# Treatment of Complexity, Uncertainty and Risk-taking in the Planning of Mega Urban Transport Infrastructure Projects: Lessons drawn from elsewhere

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# OMEGA 1 Project: 'Smaller Project' Overview

- **OMEGA 1 Project Title:**

  *Improving the treatment of complexity, uncertainty and risk-taking in the planning of Urban Mega Transport Projects: Lessons from other disciplines and professions* (including military, earthquake engineering, civil engineering, medicine, agriculture, insurance and banking).

- **Project duration:** 18 Months, from January 2006 to June 2008
- **Funding body:** Volvo Research & Educational Foundations (VREF)

# OMEGA 'Smaller Project' structure & outputs

- **Part 1: Working Paper #1:** *Concept clarification: literature review of complexity, uncertainty, and risk in decision-making and planning*
- **Part 2: Working Paper #2:** *Contemporary treatment of Complexity, Uncertainty and Risk in strategic decision-making in selected disciplines* (based on 9 commissioned papers)
- **Part 3: Working Paper #3:** *The treatment of Complexity, Uncertainty and Risk in urban transport and city & regional policy-making & planning* (based on 6 commissioned papers)
- **Part 4: Working Paper #4:** *The relevance of findings to the planning, appraisal & evaluation of MUTPs* (based on 4 Working Papers)

# Part 2: Contents of Working Paper #2
## *The Contemporary Treatment of Complexity, Uncertainty and Risk in strategic decision-making in selected disciplines*

- **Earthquake engineering and seismic risk** Dr. Tiziana Rossetto, UCL
- **Military Strategy and planning** Dr. John Stone, Kings College London

- **Agriculture Pests** Prof. John Mumford, Imperial College London
- **Public Health planning** Dr Carlos Dora, WHO, Dr Katherine Walker, IRGC
- **Perspectives of the actuary in the insurance sector** Lis Gibson, Deloitte
- **Project Finance** : A banker's pespective Mark Lemmon, HSBC
- **The complexity of organizational trust** Prof. Steve Currall, UCL
- **A new kind of competence**: On avoiding mistakes in large organizations. Dr. Oliver Sparrow, The Challenge Network
- **Naturalising knowledge management** David Snowden, Cognitive Edge

# Part 3: Contents of Working Paper #3

## *The treatment of Complexity, Uncertainty and Risk in urban transport and city & regional policy-making & planning*

- **Great planning disasters re-visited** Prof. Sir Peter Hall, UCL
- **Property sector approach to major project risks** Keith Perry, Asset Factor
- **Risk and uncertainty in construction management** John Kelsey, UCL
- **Managing risk in a hyper-mobile world** Prof. John Adams, UCL
- **Complexity in city systems: Understanding, evolution, and design** Prof. Mike Batty, UCL
- **Strategic thought and regional planning: The importance of context** Prof. Harry T. Dimitriou and Prof. Robin Thompson, UCL

# Typical characteristics of MUTPs

- large-scale, complicated land-based transport infrastructure projects
  - bridges, tunnels, highways, rail links and their related transport terminals (i.e., major airports, seaports and railway termini/stations) plus combinations of such projects with construction

- costs in excess of US$ 1 billion (at 1999 prices)

- located in urban and metropolitan areas or regions

# Definitions of RUCC

- ***Risk* -** this can be seen as an uncertain consequence of an event or activity with respect to something that we value.
- ***Uncertainty*** – this may be considered as an expression of confidence about the state of knowledge in/about a given situation, ***Complexity*** – this arises in a system when a great many components interact simultaneously in a complicated form.
- ***Context*** – this is the multi-dimensional 'environment' within which a decision is made; it represents a unique set of conditions that exerts influence on the nature of the decision, and is often affected by the impact of subsequent actions.

# Normative Statements and Related Criteria for the Assessment of MUTP Decision Making under Risk, Uncertainty and Complexity

- Importance of Context
- Strategy
- Projects as Closed/Open Systems
- Governance, Regulatory Frameworks and Enforcement
- Relevant Project Information
- Tools/Techniques for Coping with Risk, Uncertainty and Complexity
- Innovation and Markets
- Project Stakeholders
- Trust and Transparency
- Project Lesson Learning/Sharing

# Importance of Context

- **Context as a key decision making factor:** An awareness of 'context' is a key factor in successful decision-making that addresses risk, uncertainty and complexity (RUC) (either explicitly or implicitly) within and outside the MUTP/planning field.

- **Gathering pace of change –the temporal nature of context:** MUTP planners and delivery agents need to be fully aware that **'change'** is gathering increasing **pace in 21st Century** due, among other things, to **rapid technological improvements and forces of globalisation**.

# Importance of Context

- **MUTPs as agents of change – their impact on context:** MUTPs themselves *may* also positively contribute to the pace of change. This is particularly important given the likelihood that inadequate sense-making of context very often later leads to **dysfunctional developments**

- **Making sense of contexts:** MUTP stakeholders must identify and appreciate the **critical contexts (and there interdependencies) that surround pivotal project decision making.** These critical contexts form the backbone of project planning and appraisal that ultimately mould the outcome of the project. **These critical contexts may change**

- **Context doesn't go away:** By accepting that context awareness is a vital pre-requisite for effective decision-making it is clearly critical **to inject this awareness for *all* phases in the project lifecycle.**

# Strategy

- **Open and transparent objectives up-front :** In the early planning stages, there should be a clear **statement of MUTP goals and objectives, roles and functions, appraisal and evaluative criteria, key input assumptions and potential impacts**.

- **What is a project?:** Planners, appraisers, delivery agents and operators need to consider MUTPs as more than 'projects' since they are often 'strategic change agents' that have **far reaching spatial, social, economic, environmental and other impacts at different phases of their project lifecycle.** As a minimum, MUTPs represent a **bundle of projects (programmes)** and at a maximum are a **bundle of mega projects which may be seen together as 'meta project'**

# Strategy

- **Reaching a balance between the short and long term:** An 'effective' strategy is one that achieves desirable (political) effects *without* incurring **disproportionate costs (both monetized and non-monetized).** Planning strategies for MUTPs need to **balance requirements for implementing a vision** for the project (and its accompanying spatial and temporal contexts) with the **practical requirements** associated with the efficiency of services offered, their cost ceilings etc., and of course, the resources (including institutional and regulatory support) available to deliver the project.

- it is important to acknowledge that for PPP/PFI projects**, private sector goals and objectives may well *not* naturally align precisely with those of public sector sponsors**

# Strategy

- **Robustness and flexibillty:** Strategies for the planning of MUTPs typically need to be **flexible/adjustable and robust, paying due attention to short, medium and long term consequences *simultaneously*** with mid-term measures acting as the bridge between short term aims and long term aspirations. **Changes in context** brought about by such influences as **changing stakeholder positions** in response to changing international, national and local policies and enforcement legislation are also critically important.
- highly prescribed **'blueprint' approaches** to MUTP planning, appraisal and delivery are too inflexible, contextually insensitive and are rarely appropriate over the project lifecycle.

# Strategy

- **When is the right time to freeze/defrost?:** Any strategy for planning MUTPs needs to take a practical and realistic view of ***when*** **the MUTP design work is to be 'frozen' as a basis for providing the blueprint for implementation and funding**. Once constructed and operational, it is also important for MUTP planners and managers to understand the **importance of 'defrosting' this blueprint** so that subsequent project developments can naturally **adapt to changing forces, influences and needs**.

# Projects as Closed/Open Systems

- **Artificial boundaries:** MUTPs are demonstrably not **'closed systems'** or a system of **commoditised services** (though they may encompass elements of commodity service provision). Rather, they are **'open systems'** treated on specific occasions (for practical purposes alone) as 'closed systems' that themselves **change contexts and are themselves changed by context.**

- **Promoting open systems:** Systems must be in place to allow MUTP planning, appraisal and delivery exercises to be treated as 'open systems' that see the **project and its interaction with 'context' as exploratory and almost organic**, and which allow for **unexpected outcomes** to become recognized and accepted as part of an **'emergent order'**

# Projects as Closed/Open Systems

- **Is the tightly controlled delivery of complex projects realistic?:** MUTPs are frequently planned, considered and operated as 'closed systems'. Reality, however, suggests that MUTP planning (especially) and delivery (also) are **subject to manifold contextual influences that make detailed control on all fronts difficult if not impossible** to achieve.

- **Project sensitivity to changing policy/legislative contexts:** International bodies such as the EU increasingly provide **standards to assess and reduce risks** during the implementation of cross-border projects and projects that fall within their international jurisdiction. National bodies are typically responsible for implementing systems to meet these international standards at the local level as well as those deemed necessary for national and local requirements. Such regulations can both reduce and increase project uncertainties, risks and complexities plus the **sensitivity of the project to changing policy and planning contexts.**

# Governance, Regulatory Frameworks and Enforcement

- **The effectiveness of regulatory frameworks:** Even when international agencies exist with regulatory frameworks and accompanying codes of practice, their frequent limited or **non-enforcement,** combined with **inadequate inspection procedures**, are potentially very problematic. It is common for **environmental risks** caused by MUTPs to trigger pressure from concerned stakeholder groups that lead to the call and introduction of further legislation and regulations..

- **Competitive practices hiding risk, uncertainty and complexity:** In the **spirit of globalization**, governments and international agencies - with the support of regulators and anti-trust lawyers etc. - seek to increase competition and **competitive practices** as a means of directly or indirectly further **reducing barriers to competition**. This *can* throw MUTP stakeholder companies into the ever-more heated pursuit of a **'best practice'**

# Governance, Regulatory Frameworks and Enforcement

- **Regulations as tipping points:** Constraints on what commences initially as an 'ordered' MUTP system can easily produce conditions under which that system **shifts to being more complex and increasingly dysfunctional**, to a point where it even **collapses into a chaotic state**. Translating this into the **regulative frameworks** for MUTP planning, delivery and operations - where public bodies seek to exert **excessive control through bureaucracy** – this may result in a slow build up of tension through **frustration between MUTP provider and enforcer** that ultimately leads to a collapse of the system.

# Relevant Project Information

- **<u>The identification of relevant information:</u> Decisions made under partial and especially inadequate information** expose a project to the influence of uncertainty. The more knowledge available about the project and its context, and the interface between the two, the less uncertainty and hence the less risk surrounds decisions. This highlights the critical importance of possessing ***relevant*** **information about the dynamics of these contexts** as a potential determinant to project 'successes.

- **<u>The importance of project monitoring throughout the life cycle:</u>** Given the above, **regular and sustained monitoring** throughout the MUTP project lifecycle of all contextual influences is clearly of utmost importance. This is especially so if MUTP planning and delivery is to be effective in **responding to changing circumstances**. Particular importance needs to be paid to **contextual change resulting from a sense-making of the interplay of ideas, beliefs and values associated with different stakeholder groups and individuals**.

# Tools/Techniques for Coping with Risk, Uncertainty and Complexity

- **The limited use of models:** While models and other analytical tools (including 'case histories') that are firmly based on ‘closed system’ thinking do pose major limitations, they do have an important role to play in attempting to **sense-make a MUTP during its different lifecycle phases.** Such tools, however, are generally fundamentally flawed by virtue of their **in-built inability to cope with open systems and the evolutionary fluidity that ultimately accompanies their development over time.**

- these **tools and techniques *may* sustain, even reinforce, undesirable path-dependent practices that are contrary to sustainable development visions and ultimately have the effect of the 'templating' of unsuitable solutions**

# Tools/Techniques for Coping with Risk, Uncertainty and Complexity

- **<u>The limited applicability of best practice:</u>** Many note that **hindsight and 'best practice' is likely to be *only* appropriate in the context of 'ordered, stable closed systems'** and most applicable during project construction. This is so since **constant changes in context make it especially difficult to effectively use prescriptive tools, models and techniques that are based on the notion of a 'closed system' equilibrium** when the 'equilibrium' is in fact not known.

- **<u>Balancing the decision making process:</u>** Systems should be put in place to **guard against misrepresentations derived from unchallenged path-dependent MUTP analytical and forecasting practices.** MUTP planning, appraisal and delivery tools and techniques should instead be part of a **balanced decision making process and framework that prevent these tools and techniques being used to solely support project sponsor vested interests or 'gut feelings'** derived from past practices in different contexts.

# Innovation and Markets

- **The importance of innovation:** **Innovation** is critically important to the 'success' of any MUTP. Such projects may indeed themselves be seen **as large-scale technical social innovation systems.** The adoption of decision-making based entirely on **path dependent processes** can stifle innovation to the detriment of the organisations involved in the planning, appraisal and delivery of MUTPs *and* their stakeholders. Parties employing such practices typically become less responsive and adaptable to new risks
- **innovation requires some excess capacity within their institutional** responsibilities for their planning, appraisal and delivery. Such resources are though not always available, especially in companies that are competing in the open market to the bottom line.

# Innovation and Markets

- **<u>Innovation causes conflicts:</u>** One of the *almost* **inevitable consequences of innovation** and change in decision making regarding MUTP developments is to bring about **conflicts.** This accounts for much of the **resistance to innovation in MUTP developments** – especially among the more conservative organisations/agencies involved. Few such parties embrace **change as a learning experience;** a feature which improves innovation capabilities. **.**

# Project Stakeholders

- **Stakeholder analysis and monitoring:** The ability to identify and understand the **motives, beliefs and values of the wide range of stakeholders** involved in or impacted by MUTPs is *extremely* difficult, but nonetheless vitally important. **Stakeholder perceptions about 'the project' and any accompanying development** including restructuring and regeneration initiatives, represent one of the most powerful contextual forces for MUTPs

- **Consensus-building at the preliminary stages** of MUTP planning and formulation stages is typically essential for all such projects.

- **constant scanning of stakeholder groups, organisations and networks over time,** in order to determine their **agendas, willingness to commit, and ability and capacity to exert effective influence,** will remain critical before and after key decisions are made.

# Trust and Transparency

- **The role of transparency and trust: Relationships among MUTP stakeholders** are critical factors in reducing aspects of risk, uncertainty and complexity in decision-making attributed to various stages of an MUTP's development. Of particular significance here is the **transparency in the interaction of stakeholders and the role of trust.** The building (and sustaining) of **reputation and trust** is vital in all aspects of MUTP stakeholder relations.

- **Identification of key decisions:** For MUTPs to be implemented successfully, their planners, appraisers and deliverers need to identify which **key decisions require a high level of trust** and ensure this is delivered. This calls for a **differentiation to be made between trustees and trustors** (i.e., clarification of who is responsible for delivering the trust and those who are to expect it is delivered).

# Project Lesson Learning/Sharing

- **Project Evaluation:** **Project learning** *must* be an integral part of MUTP decision making, and to this end**, systems need to be put in place for distributing both positive and negative lessons** learnt by all stakeholders during each phase of the project. These systems need, furthermore, to facilitate the **sharing of these lessons** with the wider community impacted by the project during the evaluation stage.