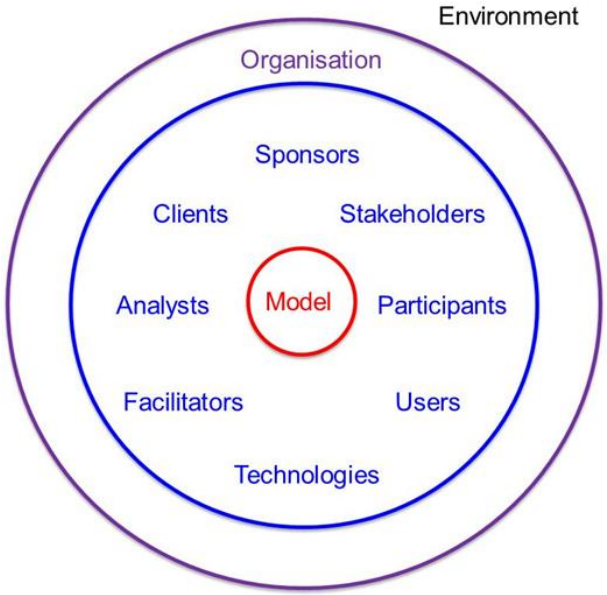
Conducting Behavioural OR studies:
Variance, process and modelling approaches

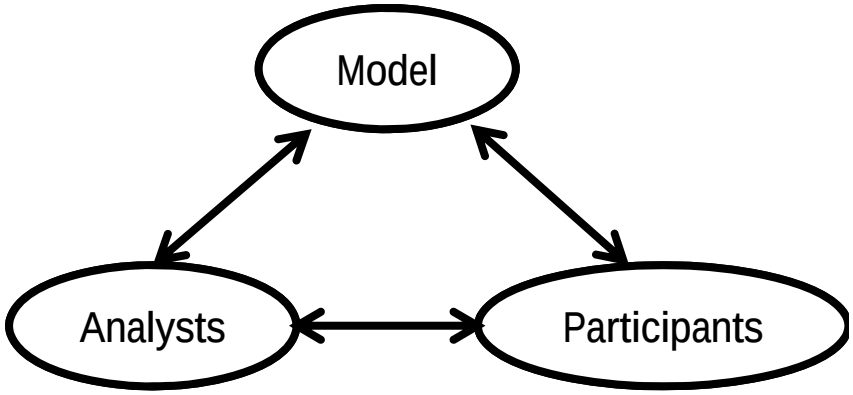
L. Alberto Franco
Loughborough University, UK

Etienne A.J.A. Rouwette
Radboud University , The Netherlands

Aim of this talk

- OR is concerned with ***intervening*** in a situation in order to change it.
- Within this context, we are in interested in advancing our understanding of the behavioural dimension of ***OR*** as a ***process***.
- Our aim is to discuss some ***research approaches*** for the study of ***behaviour in OR-supported processes***.





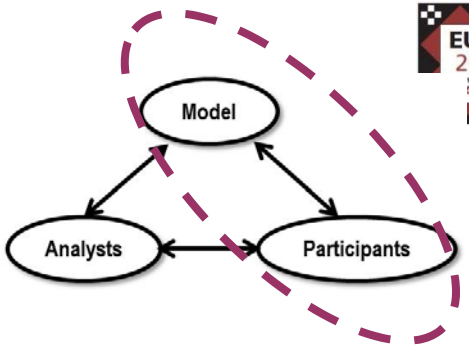
Theoretical background

- We draw on the distinction made by Poole (2004) between variance, process and modelling approaches to the study of organisational change and innovation processes.
- ***Variance*** approach:
  - used to explain change in terms of relationships between independent and dependent variables
- ***Process*** approach:
  - used to explain how a sequence of events leads to some outcome.
- ***Modelling*** approach:
  - bridges gap between variance and process approaches by providing a means to test/develop a theory of behaviour.

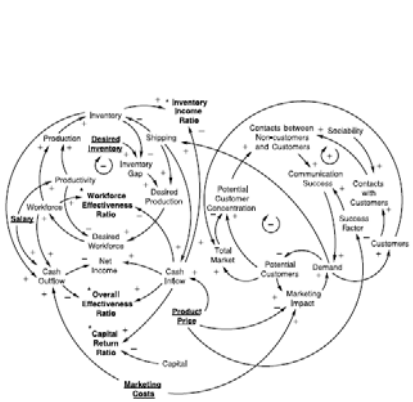
Variance approach: Overview

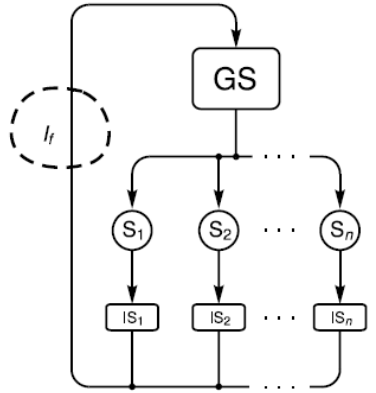
- Examines questions such as:
  - What are the causes (or correlates) of change in individuals, groups and/or organisations?
- Changes of interest include those associated with the performance, cognitive structures, commitment, etc. of an ‘agent’.
- Primary components of a variance approach are:
  - Variables that capture important aspects or attributes of the agent under study.
  - Relationships between these variables.
- Explanations take the form of theoretical causal statements (or ‘research models’) that incorporate these variables
  - e.g. X -> Y -> Z
- Developing reliable and valid measures of those variables is critical.

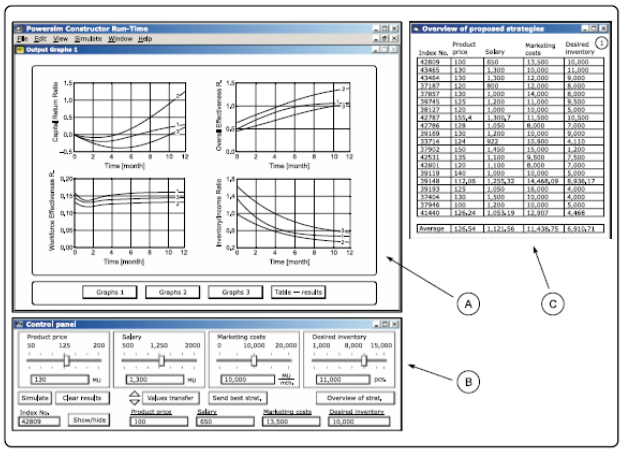
Variance approach: Example



- Skraba et al.'s (SDR 2003) study of the effect of feedback information on a SD-supported group process:
- Task was to determine best strategy.
- The use of group feedback information, in addition to using the SD model:
  - positively influenced convergence of the decision process;
  - contributed to higher (individual) performance.

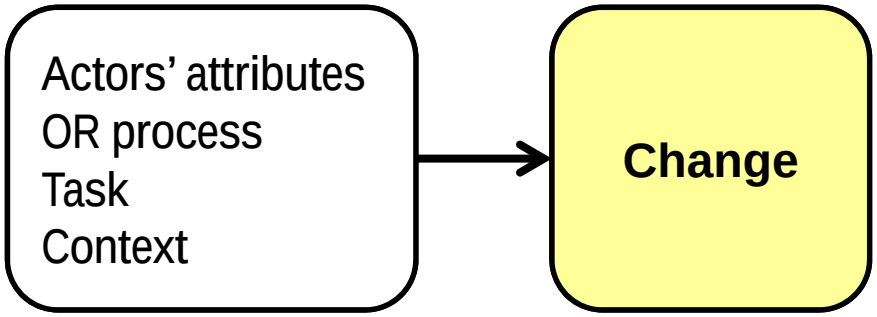






Variance approach: Pros & cons

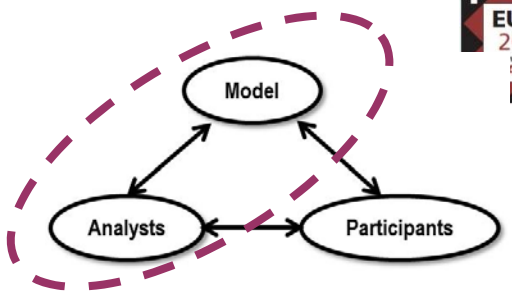
- Well suited for testing hypotheses via experiments and surveys.
  - Use of general linear model underlying most common statistical methods.
- Useful for studying rapid individual/group level change in OR-supported processes.
- Disadvantages:
  - Difficult to study how change unfolds in interaction, moment by moment.
  - Rule out influence of factors that might figure in a OR-supported process.



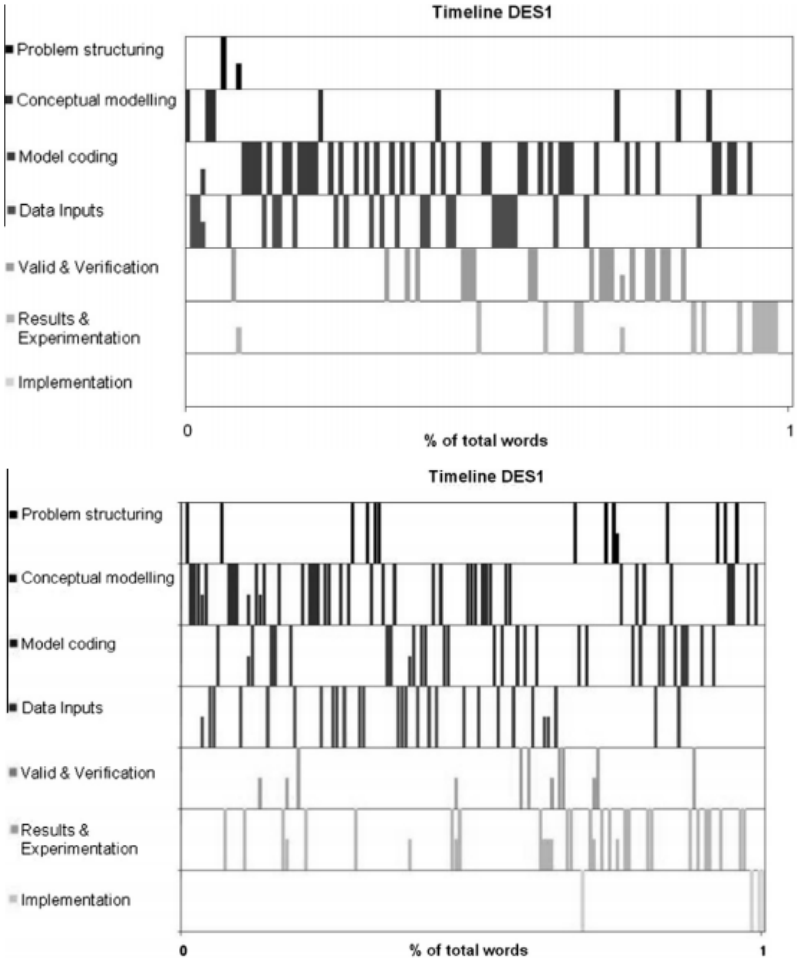
Process approach: Overview

- Examine research questions such as:
  - how changes in individuals/groups came about within an OR-supported process?
  - how do OR-supported processes unfold over time?
- Unit of analysis is an evolving ‘agent’ which makes events happen and to which events occur (Abbot 1988).
  - ‘Change’ here is developmental (Poole et al 2000).
- Explanations take the form of ‘theoretical narratives’ that account for the sequence of events observed.
- What counts as an ‘event’, and the temporal ordering of events are both critical.

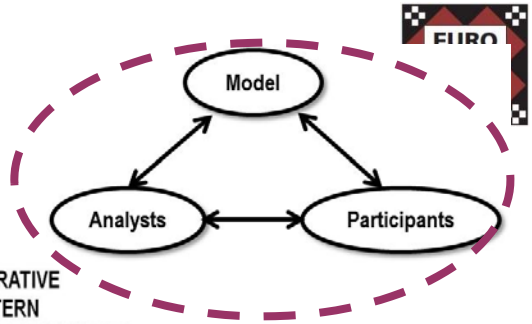
Process approach: Example 1



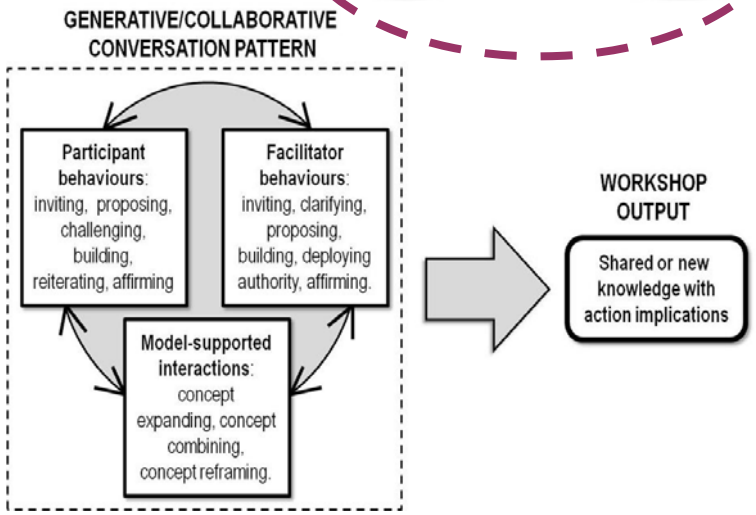
- Tako & Robinson's (EJOR 2010) study of expert DES and SD modellers:
  - ***Seven modelling stages*** identified.
  - All modellers switch between stages, BUT…
    - ***DES modellers*** follow a more ***linear progression***.
  - ***SD modellers*** focus more on ***conceptual modelling***
  - ***DES modellers*** focus more on ***model coding*** and ***V&V***.

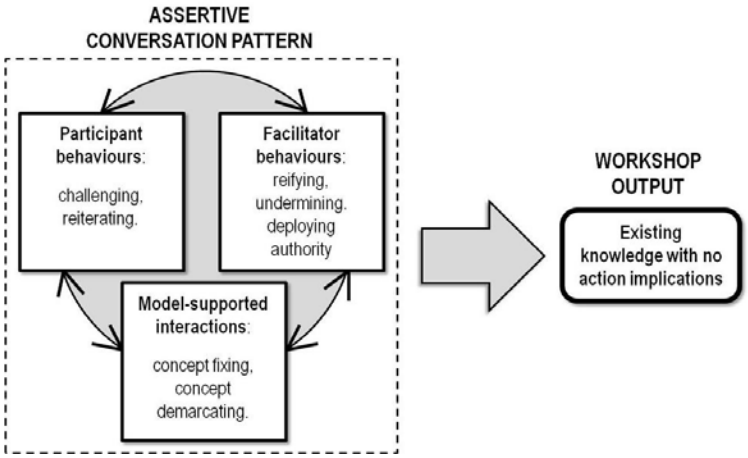


Process approach: Example 2

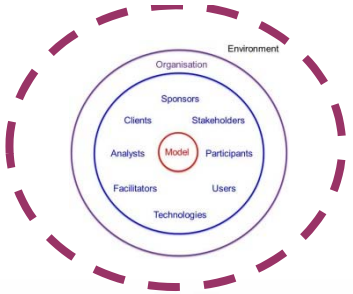


- Tavella & Franco's (GDN 2015) study of facilitated modelling processes:
  - ***Generative model-supported conversations*** (e.g. inviting, proposing, clarifying, building) lead to new or shared knowledge.
  - ***Assertive model-supported conversations*** (e.g. challenging, reiterating, undermining, deploying authority) lead to recycling existing knowledge.

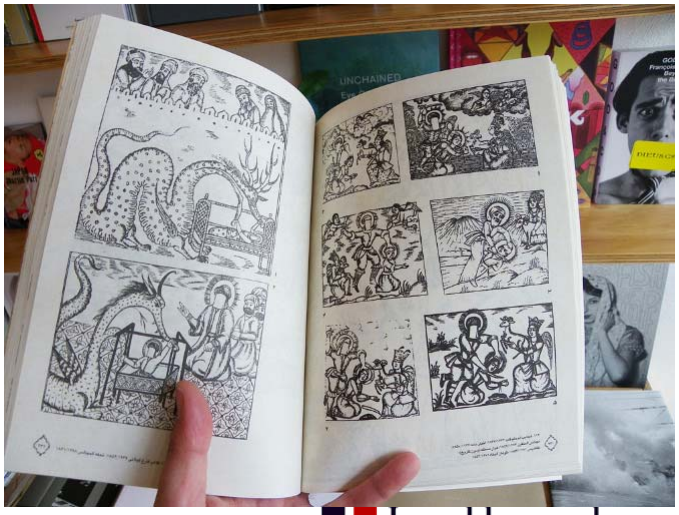




Process approach: Example 3

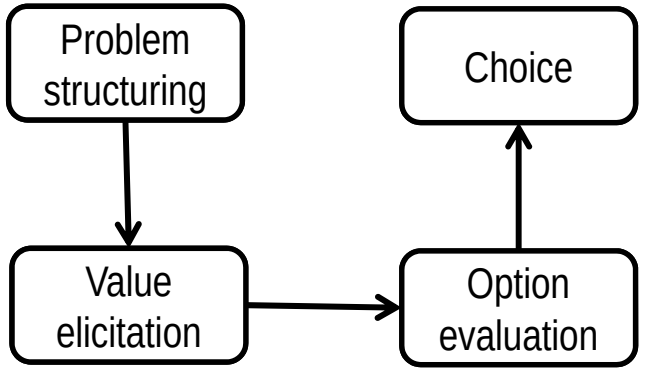


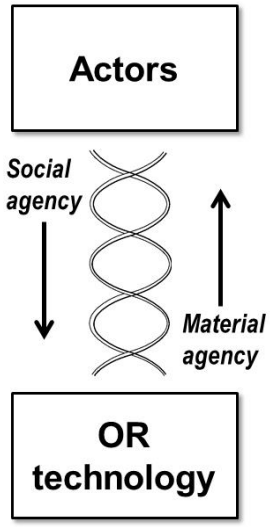
- Ormerod's (JORS 2013) study of an OR project with UK NCB during 1970s-1980s:
  - used the concept of 'mangle' (Pickering 1995) to examine intervention;
  - showed how complex intertwining of material and social factors affected the intervention's design, deployment and outcomes.



Process approach: Pros & cons

- Well suited for developing process theories in the form of:
  - ***Typologies*** of OR-supported processes.
  - ***Descriptions*** of the socio-technical interactions that are typical of OR-supported processes.
- Disadvantages:
  - Needs lots of data.
  - Intensive effort in coding and analysis.



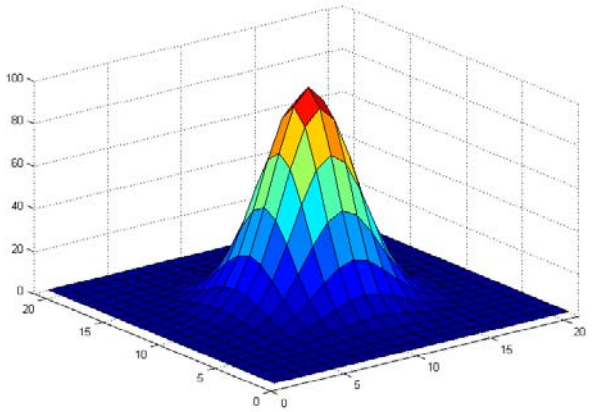


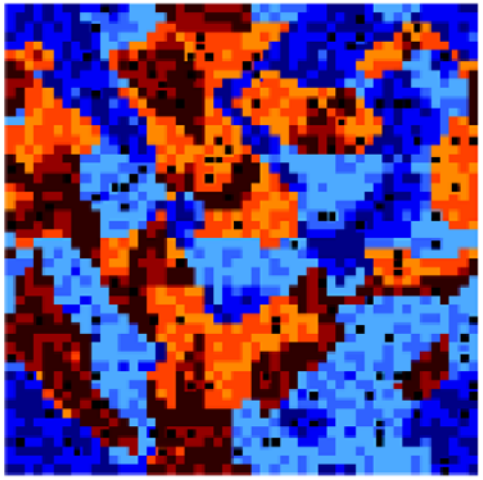
Modelling approach: Overview

- A way to bridge the gap between variance and process approaches because models :
  - explicitly articulate generative mechanisms responsible for change (variance approach);
  - describe progression of events (process approach).
- Flexible:
  - can be used inductively and/or deductively.
- Different types of models available (Dooley 2004):
  - Dynamic models (e.g. System Dynamics, Markov models).
  - Computational models (e.g. Cellular Automata, Rugged Landscape).
  - Self-organising models.
  - Complex Adaptive System models.

Modelling approach: Pros and cons

- It can answer both the “how” and “why” of the impact of OR-supported processes.
- Useful for deriving implications of theories that cannot be deduced from their verbal forms.
- Disadvantages:
  - simpler than reality;
  - does not model conversation (only information transfer).





Modelling approach: Current status

- To our knowledge, there is a ***dearth of studies*** that apply a modelling approach to understand behaviour in the OR-supported processes.
- Few studies have used modelling to examine ***un-aided*** group decision making processes:
  - Larson's (SGR 2007) uses an agent-based model to study the effect of diversity on group decision making performance.
    - diverse groups better than homogeneous groups, and even their best individual members
    - cooperative behaviours benefit performance of diverse groups, but impair performance of homogeneous groups.
- This area has great, yet untapped, potential for Behavioural OR.

Implications

- The three approaches should be seen as being complementary rather than as competing or opposite.
  - Each approach seeks to answer different questions.
  - Each approach provides a different, but partial, understanding of behavioural dimension of OR-supported processes.
- There is no one ‘right’ way to study behaviour in OR-supported processes:
  - combining the pluralistic insights from the three approaches can provide a richer understanding of the behavioural dimensions of OR-supported processes than any one approach can provide by itself.

Thank you!

L. Alberto Franco E: l.a.franco@lboro.ac.uk
Etienne Rouwette E: e.rouwette@fm.ru.nl