprehensive rationalism	Value-free, substantive	Expert oriented
60s/70s and onwards 'Procedural' tradition	Process planning	Disjointed-incrementalism	Procedural	Process management
	Administrative planning	Bounded rationality	Satisfying	
	Advocacy planning	Pluralism	Value-laden, partisan	Empowerment
	Critical planning	Structuralism	Value-laden, potentially distorting	
70s/80s and onwards 'Strategic' tradition	Strategic planning	Mixed scanning	Strategic	Continuous generation of combined process and substantive information
80s/90s and onwards 'Participatory' tradition	Communicative planning	Social-interaction	Socially constructed, value-laden, context-bound, class-bound	Facilitation of 'reasoning together'
	Development planning	Pragmatism	Empirically based and stems from reconstruction of experiences	Community supportive, empirically based, experimentally-oriented, and information and knowledge disseminating
	Governance	Integrated management	Multidimensional	
	Planning analytics	Real-life rationality	Power-laden and actively produced through social interaction	

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5) Dominant planning style & policy model (MAS)

- MAS seems to fit best to participatory tradition

- Although, MAS contains characteristics from:

  - Rationality tradition (full knowledge; explicit goals)
  - Procedural tradition (no optimizing but satisfying)
  - Strategic tradition (comparison of desires/objectives and existing situation → modifications)
  - Participatory tradition (explicit multi actor)

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Conceptual framework = interconnected

Specific characteristics of information, knowledge and instruments

Dominant policy model

Content of planning issue

Dominant planning style

Potential planning support role of dedicated information, knowledge and instruments in planning practice

Characteristics of planning and policy process

Political context

User characteristics

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Confrontation Framework - PSS

- Some observations/interpretations:

  - In general, there seems to be a continuous mismatch between supply of and demand for planning support

  - Most PSS and their applications are just insufficiently attuned to specifics of planning situation at hand →
    need for dedication

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Confrontation Framework - MAS

- ## Some observations/interpretations:

  - MAS research is foremost driven by scientific curiosity

  - Present MAS research is foremost focused on prototypical instruments → early stage of development

  - MAS applications hardly take factors of conceptual framework explicitly into account

  - Too much focus on intentional support role of MAS →
    - to become applicable in planning practice, there is a need for explicit demand driven development (→ dedication)

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Recommendations planning-oriented PSS/MAS research

- Redirect focus from instruments (= means) to support role (= goal)

- Move from case study approach to real-world applications

- Fit PSS/MAS explicitly to planning process, tasks, capabilities potential users, planning context, etc → conceptual framework variables

- Start from factual demands of planning practice and develop instruments in close cooperation within planning process → Communities of Practice

- Focus more on deriving at transparency in process causality (What-If scenarios) than on simulation of outcomes

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PSS/MAS questions & remarks

??? & !!!

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Workshop statements

- Some statements:

    - Participatory planning is over its top (e.g., pragmatics) → so why bother about MAS?

    - Research is foremost interested in science, not in planning practice → so why expect something useful for planning practice out of it?

    - Planning practice is foremost interested in acceptable outcomes → so why perform research for planning practice?