What-Ifs, If-Whats and Maybes:

Sketch of Ubiquitous Collaborative Decision Support Technology

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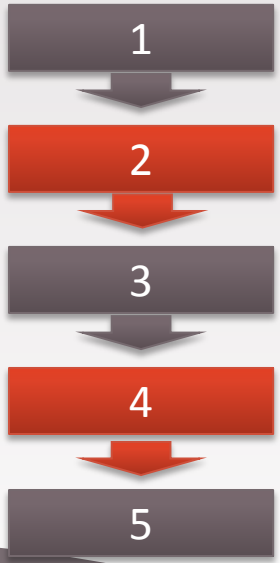

Introduction: shifting contexts

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Shifting contexts

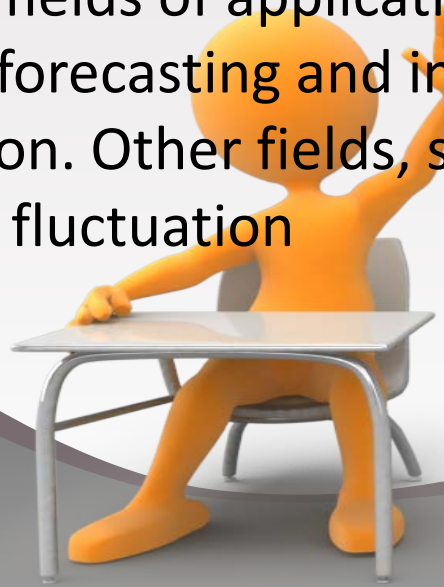
What-Ifs, If-Whats and Maybes

GIS research and technology has rapidly developed over the last decades

Does not necessarily mean that academic progress has been univocally applied to urban planning professional practice

What-Ifs, If-Whats and Maybes

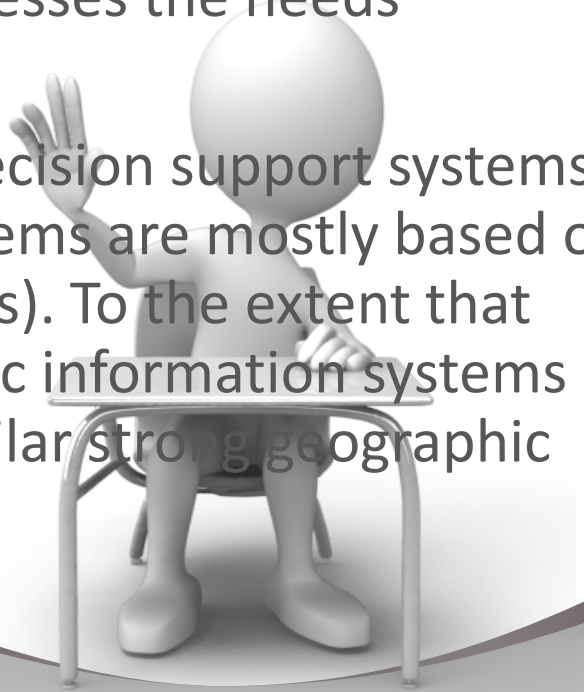
The application success of decision support systems shows considerable more variability. In some fields of application, such as transportation planning, the use of forecasting and impact assessment models is relatively common. Other fields, such as retail planning, have shown significant fluctuation



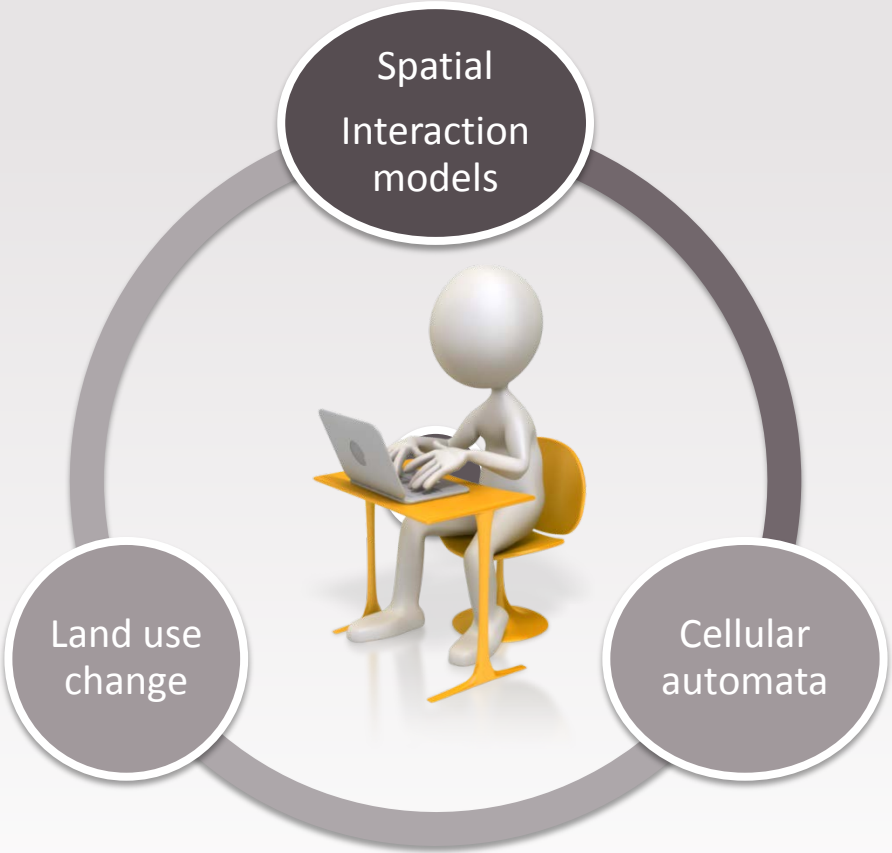
What-Ifs, If-Whats and Maybes

In general, the acceptance of new technology depends on perceived needs, awareness of the technology and the extent to which the technology successfully addresses the needs

Geographic information systems and decision support systems have a strong ‘geography’ identity. Systems are mostly based on spatial entities (mostly grids or polygons). To the extent that commercial and open source geographic information systems have been enriched with models, a similar strong geographic flavor can be discerned



Examples


Spatial
Interaction
models
Land use
change
Cellular
automata

What-Ifs, If-Whats and Maybes

- Dominance of aggregate models is understandable
  - flirting of geography and regional science with aggregate models, originally developed in physics in combination
  - geography background of early developers,
  - technical considerations such as the fact that the spatial representation of the data in geographic information systems is congruent with the principles underlying these aggregate models.

What-Ifs, If-Whats and Maybes

- The dominant inclusion of aggregate models in GIS not only understandable from the evolution of the key underlying disciplines, but also from a computer science perspective in that limited memory and computing power necessitated constraints on data and model complexity in the early years.

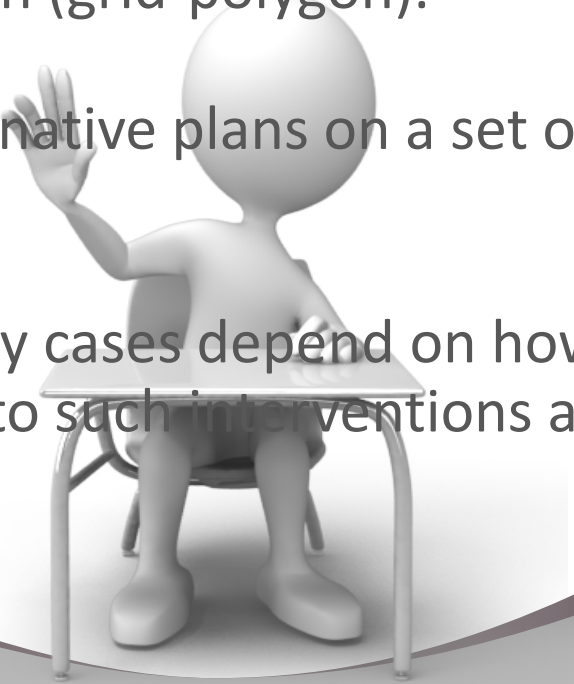
- Conveniently, the latter was amplified by the methodological principle of parsimony as the hallmark of scientific research a model development

What-Ifs, If-Whats and Maybes

Spatial decision support systems provide the functionalities for evidence-based planning and design, with space typically represented at some level of aggregation (grid-polygon).

The system produces the values of alternative plans on a set of performance indicators

The effects of plan interventions in many cases depend on how individuals and household are reacting to such interventions and adapt their current behavior.



From aggregate to microscopic models

What-Ifs, If-Whats and Maybes

- In light of the increasing complexity of decision making processes and increasing personalization of lifestyles, classic systems have become increasingly inadequate and obsolete.

- As argued by Chapin (1968) already decades ago, most land uses and transportation systems do no exist for their own sake, but are means for conducting mandatory and discretionary activities. People have certain needs and desires and in order to achieve these, they need to become involved in a set of activities.

What-Ifs, If-Whats and Maybes

- Modelling consumer reactions to changing exogenous circumstances and plan interventions in terms of changes in their daily activity travel patterns thus seems paramount to fulfil the articulated need of policy assessment in some policy domains.

What-Ifs, If-Whats and Maybes

- Such microscopic models should logically outperform conventional aggregate models in that they capture particular behavioural mechanisms, behavioural heterogeneity and complexity that the spatial interaction models fundamentally ignore.

- Such microscopic models become feasible.

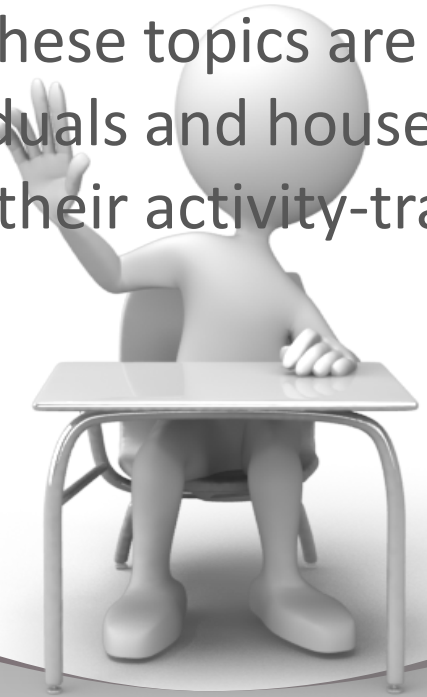
Shift to integral performance assessments

What-Ifs, If-Whats and Maybes

A shift from aggregate spatial interaction models to microscopic spatial choice and decision-making models would enhance our ability to better support urban decision making processes.

What-Ifs, If-Whats and Maybes

Energy efficiency, social cohesion, cultural and economic prosperity, health and safe built environments characterize sustainable urban development. All these topics are strongly intertwined with how individuals and households organize their daily lifes, reflected in their activity-travel patterns in different urban settings.

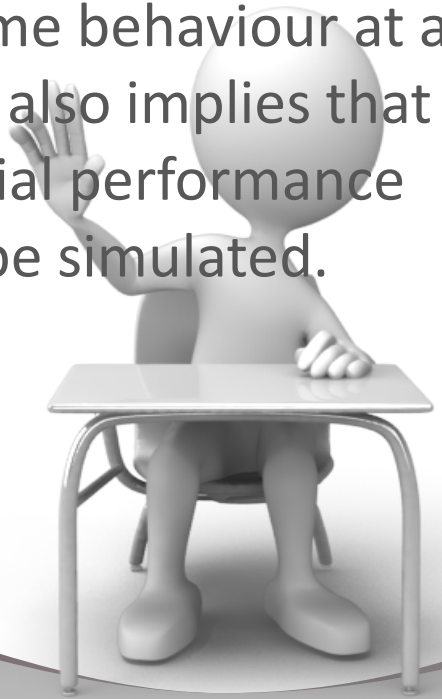


What-Ifs, If-Whats and Maybes

Assuming that the achievement of these goals depends, at least partially, on a good understanding of urban activity-travel patterns, the development of valid and reliable activity-based models seems paramount to better support urban planning processes

What-Ifs, If-Whats and Maybes

It does not only have the advantage that actual decision makers as opposed to spatial units, which do not make any decisions, are modelled, the attention to space-time behaviour at a high level of spatial and temporal resolution also implies that in addition to the usual economic and social performance indicators, environmental impacts can be simulated.



Ubiquitous pervasive information

What-Ifs, If-Whats and Maybes

- A better understanding of activity-travel patterns should ultimately lead to improved evidence-based planning, but due to dynamics in both the urban system and people's preferences, and the omnipresence of imperfect information, by definition urban systems will always be out of equilibrium.

What-Ifs, If-Whats and Maybes

- Information and communication technology can play a critical role in reducing user disutility of artificial urban systems out-of-equilibrium.
  - First, by providing the right information at the right time, the uncertainty and possibly ineffective behavioural response and decisions that stem from incomplete and imperfect information may be reduced.
  - Second, public and private firms and organisations may also profit.

What-Ifs, If-Whats and Maybes

- Information and communication technology can play a critical role in reducing user disutility of artificial urban systems out-of-equilibrium.
    - Thirdly, information and communication technology may also be used to try and persuade people to behaviour in a certain way. The underlying objective may be to improve personal service, but also to optimize service-level performance or some combination of these

What-Ifs, If-Whats and Maybes

- Our contention is that ICT will be the new layer for the “smart” city of the future.

- Mobile technology, combined with intelligent systems, will create ubiquitous environments and make information omnipresent. Intelligence, accuracy, personalization, persuasion, real time are some of the buzzwords in this development

What-Ifs, If-Whats and Maybes

- Mobile tools and mobile e-services will mark the next major developments in spatial decision support systems.
- Due to the emergence of grid computing and service-oriented architectures, computing is becoming increasingly less confined to traditional computing platforms.
- Grid computing promises the accessibility of vast computing and data resources across geographically dispersed areas

What-Ifs, If-Whats and Maybes

- Mobile wireless devices significantly enhanced this capability to deliver access to high-performance computing under demanding circumstances.

- Cloud computing makes storage of large amounts of data a lesser problem. E-services guarantee access to software.

What-Ifs, If-Whats and Maybes

- Web2.0 technology does offer new opportunities. Members of a community can exchange information, trace particular others, identify the most current location of particular friends, etc.

- These functionalities offer the co-production of maps, databases, exchange of real time information, a platform for organizing meetings and location-based services, etc.

What-Ifs, If-Whats and Maybes

- Application rapidly emerge: updates of databases, underlying navigation systems, group-tracing systems, updates and experiences of actual, real time transport systems, community-based portals in the context of plan development, and many similar examples could be mentioned.

Research agenda

New challenges

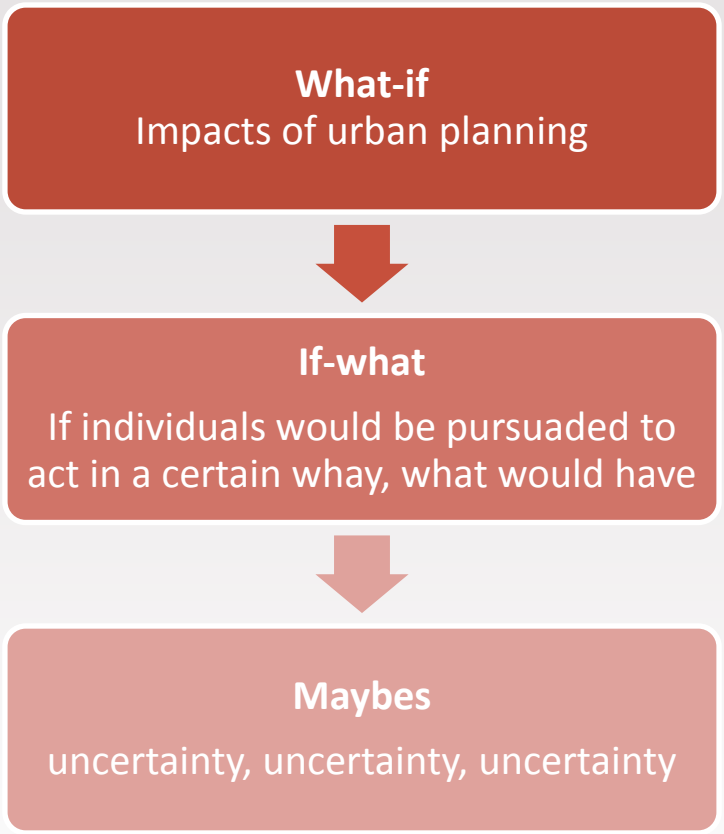
short-term traffic forecasting, individual use of travel information, and particularly in modeling traveller response to persuasive information as a function of different underlying goals (personal preferences, system performance or some combination).

strategic decisions under conditions of uncertainty are still at the very early stages of development

technology for technology;

People themselves are the sensors of new rich data

Conclusions



Thank You

Questions ?