

Modelling and the Criminal Justice System

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Outline

- Modelling and Simulation Modelling
- History of Quantitative Modelling in the Criminal Justice System
- Advantages of Modelling
- Limitations and Disadvantages
- Barriers to Modelling the Criminal Justice System
- Conclusions

The Criminal Justice System

- *“The criminal justice system is an information-intensive public bureaucracy (or, rather, group of bureaucracies, that uses reams of paper and generates mountains of data”*
- *“The system’s output is not a tangible product, but decisions” (Maltz, 1994)*

What is a Model?

“A model is a representation of a phenomenon, process or system”

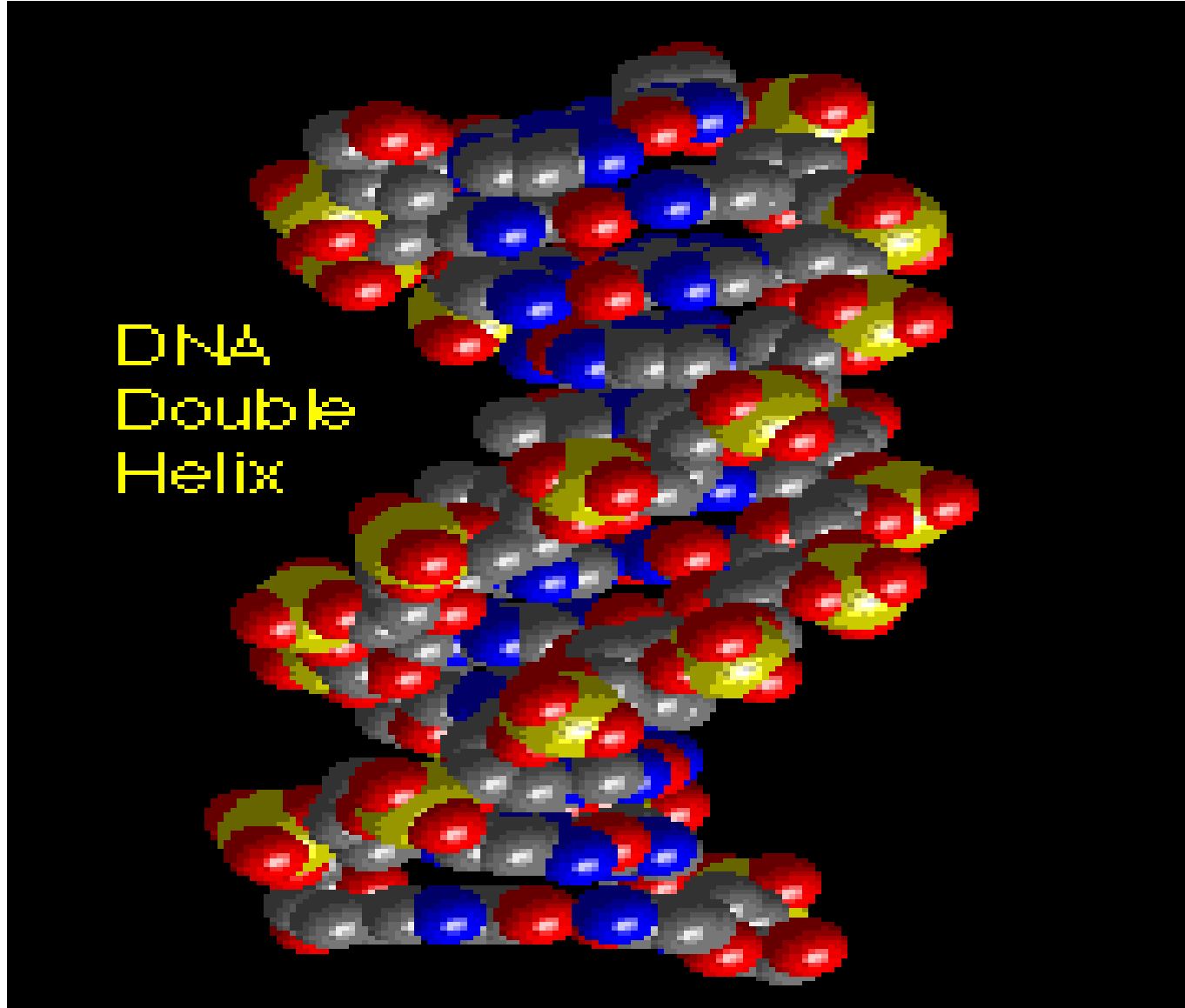
- conceptual representation
- physical representation
- spatial representation
- quantitative representation
 - statistical
 - mathematical
 - operations research
 - economics



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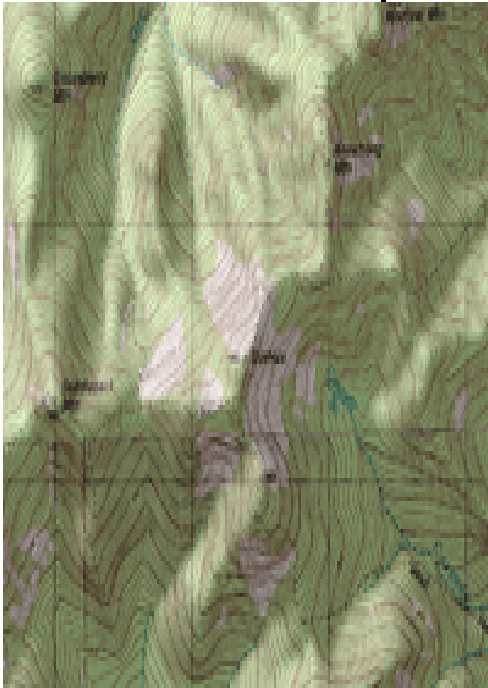


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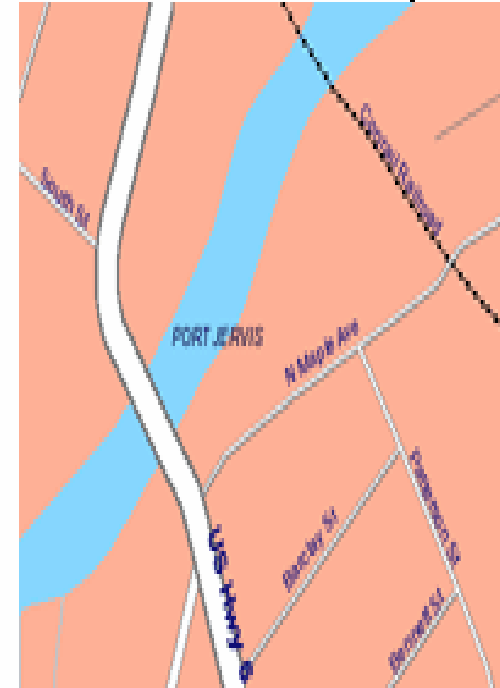
Shaded Relief Maps



1-Meter Aerial Photos



Detailed Street Maps



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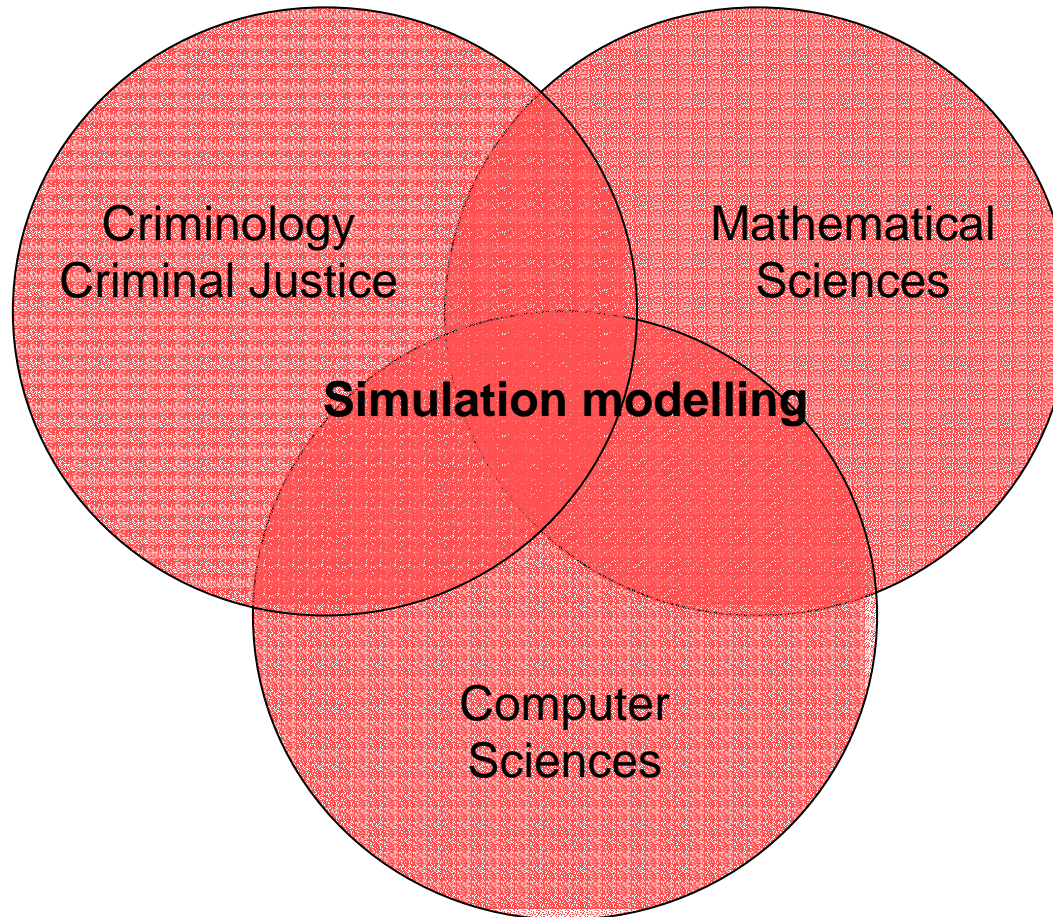
Simulation Modelling

- A **simulation model** is a mathematical specification of a system that depicts quantitatively how the system behaves.
- Aims of simulation modelling
 - identify and illustrate the key features and relationships of a system or other physical or social phenomenon
 - to simulate the behaviour of a system or phenomenon under alternative conditions and;
 - to project its behaviour or status into the future.

Modelling, Policy Analysis and Decision Making

- Simulation models are **tools** for policy analysis
 - Answer “what if” questions
 - Allow for the comparison of different scenarios
 - Allow for examination of the costs of different scenarios
 - Enable the long-term implications of different scenarios to be examined
 - Projections
- Enable hard questions to be answered

Overlap Among the Disciplines



History of Quantitative Modelling in the Criminal Justice System

- Early mathematical modellers
 - 1825 - France began collection of criminal justice statistics
 - *Research on the propensity of crime at different ages* (Quetelet, 1831)
 - *Researches on the probability of criminal and civil verdicts* (Poisson, 1837)
- Little quantitative modelling work done between this time and the 1960's
 - Conceptual models
 - Ecological models (Shaw & McKay; 1969)
 - Models of delinquent behaviour (Glueck & Glueck; 1950)
- Late 1960's rapid increase in crime in USA

Modelling in the Criminal Justice System

- Examples of early quantitative models:
 - funnelling effect of crime
 - recidivism – positive feedback loop
 - criminal career models
- Focus on explaining criminal behaviour
- Need also to understand the interaction with the criminal justice system.

Early models of the criminal justice system

- USA - (1973). *JUSSIM II, An Interactive Feedback Model for Criminal Justice Planning*, Urban Systems Institute, Carnegie-Mellon University.
- UK - (1985). *Modelling the Criminal Justice System*. Home Office: London
- Australia – (1993). *A Computer Simulation Model of the District Criminal Court of New South Wales*, NSW Bureau of Crime Statistics and Research, Sydney.

Current Models of the Criminal Justice System

- A lot of interest in modelling
- Representatives from across Australia, New Zealand, United Kingdom and the USA
- Modelling as varied as the jurisdictions

Advantages of Using Models

- Transforms operational and administrative data into decision making data
- Facilitates the process of evidence based decision making
- Enables the downstream and long-term impacts of change to be examined

Transforms operational and administrative data

- uses expensive data to aid decision making
- in depth analysis of system data
- quality control of data collection
- linking of data across systems

Facilitates Decision Making

- experimentation with different proposals
- requires explicit understanding of the proposals
 - who is targeted?
 - how long is the program?
 - what is the efficacy?
 - how much will it cost?
- expectations of impact of proposed changes
 - resource allocations
 - timelines for outcomes

'Downstream' and Long Term Impacts

- examination of 'what if?' scenarios
- anticipate possible outcomes (downstream and/or long term)
 - workload
 - financial
- examples
 - examine the impact of changing policing practices on custodial corrections
 - examine the impact of early intervention on numbers of young offenders in the system
- powerful tool for budget bids and program proposals

Limitations and Disadvantages

- Models are as good as the data that underpins them
- Models are as good as the science that underpins them
- Models are tools not crystal balls
- Building and using models requires team work
- Modelling needs an ongoing resource commitment

Data Limitations

- Models are simplified representations of the system
- Data limitations
 - data necessary for models not always collected
 - quality of the data and data cleaning
 - difficulties with cross agency linkage
 - unavailable data
 - privacy concerns
- Data assumptions

Science Limitations

- models based on assumptions
 - theoretical assumptions
 - analytical assumptions
- assumptions may not be right even if they are the best science can offer
- outputs from the model may change as we improve the science
- technology keeps getting better
 - software
 - hardware

Models are Tools not Crystal Balls

- tools for forecasting the relative impacts of different scenarios
 - can not predict the future
 - can not predict wars, change of governments, mass murders
- tools to assist in the decision making process not a substitute for decision making
 - need to understand the assumptions of the model
 - need to use the output of the models in the policy impact analysis

Team Work

- building models
 - skills to build models not in one person
 - theory, system, statistics, technology
 - modelling needs people who understand the business and organisational needs
- using models
 - need communication between model builders and model users
 - need to understand the capabilities and limitations
 - need to tailor the model to meet the business needs
- models are as good as the use they get

Ongoing Resource Commitments

- systems are dynamic not static
 - system changes legislative, policy, restructure/reorganisation
 - data changes
- models need to be updated and maintained
 - become obsolete quickly
- models need to be adapted to meet the user needs
- ongoing training needs
 - expertise to develop and maintain models
 - expertise to use and interpret the outputs of the model

Barriers to Modelling in the Criminal Justice System

- Accepted practice in sciences, engineering, environmental studies, transport, health, epidemiology
- So why?
 - Complexity of the system and quality of data
 - Lack of qualified practitioners
 - Politicised nature of decision making

System and Data Issues

- may have historically been accurate
- however;
 - increasing sophistication in information systems
 - increasing computer power
- “chicken and egg” argument
 - need to prove the value of modelling
 - need to facilitate data collection

Lack of Qualified Practitioners

“I would have liked to have persuaded our university criminology departments to lift their game and teach more quantitative methods” Adam Graycar – exiting Director, Australian Institute of Criminology

- Leads to
 - little appreciation of the benefits of modelling
 - inability to communicate
- Skills required for effective service delivery may not be the same as those required for policy analysis

Lack of Qualified Practitioners



Criminology
Criminal Justice



Mathematical
Sciences



Simulation modelling

Computer
Sciences

Politicised nature of Decision Making

“What makes public policy frustrating - but fascinating - is the need to mesh two logics . one, the messy world of politics and the other, the aspiration for orderly, rational policy choices.” (Weller, 1980)

modelling – orderly rational
criminal justice system - political

Justice Modelling @ Griffith

Highly Politicised

Not Politicised



Little Modelling

Lots of Models

Conclusions

- increasing sophistication of technology and availability of data
- however
 - limitations of the models need to be clearly understood
 - process of modelling is as important as the outputs
 - sophisticated technology is an aid to not a substitute for good judgement/research/analysis
- modelling enables us to examine and explore things that would otherwise be difficult or even impossible to examine

Last Words

- *decisions have to be made; and*
- *using a quantitative (explicit, articulated) approach will lead (on average) to better decisions than using non-quantitative (implicit, unarticulated) approaches (such as those used (?) by human decision makers).*