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Centre for Mega Projects in Transport and Development

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BERGEK ET AL'S ANALYTICAL FRAMEWORK OF FUNCTIONAL DYNAMICS OF TECHNOLOGICAL INNOVATION SYSTEMS (TISS): PROPOSAL FOR APPLICATION TO MEGA TRANSPORT PROJECTS (MUTPS) AS RESEARCHED BY OMEGA CENTRE

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PART 1: PURPOSES AND BACKGROUND OF PAPER

1.0 Purposes

1.1 The purposes of this Paper are essentially threefold:

- to reiterate the OMEGA Centre research programme aims since these are of fundamental importance in formulating the proposed framework of analysis and synthesis of Case Study workstreams;
- to present the Scheme of Analysis put forward by Bergek et al (see Appendix 1) as a recommended framework for synthesising findings from the OMEGA 2 Case Studies as a basis for deriving and 'testing' emerging lessons and guidelines (Part 2 of this Paper). The Bergek et al scheme of analysis was commended to us by Prof. Staffan Jacobsson and appears to resonate strongly with our work. Prof. Jacobsson was a member of our VREF Mid-Term Review Panel and is also a member of VREF's Scientific Commitee); and
- to demonstrate how the Bergek et al framework could be developed to encompass the comparative analysis and synthesis needs of the OMEGA Research programme (see Part 3 of this Paper).

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1.2 As explained below (in Part 3), the intention of this paper is to provide the basis to further refine the proposed framework as adapted for the OMEGA Project, in discussion with Partners - at the OMEGA Workshop in Lund in April 2009 in the first instance.

1.3 It is perhaps appropriate at this stage to acknowledge that Partner input to the project is essentially contractually geared to the completion of Case Study data collection, analysis and synthesis, together with a further 'country-based' synthesis of the Case Study projects - due for completion by end-2009. Thereafter, any further input on the part of Partners will necessarily be primarily on a voluntary basis, though this will of course be greatly welcomed.

2.0 Background

2.1 The June 2008 Paper prepared by Harry Dimitriou (see Appendix 2) provided background material relating to many of the methodological aspects of the OMEGA 2 Project which are directly relevant to the derivation of an analytical framework. The Paper, entitled 'Hypothesis-Led Research Questionnaire Design: Application of Cresswell's Principles to CTRL Case Study (Second Background Note)' was circulated across the OMEGA Network. Additional background information can also be found at Appendices 3 and 4, as follows:

- a note prepared by the Australian Team entitled 'OMEGA Project Methodology, Comparative Research and the Hypothesis Led Questions' which (inter alia) provides a very useful analysis of ongoing research and data needs relative to OMEGA research objectives (Appendix 3);
- a note prepared by the OMEGA Centre Team in response to the above (Appendix 4).

2.2 Key extracts from the Dimitriou Paper at Appendix 2 concerning Research Programme Aims, Study Purpose and Definitions which need to be borne in mind when considering the formulation of an analytical framework for the OMEGA 2 Project are seen to be as follows:

2.2.1 **OMEGA Research Programme Aims**

- **To evaluate the extent to which MUTPs meet planned objectives** (including completion dates, keeping to budget targets and operational performance targets) *and* contribute to the sustainable development visions such projects are intended to contribute to.

- **To seek generic and context-specific insights** into how and why these MUTPs have been planned the way they have – including insights into how MUTPs can be retrofitted to successfully contribute to visions of sustainable development.

- **To gather evidence of the degree to which MUTP planning, viability and delivery has been compromised** by:
  - the inability to capitalise on the wider benefits that they could generate;

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- the institutional frameworks and regulatory mechanisms employed to deliver them;
- fixed deadlines dictated by major national/international events and important development agendas; and
- the formal planning process (including public participation).

- **To provide insights into how cultural perceptions and treatment of uncertainty, risk and complexity in policy-making, planning and management of MUTPs differ** from one regional or national context to another and the way these have an impact on results and technology-transfer.

- **To offer insights into whether current planning, appraisal and evaluation methods in MUTP studies are suited to the fast changing and uncertain realities of the 21st century.**

2.2.2 Study Purpose Statement:

The overall purpose of the research programme is to foster institutional learning from the growing experience of planning, appraising and evaluating MUTPs and their impacts from a comparative analysis of case studies spanning Europe, USA, Asia and Australia and through these studies identify both pitfalls and achievements of past planning experiences together with their major social, economic, territorial and environmental impacts so that they may become better understood as a basis for generic lesson-learning for future MUTPs (paraphrased from OMEGA Centre two-page summary, October 2006).

- **Overall Research Questions** that emerge from the above Study Purpose Statement include**:**

  - **Questions #1:** What constitutes a 'successful mega urban transport project (MUTP) in the 21st Century?
  - **Questions #2:** How well has risk, uncertainty and complexity been treated in the planning, appraisal and evaluation of such projects?
  - **Questions #3:** How important is context in making judgements regarding the above questions?

- **The Overall Research Hypotheses** that emerge from the above Study Purpose Statement and Overall Research Questions include:

  - **Hypotheses #1:** Traditional criteria relating to cost overruns, completion dates, generation of travel time savings for users and rates of returns to investors are inadequate measures of success in the 21st Century as sustainable development concerns become increasingly critical both globally and locally.
  - **Hypotheses #2:** The new emerging international and local agenda related to vision(s) of sustainable development is multi-dimensional and goes beyond notions of environmental sustainability, as critical as this may be, in that it also concerns inter-related concepts of economic sustainability, social sustainability and institutional sustainability.

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- **Hypotheses #3:** The level of competence in decision-making and planning in today's fast-changing world is best assessed by the adequacy of the treatment of risk, uncertainty and complexity and sensitivity to context – all of which are important demands on Strategic Planning.

2.2.3 Key Definitions

- **Key Definition #1:** Mega urban transport projects (MUTPs) as defined by this Study are post-1990 completed road, rail, bridge and tunnel projects or a combination of these, each costing in excess of US$0.5 billion (at 1990 prices), located wither within urban areas or having a significant impact on urban and metropolitan development.

- **Key Definition #2**: Principal Stakeholders are those 'key' people and organisations who may *directly* affect, be affected by, or perceive themselves to be *directly* affected by, a decision or activity associated with the a decision(s) or an activity or a 'project' (after www.riskmanagement.qld.gov.au/info/guide/gls.htm). For the purposes of this Study, the term 'project' refers to OMEGA Case Study Projects, while the term 'key stakeholder' refers to those:
  - who's actions/decisions are/were critical to the success/failure of the project as a whole (or a component part thereof) in terms of its planning, appraisal, evaluation, implementation, operation and impacts, and/or;
  - who have either possess first hand knowledge of/involvement in the planning, appraisal, evaluation, implementation, operation or impact of the project (or a component part thereof) or are experienced observers thereof, and/or;
  - who share information and knowledge about the project (or a component part thereof) so as to influence project outcomes or opinions about project outcomes.

- **Key Definition #3: Sustainability Development Visions (SDVs)** as defined by this Study are multi-dimensional. They comprise of economic, environmental, social, *and* institutional dimensions each of which (or together) pose impose important Sustainability Development Challenges to MUTPS. Each dimension of the SDV are identified by a set of concepts, issues and methodologies/techniques which pose various levels of risks, uncertainties and complexities in different contexts.

- **Key Definition #4**: **Sustainability Development Challenges (SDCs)** are defined here as problems, issues and concerns that present obstacles to the achievement of SDVs and which therefore need to be overcome or ameliorated for significant progress to be made for MUTPs to constructively contribute toward the SDV aspired after. Progress in the achievement of this is assisted by the employment of Sustainable Development Indicators (SDIs). The main SDCs to MUTP identified for this Study are summarised in matrix already distributed to Partners.

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- **Key Definition #5: Context** as defined by this Study represents "the circumstances relevant to something under consideration" and/or "the discourse that surrounds a language unit and helps determine its interpretation" (WordNet, Princeton University, http://wordnet.princeton.edu/20/12/08). It pertains to information that should be kept in mind when making a decision. Context can relate to one or more dimensions, including psychological, temporal, geographical/spatial, cultural, institutional and ideological/political dimensions that shape the way we understand the performance of an event.

2.3 The Paper at Appendix 3 includes a useful table (page 3) that summarises the OMEGA Research Objectives and likely data sources. This is reproduced below as Figure 1 with amendments inserted by the OMEGA Centre team.

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Figure 1: OMEGA PROJECT 2 PROCESS TO FULFIL RESEARCH OBJECTIVES

		Pre-Hypothesis Research Narrative Pattern Analysis	Project Profile Secondary Source Project Data	Hypothesis-led Research Hypothesis Narrative Analysis	Position and Background Papers	Finalising Action or Research Required to Meet Objective
	Data Collection Processes	A. Opening Question - relationship to project. B. Prompting Questions 1. Pivotal events? 2. Project rescued or sabotaged? 3. Moments of stagnation or breakthrough 4. When the community suffered or was inspired? 5. The project in 10 years.	• Introduction • Background • Principal Characteristics • Timeline • Funding • Operations	• Success • Evaluation • Decision-making Process • Risk, Uncertainty, Complexity	• History of transport planning by country, especially since WWII • Relationship of MUTPs with: Biodiversity, Globalisation,Privatisation, Cohesion, Accountability,Spatial Restructuring, Institutional Development, Energy, Ecology.	
Omega Research Objectives	1. Place in the public domain, an international database of MUTP profiles that summarise key planning, performance and impact features (where 'impact' refers to the impact of decision-making).	Raw data and patterns of knowledge emanating from pre-hypothesis work will also yield information concerning the planning and, delivery, operation and performance of MUTPs.	• All sectors of profile deliver this objective • Current (June 08) profile includes data on planning, performance and impact features of each project.	Raw data and patterns of knowledge emanating from hypothesis-led work will also yield information concerning the planning and, delivery, operation and performance of MUTPs.	Transport planning regime relevant to each country could provide more details for profile databases. Importance of Context - temporal, spatial, cultural, economic etc.	• Development of a publicly available database to house information • Ongoing hosting arrangements to be made for that database.
	2. Apply generic principles and lessons relating to the treatment of risk, uncertainty and complexity derived from disciplines within/outside transportation and territorial planning to the planning of MUTPs. Key input from OMEGA 1 - generic and context-specific lessons regarding the treatment of RUC	Index Questions on risk, uncertainty and complexity provide qualitative measure of: • Level of perceived RUC in context of each MUTP • Effect of RUC on planning the MUTP • Perceived level of RUC in comparison to another project. • Additional references to the treatment of RUC in index 8.	The Section on Risk Analysis provides quantitative description of whether/how risk dealt with for each MUTP. Including what processes were used. RUC not specifically referred to in the Template but background data covers viability/feasibility assessments.	Fourth question on RUC provides further qualitative data on how RUC process described in profile worked for the MUTP. Needs to be updated to reflect: • proposed changes to overarching questions • hypotheses relating to RUC.	Should be possible to draw out lessons relating to the treatment of RUC in MUTP planning and delivery in (for example) different eras in different countries as part of synthesis of WP1 Should be possible to identify the degree to which the sustainable development (visions) increase/impact on RUC from WP2	• Collected data to be synthesised - verify how RUC dealt with in MUTP planning/delivery • Compare data with findings of OMEGA 1 - uncover relevant RUC principles for dissemination • Disseminate findings under Objective 6.

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Fig 1 Cont'd

		Pre-Hypothesis Research Narrative Pattern Analysis	Project Profile Secondary Source Project Data	Hypothesis-led Research Hypothesis Narrative Analysis	Position and Background Papers	Finalising Action or Research Required to Meet Objective
	Data Collection Processes	A. Opening Question - relationship to project. B. Prompting Questions 1. Pivotal events? 2. Project rescued or sabotaged? 3. Moments of stagnation or breakthrough 4. When the community suffered or was inspired? 5. The project in 10 years.	• Introduction • Background • Principal Characteristics • Timeline • Funding • Operations	• Success • Evaluation • Decision-making Process • Risk, Uncertainty, Complexity	• History of transport planning by country, especially since WWII • Relationship of MUTPs with: Biodiversity, Globalisation,Privatisation, Cohesion, Accountability,Spatial Restructuring, Institutional Development, Energy, Ecology.	
Omega Research Objectives	3. Build up an understanding of how MUTPs impact on and contribute to sustainable development.	Analysis of pre-hypothesis data to generate patterns of knowledge about Case Study MUTPs' relationship with sustainability visions.	Template data covers (inter alia) national/regional/local policies relating to sustainability visions/issues as contextual information.	Second question on evaluation includes question about sustainable development. Properly directed this question could provide qualitative data from which the perception of how MUTPs impact sustainable development could be inferred. A number of questions/hypotheses refer indirectly to sustainability issues - need to scan narrative for this. Needs to be updated to reflect: • proposed changes to overarching questions • hypotheses relating to RUC.	Papers on what is the relationship of MUTP with: Biodiversity, Globalisation,Privatisation, Cohesion, Accountability,Spatial Restructuring, Institutional Development, Energy, Ecology.	• Information Papers to be synthesised into overall picture of how MUTPs impact these areas. • Cross-reference with hypothesis-led inferences could validate findings. • Overall paper/book to be developed. • Subject to budget, additional Papers on sustainable development challenges and their application to MUTPs are to be commissioned.

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Fig 1 Cont'd

		Pre-Hypothesis Research Narrative Pattern Analysis	Project Profile Secondary Source Project Data	Hypothesis-led Research Hypothesis Narrative Analysis	Position and Background Papers	Finalising Action or Research Required to Meet Objective
	Data Collection Processes	A. Opening Question - relationship to project. B. Prompting Questions 1. Pivotal events? 2. Project rescued or sabotaged? 3. Moments of stagnation or breakthrough 4. When the community suffered or was inspired? 5. The project in 10 years.	• Introduction • Background • Principal Characteristics • Timeline • Funding • Operations	• Success • Evaluation • Decision-making Process • Risk, Uncertainty, Complexity	• History of transport planning by country, especially since WWII • Relationship of MUTPs with: Biodiversity, Globalisation,Privatisation, Cohesion, Accountability,Spatial Restructuring, Institutional Development, Energy, Ecology.	
Omega Research Objectives	4. Build a significant *new* body of knowledge about decision-making in the planning, appraisal and evaluation of MUTPs using narrative pattern analysis.	Totality of collected narratives and indexes will be used in building this new body of knowledge.	Project timeline provides contextual data concerning the decision-making process for Case Study MUTPs.	Totality of collected narratives and indexes will be used in building this new body of knowledge.	As above - possible to draw out lessons relating to the treatment of RUC in MUTP planning and delivery in different eras in different countries as part of synthesis of WP1	• Narrative analysis to be completed using Sensemaker Software - ongoing process (additional completed Case Studies will enrich overall database) • Findings of analysis to be presented as new information under Objectives 6 and 7. • Subject to budget, thought is also being given to the commissioning of a Paper on decision-making in the political environment.
	5. Draw up generic and context-specific lessons from the research as the basis for sensemaking forces that mould contexts so as to explain notions of 'success' within such contexts.	Patterns of knowledge emanating from the pre-hypothesis research phase will inform the process of compiling generic and context-specific lessons.	• Profile will provide context information from which generic situations, identifiable in MUTPs studied, can be drawn • Profile will provide context information from which context-specific situations, for each MUTP can be identified	First question on success provides qualitative data on perception of individual project as a 'success' and if properly guided by inference information on criteria relevant to each MUTP that guided judgement of that success.	National and international insights into the planning and delivery of MUTPs (WP1) and impact of sustainability visions/challenges (WP2) will assist compilation of generic and context-specific lessons.	• Data will be combined to give factors to judge success relevant to generic situations in MUTPs and those relevant to context-specific situations in MUTPs. • Dissemination under Objective 6.

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Fig 1 Cont'd

		Pre-Hypothesis Research Narrative Pattern Analysis	Project Profile Secondary Source Project Data	Hypothesis-led Research Hypothesis Narrative Analysis	Position and Background Papers	Finalising Action or Research Required to Meet Objective
	Data Collection Processes	A. Opening Question - relationship to project. B. Prompting Questions 1. Pivotal events? 2. Project rescued or sabotaged? 3. Moments of stagnation or breakthrough 4. When the community suffered or was inspired? 5. The project in 10 years.	• Introduction • Background • Principal Characteristics • Timeline • Funding • Operations	• Success • Evaluation • Decision-making Process • Risk, Uncertainty, Complexity	• History of transport planning by country, especially since WWII • Relationship of MUTPs with: Biodiversity, Globalisation,Privatisation, Cohesion, Accountability,Spatial Restructuring, Institutional Development, Energy, Ecology.	
Omega Research Objectives	5. Cont'd			In addition, responses to Hypotheses (Part 2) and Concluding Questions (Part 3) are expected to eiither indicate the context for success or the particular ingredients for success (e.g. champions, real estate as a funding vehicle etc. etc.) Needs to be updated to reflect: • proposed changes to overarching questions • hypotheses relating to RUC.		
	6. Develop and deliver new generic and context-specific decision guidelines and selected tools to assist public and private sector bodies in planning, appraising, implementing and evaluating MUTPs with particular regard to the treatment of: risk, uncertainty, complexity and key sustainability challenges.		As for objective 5.	Needs to be updated to reflect: • proposed changes to overarching questions • hypotheses relating to RUC.		• In combination with findings on generic/context-specific situations, develop findings of Objective 2 into decision tools and guidelines for dissemination. • Develpp findings from Objectives 4 and 5 into guidelines and selected tools for dissemination.

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Fig 1 Cont'd

		Pre-Hypothesis Research Narrative Pattern Analysis	Project Profile Secondary Source Project Data	Hypothesis-led Research Hypothesis Narrative Analysis	Position and Background Papers	Finalising Action or Research Required to Meet Objective
	Data Collection Processes	A. Opening Question - relationship to project. B. Prompting Questions 1. Pivotal events? 2. Project rescued or sabotaged? 3. Moments of stagnation or breakthrough 4. When the community suffered or was inspired? 5. The project in 10 years.	• Introduction • Background • Principal Characteristics • Timeline • Funding • Operations	• Success • Evaluation • Decision-making Process • Risk, Uncertainty, Complexity	• History of transport planning by country, especially since WWII • Relationship of MUTPs with: Biodiversity, Globalisation,Privatisation, Cohesion, Accountability,Spatial Restructuring, Institutional Development, Energy, Ecology.	
Omega Research Objectives	7. Build up the institutional and professional capacities on an international scale in MUTP decision-making and planning through the development of a network of experts and especially trained individuals and formal international educational and training programmes that draw upon ongoing MUTP research.					• Objective in part delivered by development of OMEGA Research Team. • Work is progressing on development of international education programme in association with UCL Business School (short courses, MScs, MBAs to include the planning and appraisal of MUTPs. • OMEGA website represents a vehicle for hosting a collaborative network where experiences are shared and open discussion can take place so as to further knowledge of MUTP planning, delivery and operation. • Dissemination by network of experts via Conferences and Workshops

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PART 2:
PRESENTATION OF BERGEK ET AL SCHEME OF ANALYSIS[1]

1.0 Introduction

1.1 As noted above (Part 1), the main purpose of Part 2 is to present the Scheme of Analysis put forward by Bergek et al (see Appendix 1) as a recommended framework for synthesising findings from the OMEGA 2 Case Studies as a basis for deriving and 'testing' emerging lessons and guidelines.

1.2 Because of the different use of specialised terminology it may appear at first sight that the scheme of analysis developed for technological innovation systems does not easily lend itself to the OMEGA Research Programme. It is hoped, however, after reading the Bergek et al Paper and the extracts and explanations presented below in Parts 2 and 3, the relevance of this recommended framework as a *process for synthesising findings* will become very apparent. Wr have concluded that innovation systems and MUTPs fundamentally share much common ground by virtue of the fact that:

- both are systems that comprise a group of components (devices, objects and agents) that ostensibly serve a common purpose, and;
- MUTPs are technological innovation systems in their own right (representing evolving systems that are subject to considerable fluidity in the face of ever changing contextual elements/challenges).

1.3 A systems approach to innovation is often seen as a more appropriate alternative to policy action by scholars on innovation and technology than one based on 'the market failure approach' where the latter refers to synchronized efforts aimed at correcting failures of private markets to achieve efficiency.

1.4 Such systems approaches focus policymakers' attention on areas where private market performance is weakest and allows comparisons of development policies and entail the use of policies to correct market failures that may be evaluated by the non-market benefits created for society.

1.5 Because these approaches have in the past been criticized for not providing adequate guidelines for policy-makers to assess the relative performance of innovation systems and identify/compare key policy issues and goals, the framework proposed by Bergek et al specifically seeks to do this.

[1] This text is paraphrased from the original source contained in Appendix 1.

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2.0 The positioning and development of the analytical approach

2.1. The innovation system as an analytical construct

2.1.1 Here a 'system' is defined as "a group of components (devices, objects or agents) serving a common purpose"[2].

2.1.2 The components of an 'innovation system' are its "actors, networks and systems contributing to overall function of developing, diffusing and utilizing new products (goods and services) and processes".

2.1.3 The system does not have to exist in reality as fully fledged … but instead "may be emerging with very weak interactions between components." ….. The "interaction between components may be unplanned and unintentional rather than deliberative, even in a more developed innovation system."

2.1.4 It is not presumed here that 'actors' "necessarily share the same goal, and even if they do, they do not have to be working together consciously towards it (although some may). Indeed, conflicts and tensions are part and parcel of the dynamics of innovation systems. Clearly we do not see the systems components as directed or orchestrated by any specific actors".

2.1.5 The reference here is to technological innovation systems (TIS) "i.e. socio-technological systems focused on the development, diffusion and use of a particular technology (in terms of knowledge, product or both)."

2.1.6 "TISs do not only contain components exclusively dedicated to the technology in focus, but all components that influence the innovation process for that technology. A TIS may be a sub-system of a sectoral system or may cur across several sectors. TISs may have a geographical dimension, but are often international in nature."

2.1.7 MUTPs as technological innovation systems.

By adopting a systems approach to innovation in the context of the OMEGA research programme one would have to adopt the premise that mega urban transport projects (MUTPs) as defined by the Centre are not only 'technological innovation systems' but are of the kind outlined by Bergek et al (2007) – i.e., exhibit the same/similar characteristics of:

- components (actors, networks and systems);
- emerging weak interactions between components;
- unplanned and unintentional interactions among components;
- actors not necessarily sharing the same goals;
- conflicts and tensions as part and parcel of the dynamics of innovation;

[2] Text shown in quotation marks is, for the purposes of Part 2, taken directly from the Bergek et al Paper (given in Appendix 1).

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- systems components not necessarily directed or orchestrated by any specific actors;
- representing a sub-system occurring very often across several sectors; and
- possessing geographical dimensions that are international in character.

2.2 Previous innovation system approaches to innovation policy

2.2.1 "A central proposition of systems literature on policy is that just as the nature of actors/markets obstruct the formation of a TIS, so can institutions and networks … Eventually, such weaknesses in systems structure may lead to 'system failure'".

2.2.2 Most reference to 'systems failure' refer to "perceived weaknesses in the structural composition of a system" these include:
- Infrastructure failures (related to actors and artefacts);
- Institutional failures (related to institutions);
- Interaction failures (networks); and
- Capability failures (relating to actors).

2.2.3 To identify central policy issues in specific innovation systems the authors introduce a framework outlining seven key processes (labelled as 'functions') which have a direct and immediate impact on the development, diffusion and use of technologies (i.e. the overall function of the TIS).

2.2.4 This functions approach to ISs "focuses on what is actually 'achieved' in the system rather than on the dynamics in terms of structural components only – it allows us to separate structure from content and to formulate both policy goals and policy problems in functional terms."

2.3 The development of the "functional dynamics approach"

2.3.1 "Concerns have been raised with regard to the conceptual heterogeneity of the innovation system concept"; this is one of the starting points of the functional dynamics approach presented here.

2.3.2 "A scrutiny of literature revealed that the systems approaches in ISs share an understanding of a set of basic functions (defined here as "the contribution of a component or a set of components to the overall function of the innovation system").

2.3.3 Here these are categorised into seven functions (see Appendix A - note that these are not considered to be exhaustive):
- knowledge development and diffusion;
- entrepreneurial experimentation;
- influence on the direction of search;
- market formation;
- development of positive external economics;
- legitimation; and

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- resource mobilisation.

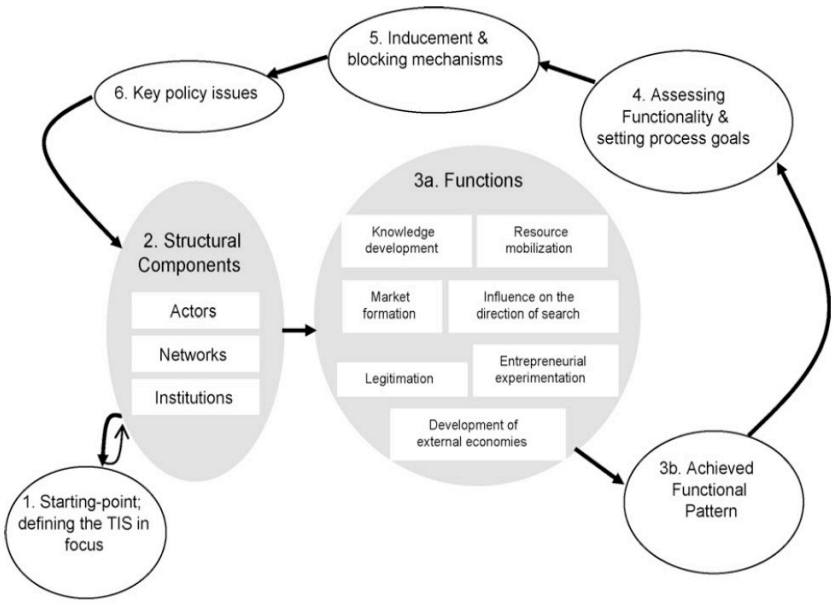
2.3.4 Rather than covering all the above as advocated for the "functions approach" to ISs most policy researchers undertaking "conventional innovation systems analysis" seem to focus on a few functions or on general policy problems to be solved without stating any clear reason for that particular focus. The broader and more comprehensive nature of the former approach "allows for the systematic identification of policy problems".

3.0 The scheme of analysis

3.1 Here "the scheme of analysis" refers to a number of sub-analyses undertaken as six steps (see Figure 2) as follows[3]:

- **Step 1** entails defining the technological innovation system in focus;
- **Step 2** entails identifying the structural components (defined here as actors, networks and institutions);
- **Step 3** focuses on functions of the system under study (defined in terms of the seven key processes that come up with an "achieved functional pattern of functions");
- **Step 4** examines how well the functions are fulfilled and set process goals in terms of a "desired" functional pattern;
- **Step 5** entails "the identification of mechanisms that induce (drive) or block a development towards the desirable functional pattern";
- **Step 6** involves the specification of the key policy issues related to the inducing and blocking mechanisms to the achievement of the desirable functional pattern.

Figure 2: Bergek et al's Analytical Framework of the Functional Dynamics of Technological Innovation Systems (TISs)



[3] "It should be noted that the analysis will most often not proceed in a linear fashion"…. but instead "entail a great number of iterations between steps in the process of the analysis".

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3.2 **Step 1: defining the TIS in focus**

3.2.1 Deciding the precise unit of analysis – or focus – of the study is not straightforward and involves a number of critical choices with regard to both structure and functions….and entails an examination of how the choice of starting point has affected the analysis.

3.2.2 Three types of choices that analysts need to consider include:

- choice between knowledge fields and/or products or artefacts as a focusing device;
- choice between breadth and depth; and
- choice of spatial domain.

3.2.3 The "starting point depends on the aim of the study and the interests of the involved stakeholders (i.e. researchers/policy-makers).

3.2.4 Regarding the choice between breadth and depth of the study, one has to consider two things:

- the level of aggregation/disaggregation of the study; and
- the range of applications in which the technology is relevant.

Although not explicitly stated by Bergek et al, one must also assume that the availability of resources and data to enable systematic and coherent analysis and synthesis of the system represents a key factor.

3.2.5 Finding the appropriate focus is thus not always straightforward – it may be necessary to start with a broader starting point and narrow it down as the understanding of the innovation system increases and more narrow foci are identified.

3.2.6 Furthermore, "given the large uncertainties involved when the analysis concerns an emerging system a definite focus may be difficult to choose and may have to be changed over time".

3.2.7 Having made the choices above – as a complement – the study may have a spatial focus (this is though only one kind of contextual measure) and while TISs may well be generally global in character there may be reasons to focus on a spatially limited part of a system (the line-haul, the terminal the sub-regional territory).

3.3 **Step 2: Identifying structural components**

3.3.1 This step entails the identification and analysis of the structural components of the system, commencing with the *actors* (firms/public bodies/stakeholders involved throughout project – both up-stream and down-stream). A stakeholder categorisation would prove useful here within which to populate the various actors.

3.3.2 The second structural component of interest is that of *networks* – informal and formal; again a categorisation of networks needs to be

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drawn up here. These can often feature as networks of actors. Formal networks are, as one would expect, more easily identified than informal.

3.3.3 The third structural component is *institutions*. These have to do with "culture, norms, laws, regulations and routines" (another form of context, perhaps?). "Generally, institutions need to be adjusted or aligned to a new technology". (In the case of MUTPs there are institutions/agencies specifically set up for the project and those that existed before it/introduced after it – both the latter often have to experience an alignment period to the project once completed). "Sometimes, it is the very lack of institutions that is of interest".

3.3.4 "For TISs that are only just emerging there are inherent uncertainties, implying that the identification of structural components is thorny…It may prove hard to recognize the relevant actors when directories are scarce, no industry associations exist or if the actors themselves are not aware of belonging to a certain TIS.

3.4 Step 3: Mapping the functional pattern of the TIS

3.4.1 As shown by Figure 2, Step 3 is broken down into two 'sub-steps', as follows:

- **Step 3a. Mapping the functional pattern of the TIS** - i.e. identifying the extent to which functions are fulfilled in the system (or how the system behaves in terms of a set of key processes);
- **Step 3b. Achieved functional pattern** - represents a synthesis of findings from the analysis in 3a to provide a description and tentative assessment of strengths and weaknesses of processes in the system.

3.4.2 The first task of this step (3a) is to describe "the functional patterns of the system." This analysis aims to establish "how the TIS is behaving in terms of a set of key processes". This has no normative features as assessing the "goodness" of the current functional pattern will be dealt with later. It identifies the following seven elements:

- **Knowledge development and diffusion**
  - "This is the function that is normally at the heart of the TIS and is concerned with how well the local TIS performs in terms of its knowledge base and evolution.
  - The function captures the breadth and depth of the current knowledge and how it changes over time.
  - Different types of knowledge can be distinguished (e.g. scientific, technological, market, logistics etc).
  - "The current level and dynamics of the function could be measured by a range of indicators.

- **Influence on the direction of search**
  - Visions, expectations and beliefs in growth potential;

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- Actors' perceptions of the relevance of different types and sources of knowledge;
- Actors' assessment of present and future technological opportunities and conditions;
- Regulations and policy
- Articulation of demand
- Technical bottlenecks or "reverse salients";
- Crisis in current business.

- **Entrepreneurial experimentation**
  - "A TIS evolves under considerable uncertainty in terms of technologies, applications and markets. This uncertainty is a fundamental feature of technological and industrial development and is not limited to early phases in the evolution of a TIS".
  - "The main source of uncertainty reduction is entrepreneurial experimentation" (is it??? Some would argue it represents a major source of uncertainty addition) whereby many will fail, some will succeed and a social learning process will unfold (currently this is poorly developed in MUTP planning and is confined with the major companies that have a long track record in the field, often not sharing experiences. In effect the OMEGA research programme is an attempt to map out a number of experiments and register lessons learned.

- **Market formation**
  - "For an emerging TIS or one in a period of transformation, markets may not exist, or be greatly underdeveloped."
  - "Market formation normally goes through three phases with quite distinct features": (1)'nursing markets' need to evolve so that a "learning space" is opened up; (2) 'bridging markets' which allows for volumes to increase and for an enlargement in the TIS in terms of number of actors; (3) 'mature successful mass markets'.

- **Legitimation**
  - "Legitimacy is a matter of social acceptance and compliance with relevant institutions – the new technology and its proponents need to be considered appropriate and desirable by relevant actors in order for resources to be mobilized".
  - "Legitimacy is a prerequisite for the formation of new industries …it is not given but is formed through conscious actions by various organisations.
  - This process may take considerable time and is often complicated by competition from adversaries.
  - Different legitimation strategies include: (1) institutional alignment; (2) manipulation of the rules of the game; (3) conformance to the rules; and (4) creation (developing a new institutional framework).

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- "Mapping the functional dynamics of legitimation includes analyzing both the legitimacy of the TIS in the eyes of the various relevant actors and stakeholders and the activities within the system that may increase this legitimacy.

- **Resource mobilization**
  - "As aTIS evolves, a range of different resources needs to be mobilized".
  - There is then a need to understand the extent the system is able to mobilize: (1) competence/human capital in education/training as well as in entrepreneurship, management and finance, as well as (2) complementary assets such as products, services and infrastructure.
  - Resource mobilization may be measured by: (1) rising volume of capital; (2) increasing volume of seed/venture capital; (3) changing volume/quantity of human resources; and (4) changes in complementary assets.

- **Development of positive externalities**
  - "The systematic nature of the innovation and diffusion process strongly suggests that the generation of positive external economies is a key process in the formation and growth of a TIS".
  - "Entry of new firms into the emerging TIS is central to the development of (positive and negative) externalities."
  - "In sum, the analyst needs to capture the strengths of the functional dynamics" of innovation and diffusion by searching for external economics in the form of resolution of uncertainties, political power, legitimacy, combinatorial opportunities, pooled labour markets" etc as well as information and knowledge flows. (Opportunities in related real estate development for MUTP stakeholders initially involved in line-haul development may constitute an illustration of this).

3.4.3 The second task of this step (3b) is to synthesise the findings from task 3a so as to both describe and assess the principal strengths and weaknesses of (important) processes present in the TIS. The assessment of strengths and weaknesses is, as this stage, somewhat tentative pending further 'testing' and refinement.

3.5 **Step 4: Assessing functionality of the TIS and setting process goals**

3.5.1 The preceding analysis provides a description of the dynamics of the key seven processes or functions in the evolution of the ITS, as well as a tentative assessment of the strengths and weaknesses of these processes. This does not, however, inform us whether the TIS as a whole is well functioning or not (the primary focus of investigation of the OMEGA Centre's research into MUTPs).

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3.5.2 “In order assess system functionality – i.e., not how, but how well the system is functioning – we need ways to evaluate the relative ‘goodness’ of a particular structure” (presumably against pre-agreed criteria) in terms of the seven clearly specified key processes.

3.5.3 “We face here one of the major challenges for analysts and policy makers …. So far, we have identified two bases for an assessment: (1) the phase of development; and (2) system comparisons. Both are associated with different types of problems and in order to balance each other’s weakness, they should probably be used in combination.”

3.5.4 Phases of development:

- One needs to distinguish between a formative phase and a growth phase as definition of ‘functionality’ may differ between these phases.

- The next analysis needs to examine whether functionality matches the needs of that particular phase or that of the next, as well.

- The analysts may use a number of indicators to know whether or not the system is in a formative phase or not.

- The formative stage (possibly applicable to a number of our Case Studies) may be indicated by:
  - the time dimension;
  - the presence of prevailing uncertainties;
  - the price/performance of products/services not well developed;
  - the volume of diffusion and economic activities that is but a fraction of estimated potential;
  - the demand being unarticulated; and
  - the absence of powerful self reinforcing features and weak positive externalities (even strong negative externalities).

- “A common error made by analysts is to judge a TIS that is in a formative phase by using criteria that are more suitable for evaluating a system which is in a growth phase”.

- “The formative phase is characterised by high uncertainty in terms of technologies and markets …. Key words are therefore experimentation and variety creation” which requires extensive (co-ordinated) ‘entrepreneurial experimentation in such ways that ‘knowledge development’ occurs (a primary aim of the OMEGA research programme).

- “Moreover, a process of ‘legitimation’ must start, helping to overcome the ‘liability of newness’ associated with new actors and technologies and eventually leading to institutional change.”

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- "Finally, 'knowledge development' is to a large extent dependent on cooperation between actors (in networks) …..which require 'market formation.'

- "At some stage in time, the TIS may be able to 'change gear' and begin to develop in a self-sustaining way as it moves into the 'growth stage'. In this phase, the focus shifts to system expansion and large-scale technology diffusion through the formation of 'bridging markets' and subsequently 'mass markets.

3.5.5 Comparisons between TISs

- Comparing the focal TIS across nations "is a powerful way of improving the understanding for decision-makers" as it provides an invaluable basis for knowledge building and improved practice elsewhere/in the future.

- There needs to be a comparative assessment of how well these different systems (MUTPs) are performing (relative to their own context and generic principles/visions of sustainability).

- A subsequent search for an explanation for the assessments based on the phase analyses and or one or more comparative analyses will drive out conclusions regarding the functionality of the system in a comparative framework from which generic and context-specific lessons and guidelines can potentially be extracted.

- In so doing, it is then also possible to specify policy goals (in the form of tentative generic and context-specific guidelines/lessons) in terms of how the functional pattern should develop in order to reach higher (better) functionality - i.e. towards a 'targeted' functional pattern".

- Following the preceding methodology, policy goals (tentative guidelines/lessons) may be expressed "in terms of the seven key processes in contrast to final goals (such as growth)."

- This approach is important as it offers "the advantage for policy makers in that they are 'closer' to the various instruments that can be used, and they also make it easier to evaluate how well a specific policy works". This is especially valuable for the early phases of development where/when uncertainty is typically highest.

3.6 **Step 5: Identify inducements and blocking mechanisms**

3.6.1 "There are many reasons for expecting that the environment (context) is biased, and will remain biased, in favour of established TIS" with the result that new technologies experience "weak functional dynamics and develop slowly, or in a stunted way."

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3.6.2 These weak functional dynamics "may be found in the features of the structural components of the emerging system and in the larger context surrounding….for instance, the reaction, or lack of it to global warming act as either an inducement mechanism or as a blocking mechanism" which may influence many emerging TISs.

3.6.3 "What is being achieved in the TIS is therefore only in part a result of the internal dynamics of the system" – exogenous factors also come into play, influencing the internal dynamics (see Friend and Hickling, 2005 and Peter Hall's Planning Disasters book re: this, plus Myrdal, 1957:18).

3.6.4 From a policy perspective, it is particularly important to understand the 'blocking mechanisms' that shape the nature of the dynamics". These could be one of the following:

- "The proponents of the new technology may be organisationally too weak to a contribute to a 'legitimation' process";
- Underdeveloped capabilities may exist among potential customers which may/can lead to an "absence, or poor articulation of demand which (in turn) results in a poor development of: (1) the dynamics of 'market formation', (2) influence on the direction of search; and (3) entrepreneurial experimentation; and
- "Networks may fail to aid new technology simply because of poor connectivity between actors".

3.6.5 "It is empirically possible, and very useful, to map the relationship between inducement/blocking mechanisms and functional patterns" especially for systems in a 'formative stage.'

3.6.6 The 'functional pattern of aTIS in its formative stage may be summarized as follows:

- Knowledge development and diffusion: these are often pilot projects;
- Market formation: local projects constitute 'nursing markets' albeit fragmented;
- Influence on direction of search: can be supported by government R&D funding/search for new markets;
- Entrepreneurial experimentation: provides basis for selected new "developed solutions";
- Resource mobilization: can rely on EU & R&D funding/co-funding;
- Legitimation: characterised by partly underdeveloped legitimacy;
- Development of positive externalities: early stage of cluster formation.

3.6.7 The current functional pattern is shaped by both inducement and blocking mechanisms (see Figure 2). There are two significant 'inducement mechanisms':

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- A belief in growth potential – driven by a range of factors including demographic change, public sector funding restrictions and emerging technological opportunities; and
- government R&D policy – which points to opportunities and provides research for experimentation.

3.6.8 'Blocking mechanisms' are typically identified by the following functions:

- The absence of standards (which lead to a fragmented market) and prevents mature market formation;
- Entrepreneurial experimentation, influence on direction of search and legitimation are blocked by two (three) factors, namely:
  - lack of capability,
  - poor articulation of demand, and
  - uncertainties of customer needs.
- In some instances, the impact of blocking mechanisms is magnified by the interdependencies of under-performing functions.
- "Clearly, it could be argued that policy must focus on reducing the strength of the blocking mechanisms that have such a pervasive effect."

3.7 **Step 6: Specify key policy issues**

3.7.1 "Having made explicit both the reasons for setting the process goals, and how to measure whether the goals are reached, we can now begin to specify the key policy issues related to the mechanisms that (1) block or (2) induce a development of a desirable functional pattern.

3.7.2 "We argue that policy should aim at remedying poor functionality by strengthening/adding inducement mechanisms and weakening/removing blocking mechanisms.

3.7.3 Examples of six specific policy issues connected to removing or reducing the strength of the many blocking mechanisms include:

- How to raise user capability so that demand is articulated and uncertainties reduced;
- How to support users in order to: (1) increase their knowledge of their benefits; (2) diffuse knowledge of the outcomes of early experimentation as a means to reducing further uncertainties;
- How to support experimentation with new applications in order to reduce the level of uncertainty of needs;
- How to develop standards to move from fragmented markets to more cohesive markets;
- How to alter research and education to allow for improved resource mobilization; and
- How to improve a weak advocacy coalition so that ot can improve the process of 'legitimization.

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4.0 Summary and discussion

4.1 The purpose of the above is to present /explain a six stepped "scheme of analysis that can be used to identify the key policy issues and set goals in any TIS" that employs at its core seven key processes, labelled as 'functions'.

4.2 "The main application of the framework is the identification of 'system failures' or weaknesses, expressed in functional terms. Policy makers can also define process goals of their intervention in terms of ….. an altered way in which the seven key processes are operating."

4.3 By explaining the nature of these processes in terms of the outcome of a balance between various inducement (enabling) and blocking (resistant) mechanisms, the functional dynamics approach can then be used as a focusing device for policy makers that seek to identify the key policy challenges for moving a specific TIS towards these process goals."

4.4 "In the course of analysis, many sources of uncertainties have been identified - both those inherent in the process as well as "those additional sources facing the analyst in search of useful methods and tools." From this knowledge information will emerge about appropriate indicators and about how to assess functionality (of the system).

4.5 Regarding the 'functionality' of the system, three points are made:

- There is a need for much further research on 'the goodness' of different functional patterns - here assessment was presented in terms of requirements of particular phases of development, and on comparisons between systems. What would be beneficial here is to draw out generic as opposed to phase (context) specific criteria.

- A promising way forward seems to be one based on the phase of development of the system. In particular, it is argued that a better appreciation of the 'formative phase' of systems be acquired so as to establish "to what extent, and in what ways, the functional requirements of that phase differ from those of later phases." Although it is acknowledged that "systems are different and develop on different ways ….it ought to be possible …to develop a taxonomy of 'archetypal' development paths with associated functional patterns by empirical investigation."

- Such taxonomy may be required to better inform policy makers under what conditions (context) "a transition between the 'formative phase' and 'growth phase' may occur and how the foundation for such a transition can be laid." What needs to be noted is that "a formative phase does not necessarily lead to a successful growth phase."

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4.6 In conclusion, it needs to be noted that an analysis of this kind outlined "builds on present knowledge and is therefore by no means a 'finished product'. It is instead part of a 'systematic learning process' that can be subsequently improved upon bettering our "understanding of the opportunities and limitations of innovation system analysis and policy making."

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PART 3:
ADAPTING BERGEK ET AL FRAMEWORK TO ANALYSIS AND SYNTHESIS NEEDS OF OMEGA RESEARCH PROGRAMME

1.0 Introduction

1.1 Here we seek to show how the Bergek et al framework could be modified to meet the needs of the Omega Research Programme while retaining the fundamental principles it puts forward. While we fully accept that there might be a number of possible frameworks that could lend themselves to the on-going OMEGA Research Programme, the framework proposed by Bergek et al appears eminently suitable for our needs for the reasons stated in Part 2. To reiterate, it is considered that MUTPs lend themselves to the Bergek et al approach in that they are:

- characteristically 'systems' comprising a group of components (devices, objects, agents) that ostensibly serve a common purpose, and;
- innovation systems in their own right (as evolving systems that are subject to considerable fluidity in the face of ever changing contextual elements/challenges).

1.2 The bulk of Part 3 is presented in tabular form and should be read in conjunction with Figure 3, which presents an overview of the framework process. The tables presented below show, for each Step, how the OMEGA research programme fits into the core structure of the Bergek et al framework and simultaneously highlighting key areas where modifications are likely to be necessary.

1.3 It should be noted that the following 'step-by-step' proposals are principally concerned with establishing how, *in principle*, it is possible to accommodate the Omega research programme's need for a suitable analysis and synthesis framework within the Bergek et al model. It is acknowledged that the precise mechanisms associated with each Step still need some additional thought and development before finalising an analysis and synthesis framework that is in full readiness for application to the OMEGA Research Programme. The major part of this development will take place during discussions with OMEGA Partners at the forthcoming Lund Workshop in April 2009. Following which additional refinements will be made as appropriate.

1.4 Partners may also care to note that, in regard to Figure 3 (below) and paragraph 1.3 in Part 1:

- Steps 1-3b generally relate to the individual Case Study syntheses and Country-based syntheses that need to be completed by end-2009);
- Steps 4 and 5 will also require Partner input and guidance;
- Step 6 will be largely undertaken by the Centre Team but Partner input (on a voluntary basis) will be greatly welcomed.

These points are more readily explained by reference to Figure 3 and the tables presented below.

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1.5 To complete the Steps presented below it will be necessary to make use of quantitative and qualitative *data inputs* derived from a number of sources, including:

- **Case Study data** (project characteristics, project timeline etc.);
- **Pre-Hypothesis** interview transcripts and Case Study-based analyses thereof;
- **Hypothesis-Led interview transcripts** and Case Study-based analyses thereof;
- **Case Study Syntheses** (of above data);
- **Country Syntheses of Case Study Findings** (of above data);
- **OMEGA 1 Project**, Working Paper #4 (Risk, Uncertainty, Complexity and Context);
- **OMEGA 2 Working Paper #1 Series** (National Policy Frameworks) and synthesis thereof;
- **OMEGA 2 Working Paper #2 Series** (Sustainable Development Challenges) and synthesis thereof.

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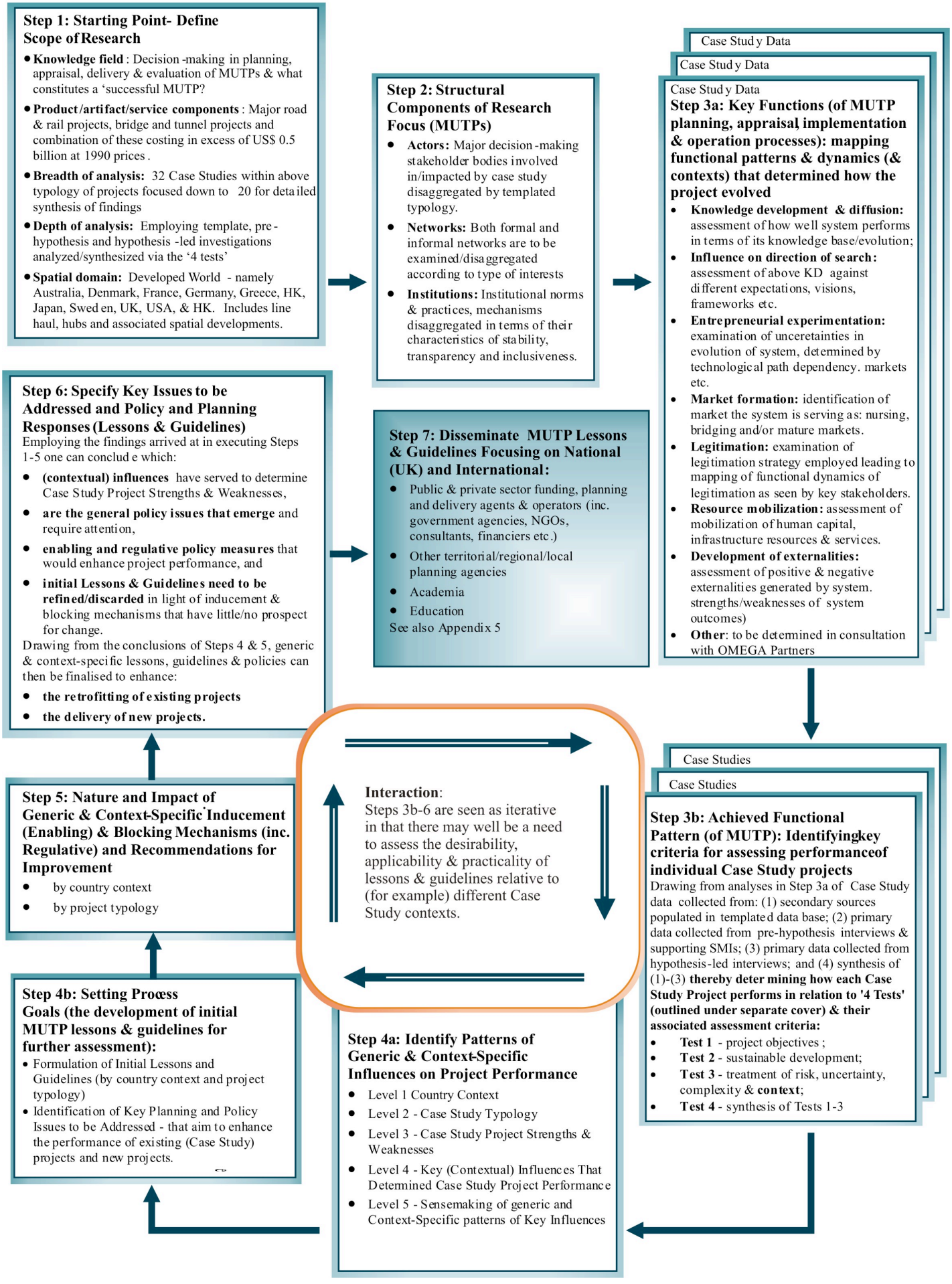
Figure 3 - Scheme of Analysis Framework Adapted to OMEGA Research Programme



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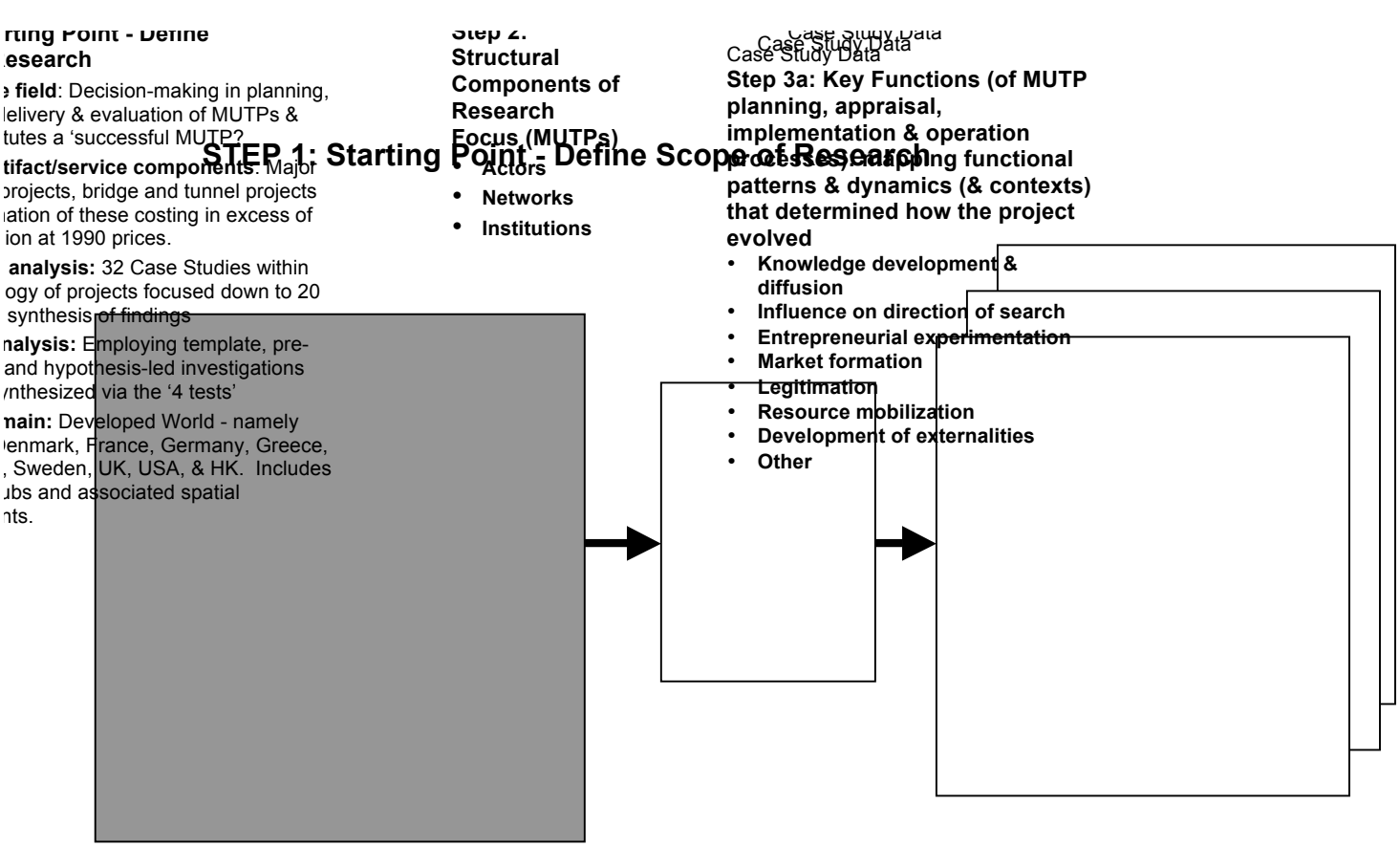

Step/tasks	OMEGA Response/Applicability	Data Sources
Step 1 Title →	**Bergek et al Paper - The starting point for the analysis: defining the TIS in focus** **OMEGA - Starting Point: Define Scope of Research**	
Knowledge field or Product/ Artifact?	• It is suggested here that the OMEGA Research Programme encompasses both Knowledge Fields and Products/Artifacts • **Knowledge Fields:** research into decision-making by key stakeholders in the planning, appraisal, implementation and operation of MUTPs and how well risk, uncertainty, complexity and context have been treated in these processes. • **Products/Artifacts:** comprise MUTPs as defined by the original OMEGA Proposal and its overarching research question – i.e., what constitutes a successful MUTP in the 21st century. Here, products/artifacts are also taken to include those 'services' and other externalities provided by (or as a result of) MUTPs.	OMEGA Research Proposal

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STEP 1: Starting Point - Define Scope of Research (Continued)

Step/Tasks	OMEGA Response/Applicability	Data Sources
Breadth & depth (of analysis & synthesis)	• **Breadth of research** is defined by: o OMEGA definition of MUTPs (US$ 0.5bn @ 1999 prices); o Selected typology of MUTPs (road, rail, bridge and combinations thereof); o 32 selected Case Studies; o Decision-making involved in the whole project lifecycle (from conception to operation): from planning and appraisal through to execution and evaluation disaggregated by analysis of stakeholder involvement/influence/interaction; o Contextual concerns that determine the nature of funding, characters of project ownership, reasons for construction etc. • **Depth of research** is defined by: o The need to respond to all key aspects of the overarching research question (i.e. 'what constitutes a successful MUTP') and related sub-questions that amplify different aspects of this overarching question (see Part 1 above); o The decision to employ the '4 Tests' and the scope/coverage implied by them; o The criteria used to enable the assessment of project performance relative to the '4 Tests'; o The availability of data from (inter alia): templates, pre-hypothesis investigations, hypothesis-led investigations and syntheses thereof plus Working Paper Series 1 (and synthesis), Working Paper Series 2 (and synthesis), OMEGA 1 findings; o The number, composition and capacity of Centre and Partner research teams with allocated study duration and budget as approved by VREF. **Note:** Case Studies - in regard to the breadth and depth of research it should be noted that the current intention is to: o complete project templates for all 32 identified OMEGA Case Studies; o undertake both pre-hypothesis and hypothesis-led research for all 32 Case Study projects, yielding a minimum of 650 interviews with key stakeholders (which are to be transcribed) for analysis which will be input to Case Study syntheses; o prepare syntheses of findings for all Case Studies; o prepare syntheses of findings for typologies of projects and for different contextual elements (e.g. by country, project funding type, development/implementation period etc.); o prepare context-specific and generic lessons and guidelines for the retrofitting of existing Case Study projects (as well as new projects).]	OMEGA Research Proposal
Spatial (and temporal) domain	Spatial domain confined to: • Countries of the Developed World with projects completed since 1990. • Projects in the UK (Centre Case Studies) & Partner countries of: Australia, France, Germany, Greece, Hong Kong (PRC); Japan, Netherlands, Sweden & USA. • The hinterlands of the projects as defined by the Partner analysis highlighting a specific region/sub-region/locality with which the Case Study MUTP is believed to principally interact. • The project's line haul, principal transport hubs, associated developments & spatial/policy plans with which the Case Study projects have been determined/interact. **Note:** OMEGA specifically does not seek to precisely identify the spatial distribution of impacts associated with each Case Study MUTP.	OMEGA Research Proposal

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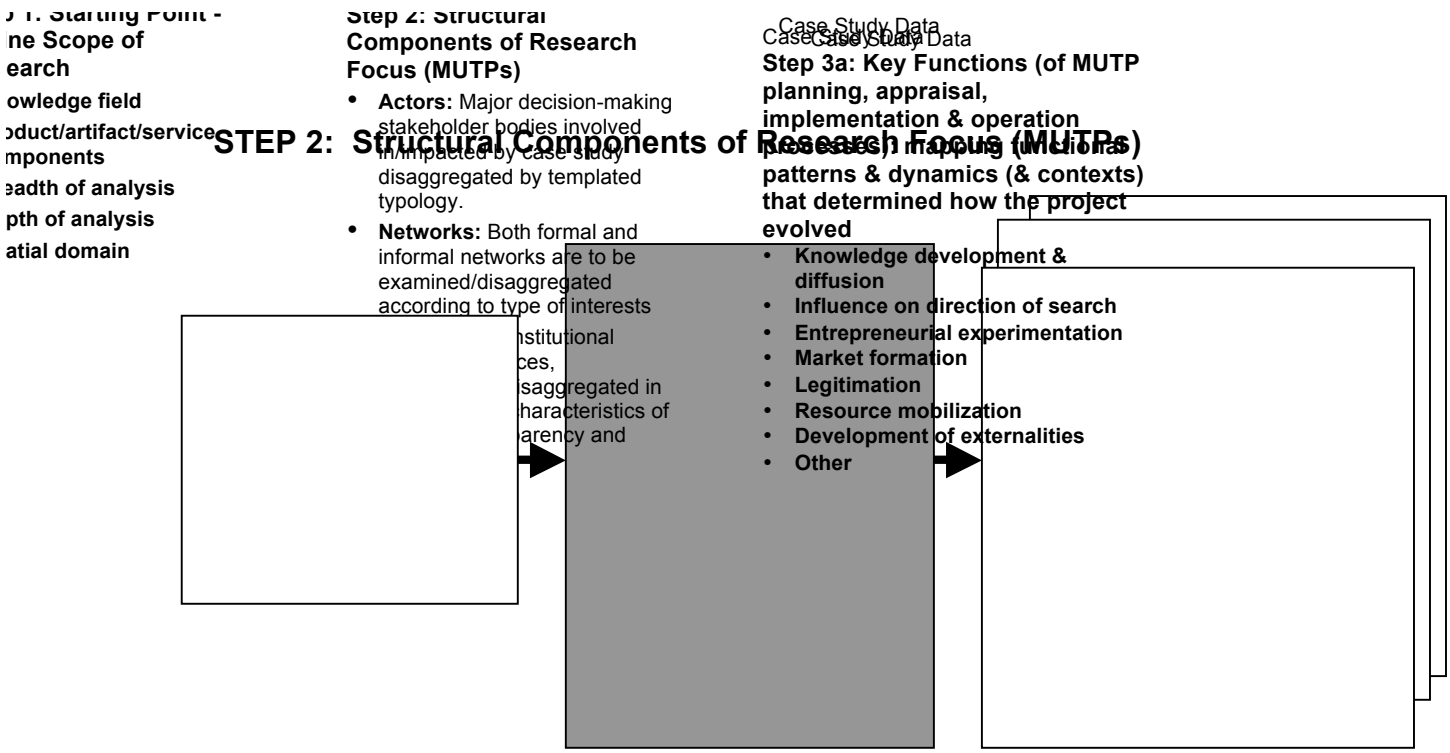

Step/Tasks	OMEGA Response/Applicability	Data Sources
Step 2 Title →	**Bergek et al Paper - Identifying the structural components of the TIS** **OMEGA - Structural Components of Research Focus (MUTPs)**	
Actors	• **Major stakeholders involved in/impacted by Case Studies** with clear criteria provided of what constitutes "major". It should be here noted that the VREF proposal focused primarily on stakeholders that were project patrons rather than community & other parties impacted by projects • **A templated typology of major stakeholders** is to be provided which differentiates between those belonging to the: public sector agencies, private sector organizations, NGOs, local/community groups & mixed agencies (e.g. PPPs) • **A further disaggregation of major stakeholders is to be provided** that define their focus of interest, agenda, task/remit, mandate, influence on decision-making and project outcomes. • **Examples include:** champions, key decision makers, lobbyists, sponsors/promoters, implementation agents, policy-makers, government departments, local authorities, regional development bodies, community groups, developers, financiers etc.	• WP#1 • Case Study project template & timeline • Case Study interview transcripts
Networks	• **Both formal and informal networks** are to be examined. • **A further disaggregation of these networks is to be provided** that define in their focus, agenda, task/remit, mandate, influence on decision-making and project outcome, longevity etc. • **Examples include:** networked lobby groups, community groups, political groups, local authority groups etc.	• Case Study templates & timelines • Case Study interview transcripts
Institutions (& their frameworks)	• **Institutional norms & practices:** cultural norms, laws, regulations, regimes, policy frameworks etc. • **Institutional mechanisms:** includes enabling mechanisms; planning & environmental regimes; planning & transport policy frameworks; visions; guidelines; political party lines; governance regimes; private sector promotional practices etc. • **Characteristics of norms, practices & mechanisms:** identification of degree of stability and transparency and whether derived in an inclusive, consultative, autocratic manner.	• WP#1 • WP#2 • Case Study templates & timelines • Case Study interview transcripts

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Case Study Data

Case Study Data

Step 2: Structural Components of Research Focus (MUTPs)

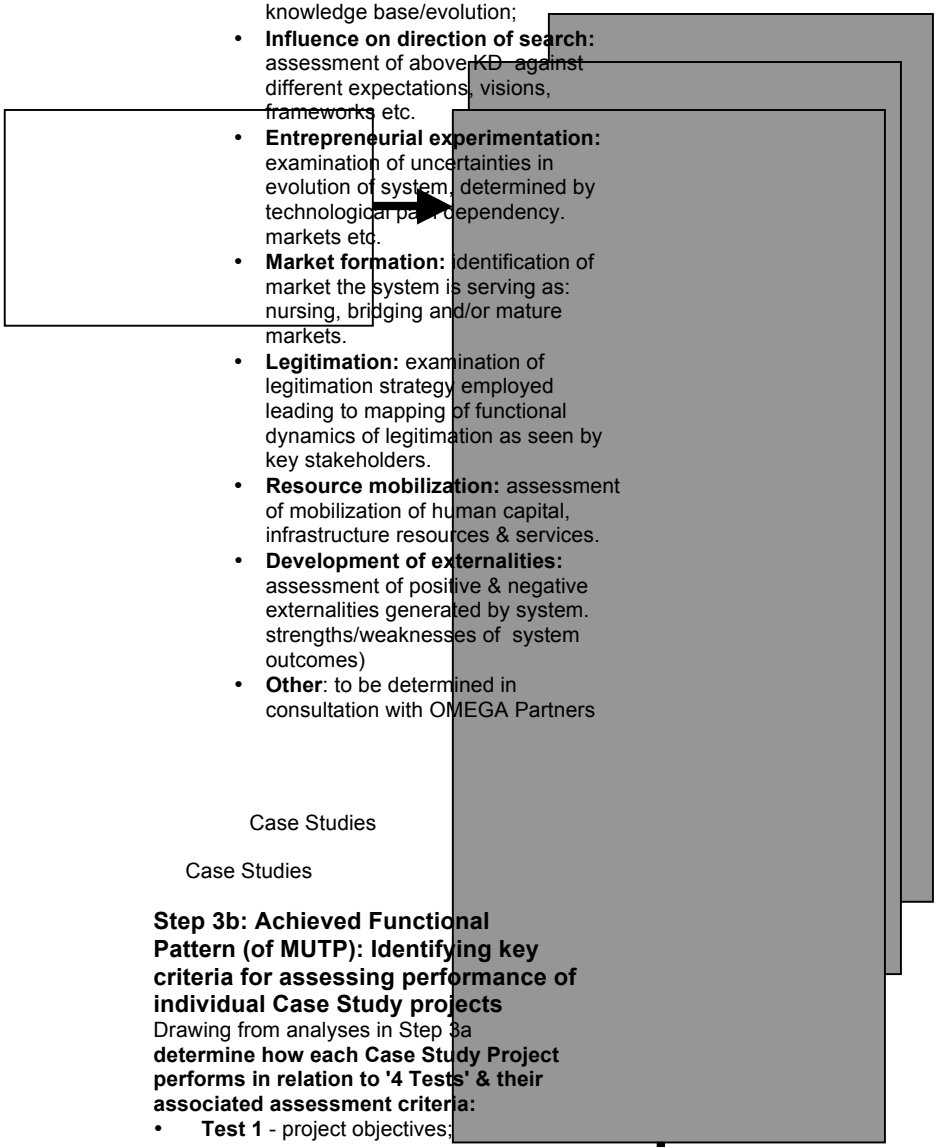
- **Actors**
- **Networks**
- **Institutions**

Case Study Data

Step 3a: Key Functions (of MUTP planning, appraisal, implementation & operation processes): mapping functional patterns & dynamics (& contexts) that determined how the project evolved

- **Knowledge development & diffusion:** assessment of how well system performs in terms of its knowledge base/evolution;
- **Influence on direction of search:** assessment of above KD against different expectations, visions, frameworks etc.
- **Entrepreneurial experimentation:** examination of uncertainties in evolution of system, determined by technological path dependency. markets etc.
- **Market formation:** identification of market the system is serving as: nursing, bridging and/or mature markets.
- **Legitimation:** examination of legitimation strategy employed leading to mapping of functional dynamics of legitimation as seen by key stakeholders.
- **Resource mobilization:** assessment of mobilization of human capital, infrastructure resources & services.
- **Development of externalities:** assessment of positive & negative externalities generated by system. strengths/weaknesses of system outcomes)
- **Other**: to be determined in consultation with OMEGA Partners

STEP 3a: Key Functions (of MUTP planning, appraisal, implementation & operation processes): mapping functional patterns & dynamics (& contexts) that determined how the project evolved



Case Studies

Case Studies

Step 3b: Achieved Functional Pattern (of MUTP): Identifying key criteria for assessing performance of individual Case Study projects

Drawing from analyses in Step 3a **determine how each Case Study Project performs in relation to '4 Tests' & their associated assessment criteria:**

- **Test 1** - project objectives;
- **Test 2** - sustainable development;
- **Test 3** - treatment of risk, uncertainty, complexity & **context**;
- **Test 4** - synthesis of Tests 1-3

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Step/tasks	OMEGA Response/Applicability	Data Sources
Step 3a Title →	**Bergek et al Paper - Mapping the functional pattern of the TIS (shown as 'Functions' on Figure 1)** **OMEGA - Key Functions (of MUTP planning, appraisal, implementation & processes): mapping functional patterns & dynamics (& contexts) that determined how the project evolved**	
Knowledge development & diffusion	• **Knowledge development & dissemination/diffusion** is defined as the assessment of how well the system performs in terms of its knowledge base & evolution. • **The knowledge base** is taken to include: o the availability and continuing development of 'good' practice guidance for MUTP planning/appraisal/delivery/operations relative to integration of planning-transport-sustainability visions; o accessibility to/sharing and dissemination of such guidance amongst key stakeholders. • **The 'mapping' process** in respect of this element entails an assessment of the extent to which the available (and accessible) knowledge base was applied in the planning, appraisal, delivery and operation of the Case Study project.	• WP#1 • WP#2 • Case Study templates & timelines • Case Study interview transcripts
Influence on direction of search	• **Influence on direction of search** represents the assessment of the impacts of various key influences in determining the key objectives, characteristics and outcomes of the Case Study projects. • **These key influences include**: o the existence of overarching visions, expectations and beliefs that helped shape project objectives (such as climate change, sustainability, economic growth, regeneration etc.); o stakeholder perceptions of the relevance of different types and sources of knowledge; o stakeholder assessments of present and future technological opportunities; o policy and statutory/regulatory frameworks o stakeholder articulation of demand for MUTP 'products and services'; o technical bottlenecks, including addressing perceived problems such as incomplete networks, congestion etc.	• WP#1 • WP#2 • Case Study templates & timelines • Case Study interview transcripts
Entrepreneurial experimentation	• **Entrepreneurial experimentation:** for this element there is a need to assess uncertainties in the evolution of the 'system' (Case Study MUTP), determined by technological path dependency, markets etc. This includes an examination of entrepreneurial experimentation as a means to reduce uncertainty. It involves a variety of matters such as: o probing new systems & technologies and innovation in technical aspects; o encouraging diversity and spreading financial risk; o identifying new entrants to the system; o identifying different types of applications; o exploring new technological applications etc. • **For the Case Study projects** this could include exploration of policy initiatives that have been used to link MUTPs with spatial development/growth, restructuring, regeneration etc., exploration of new financing sources/methods (PPP/PFI) etc.	• Case Study templates & timelines • Case Study interview transcripts

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STEP 3a Continued

Step/Tasks	OMEGA Response/Applicability	Data Sources
Market formation	• **Market formation** comprises: o the identification of the market (Case Study MUTP) the system is serving - whether these are 'nursing', 'bridging' and/or 'mature' markets; o identifying whether the market is new, expanding, diversifying; o identifying what is driving new market formation and demand. • This element can therefore be taken as representing the both the broad context for MUTP conception and the type of forces that shape its ultimate desired/needed form and operation.	• Case Study templates & timelines • Case Study interview transcripts
Legitimation	• **Legitimation:** this requires an examination of the legitimation strategies employed (for Case Study MUTPs), leading to the mapping of functional dynamics of legitimation as seen by key stakeholders. It involves the identification of: o social acceptance and compliance with relevant institutions, with a focus on the perceptions of key stakeholders; o how legitimacy influences demand, legislation and behaviour - including what/who influences legitimacy, and by what means. • **For Case Study MUTPs** this means: o analysing the legitimacy of the MUTP in the eyes of relevant stakeholders; o identifying activities that increase such legitimacy; o identifying key points/moments in time when sufficient 'momentum'/consensus/critical mass has been obtained to enable acceptance of the Case Study project concept and form by key stakeholders; o identifying whether the Case Study MUTP outcomes are reflective of current institutions or have resulted in changed institutions?	• Case Study templates & timelines • Case Study interview transcripts
Resource mobilization	• **Resource mobilization:** this requires the assessment of the mobilization of human capital, infrastructure resources & services - including the availability of competence/human capital, financial capital and complementary assets. • For Case Study MUTPs, this may include the identifying the availability of investment capital, different forms/types of investment, key personnel/stakeholders 'within' and 'outside' the project.	• Case Study templates & timelines • Case Study interview transcripts
Development of positive/ negative externalities	• **Development of positive and negative externalities:** for this element there is a need to assess the positive and negative externalities generated by system (Case Study MUTP). Such externalities include: o information flows/knowledge building (or lack of these); o resolution/creation/enhancement of uncertainties; o increase/decrease of stakeholder's political power and legitimacy; o combinatorial opportunities; o pooled labour. • **For Case Study MUTPs** this can be taken as including such externalities as: o regeneration impacts; o economic growth; o achievement of spatial restructuring; o sustainable development forms; o use of 'green' technology and reduced carbon emissions/footprint etc. The intention is to consult further with OMEGA Partners on the number/type of other elements to be included in this assessment.	• Case Study templates & timelines • Case Study interview transcripts

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STEP 3a Continued

Step/Tasks	OMEGA Response/Applicability	Data Sources
Development of positive/ negative externalities	• **Development of positive and negative externalities:** for this element there is a need to assess the positive and negative externalities generated by system (Case Study MUTP). Such externalities include: o information flows/knowledge building (or lack of these); o resolution/creation/enhancement of uncertainties; o increase/decrease of stakeholder's political power and legitimacy; o combinatorial opportunities; o pooled labour. • **For Case Study MUTPs** this can be taken as including such externalities as: o regeneration impacts; o economic growth; o achievement of spatial restructuring; o sustainable development forms; o use of 'green' technology and reduced carbon emissions/footprint etc. However, it should be noted that the intention is to consult further with OMEGA Partners on the number and type of other elements that need to be included in this assessment.	• Case Study templates & timelines • Case Study interview transcripts

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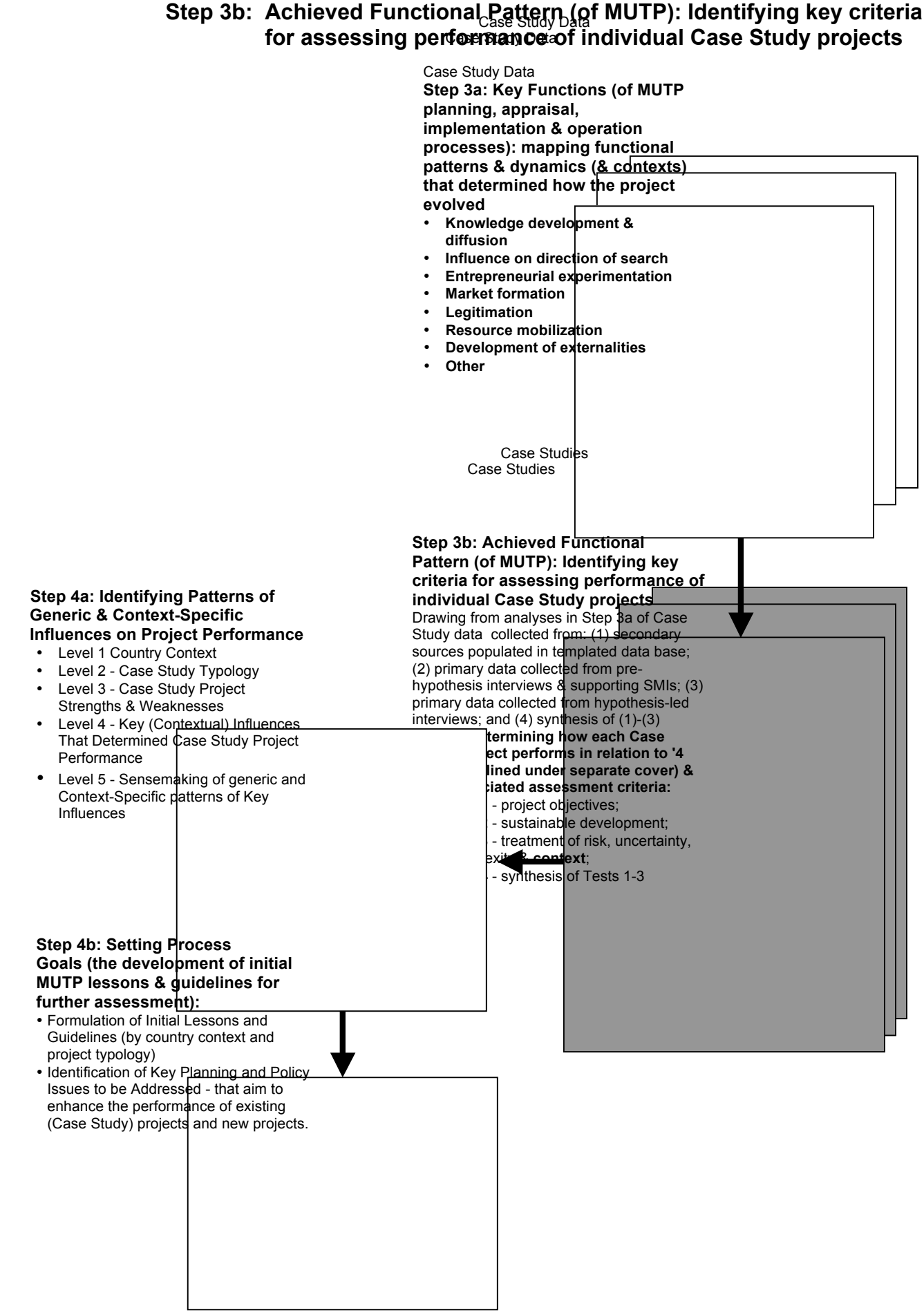
Step 3b: Achieved Functional Pattern (of MUTP): Identifying key criteria for assessing performance of individual Case Study projects



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Step/tasks	OMEGA Response/Applicability	Data Sources
Step 3b Title →	**Bergek et al Paper - Mapping the functional pattern of the TIS (shown as 'Achieved Functional Pattern' on Figure 1)** **OMEGA - Achieved Functional Pattern (of individual MUTP): Identifying key criteria for assessing performance of individual Case Study projects**	
Assessment of System's Functionality	• **Identification of functional pattern of Case Study MUTP** drawing from the analyses in Step 3a. • **Further identification of MUTP functional pattern of Case Study** drawing Case Study data collected from: o secondary sources populated in templated data base; o primary data sources collected from pre-hypothesis interviews & supporting SMIs; & o primary data sources collected from hypothesis-led interviews, • **Tentative assessment of strengths and weaknesses of individual case study by Employing 4 Tests to Case Study:** o **Test 1** – against set project objectives & related criteria; o **Test 2** – against sustainable development challenges & visions & related criteria; & o **Test 3** – against judgements of treatment of risk, uncertainty, complexity in decision-making & their contexts, & related criteria; o **Test 4** – synthesis of findings of T1 to T3, determining overall how Case Study Project performs in relation to '4 Tests' **Note**: evaluative criteria associated with each 'Test' are currently under development.	• Case Study templates & timelines • Case Study interview transcripts • OMEGA 1 Project (WP#4) • Multi Criteria Analysis
Assessment of Overall Functional Pattern Performance	• Based on the immediate above analytical/synthesis steps, conclude on overall functional pattern performance of each Case Study project as a basis for later multiple comparative study with other national projects/international Case Studies in Step 4	

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Case Studies

STEP 4a: Identifying Patterns of Generic and Context-Specific Influences on Project Performance

Step 3b: Achieved Functional Pattern (of MUTP): Identifying key criteria for assessing performance of transformational Case Study Projects

Drawing from analyses in Step 3a **determine how each Case Study Project performs in relation to '4 Tests' & their associated assessment criteria:**

- **Test 1** - project objectives;
- **Test 2** - sustainable development;
- **Test 3** - treatment of risk, uncertainty, complexity & **context**;
- **Test 4** - synthesis of Tests 1-3

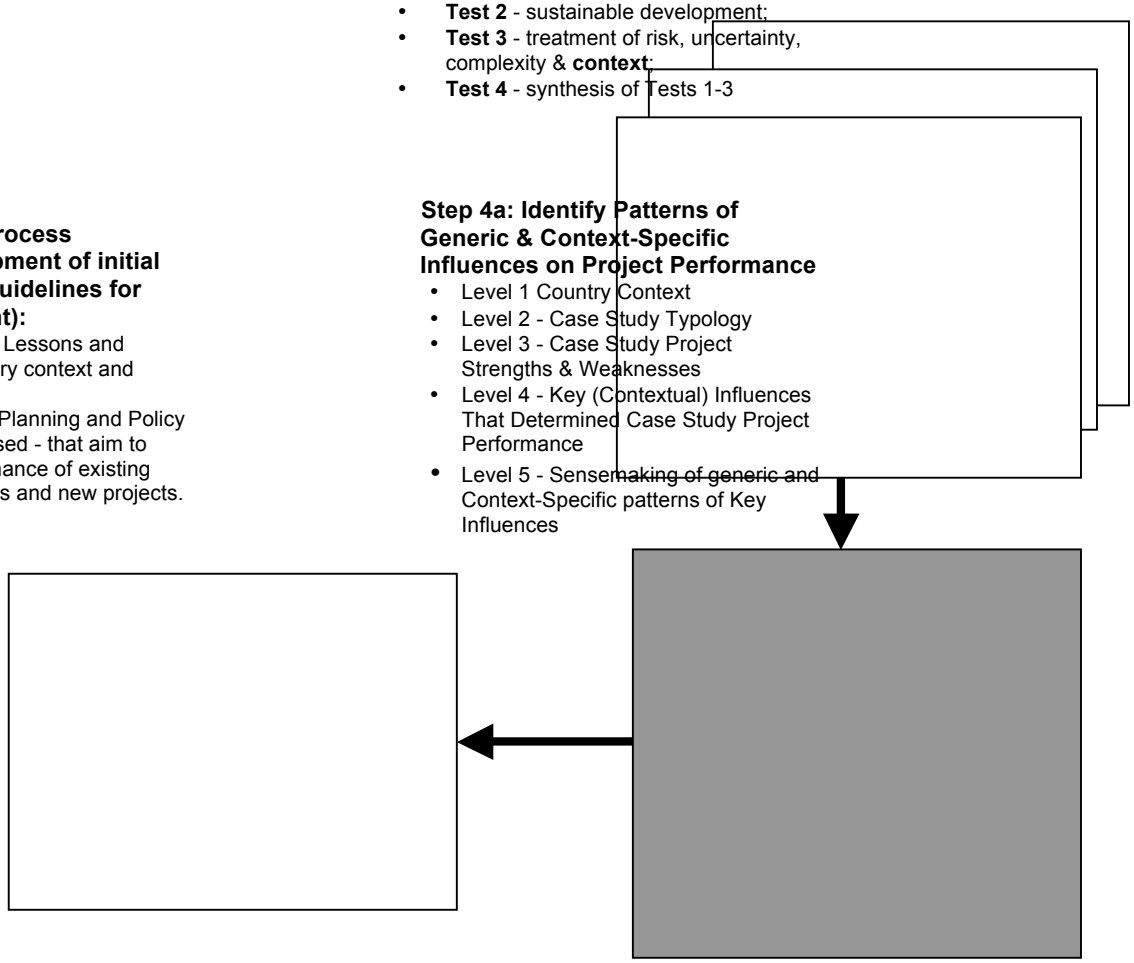
Step 4a: Identify Patterns of Generic & Context-Specific Influences on Project Performance

- Level 1 Country Context
- Level 2 - Case Study Typology
- Level 3 - Case Study Project Strengths & Weaknesses
- Level 4 - Key (Contextual) Influences That Determined Case Study Project Performance
- Level 5 - Sensemaking of generic and Context-Specific patterns of Key Influences

tep 4b: Setting Process oals (the development of initial UTP lessons & guidelines for urther assessment):

Formulation of Initial Lessons and Guidelines (by country context and project typology)

Identification of Key Planning and Policy Issues to be Addressed - that aim to enhance the performance of existing (Case Study) projects and new projects.



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Step/Tasks	OMEGA Response/Applicability	Data Sources
Step 4a Title →	**Bergek et al Paper - Assessing the functionality of the TIS and setting process goals** **OMEGA - Step 4a: Identify Patterns of Generic and Context-Specific Influences on Project Performance**	
Functionality of System	• Whilst the Bergek et al approach remains broadly appropriate, it is necessary to modify this Step in order to take account of the wide range of multiple contexts which are likely to have had a significant influence on the 'performance' of the Case Study projects (strengths and weaknesses) as determined by the analysis in Step 3b using the '4 Tests'. Thus, as shown in Figure 4, Step 4a entails the identification of (firstly) the key contextual influences that have driven Case Study project performance and (secondly), based on this, the emerging patterns of influence that are either broadly applicable across multiple projects (generic) or rather more specific to individual projects (context specific). This sub-process is presented graphically in Figure 4 below and is summarised as follows: ○ **Level 1** (country context) and **Level 2** (project type context) represent the starting point for this sub-process as these are essentially the principal 'fixed' elements. Country contexts: Australia, France, Germany, Greece, Hong Kong, Japan, Netherlands, Sweden, USA, UK. Project Types: Rail ○ Conventional heavy rail (passenger/freight/combination) ○ High speed rail (passenger/freight/combination) ○ Metro ○ LRT Road (including motorway/freeway, bridge, tunnel and combinations thereof) ○ Intra-urban ○ Inter urban It is readily accepted that both of the above (country context and project type) are capable of considerable further sub-division - e.g. to take account of project location within a country. However, in order to avoid commencing this sub-process from a wide range of multiple points that may ultimately prove confusing, it is suggested to adopt the above rather simpler classification approach. In addition, it is expected that the further breakdown of contextual influences will take place at Level 4 (see below). ○ **Level 3** of this sub-process comprises the input by the Centre and Partners (from the '4 Tests' in Step 3b) of the key strengths and weaknesses of each case Study project. ○ **Level 4** entails an assessment by the Centre and Partners of the 10 most influential contextual forces that have determined (either singly or in combination - e.g. as a 'string of contextual forces') project performance for each Case Study project. These contextual influences will need to be ranked in order of importance by the Centre and Partners for each project. ○ **Level 5** comprises a sensemaking exercise where we will seek to identify contextual influences that have a degree of universality across multiple projects (generic influences) and those which are applicable largely to individual Case Study projects (context-specific influences). The precise mechanics of this sub-process will be developed further in discussion with Partners.	• Based on input from Step 3b. • Compare & contrast analysis

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vel 1 - Country Context

e.g. Aus

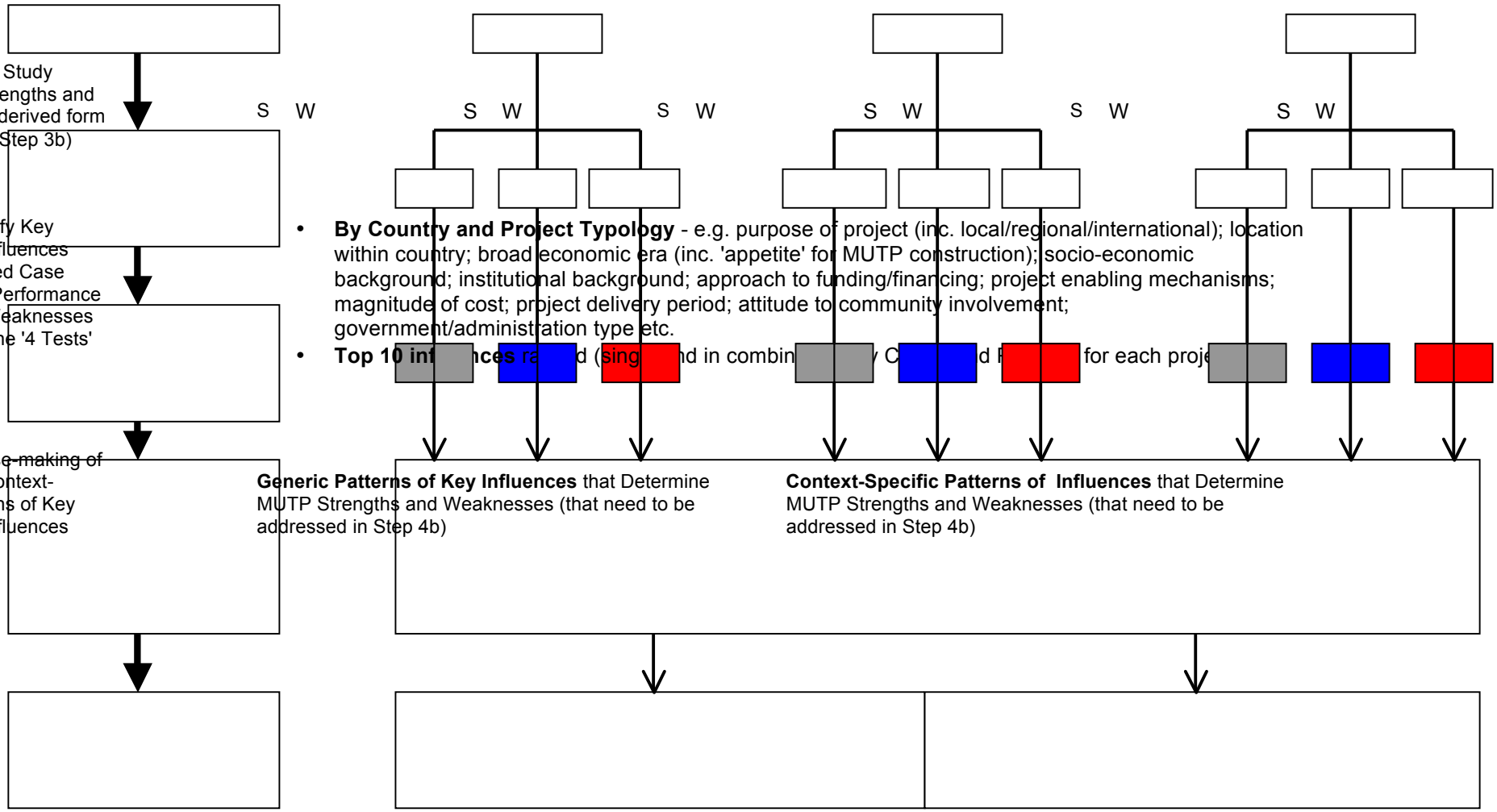
e.g. HK

e.g. USA

vel 2 - Case Study
oject Typology:
Rail
Road

Rd 1 Rd 2 Rail 2 Rail 1 Rail 4 Rd 2 Rail 2 Rd 2 Rail 1

Figure 4: Step 4a - Identify Patterns of Generic and Context-Specific Influences on Project Performance



vel 3 - Case Study
oject Key Strengths and
eaknesses (derived form
e '4 Tests' in Step 3b)

vel 4 - Identify Key
ontextual) Influences
at Determined Case
udy Project Performance
trengths & Weaknesses
erived from the '4 Tests'
Step 3b)

- **By Country and Project Typology** - e.g. purpose of project (inc. local/regional/international); location within country; broad economic era (inc. 'appetite' for MUTP construction); socio-economic background; institutional background; approach to funding/financing; project enabling mechanisms; magnitude of cost; project delivery period; attitude to community involvement; government/administration type etc.
- **Top 10 inf nces** ra d (sing nd in combin y C d F for each proje

vel 5 – Sense-making of
eneric and Context-
ecific Patterns of Key
ontextual) Influences

Generic Patterns of Key Influences that Determine MUTP Strengths and Weaknesses (that need to be addressed in Step 4b)

Context-Specific Patterns of Influences that Determine MUTP Strengths and Weaknesses (that need to be addressed in Step 4b)

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Step 5: Nature and Impact of Generic & Context-Specific Inducement (Enabling) & Blocking Mechanisms (inc. Regulative) and Recommendations for Improvement

- by country context
- by project typology

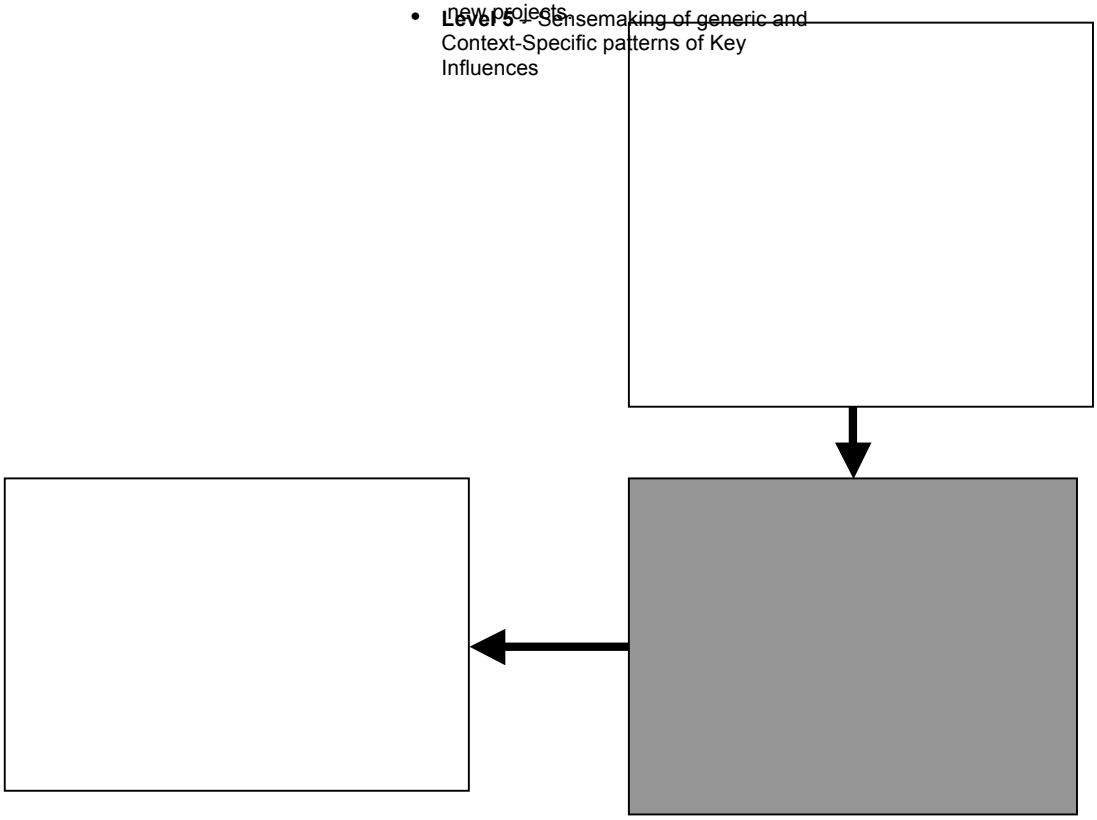
Step 4a: Identifying Patterns of Generic & Context-Specific Influences on Project Performance

- Level 1 Country Context
- Level 2 Project Typology
- Level 3 Case Study Project Strengths & Weaknesses
- **Identification of Key Planning and Policy Issues (to be Addressed)** that Determine the Performance of Existing (Case Study) projects and new projects
- **Level 5** – Sensemaking of generic and Context-Specific patterns of Key Influences

Step 4b: Setting Process Goals (the development of initial MUTP lessons & guidelines for further assessment):

- **Formulation of Initial Lessons and Guidelines** (by country context and project typology)

STEP 4b: Setting Process Goals (the development of initial MUTP lessons & guidelines for further assessment)



Step/Tasks	OMEGA Response/Applicability	Data Sources
Step 4b Title →	**Bergek et al Paper - Assessing the functionality of the TIS and setting process goals** **OMEGA - Step 4b: Setting Process Goals**	
Setting Process Goals	• **Setting process goals**: takes place after sensemaking the key generic and context-specific influences on project strengths and weaknesses that will need to be addressed through the formulation of ***Initial*** **Lessons and Guidelines (by typology & context) and Identification of Key Planning and Policy Issues to be Addressed.** • These lessons and guidelines should aim to enhance the performance of both existing (Case Study) projects and new projects. They will necessarily encompass both generic and context-specific lessons and guidelines that will be subject to further assessment in Stages 5 and 6 (see below). They will also be accompanied by key Planning and Policy Issues to be addressed.	Based on: • output from Step 3b ('4 Tests') • output from Step 4a (key influences)

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STEP 5: Identify Generic/Context-Specific Nature of Inducement (Enabling) & Blocking Mechanisms (including Regulative)

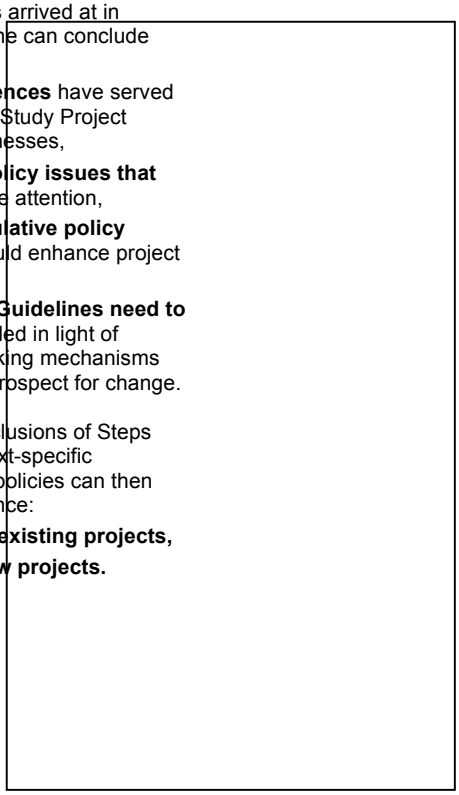
Step 6: Specify Key Issues to be Addressed and Policy and Planning Responses (Lessons & Guidelines)

Employing the findings arrived at in executing Steps 1-5 one can conclude which:

- **(contextual) influences** have served to determine Case Study Project Strengths & Weaknesses,
- **are the general policy issues that emerge** and require attention,
- **enabling and regulative policy measures** that would enhance project performance, and
- **initial Lessons & Guidelines need to be refined/discarded** in light of inducement & blocking mechanisms that have little/no prospect for change.

Drawing from the conclusions of Steps 4 & 5, generic & context-specific lessons, guidelines & policies can then be introduced to enhance:

- **the retrofitting of existing projects,**
- **the delivery of new projects.**



Step 5: Identify the Generic/Context-Specific Nature of Inducement (Enabling) & Blocking Mechanisms (including Regulative), The Nature and Scale of Their Impact and Recommendations for Improvement

- by country context
- by project typology

Step 4b: Setting Process Goals (the development of initial MUTP lessons & guidelines for further assessment):

- **Formulation of Initial Lessons and Guidelines** (by country context and project typology)
- **Identification of Key Planning and Policy Issues to be Addressed** - that aim to enhance the performance of existing (Case Study) projects and new

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Step/Tasks	OMEGA Response/Applicability	Data Sources
Step 5 Title →	**Bergek et al Paper - Identify inducement and blocking mechanisms** **OMEGA - Identify the Generic/Context-Specific Nature of Inducement (Enabling) & Blocking Mechanisms (including Regulative)**	
Inducement (Enabling) & Blocking Mechanisms (including Regulative)	The functional pattern is shaped by both **inducement and blocking mechanisms.** *Inducement mechanisms* are seen as: • a belief in growth potential (including, demographic changes, emerging technologies etc.); • government R&D policy. *Blocking mechanisms* include: • absence of standards; • lack of capability, poor articulation of demand and uncertain customer needs; • interdependencies of under-performing functions. The range and potential level of impact of these inducement and blocking mechanisms that impact on MUTP performance will need to be identified in consultation with Partners based on both Case Study data and Working Papers (see right hand column).	• Case Study templates & timelines • Case Study interview transcripts • OMEGA 1 Project (WP#4) • OMEGA WP#1 • OMEGA WP#2
Taxonomy of Generic and Context-Specific Patterns for MUTPs	Since the functional performance of a system (MUTP) is only partly a result of the internal dynamics of the project/system – in that exogenous factors also come into play - it is important to: • identify and understand the generic and context-specific nature of inducement and blocking mechanisms that influence project performance by country context and project typology (as in Step 4a), and; • assess their relative degree of impact on such levels of performance by country context and project typology. Having completed the above it should then be possible, as an output from Step 5 to determine what type of approach is needed to enhance inducement mechanisms and remove blocking mechanisms so as to enable the implementation of the tentative lessons and guidelines put forward in Step 4b. Figure 5 below illustrates the above process.	• Case Study templates & timelines • Case Study interview transcripts • OMEGA 1 Project (WP#4) • OMEGA WP#1 • OMEGA WP#2
Assessment Required	The Centre and Partners will need to undertake an assessment of enabling (opening–up opportunities) & regulative (by imposing constraints) mechanisms that need to be addressed so as to enable the implementation of Initial Lessons and Guidelines put forward in Step 4b.	
Illustrative Examples of MUTP Inducement Mechanisms	• **Belief in Growth Potential:** o belief on the part of some public and private sector agencies that MUTPs represent a key means to stimulate growth and restructuring, leading to increased programmes for such projects. • **R&D Policy:** o reflective of the propensity of some countries/governments to 'experiment' in the use of MUTPs to stimulate growth, regeneration, restructuring etc.; o the preparedness to invite innovation in MUTP planning, delivery & operations; o stimulus to MUTPs afforded by public awareness of imperatives such as climate change etc.	

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STEP 5 Continued

Illustrative Examples of MUTP Blocking Mechanisms	• **Uncertainty of Needs Amongst Potential Customers -** lack of awareness of MUTP capabilities to act as catalysts for growth, regeneration etc. • **Inadequate Knowledge of Relation Between Investment and Benefits:** o over-emphasis of role of CBA in MUTP appraisal; o Treasury attitudes to MUTP 'affordability' o lack of capability to acknowledge value of external benefits (e.g. regeneration) generated by MUTPs. • **Lack of Capability and Poorly Articulated Demand:** o climate change agenda not articulated in terms of detailed (transport) policy and not reflected in MUTP delivery programmes; o demand-based appraisal models for MUTPs too inflexible and unable to reflect wider needs. • **Lack of Standards:** o MUTPs treated as 'one-offs' with little institutional learning reflected in no sustainable or widely agreed policy framework; o lack of integration amongst MUTP sponsors and planners; o perceived inability of public sector institutions to deliver elements of MUTP planning and delivery that they control • **Weak Advocacy/Proponents** o vested interests - e.g. car lobby; o weak lobby groups; o MUTPs seen as a political risk. • **Environment biased in favour of Established TISs:** o vested interests in investment in non-MUTP public works; o inertia in policy framework for MUTPs. • **Poor Connectivity Between Actors:** o professional silos; o party political silos; o disrupted/disconnected stakeholder networks; o lack of proper consultation. • **Others** o political/institutional instability; o lack of clearly mandated and resourced institutions;	

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Determine Degree of Impact of Generic and Context-Specific Inducement and Blocking Mechanisms

Identify Appropriate Measures to Facilitate the Implementation of Tentative Lessons and Guidelines by (where feasible):

- enhancing inducement mechanisms
- removing blocking mechanisms

Identification of Patterns of Context-Specific Blocking and Inducement Mechanisms by Country Context and Project Typology

Identification of Patterns of Generic Blocking and Inducement Mechanisms by Country Context and Project Typology

Figure 5: STEP 5 - Identify the Generic/Context-Specific Nature of Inducement (Enabling) & Blocking Mechanisms (including Regulative)

Country Context	Aus		France		Germany		Greece		Hong Kong		Japan		Netherlands		Sweden		UK		USA	
Project Typology[1]	Rd	Rail	Rd	Rail	Rd	Rail	Rd	Rail	Rd	Rail	Rd	Rail	Rd	Rail	Rd	Rail	Rd	Rail	Rd	Rail
Inducement Mechanisms (examples) • Belief in Growth Potential • R&D Policy																				
Blocking Mechanisms (examples) • absence of standards; • lack of capability, poor articulation of demand and uncertain customer needs; • interdependencies of under-performing functions																				

Note 1: to include the full range of project typologies identified in Step 4a

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mploying the findings arrived at in executing Steps 1-
one can conclude what:
by country context
by project typology

(contextual) influences have served to determine Case Study Project Strengths & Weaknesses,

are the general policy issues that emerge and require attention,

enabling and regulative policy measures that would enhance project performance, and

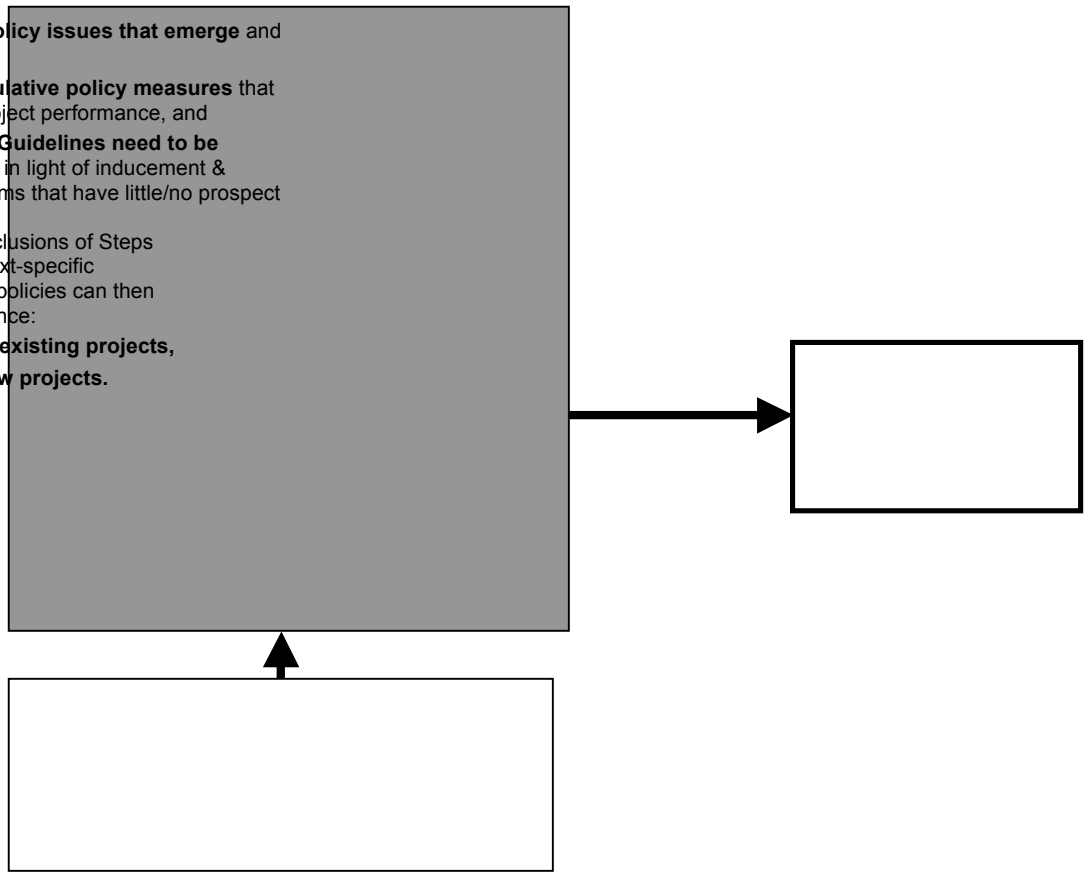
initial Lessons & Guidelines need to be refined/discarded in light of inducement & blocking mechanisms that have little/no prospect for change.

rawing from the conclusions of Steps
& 5, generic & context-specific
essons, guidelines & policies can then
e introduced to enhance:

the retrofitting of existing projects,

the delivery of new projects.

STEP 6: Specify Key Issues to be Addressed and Policy and Planning Responses (Lessons & Guidelines)



Step/Tasks	OMEGA Response/Applicability	Data Sources
Step 6 Title →	**Bergek et al Paper - Specify key policy issues** **OMEGA - Specify Key Issues to be Addressed and Policy and Planning Responses (Lessons & Guidelines)**	
Specify Key Issues to be Addressed and Policy and Planning Responses (Lessons & Guidelines)	• Employing findings arrived at in executing Steps 1-5 (based on a multiple compare & contrast study) one may identify/recommend which: ○ **(contextual) influences** have served to determine Case Study Project Strengths & Weaknesses, ○ **lessons and guidelines in general are achieved** and which are not, ○ **general policy issues emerge** and require attention (where & when), and ○ **enabling and regulative policy measures would enhance project performance** & which would not. • Drawing from the conclusions of Steps 4 & 5, generic & context-specific lessons, guidelines & policies can then be finalised to enhance: ○ **the retrofitting of existing projects**, ○ **the delivery of new projects**. • Here Policies should aim to: ○ remedy poor functionality of TIS ○ strengthen/add inducements ○ remove blocking mechanisms	• Steps 1-5

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ITERATION

Step/Tasks	OMEGA Response/Applicability
Step Title →	**Iteration**
	Steps 3b-6 are seen as iterative in that there may well be a need to assess the desirability, applicability & practicality of lessons & guidelines relative to (for example) a typology of different Case Study contexts.

STEP 7: Dissemination (not included in the Bergek et al model)

Step/Tasks	OMEGA Response/Applicability
Step 7 Title →	**OMEGA - Disseminate MUTP Lessons & Guidelines Focusing on National (UK) and International:** • Public & private sector funding, planning and delivery agents & operators (inc. government agencies, NGOs, consultants, financiers etc.) • Other territorial/regional/local planning agencies • Academia • Education See Appendix 5 for a more detailed breakdown.

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Appendix 1:

Analysing the functional dynamics of technological innovation systems: A scheme of analysis - Anna Bergek, Staffan Jacobsson, Bo Carlsson, Sven Lindmark, Annika Rickne

(A separate file to accompany this document)

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Appendix 2

Background Note on Hypothesis-led Research Questionnaire Design: Application of Cresswell's Principles to CTRL Case Study

Prepared by Harry T. Dimitriou

For presentation to OMEGA Centre Team,
16th January 2008 and amended 4th June 2008

BACKGROUND

Research programme's overall premise:

In many parts of the world Mega Urban Transport Projects (MUTPs) have aroused considerable controversy around the ability of agencies to deliver not only the infrastructure itself, but also the associated services and particularly the intended types of development impacts. It is evident that few attempts have been made to bring about institutional learning from the growing experience of planning and implementing MUTPs. As a result, using the Channel Tunnel Rail Link (CTRL) as a case study, the overall aim of this questionnaire is to gain better understanding of:

- how decision-making of principal stakeholders for MUTP planning seeks to address intended objectives;
- the criteria by which MUTP successes/failures should be evaluated; and
- which MUTPs are considered as successes and which as failures in the context of sustainable development visions, and the reasons for their status.

Underlying arguments of the research programme:

- **Argument 1:** There is potentially great value in placing in the public domain an international data base of gathered MUTP profiles (and stories) that summarize key planning, performance and impact features to facilitate comparative analysis, lesson-sharing and learning for future MUTP planning exercises.
- **Argument 2:** While the contributions that MUTPs make to economic growth (measured in terms of construction cost savings, travel time savings, GDP growth etc.) has been the primary overriding measure of the success of such projects in the 20th Century this has been overtaken in the 21st century by concerns of the ability of such projects to effectively respond to a fast changing priorities that increasingly need to address the risks, uncertainties and complexities of the evolving sustainable development vision.
- **Argument 3:** The application of generic principles and lessons relating to the treatment of complexity, uncertainty and risk in decision-making and planning derived from sectors, disciplines and professions outside transportation and territorial planning, where these concepts have long-time been at the milieu of complex problem solving, will therefore greatly benefit MUTPs.
- **Argument 4:** The impacts on, and contributions to sustainable development by MUTPs are poorly understood and therefore in need of further analysis and understanding, particularly in light of the different interpretations of the sustainable development vision(s) over time and place.
- **Argument 5:** The build-up of a significant new body of knowledge about decision-making in the planning, appraisal and evaluation of MUTPs through the application of innovative methods of story-line analysis employing narrative pattern analysis derived from pre-hypothesis led investigations - will greatly enrich the understanding of past MUTP decision-making and planning when complimented with the analysis and findings of more traditional hypothesis-led investigations.
- **Argument 6:** The drawing-up of generic and context-specific lessons from case study research will greatly assist the better understanding of the importance of 'context' in MUTP planning, appraisal and evaluation, and the appropriate bundles of criteria to guide judgements about the success of such projects in different contexts.
- **Argument 7:** There is a dearth of generic and context-specific tools and guidelines to assist the public and private sectors in the development and delivery of MUTPs which especially focus on the complexity, risk and uncertainty such projects typically encounter.

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- **Argument 8:** There is an urgent need to build-up the institutional and professional capacities on an international scale in MUTP decision-making and planning for the future development of such projects and that while this can commence with the setting-up and sustaining of a knowledge-building network of experts and especially trained individuals such as the OMEGA Centre and its Partnership Network, this needs to be also complimented by formal international education and training programmes that draw upon on-going MUTP research.

Research programme strategy:

- **To establish a Centre of Excellence (CoE) in Mega Urban Transport Project Studies at UCL** together with a 'knowledge building network' of initially ten Academic Partners in the Developed World undertaking a common agenda of research with the possibility of later extending this later to the Developing World.
- **To incorporate the findings from a complimentary VREF Smaller Project** on the treatment of risk, uncertainty and complexity in decision making and planning outside the field of MUTP planning.
- **To prepare as background papers insights into how important policy agendas** are treated by MUTPs and relate these to both MUTP development and delivery, and the sustainable development visions such projects are expected to serve.
- **To develop new investigative and analytical tools as part of the primary data collection exercise** relying extensively on story-line narrative analysis derived from face-to-face pre-hypothesis interviews and website questionnaires for a variety of categories of stakeholders.
- **To conduct more traditional interviews based** as part of the primary data collection exercises based on hypothesis-led questionnaires for a variety of categories of stakeholders with a view to later comparing/contrasting/combining findings with those derived from the pre-hypothesis investigations.
- **To use the UK CTRL Case Study as pilot investigations for the Partner Case Studies** and bring together into a single shared database all case study material to provide a unique global information resource.
- **To accumulate from the above strategy a body of theoretical and case study evidence** that will be used as a basis to identify generic and context-specific lessons and from this devise new planning paradigms and guidelines.

SOURCES OF QUESTIONS

The questions posed in the hypothesis-led questionnaires are based on (null and alternative') hypotheses and research questions derived from:

- **a wide set of literature reviews** associated with declared scope of research programme;
- **VREF Smaller Project** commissioned papers and their analysis;
- **Hybrid pre-hypothesis interviews** based on case study story-telling;
- **CoE Working Paper Series# 1** prepared by on the national policy, planning and funding frameworks for the delivery of MUTPs; and
- **CoE Working Paper Series# 2** prepared by Partners on a selected range of sustainable development challenges confronting the planning, appraisal and evaluation of MUTPs.
- **MUTP Stakeholders** such as the Major Projects Association in the UK and the Contractors Association of New York in USA

RESEARCH PROGRAMME AIMS

- **To evaluate the extent to which MUTPs meet planned objectives** (including completion dates, keeping to budget targets and operational performance targets) *and* contribute to the sustainable development visions such projects are intended to contribute to.
- **To seek generic and context-specific insights** into how and why these MUTPs have been planned the way they have – including insights into how MUTPs can be retrofitted to successfully contribute to visions of sustainable development.
- **To gather evidence of the degree to which MUTP planning, viability and delivery has been compromised** by:

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- the inability to capitalise on the wider benefits that they could generate;
- the institutional frameworks and regulatory mechanisms employed to deliver them;
- fixed deadlines dictated by major national/international events and important development agendas; and
- the formal planning process (including public participation).

- **To provide insights into how cultural perceptions and treatment of uncertainty, risk and complexity in policy-making, planning and management of MUTPs differ** from one regional or national context to another and the way these have an impact on results and technology-transfer.
- **To offer insights into whether current planning, appraisal and evaluation methods in MUTP studies are suited to the fast changing and uncertain realities of the 21st century.**

TOPICS FOR RESEARCH

Study Purpose Statement:

The overall purpose of the research programme (hereafter called 'The Study') is to foster institutional learning from the growing experience of planning, appraising and evaluating MUTPs and their impacts from a comparative analysis of case studies spanning Europe, USA, Asia and Australia and through these studies identify both pitfalls and achievements of past planning experiences together with their major social, economic, territorial and environmental impacts so that they may become better understood as a basis for generic lesson-learning for future MUTPs (paraphrased from OMEGA Centre two-page summary, October 2006) .

Overall Research Questions that emerge from the above Study Purpose Statement include**:**

- **Questions #1:** What constitutes a 'successful mega urban transport project (MUTP) in the 21st Century?
- **Questions #2:** How well has risk, uncertainty and complexity been treated in the planning, appraisal and evaluation of such projects?
- **Questions #3:** How important is context in making judgements regarding the above questions?

The Overall Research Hypotheses that emerge from the above Study Purpose Statement and Overall Research Questions include:

- **Hypotheses #1:** Traditional criteria relating to cost overruns, completion dates, generation of travel time savings for users and rates of returns to investors are inadequate measures of success in the 21st Century as sustainable development concerns become increasingly critical both globally and locally.
- **Hypotheses #2:** The new emerging international and local agenda related to vision(s) of sustainable development is multi-dimensional and goes beyond notions of environmental sustainability, as critical as this may be, in that it also concerns inter-related concepts of economic sustainability, social sustainability and institutional sustainability.
- **Hypotheses #3:** The level of competence in decision-making and planning in today's fast-changing world is best assessed by the adequacy of the treatment of risk, uncertainty and complexity and sensitivity to context – all of which are important demands on Strategic Planning.

Key Definitions include those for:

- Mega urban transport projects,
- Principal stakeholders,
- Sustainability development visions,
- Context, and
- Generic and context-specific lessons.

These are defined below as follows:

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- **Key Definition #1:** Mega urban transport projects (MUTPs) as defined by this Study are post-1990 completed road, rail, bridge and tunnel projects or a combination of these , each costing in excess of US$1 billion (at 1990 prices), located wither within urban areas or having a significant impact on urban and metropolitan development.
- **Key Definition #2**: Principal Stakeholders are those 'key' people and organisations who may *directly* affect, be affected by, or perceive themselves to be *directly* affected by, a decision or activity associated with the a decision(s) or an activity or a 'project' (after www.riskmanagement.qld.gov.au/info/guide/gls.htm). For the purposes of this Study, the term 'project' refers to OMEGA Case Study Projects, while the term 'key stakeholder' refers to those:
  - who's actions/decisions are/were critical to the success/failure of the project as a whole (or a component part thereof) in terms of its planning, appraisal, evaluation, implementation, operation and impacts, and/or;
  - who have either possess first hand knowledge of/involvement in the planning, appraisal, evaluation, implementation, operation or impact of the project (or a component part thereof) or are experienced observers thereof, and/or;
  - who share information and knowledge about the project (or a component part thereof) so as to influence project outcomes or opinions about project outcomes.
- **Key Definition #3: Sustainability Development Visions (SDVs)** as defined by this Study are multi-dimensional. They comprise of economic, environmental, social, *and* institutional dimensions each of which (or together) pose impose important Sustainability Development Challenges to MUTPS. Each dimension of the SDV are identified by a set of concepts, issues and methodologies/techniques which pose various levels of risks, uncertainties and complexities in different contexts.

- **Key Definition #4**: **Sustainability Development Challenges (SDCs)** are defined here as problems, issues and concerns that present obstacles to the achievement of SDVs and which therefore need to be overcome or ameliorated for significant progress to be made for MUTPs to constructively contribute toward the SDV aspired after. Progress in the achievement of this is assisted by the employment of Sustainable Development Indicators (SDIs). The main SDCs to MUTP identified for this Study are summarised in matrix already distributed to Partners.
- **Key Definition #5: Context** as defined by this Study represents "the circumstances relevant to something under consideration" and/or "the discourse that surrounds a language unit and helps determine its interpretation" (WordNet, Princeton University, http://wordnet.princeton.edu/20/12/08). It pertains to information that should be kept in mind when making a decision. Context can relate to one or more dimensions, including psychological, temporal, geographical/spatial, cultural, institutional and ideological/political dimensions that shape the way we understand the performance of an event.
- **Key Definition #6: Lessons** as defined by this Study are "experiences, examples, or observations that impart beneficial new knowledge or wisdom" (The Free Dic http:// www. The freedictionary. com/ Lessons tionary, 20/12/07). '**Generic lessons'** are seen as experiences, observations, knowledge and models that are applicable to an entire class, group or can be used by many nations, factions or groups (http://www.cs.bham.ac.uk/research/projects/poplog/computers). '**Context-specific lessons'** are thus experiences, observations, knowledge and/or models that pertain to particular contexts alone.

The Channel Tunnel Rail Link (CTRL)

Drawing from the above, the following are illustrative of the proposed questions that are to be posed to CTRL principal stakeholders:

- **Question 1 (The over-arching question for the CTRL case study**): "Can the CTRL project (as just completed) be deemed a 'success' in terms of the objectives set for it by its sponsors from the day it received formal approval and in terms it being completed on time, within budget and as per forecasts (initial and/or revised)?

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- **Question 2 (A sub-question which derives from the above over-arching question is)**:
  "What measures of success should be used today - if economic growth based measures (travel time savings, contribution to GDP etc) are now not necessarily deemed to be of overriding importance - especially where and when economic growth based related criteria are pursued at the expense of effectively tackling sustainable development challenges?

- **Question 3A:**
  "What do you consider the principal sustainable development challenges (SDCs) of the CTRL to be?

- **Question 3B:** Where the SDCs are as identified below, please indicate how successful you consider the CTRL project has coped with these challenges, assigning a value of one to ten to each, where one represents the highest weighting and ten the lowest:

SDC #	Sustainable development challenges (SDCs) confronted by CTRL	Ranking (the latter the lowest)
1.	Ensuring **accountability** in decision-making	
2.	Providing **transparency** in decision-making	
3.	Ensuring institutional **capacity building** & public consultation	
4.	Addressing concerns of **biodiversity**	
5.	Addressing concerns of **ecology**	
6.	Promoting **health**	
7.	Addressing concerns of **safety**	
8.	Promoting **energy saving**	
9.	Contributing to **social cohesion**	
10.	Contributing to goals of **equity**	
11.	Promoting economic c**ompetitiveness**	
12.	Successfully involving the **private sector**	
13.	Addressing forces of **globalisation**	
14.	Enhancing **operations efficiency**	
15.	Guaranteeing **affordability** of project	
16.	Ensuring economic **viability** of project	
17.	Promoting enhanced **accessibility**	
18.	Contributing to planned **spatial & territorial re-structurin**g	
19.	Addressing concerns of **subsidiarity**	
20.	**Others**	

A fuller set of hypothesis-led questions in the questionnaire for the CTRL are provided in a later separate note posted on the OMEGA Centre website. These have been derived from the presentations made at the Naples Workshop last summer and are as presented at the Volos Workshop in May 2008. (Both these presentations have also been posted on the OMEGA website).

It should be noted that the project-specific questions and hypothesis incorporated in the CTRL hypothesis-led questionnaire have been developed solely for the CTRL pilot project and *cannot* be presumed to be pertinent to the other UK case studies or indeed any other case studies, although Partners some have argued there is scope to re-examine some of these via a moodle dialogue which is to take place regarding this among the Partners up to 20th June 2008.

Harry T. Dimitriou
15th January 2008 revised June 2008

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Appendix 3

OMEGA Project Methodology, Comparative Research and the Hypothesis Led Questions

Prepared by
OMEGA Australian Team,
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June 2008

Introduction

Perhaps not surprisingly, given the scope of its subject, the OMEGA project embodies methodologically complex research. It involves a mixed method approach, which combines collection and analysis of both qualitative and quantitative data for each of 33 Mega Urban Transport Projects (MUTPs). It proposes comparison of these 33 cases of MUTP, and it proposes this comparison across national contexts. This complexity is no bad thing. It will bring with it a much greater depth of understanding than any one method or part of the project would standing alone. However this complexity does mean that, in order to gain full value from the data collected and to avoid claims of invalidity, there must be clarity about the methodological process, the integrity of the data and the type of questions that need to be answered.

One central need is for a clearly stated research intent that is shared by all researchers. A pitfall of a research approach involving many researchers is the potential for this research intent to be blurred or pulled in different directions at the will of different research interests. The mixed-methods approach can compound this problem. Producing case studies, a qualitative approach, seeks to 'learn participants views about a particular phenomenon' (Creswell & Plano-Clark, 2007). This approach is grounded in a constructivist world view. By also testing hypotheses, we are seeking to find out what is 'really' driving MUTPs. In that there is a positivist assumption that there is some true reality that would ground a theory. As Galtung (1990) points out, social scientists tend to fall into two categories: story tellers, or theory builders. OMEGA seems to be being both. Creswell and Plano-Clark (2007) warn that while both qualitative and quantitative methods can be used in the same project, there are methodological risks.

This paper is not merely an academic discussion of methodology but seeks to address specific issues arising from the OMEGA project. The paper brings together two matters in particular for consideration: first the international comparative basis of the research, and secondly the proposed hypothesis led questions. In doing so we believe it is important to tie back our observations to the expressed objectives of the project, particularly at this critical time in the project with the forthcoming VREF review. The paper starts by reviewing the aims of the OMEGA project as expressed to VREF. We then consider how the products of the current data collection will deliver on these aims. We consider how the project profile fulfils our needs for comparative contextual data, and then discuss the hypothesis-led phase of the research which seeks answers to overarching questions designed to enable comparison. Here we encounter some conceptual and practical difficulties.

The commitments of the OMEGA Project

The proposal to VREF (University College London, 2005) for the establishment of the CoE, now titled OMEGA, contains a number of statements about commitments, hypotheses and objectives of our research project. Dimitriou (2008) has recently composed these statements into a series of 8 arguments from which he has generated a Study Purpose Statement, Research Questions and Hypotheses. Seven of these arguments can be translated into objectives for this research (see below). The missing argument is simply a statement that the measures of success for MUTPs used in the past are insufficient in the 21st Century. As such this argument does not lead to an objective.

OMEGA Project 2 Objectives:

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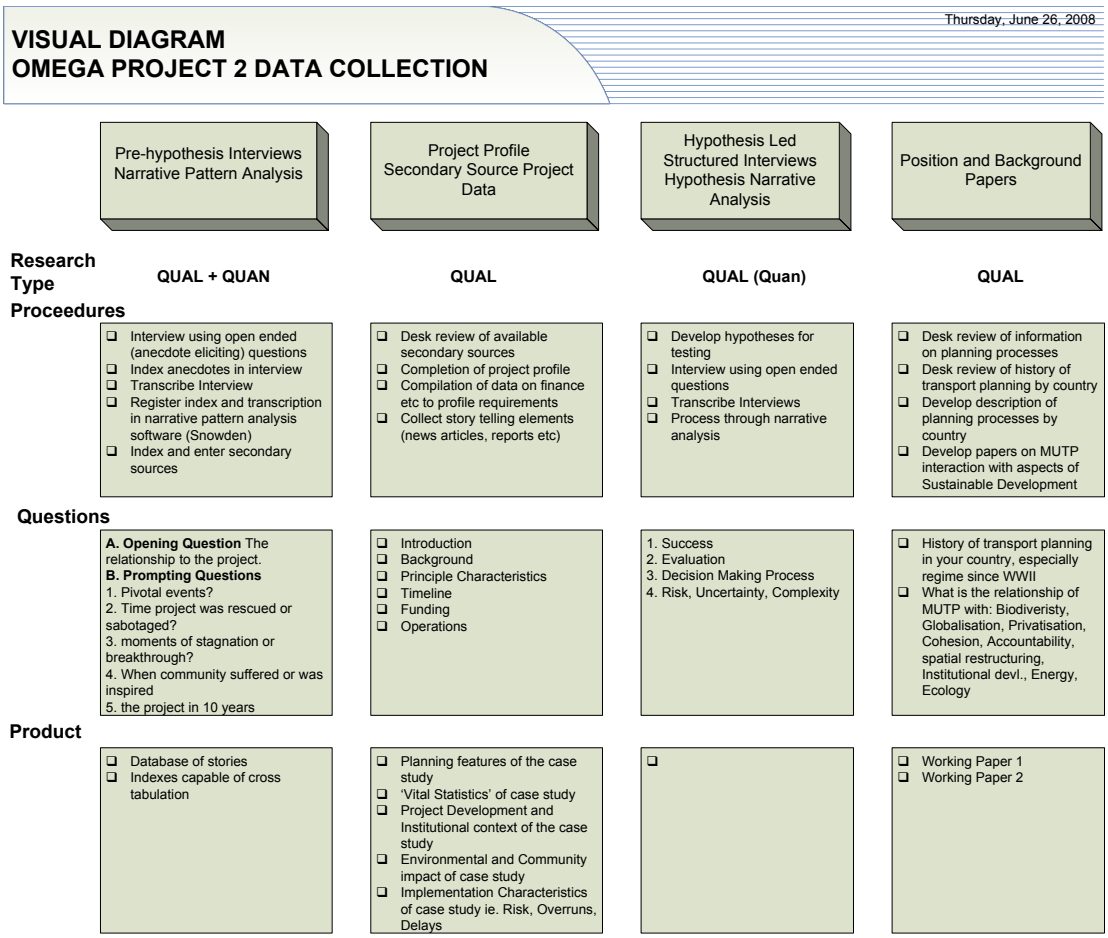
1. To place in the public domain, an international data base of MUTP profiles that summarize key planning, performance and impact features.
2. To apply generic principles and lessons to the planning of MUTPs which relate to the treatment of complexity, uncertainty and risk-taking derived from disciplines outside transportation and territorial planning.
3. To build up an understanding of how MUTPs impact on and contribute to sustainable development
4. To build a significant *new* body of knowledge about decision-making in the planning, appraisal and evaluation of MUTPs using narrative pattern analysis
5. To draw up generic and context-specific lessons from the research as the basis for categorising generic and/or context-specific situations and matching each with a 'bundle' of criteria to guide judgements about the 'success' of MUTPs.
6. To develop and deliver new generic and context-specific decision tools and guidelines to assist public and private sector bodies in planning, appraising, implementing and evaluating MUTPs with particular regard to the treatment of: complexity, risk and uncertainty and key challenges.
7. To build up the institutional and professional capacities on an international scale in MUTP decision making and planning through development of a network of experts and especially trained individuals, and formal international educational and training programs that draw upon ongoing MUTP research

The VREF proposal (University College London, 2005) also outlines a data collection process that will be followed. This data collection process has been refined in various documents. The diagram below summarises the data collection processes currently in train (following Creswell 2007).



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How well are our objectives being met by our data collection process?

If we cross tabulate our research objectives with our data collection process the results look like this:

OMEGA Project 2 Process to Fulfil Research Objectives

Thursday, June 26, 2008

OMEGA Research Objectives	Data Collection Processes: Pre-hypothesis Interviews Narrative Pattern Analysis	Project Profile Secondary Source Project Data	Hypothesis Led Structured Interviews Hypothesis Narrative Analysis	Position and Background Papers	Finalising Action or Research required to complete objective
	A. Opening Question The relationship to the project. **B. Prompting Questions** 1. Pivotal events? 2. Time project was rescued or sabotaged? 3. moments of stagnation or breakthrough? 4. When community suffered or was inspired 5. the project in 10 years	❑ Introduction ❑ Background ❑ Principle Characteristics ❑ Timeline ❑ Funding ❑ Operations	1. Success 2. Evaluation 3. Decision Making Process 4. Risk, Uncertainty, Complexity	❑ History of transport planning in your country, especially regime since WWII ❑ What is the relationship of MUTP with: Biodiveristy, Globalisation, Privatisation, Cohesion, Accountability, spatial restructuring, Institutional devl., Energy, Ecology	
1. Place in the public domain, an international data base of MUTP profiles that summarize key planning, performance and impact features.		❑ All sections of profile deliver this objective. ❑ Current (June 08) profile includes data on planning, performance and impact features of each project		❑ Transport planning regime relevant to each country could provide more details for profile database	❑ Development of a publicly available database to house information ❑ Ongoing hosting arrangements to be made for that database in some form
2. Apply generic principles and lessons relating to the treatment of complexity, uncertainty and risk-taking derived from disciplines outside transportation and territorial planning to the planning of MUTPs	❑ Index question on risk, uncertainty and complexity provides quantitative measure of: - level perceived RUC in context of each MUTP, - The effect of RUC on planning the MUTP - Perceived level of RUC in comparison to another project	❑ The section on risk analysis provides quantitative description of whether/how risk dealt with for each MUTP. Including what process was used.	❑ Fourth question on risk, uncertainty, complexity provides further qualitative data on how RUC process described in profile worked for the MUTP.		❑ Collected data to be synthesised verify how RUC dealt with in MUTP planning/ delivery. ❑ Compare data with findings of OMEGA project 1 uncover relevant RUC principles for dissemination ❑ Disseminate findings under Objective 6
3. Build up an understanding of how MUTPs impact on and contribute to sustainable development			❑ Second question on evaluation includes question about sustainable development. Properly directed this question could provide qualitative data from which the perception of how MUTPs impact sustainable development could be inferred	❑ Papers on what is the relationship of MUTP with: Biodiveristy, Globalisation, Privatisation, Cohesion, Accountability, spatial restructuring, Institutional devl., Energy, Ecology	❑ Information in papers to be synthesised into overall picture of how MUTPs impact these areas ❑ Cross reference with hypothesis led inferences could validate findings ❑ Overall paper/book to be developed
4. Build a significant *new* body of knowledge about decision-making in the planning, appraisal and evaluation of MUTPs using narrative pattern analysis	❑ Totality of collected narratives and indexes will be used in building this new body of knowledge			❑	❑ Narrative analysis to be completed using cognitive edge software. ❑ Findings of analysis to be presented as new information under objective 6 and 7.
5. Draw up generic and context-specific lessons from the research as the basis for categorising generic and/or context-specific situations and matching each with a 'bundle' of criteria to guide judgements about the 'success' of MUTPs.		❑ Profile will provide context information from which generic situations, identifiable in MUTPs studied, can be drawn ❑ Profile will provide context information from which context specific situations for each MUTP can be identified	❑ First question on success provides qualitative data on perception of individual project as a 'success' and if properly guided by inference information on criteria to relevant to each MUTP that guided judgement of that success		❑ Data will be combined to give factors to judge success relevant to generic situations in MUTPs and those relevant to context specific situations in MUTPs ❑ Disseminate under objective 6
6. Develop and deliver new generic and context-specific decision tools and guidelines to assist public and private sector bodies in planning, appraising, implementing and evaluating MUTPs with particular regard to the treatment of: complexity, risk and uncertainty and key sustainability challenges.		❑ As for objective 5.			❑ In combination with findings on generic/context specific situations, Develop findings of objective 2 into decision tools and guidelines for dissemination. ❑ Develop findings from objective 4 and 5 into decision tools and guidelines and disseminate.
7. Build up the institutional and professional capacities on an international scale in MUTP decision making and planning through development of network of experts and especially trained individuals and formal international educational and training programs that draw upon ongoing MUTP research					❑ Objective in part delivered by development of OMEGA research team ❑ Work is progressing on development of international education program in association with University College London Business School.

In summary objectives 1, 4 and 7 seem to be sufficiently resourced in terms of our data collection. Each of the other objectives raise some questions about the sufficiency of the data being collected. Each will be dealt with in turn.

Objective 2

This objective could potentially be fulfilled simply by the applying findings on risk, uncertainty and complexity (for short RUC) best practice from OMEGA Project 1 to the MUTPs after the profiles are completed and developing lessons learned. However this process would be greatly enhanced if the data on risk analysis processes collected for each MUTP was sufficient to allow comparison of this data against 'best practice', and between each MUTP. The required information on risk will need to establish what procedures are set in place for appraisal, distribution and management of both political and project risks. What is done

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formally, and what informally? How is the public-private partnership managed procedurally? What are the internal processes?

Objective 3

This objective requires clarification. It is important to note is that 'impact' of MUTPs does not seem here to refer to the usual social and environmental impact analysis of the project which is sometimes conducted as part of the evaluation of projects. 'Impact' here refers to something much broader, namely the impact of the project on sustainable development objectives. It would be a misunderstanding of the OMEGA project to expect a detailed environmental and social impact analysis for each of the thirty or so case studies.

The data collection process we have in train uses the second working paper to deliver on this objective. We believe this data collection is usefully supported by recently suggested hypothesis-led questions on whether evaluation processes actually considered sustainable development. Data collected under this question should provide insight into those parts of the sustainable development vision that project proponents considered, and therefore possibly provide some support to findings in the working papers.

It is noted however that the working papers do not cover all of the elements of sustainable development that have been identified as possibly being impacted by MUTPs. Nor has provision been made in the research agenda to develop further research papers should the data collected under the hypothesis-led questioning suggest other elements of sustainable development which are being impacted or contributed to.

Objective 5

The wording of this objective is currently very difficult to penetrate. It is to "Draw up generic and context-specific lessons from the research as the basis for categorising generic and/or context-specific situations and matching each with a 'bundle' of criteria to guide judgements about the 'success' of MUTPs." This could be taken to mean that we would like to find a number of bundles of criteria which, if present in a MUTP, would seem to point to success. There would be a number of bundles because one bundle would represent the generic factors (that is those factors present in all our MUTPs which are successful), and there might be a number of other bundles which are identifiable and required when certain contextual factors are present (for example projects in particular countries, or of particular types).

Taken this way, the research under this objective is effectively what Creswell and Plano-Clark (2007) describe as a 'correlation design' research project. The objective calls for identification of a bundle of criteria which is causally associated with judgements about 'success'. Accordingly what is required is:

1. clear notions about factors present in the case study that might be causally related to 'success',
2. whether and how these factors are present in each case study,
3. a way of determining which projects are a success.

We have already seen from the work in Volos that each national team has quite different perspectives on the factors which are relevant for study in MUTPs. The results of the ten nation study will almost certainly be surprising and will probably reveal a diversity of frameworks for analysis. Thus one way we could address point 1 above would be to use our different frameworks of analysis to uncover those factors which might be present in bundles to produce success. That is to say 'success' might be a result of a combination of, for example, institutional, discursive, financial, and power relations factors.

If the project profile additionally collected information on these factors, it would provide the possibility of correlation (against their presence or absence in projects) with 'success' thus answering the objective in 4. Backed by qualitative results from the interview process, data collected in this way may also provide information on context specific lessons.

Analysed this way, it would also be possible to reconstruct the research against a variety of interpretations of success. Projects could be reclassified a success under various criteria

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such as “project met all objectives”, “project was on time/on budget”, “project met X,Y,Z sustainable development objectives”.

If this were done properly the output could be delivered under objective 6, as recommendations of factors which ‘must’ be present to deliver ‘successful’ projects.

Objective 6

This objective is about outreach of the research as deliverable decision-making tools and guidelines. At present the objective can be met from the research to be undertaken. The relevance and power of the deliverables under this objective will be enhanced if the other objectives are enhanced.

A quick review of comparative method

Basic contextual data (which is where possible quantitative) can in most cases meet the need for comparison better than opinion data from key informants. Before moving on to a discussion of where the context data we are collecting in the profile might be adjusted some quick words on methodological issues.

International comparative research

For methodological integrity, any project of comparison requires independent units of analysis and construct equivalence. Independent units are required if some conclusion is to be drawn about the causality of observed similarity and difference. If the same observation can be made in two independent cases, then that would indicate an underlying logic or law which gives rise to the observed activity. If however the observation is a function of the two cases having learnt the activity from each other (or a third party) then rather than representing some underlying logic it could just as easily be described as part of a generalised external construct (or story) into which both cases have bought.

Construct equivalence is required if anything is going to be able to be said about how the things under comparison are different. If everything about them is different then comparison becomes meaningless. This has direct bearing on the question of case study comparison. Theoretically the justification for in-depth case study research is its uniqueness, the insight that can be found from a particularised set of circumstances (Scheuch, 1990). Thus by nature there should not be construct equivalence amongst case studies.

In this OMEGA project both of these requirements for comparison present problems. Our unit of analysis is each case of an MUTP. Discussed in this way there is no issue from doing ‘case studies’. We are stating that the comparative unit is an MUTP, which presumably as a group have construct equivalence. There is a presumption of independence between the cases which is based on (maybe) the theory that countries or nation/states are socially independent. However, for well known reasons to do with globalisation, this is controversial, even at the level of countries (nation/states), let alone for the cases. The same companies, financiers etc. are involved in many of the cases. Certainly in Australia’s cases, two were built and managed by the same proponent. Globalisation of ideas and techniques is clearly present not only in the construction techniques used, but in project management techniques and in the government administration technologies used. The apparently independent countries are intertwined at least at the EU level, and in also in the colonial relationship between UK and Australia. This is of course not to deny the very real differences in context for the cases, but it does question the generalised presumptions of how and why that independence functions and at what level.

We have also assumed that we have construct equivalence in the unit we have selected – ‘mega project’. However we have not really delineated that equivalence. Are we saying that because these projects are all big and about transport they are comparable? If so what do we actually mean by big and transport beyond the initial definitions? How exactly does that allow a comparison between say a rail project and a freeway? When we conduct our comparison, part of what we will be building is a definition of what this thing MUTP is that can be compared.

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As mentioned above case study methodology is problematic if one is planning to conduct comparison. In *case study* research each case is considered unique. This of course denies the logic of comparison because the differences observed are supposed to be so great that comparison is meaningless. This paper has so far been written without reference to case studies. Rather what we are doing is defined as collecting information on a series of cases of MUTPs. In much of the language used in the OMEGA project, case study methodology is implied. For example 'lesson learning' is associated with the study of objects singularly because their confused context does not allow for theory building/testing. Similarly complexity theory as discussed by David Snowden (2008) suggests that complex systems are not subject to 'best practice' or rules-based solutions. Rather they require the application of multiple strategies (or lessons learned from other unique projects), followed by close observation to see which factors cause desired outcomes.

The opposition between these – namely the need for independence and construct equivalence that allows for comparisons in our research, and our understanding of each MUTP as unique, context specific units – suggests, however, that reconciliation is possible. Such reconciliation would require clarity regarding our philosophical world view, and adjustment to our language and intent. The idea of comparison lends itself to the purpose of finding an answer to what is 'really going on', or the factors which when bundled would provide generic advice to policy makers. Such could only be possible inside a positivist world view, in which that which is constructed can be 'trued up' to the real best way. This is in contrast to complexity theory, and the logic of case studies. In case studies the idea of the importance of context implies that what occurs is constructed without reference to some underlying reality or truth.

The solution to this dilemma which presents itself is mixed method research.

Mixed Method Research

Mixed method research employs both qualitative and quantitative research in the same project. This can be done in a variety of ways (see Creswell 2007). The purpose of mixed method research is to allow different research questions to be asked and then the data or findings merged to provide deeper answers. As noted in the introduction the intent of qualitative research is quite different to quantitative research. Qualitative research does not seek to test a theory, it does not develop hypotheses, rather it asks research questions which are by nature in depth, and not generalisable. Quantitative research on the other hand seeks to examine the validity of a theory, sometimes by testing hypotheses.

Under mixed method research the collision between different world views inherent in different methods of analysis can be resolved through the application of pragmatism, or through maintaining the differences between the two sets of research and providing adequate explanation when data is brought together (Creswell & Plano-Clark, 2007). It is important that in OMEGA we continue to work on our methodology to ensure we resolve these issues.

Deepening our context research

Our primary data collection method for collection of qualitative information on the context of the projects is the project profile. This qualitative data is the best type of data to allow for comparison. Therefore if we strengthen the data we are collecting in the profile on the relationship between national contexts and the projects we will strengthen our ability to compare the projects.

Kohn (1989, cited in Øyen, 1990, p. 6) posits four types of cross national research in which countries can be:

- The object of the study – the researcher's primary interest lies in the countries studied.
- The context of the study – the primary interest is vested in testing the generality of research results concerning social phenomena in two or more countries.
- The unit of analysis - where the interest is chiefly to investigate how social phenomena are systematically related to characteristics of the countries concerned.
- Trans-national - treating countries as components of a larger international system.

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For the OMEGA research we have taken the nation as the *context* of the study. The social phenomena we are researching is 'mega project'. The main aim in the OMEGA study is to take account of contextual difference within assumed similarity of phenomena (e.g. potentially common patterns of institutional behaviour). The project starts with a similarity: the MUTP. The aim is to find differences and similarities amongst mega-project experiences (as in Scheuch 1990, p. 31)

Thus we need to include in our research information on what is specific and what is generic in the common social phenomenon of mega-project planning. We have a sense of the overall national contexts from working paper 1. To continue this element of the research the profile for each case study needs to address explicitly whether identified contextual phenomena has impacted the planning and success of the project. The summary of working paper 1 presented at Volos (Wright, 2008) indicated that social phenomena related to MUTPs includes:

- Economic conditions
- Demands surrounding efficiency
- Status of populations – including rural/urban migration
- Status of wealth/service distribution
- Mega events/national policy imperatives
- Institutional conditions
- Status of environmentalism
- Modal separation in transport delivery/use

More broadly, context can be described in terms of five variables: physical-geographical, socio-economic, institutional, discursive and cultural. To enhance the possibility of cross-national (etc.) comparison, a basic data set for each case study against these variables is required. The data should be as few and as useful as possible, and confined to that which could be expected to be available across all case studies. A basic data set is suggested below for each principal investigator (not key informants) to supply for each case study.

Some of the suggested data is already contained within the CTRL template (indicated below by a tick). But we think it would be useful to view this data as a separate category, along with an explanation of its significance, which all projects could be asked to supply. The 'for instance' check list below is designed to invite discussion by all project partners so that we can eventually arrive at a common contextual data series that could be supplied across all projects to assist comparison.

Physical-geographical

The physical-geographical context relates to the space available for both urban growth and mega-project development. Is space constrained by topography (mountains, hills etc.), planning regulation, other cultural factors? The spatial distribution of cities and towns is also relevant – are population centres far apart or relatively close to one another? How densely populated is the area served by the mega-project? For example how does the topography and spatial form of Melbourne compare with that of Hong Kong or Tokyo? The function of MUTPs may vary according to whether they are linking activities within a single city, or linking nodes in a poly-nuclear urban region, or linking nations in a supra-national system. This variable can be described by the researcher without input from key informants.

Data required (for instance):

- Topographical map in region of MUTP (city or region) ✓ (or that could be the interpretation)
- Urban density of population (region) which must use common/shared currency for calculating density and for defining the region
- Map showing connectivity: what is being linked to what? ✓

Socio-economic

This variable relates to the absolute wealth (or GDP) and the distribution of wealth in the population. Both wealth and its distribution can usually be found in census data and from existing published analyses of census data. Differences among city as well as national

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contexts may be significant. A critical factor is of course how a project is funded, and how funding packages have changed over time.

Data required (for instance):

- Per capita GDP, nation, if possible for the city or region, for case studies.
- Quintile distribution of wealth/income nation/region. For area effected by case study.
- Spatial distribution of wealth/income, locality of MUTP.

Institutional

This variable describes the organizations and rules of operation and engagement that are significant to the decision. What types of organisations are in play under what rules? Who or what has the formal power and authority to decide? What informal networks exist? How do institutions empower actors?

Data required (for instance):

- Map of organisations involved with the MUTP✓.
- Accountability structure for decision-making✓ (the section on planning legislation/key enabling mechanisms may provide this).
- state/local responsibilities – how constitution/legislation defines roles.

Discursive

The discursive context: what discursive frameworks exist to justify and explain action? 'Sustainability' is one such framework. How does 'sustainability' appear in the discursive framework, and how is the term understood by the actors? In many cases it may not appear at all because of the date of the project. Also how much justification is supplied? In some contexts there may simply be little need for justification. Some potential justifications are simply taken for granted.

Data required (for instance):

- List of justifications for the MUTP ✓ (section on principle project objectives and the one on ways of appraisal might fulfil this. With objectives we need to separate out. – project 'launch' from various new re-framing stages of the project)
- Definitions of sustainable development ✓ (section on environmental statements probably fulfils this – but could actually have a bit for what is used as the definition in relevant papers)

Cultural

What is needed is how the cultural context relates specifically to transport and mobility. This may be hard to pin down, but it is clear that the cultural expectations of mobility, as well as the type of mobility vary across cities/nations. For instance the attitude to public transport versus the private car varies. A road project may in some cultures be less in need of justification than a rail project.

Data required (for instance):

- Car ownership in the population, spatial distribution of car ownership (map)
- Transport mode share either by all trips or jtw (car, motor cycle, public transport, walking cycling)
- expenditure on transport – split by mode – over time?? What time point for collection? Project inception and now?

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Hypothesis led research

Accepting that the general hypothesis-led questions should be reduced as much as possible to allow research specific to the MUTP under study. This paper is written on the basis that the amended hypothesis-led questions suggested on the OMEGA moodle (as at June 2008 see attachment A) are adopted. This paper demonstrates the efficacy of those questions as regards our research objectives.

MUTP specific hypothesis-led questions developed for each case should also focus on backing up the quantitative data collected in the profiles. Further questions should be used to ensure a complete understanding of the context is obtained, and if the advice concerning objective five is adopted to ensure understanding of selected 'factors for success' is complete. Different levels of information will be required for different case studies depending on the depth of quantitative and qualitative information available to the researcher in document reviews for the profile. Thus there is no point in attempting to meet these requirements with generic questions.

This will also allow space for individual researchers and the PhDs to combine their data collection with the hypothesis led interview process.

One further generic question that could be added may be:

Sustainable Development

Sustainable development is best seen as an essentially contested political concept, like 'justice' or 'democracy'. In such concepts there is a core of truth, but this core is mediated by human pattern interpretation, beset with prior interests and values. It is more useful to deconstruct the meaning of sustainability within different contexts (including temporal contexts) than to try and arrive at a single universal definition of 'sustainability' for the project.

Part 1 Overarching Research Question:

> a) Was 'sustainable development' a consideration in the assessment of the mega-project? (a quick 'yes', 'no', or 'partially' answer would be expected)
>
> b) Should 'sustainable development' be a criterion in any future assessment of mega-projects? (again a quick 'yes' or 'no' answer)
>
> c) If so, what in your view are the three most essential qualities of 'sustainable development' in relation to MUTPs? (a discursive answer).

Conclusion

The elephant in the room? Perhaps we should not neglect a single common factor across all projects: that is that major construction takes place. Could it be that the only common purpose of construction is … construction itself? Perhaps the truth is the reverse of what modern, rationalist ideology leads us to expect. Perhaps the desire to build is what is most significant. Ants build anthills and probably don't formulate reasons for doing so. Humans have big brains and so need to make reasons for what they do. How the building takes place, and what justifies it is of secondary importance. The latter is infinitely variable, the former quite universal. Solutions in the form of MUTPs drive problems rather than the reverse.

According to Johan Galtung (1990, p. 97) social scientists are either story tellers or pyramid builders. The story teller is a 'collectionist' – a stack of index cards is characteristic of the data collection. When the stack is big enough, the material is woven together to tell a verbal tale. Galtung (1990)remarks somewhat acidly: 'Mining reality for data and mining the library for quotations converge in the interview, only that the author of the quotation (interviewee) is intercepted before he commits his thoughts to the written or printed page. In addition, the author is usually anonymous, being too important or too unimportant'. Stories are not theories but are often confused with them: journalism with footnotes. For the pyramid builder the basic

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tool is not data but thought. In its pure form theory is neither data nor quotes but symbolic form ‘cast in a neutral or artificial language’. Having dismissed both singly, Galtung (1990)then embraces both in combination: ‘In short, the whole scientific enterprise is an invitation to an ecumenical delight, combining the intellectually flat but lush landscape of the story teller with the intellectual brilliance of the pyramid builders, in plural’ (ibid. p. 111). Why plural? Because Galtung(1990) does not believe in a single perspective in the social sciences ever being ‘correct’. Both the story teller and pyramid builder are needed, the story teller to shed diffuse and deep light and the pyramid builder to provide a sharp beam.

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Appendix 4

Response to Note Prepared by OMEGA Australian Team on OMEGA Project Methodology: Comparative research and the hypothesis-led questions

Prepared by
Harry T. Dimitriou and Phil Wright, OMEGA Team, UCL
July 2008

1. This was an excellent and invaluable paper at this very timely stage of the research which we believe has taken us forward from where we were. It reflects a full and accurate appreciation of much of the project's intended scope of research and offered very helpful perspectives that quite frankly we could *not* have arrived at ourselves by virtue of being too close to the coal face. For this we are grateful.

2. We will from hereon make comments and offer responses to the paper under the sub-headings employed by you and as they arise in the sequence of your paper, and follow this up by a conclusion with incorporated decisions for moving ahead.

Introduction

1. There is no doubt that the broad nature of the OMEGA research project has the potential to pull it in different directions at the will of different research interests. For this reason it is essential to establish clarity on what *is* to be pursued jointly in a format that facilitates comparative study and what *is not,* so as in the latter case to encourage patterns of knowledge to emerge that are more reflective of context.

2. Striking the balance is difficult, however, thanks to your contribution and the considerable preparatory work undertaken for the CTRL pilot project, we believe we have arrived closer to an acceptable balance, notwithstanding the fact that we acknowledge there is still some more spadework to be done to: (1) operationalise the comparative study in the synthesis stage, (2) further incorporate the debate about the scope and treatment of sustainable development, and (3) identify more clearly the role and impact of context (including cultural) on the findings arrived at.

3. Your reference to Galting (1990) who suggests that social scientists tend to fall into the category of story teller or theory builder misses out we believe on a third category, namely, the investigator (the investigative journalist) who on the basis of a pre-determined hunch (premise) examines the stories he/she collects to arrive at a conclusion (sometimes in the form of an accusation) which is then put into the public domain with the intent to inform and influence. Flyvbjerg's work on MUTPs was in part of this kind, albeit retrospectively dressed-up as something different and more scientific.

4. The important factor here is that we are (1) clear and transparent in what we do and (2) prepared to acknowledge that the synthesis of these findings in the mixed methodology mode later in the research programme execution will present some challenges to us all. These we presume are among the methodological risks you talked of. We all now need to prepare ourselves for this so this dialogue in a way is only just the start.

5. The conscious systematic tie-back of your observations to the original expressed objectives of the OMEGA VREF project proposal is very much welcomed. This we also did as our preparatory work for the design of the CTRL hypothesis-led questionnaire. While we have a few additional inputs to include into your two diagrams (see Figures 1 and 2), we are by and large very comfortable with these as they take us very much further from where we were.

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The commitments of the OMEGA Project

1. You state that that the argument that the measures of the success for MUTPs used in the past are insufficient in the 21st Century does *not* lead to an objective. We wish to differ. The premise here is that these measures are a product of a past context where economic growth was seen (despite all the rhetoric) as the 'king' driving force of measures of MUTP success. The objective of presenting this premise is to investigate whether the changing characteristics and context of the 21st Century demands/warrants new measures and whether these new measures are better informed, framed and operationalized by the sustainable development vision(s).

2. Apart from the points made by us immediately above which highlight the importance of context we largely concur with much of the analyses you offer for each of the other objectives. For operational purposes, though, it may be useful to break-down these objectives into sub-objectives. We highlight in more detail our specific responses to some of these objectives below.

3. *Re: Objective 2:* The proposal you make here is in line with our intentions. We are in the process of adding some further conclusions and possible recommended frameworks for the treatment of risk, uncertainty and complexity derived from the VREF Smaller Project in early August'08. What this work highlights is the strong acknowledgement of the role and impact of context in all these findings and the emergence of some common conclusions. We feel your invaluable analysis omits this dimension. We are also concerned that "……..comparison of this data against 'best practice'" could result in a less thorough assessment of the influence of context.

4. *Re: Objective 3*: Your understanding of objective 3 is spot on. You are quite right that a casual reader of the OMEGA research is likely to misinterpret this objective in the way you suggest, so any further clarification of our statement here is more than welcome. Working Paper series #2 on sustainable development (SD) challenges for MUTPs is *not* exhaustive. We acknowledge this. Subject to budget restrictions we intend to commission some additional inputs here. Suggestions of topics are welcome. In truth, the London OMEGA Team has been over-committed on other matters up until now to be able to further this agenda but is, nevertheless, fully cognisant of the need to develop a fuller agenda. We are conscious, however, that at some stage the OMEGA Project Teams internationally will have to take a common position on SD which takes forward the multi-dimensional representation of it in the proposal but which does *not* become 'everything and therefore nothing'. Indeed, the role of rhetoric and the erosion of trust arising from this rhetoric about SD could well define the common boundaries of what to include and what to exclude in our ultimate consensus of the SD vision(s), bearing in mind that the interpretation of priorities may (legitimately or otherwise) differ according to context.

5. *Objective 5:* Unless we are mistaken, your comments here present a slight difference of view with ours. Whereas you appear to be focussing on bundles of criteria which correlate, we see the task more to do with firstly the sense-making of forces that mould context (and therefore MUTPs) and *then* explain the notions of success with this understanding of context in mind, appreciating *all along* that path dependency (expressed for example through the professions, education and commercial interests) and globalization impact greatly on this. Having said this, we concur that each team's own framework for sense-making analyses could/should uncover those factors that might be present in bundles in their context as opposed to others. (We are, by the way, wary of the term 'best practice' given its close association with templating solutions and its tendency, therefore, to standardise).

   Yet again, the importance of context arises here. As regards the categorisation of success – the intention here is: (1) to have all completed projects firstly judged against the objectives that were set for them at the projects *start;* (2) to have them then judged against modified and added objectives introduced *throughout* its planning and construction; and (3) finally, to have them judged by subsequent add-on objectives, including those associated with the vision of sustainable development introduced locally and globally *after their completion*. The findings then can indeed be

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introduced as inputs to objective 6, but yet again, their importance relative to some kind of contextual analytical framework would be most valuable. The moodle note we recently sent out for the Case Study write-ups suggests the following 4 key 'tests' (for Partner comment) for assessing MUTP 'performance':

- Test 1: Extent that Case Study MUTP successfully meets its initially planned objectives;
- Test 2: Extent to which Case Study MUTP contributes to sustainable development visions and challenges of 21st century;
- Test 3: Robustness/flexibility to cope with change – opportunities for retrofitting Case Study MUTP to meet 21st century sustainable development visions and challenges;
- Test 4: Insights into how well the treatment of risk, uncertainty and complexity in planning, appraisal & evaluation of Case Study MUTP has been undertaken.

More generally on this objective, if we 'buy' the idea that 'context' is all powerful then we must necessarily acknowledge that there will perhaps have to be a strict limit to the number/scope/type of generic lessons that we can and should offer to the outside world.

A quick review of comparative methods

1. We take issue with you that contextual data should where possible be quantitative and that this kind of data informs us *better* than the opinions of informants. Perhaps we misunderstood. Certainly, case study data base material does provide a start to differentiate among projects and their contexts, as do Working Papers series #1. This is, however, merely a starting point. The end of the journey of enquiry regarding context is less clear. There is more exploration required to collectively take this further with a more developed agenda.

2. Your comments here on international comparative research re: case studies learning from each other or a third party, rather than identifying an underlying logic, is well taken *but* the agreed learning from a third party is also likely to have its own underlying logic which would be beneficial to identify where it is shared by others over time and space. The importance of a framework for construct equivalence is clear and your comments are immensely helpful, however, to erect a completed framework from the outset *without* learning from the information we collect and sense-make as the research progresses would be detrimental. So let us move forward with the erection of a comparative framework where we can, identifying and erecting acceptable units of comparative analysis based *both* on our qualitative and quantitative criteria, tied-into the various hypotheses we test both trans-nationally and within a single country. Assuming this is to be done soon by the OMEGA Team at UCL (say within the next 3 months) we can then look for the research returns for the bundling of findings/correlation of observations that emerge, matched against context characteristics and sense-making guidelines of the kind, for example offered, by the VREF Smaller Project. This, the London Team will seek to advance for further presentation and further discussion at the next OMEGA Workshop, with contributions incorporated beforehand by Partners where time permits. Certainly, the next Workshop does need to focus on this aspect of the research plus the sustainability issue.

3. We share your view that under the mixed method research the collision between different world views inherent in different methods of analysis pose major challenges to the OMEGA research project and that we need to work on our methodology here. We have from the outset acknowledged this to be the most challenging and potentially most invaluable part of the research, as we bring the findings of pre-hypothesis analyses and hypothesis analysis together under some kind of comparative framework which have yet (as indicated above) to be finalised.

Deepening our context research

1. The comments offered under this sub-heading are most useful.

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2. They provide a basis for us to move forward notwithstanding the fact that there are other contextual parameters and forces not cited, not even known at present, which *may* emerge from our respondents.

Hypothesis-led research

1. The need to have the hypothesis-led questions developed for each case in a way it compliments and further informs the quantitative data collected in the profiles is well taken. This has always been considered important in our approach, especially where we see this data base as a coat hanger for story-lines, comments and additional narrative. The construction of the timeline of the project as the spine for such additions is a good illustration of how this might work.

2. We agree that the number of generic questions should be reduced. We further agree that a question should be included that relates to the treatment of risk, uncertainty and complexity in decision-making about MUTPs; and another about sustainable development. We, however, think it important to *also* pose a generic question that addresses the subject matter of context. This we add to the revised questionnaire proposed (see appendix).

3. On this basis (see annex):

   - We agree to dropping questions 7 and 8 from our original list of generic questions in our hypothesis-led questionnaire (re: mega events/planning and social exclusion). These can, in any case, be posed if felt appropriate as follow-up questions during the non-generic parts of the interview.
   - We appreciate that the contents of some of the remaining questions are to be sub-assumed within a reconstructed questionnaire for generic questions which we will prepare and circulate to all partners *by the end of July'08*.
   - We further agree to adopt the two tier structure of the generic questions that enables the respondent to first ask open questions and then follow-up with more specific hypothesis-led questions of a more investigative kind.
   - We agree to include a question re: the treatment of risk, uncertainty and complexity but do *no*t wish to confine this to project phenomena, they should also include risk, uncertainty and complexity dimensions of the context/environment of decision-making about the project.
   - We concur with your view that there should be a generic question about sustainable development, even though this would then increase the number of generic questions to 6 if, as we propose, to insist on a generic question about context. Having a question on sustainability is critical since it is one of the main planks of our research. It is, furthermore, a topic of strategic global importance given current international concerns about climate change and because, if the evidence to date from the CTRL interviews is anything to go by, will reveal how little effective understanding there is about sustainability in general and MUTPs contributions thereto in particular.
   - The alternative – of incorporating questions about sustainability within an extended question about project appraisal/evaluation to merely confine the generic questions to 5 rather than 6 would make the appraisal/evaluation question too long. It would also dilute the boundaries between growth related appraisal criteria and broader sustainable development concerns but might be an acceptable compromise for those who strongly object to having 6 rather than 5 questions.

Conclusions

1. We noted a fairly widespread objection among Partners from the moodle discussion regarding the use of what was called 'leading' questions. We are much less concerned about this, as were our respondents, as we can report to have had excellent responses to our CTRL questionnaire. The seniority of those interviewed

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(including ex-ministers) was such that they could more than cope with questions that they considered were posed as straw-dogs. Moreover, we have found this to be the case in regard to the written responses to our questionnaire (where no interview took place).

2. We contend that the questions we asked attracted much more informative responses than neutral ones. On the other hand, we also respect the need expressed by our Partners *not* to have *all* questions presented as if they were leading the interviewee. We, therefore, recommend that at least one leading question be included as part of the more detailed back-up questioning on each topic and that the main question be posed as non-leading question.

3. We are also of the opinion that since many of our interviewees are influential, very much, hands-on senior practitioners they may *not* respond well to fairly neutral questions which they might see as being too academic/theoretical. We have found that such parties both enjoy being challenged and are well capable of responding to questions that lead them in a direction they do not agree with.

4. We conclude by presenting to you the premise that there are in fact *several* elephants in the room, and numerous emperors with no clothes. This may of course differ according to context. This research is unashamedly as much investigative as it is story-telling and theory building. The pyramid builder analogy is thus perhaps a closer description of the kind of exercise we are collectively undertaking.

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Appendix 5: STEP 7 Dissemination - OMEGA Centre 'Making a difference' (using the UCL CoE as an example)

Stakeholder Type	Stakeholders Interest in OMEGA Research	Omega value added	Research Output Type(s)	Research Output Format(s)	Accompanying Activity(ies)	OMEGA Existing Outputs
Academia	• Data Source • Research Collaboration • Findings	Access to data Access to expertise Access to results	Published Research	Academic Journals Website Material	Conference Presentations Seminars	Working Papers
Education (MSc Students)	• Latest knowledge, methods, tools and techniques to enhance skill set	Teaching material resource	Development of MSc	Case Studies Text Books Website Material	Teaching both conventional and web-based	
Professions • ICE • Project management • Finance • Spatial Planners • Transport planners • Management	• Improved decision making • Managing realistic expectations • Techniques to deal with Risk, Uncertainty and Complexity • Generic and context specific lessons for planning and delivering a successful project • Understanding emergent outcomes of infrastructure projects	Access to Data Expertise in topic Expertise in methods Reduced uncertainty	Short Courses Published Research	Case Studies Evidence based outputs targeting Professional journals News Items & Interviews Guidelines & Leaflets Website Material	Teaching both conventional and web-based Seminars & Conferences Workshops? TV/Radio/Multimedia	• ICE Ramp Study (Underway)

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Stakeholder Type	Stakeholders Interest in OMEGA Research	Omega value added	Research Output Type(s)	Research Output Format(s)	Accompanying Activity(ies)	OMEGA Existing Outputs
Consultants (misc.)	• Enhanced credibility with client • Enhance chances of winning competitive business • Insights into decision makers thinking • Access to OMEGA Methodologies	Access to Data Expertise in topic Expertise in methods Reduced uncertainty Methodology	Collaboration	Tender Documents Website Material	Working Groups Project teams Consortia Workshops? Consultancy assignments	
Government departments and Local Authorities	• What are the policy implications of research? • Policy Formulation? • Plan Formulation? • Access to OMEGA Methodologies	Track record Credibility Access to Data Expertise in topic Expertise in methods Reduced uncertainty Methodology	Collaboration Consultancy	Website Material	Working Groups Presentations Workshops Consultancy assignments	• Planning White Paper • ICE Defending Critical Infrastructure inquiry (underway)
NGOs	• What are the policy implications of research? • Policy Formulation? • Plan Formulation? • Access to OMEGA Methodologies	Access to Data Expertise in topic Expertise in methods Reduced uncertainty Methodology	Collaboration Consultancy	Short Courses Leaflets Website Material	Working Groups Presentations Workshops Consultancy assignments	• Collaboration with UITP (Heather Allen) (underway)

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