

MEGA PROJECTS AND MEGA RISKS:

**Lessons for Decision-makers
through a Comparative Analysis of
Selected Large-scale Transport
Infrastructure Projects in Europe,
USA and Asia Pacific**

VOLUME 1: BACKGROUND TO OMEGA RESEARCH PROGRAMME

**Findings of a five year international
research programme funded by the
Volvo Research and Education
Foundations (VREF)**

1st October 2011

Omega Centre

Centre for Mega Projects in Transport and Development

A global Centre of Excellence in Future Urban Transport sponsored by
Volvo Research and Educational Foundations (VREF)

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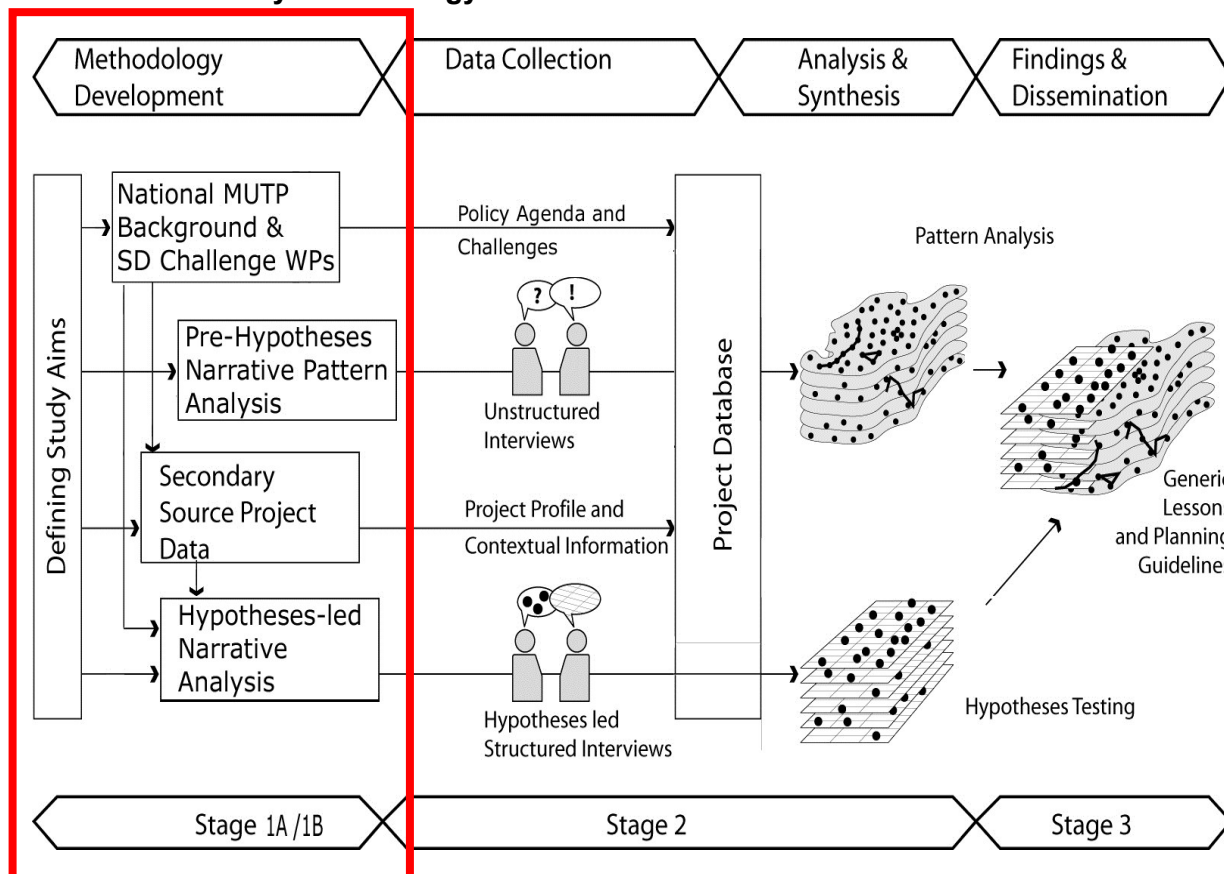
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Document Navigation Note

The figure directly below offers an overview of the overall OMEGA research programme Study Methodology. The area highlighted in red is dealt with by this volume of the report.

The OMEGA Study Methodology



Acknowledgements

The UCL OMEGA Team wish to express its sincerest gratitude to the Volvo Research and Education Foundations (VTREF) for the funding that has sustained the OMEGA research programme to date. The Team in particular wish to thank Måns Lönnroth and Professor Staffan Jacobsson for their tremendous assistance and guidance *throughout* the execution of the research and preparation of its various reports, and to Dr. Arne Wittlov who as past Chairman of the VREF Board gave us the fullest encouragement and support. Thanks are also due to the management and administrative staff of VREF, notably, Henrik Nolmark and Fabienne Niklasson, for their continued help and advice. Last but not least, thanks are due in University College London (UCL) for the tremendous assistance provided by Mike Griffiths and his team in the Research Administration Division and for the encouragement and sustained support of the past Dean of the Bartlett – Professor Christine Hawley – and of course the current Dean – Professor Alan Penn.

1. Introduction

1.1 Aims and purpose of report

This report presents the findings of a five year research programme of The Study of Decision-making in the Planning, Appraisal and Evaluation of Mega Urban Transport Projects (MUTPs): Lessons for Decision-makers - hereafter referred as the 'OMEGA 2 Project.' It is based on an international comparative study of 30 selected MUTPs¹ completed post 1990 in Europe, USA, Australia and Asia. This document follows a series of Progress Reports (see Appendix 1), culminating in the Preliminary Final Report on the Progress of the OMEGA Centre submitted in April 2010.

For the purposes of this research, MUTPs are defined as:

- Land-based transport infrastructure investments within and connecting 'urban areas' and metropolitan regions in the form of bridge, tunnel, road and rail links, or combinations of these.
- Projects that entail a construction cost of over US\$ 1 billion at 1990 prices.
- Projects completed since 1990 in Partner countries/territories.
- Projects frequently perceived as critical to the success of major urban, metropolitan, regional and/or national development.

The structure of this document reflects the Study's aims, scope and methodology as outlined in the successful Centre of Excellence (CoE) research proposal (CD ROM: [MEGA Research Programme Proposals And Progress Reports/OMEGA2 Proposal OMEGA Project 2 Proposal to VREF HD 01-04-2005.pdf](#)) submitted by the Bartlett School of Planning at University College London (UCL) to the Volvo Research and Education Foundation (VREF) in April 2005 for which a grant of SEK 25 million was awarded in December 2006. The scope and content of the proposed research programme was subsequently marginally modified in consultation with VREF on the basis of communications with representatives of its Board and Scientific Council.

The main body of this report offers a detailed account of the research programme's Study methodology and findings with cross-references provided in the form of supporting appendices and hyperlinks to the OMEGA website where more detailed documentation is housed (see www.omegacentre.bartlett.ucl.ac.uk). The preparation of this document has benefited from on-going feedback from members of the OMEGA Academic International Partnership and representatives of the VREF Academic Board and Scientific Council (namely, Måns Lönnroth and Professor Staffan Jacobsson, respectively) for which the UCL Study Team is most grateful.

The contents of this document and its supporting papers have not only provided the source of numerous national and international presentations to various interested parties throughout the Study period as part of the research programme's 'making a difference dissemination strategy' (see Section 8) but also provides the material for future book and journal publications scheduled for preparation during the CoE's extended 3 year VREF grant period awarded in December 2010.

The Final Report itself is divided into six Volumes, as follows:

¹ The selection of case studies was determined by both the availability of sufficient public domain information as regards to their principal features, performance and impacts, as well as access to past project stakeholder representatives willing to share their experiences with the international Study Team through structured and unstructured interviews. These interviews were intended to offer invaluable insights into decision-making for aspects of the project for which they were responsible, knowledgeable and/or impacted by. In these terms, the selection of the case studies was *not* random but based on access to sufficient data and information that permitted the execution of the investigations planned.

Volume 1: Background to OMEGA research programme covers:

- the aims and purposes of the report (as above);
- the aims, background and management of the research programme;
- the composition of the OMEGA Centre and Partner teams comprising the OMEGA Network;
- the various methods adopted in sharing knowledge; and
- the research programme study approach, methodology and work schedule

Volume 2: Other supporting OMEGA Centre studies comprises:

- the purpose and key findings of the 'smaller VREF project' (OMEGA 1 Project) on the treatment of risk, uncertainty and complexity;
- the purpose and key findings of commissioned Working Papers; and
- the purpose and key findings of the OMEGA 3 Project (RAMP Study) on incorporating social and environmental dimensions of sustainability into the appraisal of major infrastructure projects.

Volume 3: UK OMEGA research programme case studies: project and country findings comprises:

- the rationale for the selection of case studies;
- the Channel Tunnel Rail Link case study:
 - Project Profile
 - results of pre-hypothesis research investigations
 - results of hypothesis-led research investigations (including responses to OMEGA Overall Research Questions and Hypotheses (ORQs and ORHs))
 - case study findings in regard to the '4 tests'
- the Jubilee Line Extension case study:
 - Project Profile
 - results of pre-hypothesis research investigations
 - results of hypothesis-led research investigations (including responses to OMEGA Overall Research Questions and Hypotheses)
 - case study findings in regard to the '4 tests'
- the M6 Toll Road case study:
 - Project Profile
 - results of pre-hypothesis research investigations
 - results of hypothesis-led research investigations (including responses to OMEGA Overall Research Questions and Hypotheses)
 - case study findings in regard to the '4 tests'
- the synthesis of UK case study findings:
 - context-specific responses to the ORQs and ORHs
 - generic responses to the ORQs and ORHs
 - lessons of a context-specific nature
 - lessons of a potentially generic nature

Volume 4: OMEGA research programme international case studies: project and country findings comprises:

- the rationale for the selection of case studies and overview of methodology;
- case study and country-based findings (i.e. the same structure as Volume 3 – Project Profile, pre-hypothesis and hypothesis-led investigations, '4 tests' findings and country synthesis of findings) for:
 - France
 - Germany (Project Profiles only)
 - Greece
 - Netherlands

- Sweden
- USA
- Australia
- Hong Kong
- Japan

Volume 5: OMEGA Research programme: UK and international case studies – comparisons, findings and lessons comprises:

- explanation of the development of the overall synthesis methodology;
- a compare and contrast analyses of the ‘4 tests’ findings of all completed case studies to provide qualitative and quantitative insights;
- the identification of the principal themes and lessons derived from the OMEGA 1 Project which were used as a framework for generic lesson formulation;
- the identification of responses to the OMEGA Overall Research Questions and Hypotheses, synthesised from all case studies and country reports;
- the provision of key generic lessons for MUTP planning, appraisal and delivery;
- the identification of ‘who should do what differently’ – generic lessons for decision-makers and other key stakeholders;
- further explanation of the OMEGA Centre’s dissemination strategy; and
- thoughts on future research prospects and priorities.

Volume 6: OMEGA Research programme: Final Report Appendices comprises:

- a sequential list of appendices in order of their first reference by the body of the report, as outlined in Volumes 1 to 5 above.

1.2 Background to research programme

The OMEGA Centre at UCL was established amid concerns internationally about the capability of MUTPs to be provided *not only* on time and within budget, but also to deliver the benefits they promise, especially given the significant scale of costs and uncertainties associated with their development. The fact that a transfer of management and financial risk from the public to private sector would introduce new disciplines and greater reliability for such projects has *not* been borne out on the scale expected has spawned additional concerns. The work of the CoE and its Academic International Partners seeks to respond directly to these (and other) issues, albeit in the context of a research programme confined to the Developed World.

The fundamental underlying question posed by the OMEGA 2 Project is: *what constitutes a ‘successful’ MUTP* in light of the aims of such projects and the anticipated challenges presented by the 21st Century, where such challenges are predicted by a growing body of scholars and scientists to reflect a rising tide of global and local inter-connected uncertainties and associated risks (see Lash et al, 1996; Beck, 1999; Taleb, 2007; Renn and Walker, 2008; Beddington, 2009).

Significantly, this fundamental question thus extends the enquiry into the ‘success’ of MUTPs *well beyond* the conventional project management concerns of completing such projects ‘on time, on budget and within prescribed specifications’ as important as they may be (see Morris, 1994; Flyvbjerg et al, 2003; Altshuler and Luberoff, 2003; Allport, 2010). It alludes to:

- **project objectives** that emerge *subsequent* to the approval and construction of such projects (referred to as ‘emergent objectives’) that impact on project outcomes;
- **changing societal, political and environmental values and priorities** that evolve over time that alter expectations of such projects (see Hall, 1980: 1-12);

- **changing values, priorities and expectations** regarding desired visions present among different professions involved in MUTP development (see Dimitriou, 1992: 150-183); and
- **different values, priorities and expectations** prevalent in different development and cultural contexts.

As regards to 'development contexts', it should be emphasised that the question of MUTP 'successes' (or failures) investigated here was largely confined to the experiences of projects in ten countries in the Developed World². These were reviewed in conjunction with nine other OMEGA International Academic Partners from distinguished universities in: Australia, France, Germany, Greece, Hong Kong, Japan, Netherlands, Sweden and United States of America. Working with the assistance of The Complexity Interest Group at Glamorgan University (closely associated with Cognitive Edge Plc³), the OMEGA Centre and its International Academic Partners looked to identifying, extracting and sharing new knowledge and potential lessons for better MUTP development practices on the basis of a synthesis of the findings derived from interviews conducted with some 300 persons who represented key stakeholders of the projects reviewed.

The OMEGA International Academic Partnership network was led by 10 senior academics (one from each institution), supported by numerous research assistants and 10 PhD students, together with more than 40 researchers from a wealth of different disciplines. In undertaking this research, the CoE at UCL and its Partners look to ultimately 'making a difference' globally to the field of MUTP developments by addressing the growing international realisation that there is an *urgent* need to better understand what it takes for MUTPs to both deliver their objectives *and* to examine more closely the criteria by which they should be judged 'successful' in the context of the increasingly uncertain, complex and changing environments of the 21st Century, and the varied vision(s) of sustainability promoted both locally and globally.

The fact that there have to date been too few attempts to bring about such systematic institutional learning from MUTP international experiences⁴ has led to the work of the OMEGA Centre being increasingly welcomed by numerous influential parties internationally, including: the Transportation Research Board (TRB), the Department of Transportation's Volpe Centre for National Transportation Systems and the University of Pennsylvania's High Speed Rail Study in the USA; professional organisations such as: the Institution of Civil Engineers (ICE), the Actuary Profession, the Royal Town Planning Institute (RTPI) and the Major Projects Association (MPA), plus government and quasi-public agencies such as the Infrastructure Planning Commission (IPC), the South-East England Development Agency (SEEDA), Transport for London (TfL) and the London Olympics Delivery Authority (ODA) in

² The decision to confine the scope of the research programme to the Developing World rests on the adopted premise (examined further in the research programme) that decision-making for mega projects is *greatly* affected by its 'context'. This was an important finding of the Centre's VREF 'Smaller Project' undertaken prior to the commencement of the OMEGA 2 project (see Working Paper 4: Generic lessons for Improving The Treatment of Risk, Uncertainty and Complexity in the Planning and Mega Urban Transport Projects, OMEGA Centre, 2008). It was felt on this basis that to extend the research to case studies in the Developing World (with very different institutional, resource and development contexts from those of the Developing World) would seriously compromise the findings of the research undertaken, notwithstanding the fact that some could prove generic.

³ Cognitive Edge Plc. is a spin-off from the now defunct IBM research arm - *The Cynefin Centre for Organizational Complexity* - which up until 2006 conducted applied research investigations into knowledge building derived from narrative pattern analyses of decision-making in industry and commerce as a basis for future lesson-learning and sharing in innovation projects. Based in part on the use of tailor-made computerized software designed to identify patterns of emerging knowledge from narratives that would typically *not* be identified from hypothesis-led investigations, the approach resonates considerably with the ideas presented by Gladwell (2000) in his book entitled *The Tipping Point* and those of Surowiecki (2004) in his publication entitled *The Wisdom of Crowds*.

⁴ A reason revealed in interviews conducted in support of this research for this lack of public domain lesson-sharing - forwarded by a representative of a highly influential company involved globally in mega projects - is the high commercial value assigned to such knowledge and the competitive advantage it offers to the private sector parties involved in such ventures.

the UK, and various other government and private sector parties concerned with MUTP developments in the case study countries (see Section 2.2.2).

1.3 Aims and purpose of research programme

The overall purpose of the research programme is to foster institutional learning world-wide from growing international experiences of planning, appraising and delivering MUTPs - derived from a comparative analysis of selected case studies spanning Europe, USA, Asia and Australia - and through these studies, identify both important pitfalls and achievements of past experiences, together with their major social, economic, territorial and environmental implications. In so doing, the premise of the research is that they (the MUTPs) may become better understood as a basis for generic lesson-learning for future projects of this kind. With this in mind, the research programme strategy employed sought to:

- **Establish a CoE** together with an associated 'knowledge building network' of ten International Academic Partners to undertake a common agenda of research with the possibility of later extending this to the Developing World, subject to additional funding.
- **Incorporate the findings from other complimentary studies** undertaken by the OMEGA Centre at UCL which examined the treatment of risk, uncertainty and complexity in decision making and planning for complex mega projects *outside* the field of MUTPs.
- **Incorporate the findings from additional complimentary studies** undertaken by the OMEGA Centre at UCL which examined how better to incorporate social and environmental dimensions of sustainability into the appraisal of mega infrastructure projects.
- **Prepare as background working papers**, international insights into how important national policy, planning and funding agendas are treated by MUTPs and relate these to both MUTP developments, and the sustainable development visions such projects are expected to serve in the case study countries.
- **Develop new investigative and analytical tools** for the sense-making of complex observations as part of the primary data collection exercises, relying extensively on story-line narrative pattern analysis derived from face-to-face pre-hypothesis interviews and website questionnaires for a variety of MUTP categories of stakeholders.
- **Conduct more traditional interviews** 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.
- **Use the UK Channel Tunnel Rail Link (CTRL) case study** as a basis for 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 in the public domain.
- **Accumulate from the above strategy a body of theoretical and case study evidence** that can be used as a basis to identify generic and context-specific lessons for future MUTP developments and from this arrives at possible new planning paradigms and guidelines.

More particularly, the research programme looked to:

- **Evaluate the extent to which MUTPs meet planned objectives** (including completion dates, budget targets and operational performance targets), *and* 'emergent objectives', as well as contribute to the sustainable development visions such projects are intended to contribute.
- **Seek generic and context-specific insights** into how and why these MUTPs have been planned the way they have, with a view to providing an understanding of how they can be potentially retrofitted to successfully contribute to visions of sustainable development.

- **Gather evidence of the degree to which MUTP planning, appraisal and delivery has been compromised by:**
 - The inability to capitalise on the wider benefits that they could generate;
 - The institutional frameworks and regulatory mechanisms employed to deliver them;
 - The fixed deadlines dictated by major national/international events and important development agendas; and
 - The formal governmental planning process to which they were subjected, including requirements of public consultation and environmental appraisal.
- **Provide insights into how contextual (including cultural) perceptions affect the treatment of uncertainty, risk and complexity** in the planning, appraisal and delivery of MUTPs, and how these differ from one regional or national context to another, and the way these have an impact on results and technology-transfer.
- **Offer insights into whether current practices** of planning, appraisal and delivery methods in MUTP studies are suited to the fast changing and uncertain realities of the 21st century.

In light of the research programme's broad scope and international coverage⁵, the study necessarily sought to address geographic, policy, economic and a wide variety of other key contextual matters that typically impact MUTP decision-making at *different* levels and periods of time. As already emphasized, this recognition of the significance of context reflects the findings of the VREF 'Smaller Project' alluded to earlier (see Section 4.1) which reviewed the treatment of risk, uncertainty and complexity in decision making for planning in a number of disciplines and professions *outside* of MUTPs, such as the military, medicine, insurance and banking and earthquake engineering, where risk, uncertainty and complexity have long been seen to be at the *milieu* of strategic planning thought and action. This acknowledgement of the 'power of context' is further reflected in the writings of Gladwell (2000) and Surowiecki (2004), and led to a recognition early-on in the research programme of the need to pay very careful and respectful attention to project time-lines of key decisions, plus the changing contexts (and related values) of MUTP decision-making over their project lifecycles. This is especially important for MUTPs given that such projects are themselves frequently key drivers of change that have the potential to transform the contexts (and related values) of the places, economies and societies MUTPs are intended to serve and traverse.

Acknowledging the importance of context in judging whether MUTPs are 'successful' or not (some mega projects have been declared a 'failure' in their early history only to be declared a major success in later decades, and vice versa), the research programme pays attention to the:

- **Local, regional and national contexts** of the 30 MUTP case studies, given that they were planning, appraised and delivered in relation, for example, to their policy backgrounds, project objectives, anticipated impacts, associated developments and other projects, plans and programmes they spawned over time (see Sections 5 and 6).
- **Findings of the Working Paper #1 series** of this research programme which provides an account of the national contexts for MUTP planning, funding and appraisal since World War II for each of the Partner countries and in the UK (see Section 4.2).
- **Findings of the Country Synthesis Reports** of this research programme (see Sections 5.6 and 6.5) prepared by each Partner and the CoE which, among other things, examine key contextual lessons against the background of local, regional and national contextual matters.

⁵ As a field of study, the research programme spans expertise in a *very* large number of areas, including: civil engineering, project management, urban and regional policy/planning, transport planning and infrastructure development, science policy and innovation, economics and social theory. While this broad scope of disciplines enriches perspectives, in a world where specialist expertise flourishes and remains important, it also exposes the multi-disciplinary researcher to accusations of being insufficiently familiar with the depth of the various specialist areas of MUTP developments.

- **Findings of the Synthesis of Overall Case Studies** of this research programme (see Section 7) which address contextual matters from many perspectives, especially in relation to lessons that may be appropriate at the national level, international-regional level (e.g. Asia, Europe and sub-divisions thereof) and globally.

Because, as already indicated, the identification of lessons from both positive and negative experiences in MUTP developments has to date been largely undertaken by individual consulting firms working in the field who frequently confine these lessons to internal use and treat them as knowledge of competitive commercial advantage, the work of the OMEGA Centre and its Academic International Partners is potentially invaluable as it looks to circumvent this practice and in so doing can only benefit all those involved in the field. What the OMEGA 2 Project has done - and promises to further progress - is to place its systematic analysis of international MUTP case studies and the lessons derived from these for future MUTP developments (or the retrofitting of existing ones) into the public domain, thereby providing a knowledge platform upon which further related research developments may be built, or critical reviews undertaken. This more open approach to MUTP investigations is anticipated to significantly assist a much better understanding of MUTPs as potentially major strategic agents of change in relation to such matters as urban regeneration, territorial restructuring and economic growth; particularly important in countries of the developing world where the opportunity costs of such projects are greatest even though this is not the target audience of the Study.

A spin-off from the OMEGA 2 Project has been The RAMP Project (referred to hereafter also as the OMEGA 3 Project) where the OMEGA Centre has been commissioned by the UK Institution of Civil Engineers (ICE) and the Actuarial Profession to inform them how better to incorporate social and environmental dimensions of sustainable development into the appraisal of major infrastructure project risks. This work (undertaken in parallel with the OMEGA 2 Project) has brought the Centre in contact with senior professionals and government officials both within UK's national government (through contacts with the Department for Transport [DfT], the Highways Agency, Transport for London [TfL], the Treasury, the South-East Development Agency [SEEDA] and Infrastructure Planning Commission [IPC]) as well as at the international level through contacts with (the European Investment Bank [EIB], the European Commission [EC], the European Federation of Transport [EFT], the International Union of Urban Public Transport [IUPT], the World Bank [IBRD], the US Transportation Research Board [TRB], the US Department of Transportation [USDOT] and UN-Habitat). The findings of this complimentary research programme concluded at the end of June 2010 (see Section 4.3) *strongly* points to the need for Multi Criteria Analysis (MCA) Frameworks (informed by global, national and local policies) which place Cost Benefit Appraisal (CBA) within a wider appraisal and evaluation context performing a less central, *albeit* very informative role, where trade-offs between tangible and intangible costs and benefits can be better appraised and traded more transparently at different stages of the project cycle (see The OMEGA Ramp Study on Sustainable Development in Infrastructure, *Infrastructure Journal*, 2011 <http://www1.ijonline.com/infrastructurefinancenews/preview?articleid=68552>). Not surprisingly, what has been found by the OMEGA 3 Project (as in the case of the Study reported upon here) is that 'context matters *a great deal* in such appraisal exercises. These findings are considered to be potentially of immense relevance to the research work of the OMEGA 2 Project, as were the findings of the OMEGA 1 Project (see Section 4.2) completed in September 2008, which investigated lessons in the treatment of risk, uncertainty and complexity in the planning of projects for a number of professions and disciplines where uncertainty has long been recognised to be at the centre of their planning efforts.

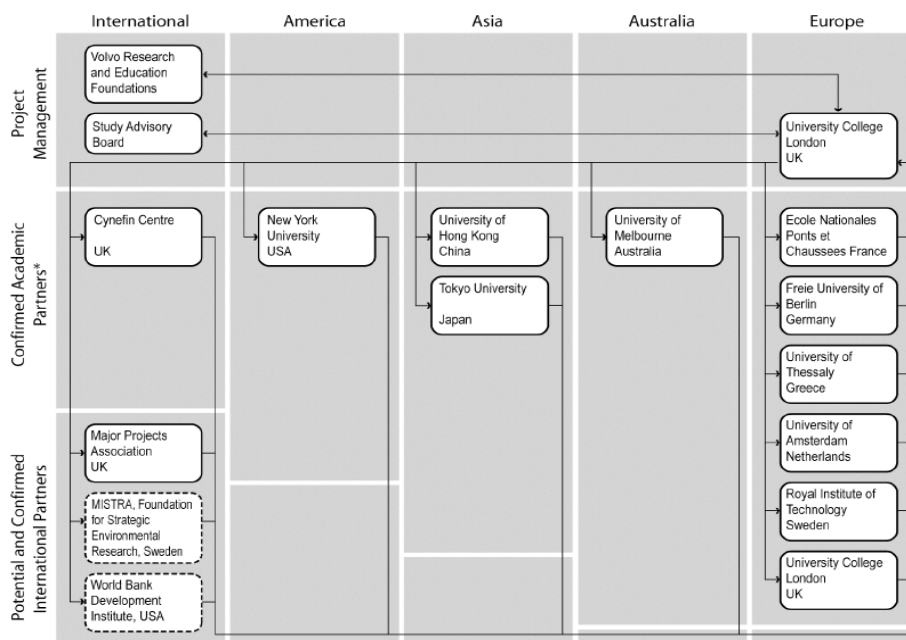
1.4 Management of research programme

The management of the OMEGA 2 research programme involved the following five principal sets of parties:

- **The Volvo Research and Education Foundations** (see <http://www.vref.se/>) - directed by an Advisory Board which in turn was advised by its Scientific Council, serviced by its Secretariat and supported by nominated Advisory Board and Scientific Council Members assigned to oversee the progress of the research programme. Progress of the research programme and its funding was monitored by VREF by reviews of annual reports submitted by the OMEGA Centre, numerous supporting visits by Måns Lönnroth and Professor Staffan Jacobsson to UCL, and of OMEGA contributions to VREF Workshops and bi-annual Conferences.
- **University College London** - comprised of the OMEGA Centre Study Team located in the Bartlett School of Planning (supported by its UK Case Study Team, inclusive of Research Assistants and PhD candidates), the Research Administration Division of UCL and the Offices of the Dean of the Bartlett which oversaw the overall progress of the research programme. The management of the research programme operations were guided by monthly OMEGA Centre Progress Meetings with the UCL Study Team, weekly management meetings by the Director of the Centre with its Administrator (until his departure in February 2010), and at quarterly meetings of the Centre's Director with UCL's Research Administration. The management of the technical work is summarized in Section 2.
- **Academic International Partners** - comprised of the nine university partners, representing the international Case Study Teams from Australia, France, Germany, Greece, Hong Kong, Japan, Netherlands, Sweden and USA. Under the overall supervision of the Director of the UCL OMEGA Study Team, each International Partner was headed by a Principal Investigator (PI) and supported by Research Assistants, including VREF funded PhD candidates. Each country team was left to manage their teams in the manner they deemed most fit, subject to their abiding by the research programme's Partner Agreement drawn up by UCL with the various Partners and submitting annual progress reports and financial accounts. The annual OMEGA Workshops offered invaluable opportunities for the Centre and Partner teams to resolve important issues of the time, while for other periods the Centre's Administrator addressed issues as they arose in consultation with the Director of the CoE. Also included among the Academic Partners is The Complexity Interest Group at Glamorgan University (closely associated with Cognitive Edge Plc.) which provided guidance, training and advice on the application of Narrative Pattern Analysis Techniques to pre-hypothesis investigations of the case study investigations and their synthesis, conducted in support of the research programme. The management of the technical work is summarised in Section 2.
- **Professional International Partners** – comprised of at least three public or private sector parties involved in MUTP developments in each case study country, of which some were co-funders of the country investigations (see Section 2.2.2). The degree of on-going communication among the Academic Partners and their professional partners varied from country to country. In the case of the UK, these communications were primarily confined to the OMEGA Centre submitting annual reports and making occasional presentations to the institutions involved on an on-going basis.
- **International Steering Group** – comprised of eleven eminent academics selected from each of the countries involved in the research programme (see Appendix 2) this body operated in virtual mode. Its members undertook reviews of Country Working Papers and selected thematic Working Papers. Members of the Group were also invited to comment and provide feedback on the draft version of the Final Report. By and large, communications with the Steering Group were conducted on an annual basis through its chairman Professor Sir Peter Hall.

The line management structure of the OMEGA 2 research programme was as set out by the successful CoE proposal submitted by UCL in April 2005 and as subsequently developed in consultation with VREF as illustrated in Figure 1.1.

Figure 1.1: Original OMEGA study management structure



What is very evident from the scale of the research programme, its international character and multi-university participation, plus the numerous complex legal, financial and personnel issues it spawned (many of which, incidentally, had not before been encountered by VREF, UCL and the other universities involved) was that they on occasions tested the metal of the management structure put in place to oversee the research. However, notwithstanding the eight month delay of receipt of nine of the ten country case studies⁶ that ultimately contributed to the three month research programme over-run, and notwithstanding the requirement of an additional SEK 2 million from VREF to complete the Study, the research programme was completed within the original projected estimate of SEK 28 million. Although this was achieved by making some painful cutbacks, the overall success of the project management can be attributed to an exceedingly high level of goodwill and support evident from Academic Partners, the considerable patience and confidence shown in the project by VREF (despite the risks involved), the exceptional support of the Research Administration Office at UCL, the sustained support provided by the Dean's Office at the Bartlett, and last – but certainly not least – the *incredible* work ethic of the UCL Study Team.

Appendix 3 offers the reader of this report some key definitions of terminology employed considered critical to a full appreciation of the Study.

1.5 References for section 1

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⁶ The tenth country studies (those for Germany) were received in February 2011 – i.e., some 14 months late.

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2. The OMEGA network

2.1 The OMEGA Centre at UCL

2.1.1 The OMEGA Centre study team

The OMEGA Centre Study Team, based in the Bartlett School of Planning (BSP) enjoyed supportive links within UCL while conducting the Study with the Department of Civil, Geomatic and Environmental Engineering (including the Centre for Transport Studies) and the Department of Geography, and within the Bartlett Faculty of the Built Environment, with the Development Planning Unit (DPU), the Centre for Advanced Spatial Analysis (CASA), the School of Construction and Project Management, the heads of which all expressed considerable interest in the work of the CoE. Links with other UK universities include those with academic colleagues from the Centre of Transport Studies at Imperial College London, the Institute of Transport Studies at Leeds University, the Science Policy Research Unit (SPRU) at Sussex University and the Department of Economics at Kent University.

The core of the OMEGA Centre Study Team comprised:

- **Professor Harry T. Dimitriou** – Study Director, Director of the OMEGA Centre and Principal Investigator. He commenced his inputs in September 2006 and typically worked on 60% of a full-time post for the initial four years and 40% in the fifth year.
- **Phil Wright** - Senior Research Fellow and Deputy Director of the OMEGA Centre. He joined the team in October 2006 and has worked on the project on a full-time basis since his appointment.
- **Dr. E. John Ward** - Senior Research Fellow and IT Specialist for the OMEGA Centre. He joined the team in January 2007 and has worked on the project on a full-time basis since his appointment.
- **Richard S. Oades** – Administrator of the OMEGA Centre. He worked on the project from September 2006 through to February 2010, largely in a (50%) part-time capacity up until June 2008, and then in a full-time capacity from July 2010 through to February 2010.
- **Yen-Ning Tseng** - Research Assistant/PhD Student and MSc Programme Design Assistant. She worked on the project typically on a (20%) part-time basis from September 2006 through to June 2010, and then on a full-time basis from July to December 2010.
- **Rob Gallagher** – Senior Research Fellow. He worked on the project largely in a (20%) part-time capacity from September to December 2010 and then on an (80%) part-time basis until September 2011.
- **June Taylor** - Research Assistant. She worked on a full-time basis for the project since December 2010 through to September June 2011.

From a technical standpoint, the OMEGA Team also benefited from the assistance of numerous other colleagues both within and outside UCL on an intermittent basis throughout the study period, often on a voluntary basis. Given they are too numerous to cite here they have been cited in Appendix 4).

It should finally be noted that from the very outset of the project – indeed also during its proposal preparation - the OMEGA Team benefited *immensely* from the on-going financial administrative support of UCL's Research Finance Division, headed by its Director Mike Griffith. Supported by his staff, notably Felix Nwabuko (up until December 2010) and Mark Burgess (from January through to September 2011) on financial matters, and Diran Solanke on legal issues, Mr. Griffith took on personal responsibility for overseeing the financial administration of the Study. The core study team additionally benefited greatly from the oversight of the overall progress of the project by two Deans of the Bartlett Faculty of the Built Environment at UCL - Professor Christine Hawley (September 2006 to August 2010)

and Professor Alan Penn (from September 2010 to September 2011) - who intermittently liaised with representatives from VREF and offered sustained support throughout the Study period.

2.1.2 OMEGA UK partners and associates

The following organisations offered support to this project; some in the form of financial assistance, others in terms of assistance in data collection and analysis:

- South East England Development Agency (SEEDA),
- London Borough of Southwark,
- Transport for London (TfL),
- UK Institution of Civil Engineers (ICE), and
- UK Actuary Profession.

2.1.3 The Complexity Interest Group

In addition to the technical support received by the UCL core Study Team acknowledged above, mention should also be made of the contributions by *The Complexity Interest Group* at Glamorgan University. Led by its Director, David Snowden, the Group's team (see Appendix 5) assisted greatly in the design of the pre-hypothesis case study investigations, the analyses of their findings and the training of the overall research programme's capability to conduct such investigations and employ techniques of *Narrative Pattern Analysis* developed by *Cognitive Edge Plc.*, a sister organisation of the *The Complexity Interest Group*.

2.2 The International OMEGA partnership network

2.2.1 The academic international partnership study teams

The Academic International Partners that supported the OMEGA Centre to conduct its case study research (often referred to as the OMEGA International Academic Partnership Network) engaged teams that were headed by senior academics as case study Principal Investigators (PIs) based in the following university departments:

- **Australia:** Australasian Centre for the Governance and Management of Urban Transport (GAMUT), Faculty of Architecture, The University of Melbourne and Department of Urban and Regional Planning, Curtin University of Technology, Perth - directed by **Prof. Nicholas Low**.
- **France:** Laboratoire Technique Territoires et Societes (LATTS), Ecole Nationales Ponts et Chaussees and UFR Lettres et Sciences Humaines, Université de Cergy-Pontoise - directed by **Prof. Elisabeth Campagnac**.
- **Germany:** Institute for Geographical Studies, Urban Studies, Free University of Berlin, Berlin, - directed by **Prof. Gerhard Braun**.
- **Greece:** Department of Urban and Regional Development, University of Thessaly - directed by **Prof. Pantelis Skayannis**.
- **Hong Kong:** Department of Real Estate and Construction, University of Hong Kong - directed by **Prof. Frederik Pretorius**.
- **Japan:** Department of Built Environment, Interdisciplinary Graduate School of Science and Engineering, Tokyo Institute of Technology and School of Regional Development Studies, Toyo University - directed by **Prof. Yasunori Muromachi**.
- **Netherlands:** Institute for Metropolitan Studies, University of Amsterdam, directed by Prof. Willem Salet.
- **Sweden:** Department of Technology and Society, Lund University - directed by **Prof. Bengt Holmberg**.

- **USA:** Rudin Centre for Transportation Policy and Management, New York University, New York City - directed by **Prof. Charles Brecher**.

Full details of the national study teams with an indication of the degree of the participation of individual team members are provided in Appendix 6.

2.2.2 The international professional partnership network

As in the case of the UK case study team, each of the Academic International Partners were supported by public and/or private sector organisations associated with MUTP developments in their country which offered support to their case studies; some in the form of financial assistance, others in terms of assistance in data collection. Details of these parties and contact persons are provided in Appendix 7 with an indication of those which provided financial support to the project.

2.2.3 The OMEGA international PhD student network

In parallel with the international research programme reported upon here, the OMEGA Centre - through its academic partnership agreements and other related arrangements - funded a total of 10 PhD students to undertake research in the field of MUTPs. The names of the PhD students, the country team to which they were affiliated, the scope and progress of their research and details of their funders are given in Appendix 8. Also included in the appendix are abstracts of each PhD thesis.

At the time of writing: 2 PhD theses have been submitted for examination and one has been rewarded, seven remain underway and one PhD candidate has since withdrawn from his studies. The OMEGA International PhD Student Network was set-up at the initiative of the students at the second OMEGA Workshop in Volos, Greece. It was established with the intention of providing a forum (real and virtual) within which the students could present their work to each other for peer review, strengthen academic connections for potential collaborative publications and exchange ideas for work management to help complete their work on time. This was supported by an additional day of events specifically tailored to PhD student needs following most OMEGA Workshops. With VREF funding assistance, this initiative subsequently spawned a VREF-CoE- funded PhD student programme of meetings which met annually since 2008 at VREF CoE Workshops and VREF Future Urban Transport (FUT) Conferences.

2.3 OMEGA Centre knowledge-sharing

2.3.1 Website

The OMEGA Centre Website (see www.omegacentre.bartlett.ucl.ac.uk) has been developed as a primary vehicle for the building and dissemination of information regarding those MUTPs studied by the Centre and its Partners plus an avenue for disseminating the various activities of the Centre as they developed over the study period. Running since October 2006, the website was a fundamental requirement when establishing the CoE. It contains:

- background information (as project profiles) of all the OMEGA 30 case studies;
- information and contact details of the Partners;
- details of the study's research aims, scope, progress and outputs;
- details of the various Working Papers produced by the Centre – not only for the OMEGA Project but also for other related studies such as the VREF Smaller Project (OMEGA Project 1) and the UK ICE/Actuary Profession RAMP Study (OMEGA Project 3);
- downloadable videos of past OMEGA Workshops;
- downloadable videos of the UK OMEGA Seminar Programme; and

- details of the new MSc Programme on Mega Infrastructure Planning, Appraisal and Delivery and the related new short course in the same field.

The website also provided the means to launch the international database of MUTP case study project profiles collected by the OMEGA Academic International Partnership network, thereby producing a highly significant and unique international MUTP database in the public domain of key planning/performance data to facilitate comparative analysis and lesson-sharing among 30 projects in 10 countries. The website has benefited from two enhancements since its establishment – one in October 2008 and another in March 2011.

2.3.2 Moodle

An important aspect of the CoE's day-to-day operation involved effective communications with OMEGA Partners spread over seven different time zones. A flexible and extendable facility was needed to allow the Centre and its Partners to readily exchange information/views (including those of any future Partners/interested parties). With this in mind, the CoE set up a *moodle* that has been customized and deployed to allow secure communication throughout the OMEGA Academic International Partnership network to help explain and discuss various research methodologies and practical tasks required to be completed in the various stages/phases of the research programme. Over and above this function, the *moodle* facilitated the construction of an expandable knowledge platform and knowledge building network linked to other relevant international information resources and research centres.

The OMEGA *moodle* holds information and discussions on the following topics:

- **Omega 1 Project:** Here discussion forums were offered regarding Working Papers #1, #2 #3 and #4.
- **OMEGA 2 Project:** Here discussion forums were offered regarding: Working Papers series #1 and #2 (referred to as a resources/support forum); Pre-Hypothesis research (resources/support forum); Hypothesis-led research (resources/support forum); and Project Profile development (resources/support forum). In total there are 38 registered users for these forums.
- **OMEGA PhD Network:** Here discussion forums and resources were made available to all PhDs candidates working within the OMEGA Academic International Partnership network. In total there have been 12 registered users.
- **VREF CoE PhD Network:** Here discussion forums and resources were made available to all PhD candidates working in the eight VREF funded CoEs world-wide employing: resources/forum/wiki/database for VREF PhDs and a MUTP Resource Library. In total there have been 60 registered users.

2.3.3 OMEGA guidance notes

As the research programme progressed, the OMEGA Centre Study Team produced a number of papers offering methodological study guidance that were circulated among the Academic International Partners to both provide advice on their case study work and ensure consistency in approach across the 10 countries/30 case studies (see Appendix 9). These papers essentially fell into three categories:

- **those produced to assist at the case study data collection stage** - including guidance offered by the Complexity Group/Cognitive Edge Team;
- **those produced to assist at the case study data analysis stage** - once again, including guidance offered by the Complexity Group/Cognitive Edge Team; and
- **those produced to assist in the case study comparative analysis and synthesis stage.**

The guidance notes were discussed, reviewed and amended via moodle and/or during OMEGA Workshop discussions throughout the study period up until the *original* scheduled for partner case study submissions in June 2009. They provided the basis of the 'best fit' of consistency that could be achieved, at the same time allowing for the inevitable diversity that prevailed.

2.3.4 OMEGA workshops and international conference

In total the research programme has hosted and funded five three-day workshops. They include the:

- **London OMEGA Workshop in January 2007:** This event acted as the study launch Workshop and was attended by 23 persons, principally from the Academic International Partner countries. In addition to presenting the overall research methodology of the five year study, the workshop provided an insight into the potential value of the narrative analysis of case study story-telling and the software developed by Cognitive Edge employed to sense-make such material as part of the overall study investigations.
- **Naples OMEGA Workshop in July 2007:** This was attended by 22 persons, principally from Academic International Partner countries and essentially focussed on research programme data collection tasks and challenges, including Cognitive Edge's pre-hypothesis data collection techniques. The event immediately followed the AESOP Conference at which the OMEGA Centre chaired a special session on mega projects.
- **Volos OMEGA Workshop in May 2008:** This event was attended by 27 persons from all Academic International Partner countries and principally focused on the research programme's analytical tasks and challenges, with particular attention paid to Cognitive Edge pre-hypothesis sense-making techniques
- **Lund OMEGA Workshop in April 2009:** This event was attended by 26 persons, principally from the Academic International Partners, with particular attention paid to the analytical framework and related criteria for case study comparative analysis and synthesis. It immediately followed the VREF Futures Urban Transport (FUT) Conference in Gothenburg.
- **Perth OMEGA Workshop in July 2011:** This event replaced the cancelled London Workshop scheduled for February 2010 when Academic International Partners were originally set to present their case study findings but were unable to meet this deadline. The Perth Workshop immediately followed the AESOP/World Schools of Planning Congress at which the OMEGA Centre chaired a special session on mega projects. The purpose of this event – the last of the OMEGA Workshops – was for the OMEGA Centre to present to its Academic International Partners the generic and context-specific findings of the five year research programme and to receive feedback from them on these conclusions for incorporation into the Final Report to be submitted to VREF in October 2011.

Appendix 10 provides details of each of the Workshop programmes and attendees. As already indicated, several of these workshops (namely those held in Naples, Volos and Lund) also offered the opportunity to the OMEGA Partner PhD network to hold 'bolt-on' workshops designed specifically to meet the research needs of the PhD students involved in the OMEGA research programme.

In addition to the above workshop, an OMEGA UCL hosted International Conference is planned (provisionally) for late 2012. This is proposed with a view to providing an international exposure to the various findings of the OMEGA five year VREF funded research programme both on a country by country basis and in terms of generic lessons and guidelines of potential value to future MUTPS.

2.3.5 OMEGA UK seminar programme

In January 2009, the OMEGA Centre launched a UK seminar programme of talks by speakers from a variety of disciplines on various aspects of the theme of mega infrastructure planning, appraisal and delivery, particularly mega transport and urban development projects. Run from the Bartlett School of Planning at UCL the seminar programme comprises of contributions from staff of the OMEGA Centre and eminent external speakers, including: consultants, civil servants, academics, journalists, NGO representatives and international development agency officials. By the end of 2011, the Centre will have organised three such annual seminar programmes (for 2009, 2010 and 2011), hosting over 20 speakers and approximately 200 attendees from a wide spectrum of industry, commerce, academe and government. Most seminars have been digitally recorded, and with the permission of speakers, have been posted on the omega Centre website. Details of the annual seminar programmes and list of attendees are given in Appendix 11. A recent welcome development is the invitation by the editor of the *Journal of the Institution of Civil Engineers* in the UK to all OMEGA seminar programme contributors to submit their seminar papers for consideration for publication.

2.3.6 OMEGA educational programmes

As part of the OMEGA Centre's strategy for disseminating the findings of its five year research programme (see Section 8.5) - with the support of a three year VREF SEK 5 million grant to extend its CoE activities – the Centre has designed, prepared and launched three sets of educational programmes that draw extensively from the findings of the Centre's research and consulting activities. These include:

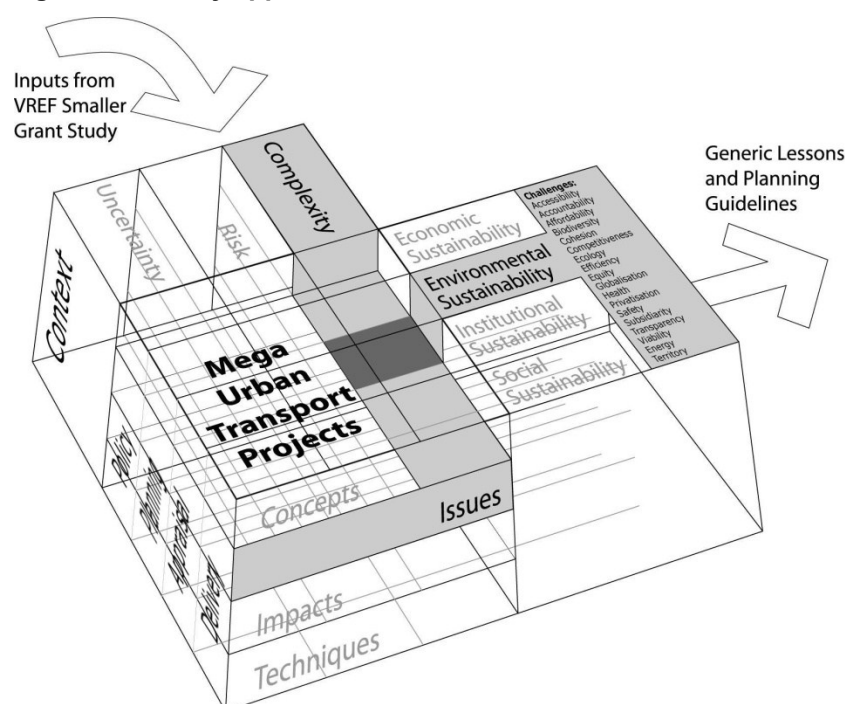
- **An MSc programme in mega infrastructure planning, appraisal and delivery** - available in both full-time and part-time modes at UCL, commencing in September 2011 (http://www.omegacentre.bartlett.ucl.ac.uk/msc/MSc_COURSE_BOOKLET.pdf);
- **Continuing professional development (CPD) programmes in mega infrastructure planning, appraisal and delivery** - to be offered at UCL, overseas (in association with other VREF CoEs where appropriate) and as in-house tailor-made capacity building initiatives for public and private sector organisations, NGOs and international development agencies. The first of these CPD initiatives is scheduled for November 2011;
- **Continuing professional development (CPD) programmes in urban transport policy, planning and management for developing countries** - to be offered at UCL, overseas (in association with other VREF CoEs where appropriate) and as in-house tailor-made capacity building initiatives for public and private sector organisations, NGOs and international development agencies,. The first of these is scheduled to commence in July 2012; and
- **PhD programme in mega infrastructure planning, appraisal and delivery, and urban transport policy, planning and management in developing countries** - the OMEGA Centre is also to continue accepting a limited number of PhD candidates who wish to undertake doctoral research in the fields of mega infrastructure planning, appraisal and delivery or urban transport policy, planning and management for developing countries.

3. Overview of research programme study approach, methodology and work schedule

3.1 Overall research study approach

The philosophy of the study approach to the research programme, whereby it is premised that risk, uncertainty and complexity (and the importance of context) should be brought to the *milieu* of decision-making regarding the planning, appraisal and delivery of MUTPs if they are to effectively meet the principal sustainability challenges of the 21st Century, is illustrated in Figure 3.1. The figure highlights how the research programme's approach has been informed by the OMEGA Centre's VREF 'Smaller Project' of identified lessons in the treatment of risk, uncertainty and complexity by other professions and disciplines which have long had these concepts at the centre of their planning concerns, such as the military, finance, medicine etc. It highlights the need to understand better the principal underlying concepts, issues, impacts and techniques of MUTP policy-making, planning, appraisal and delivery if we are to make them more effective agents of change and development. The Figure also highlights the four (rather than three) key platforms of sustainability that the OMEGA Study Team deem all MUTP developments *ultimately* need to address when planning, appraising and delivering responses to the multitude of sustainability challenges against which their 'success' may be assessed. The output of this analytical framework looks to recommending both generic and context-specific lessons for future MUTPs based on the basis of an examination of 30 case studies in 10 countries as explained in the following text.

Figure 3.1: Study approach



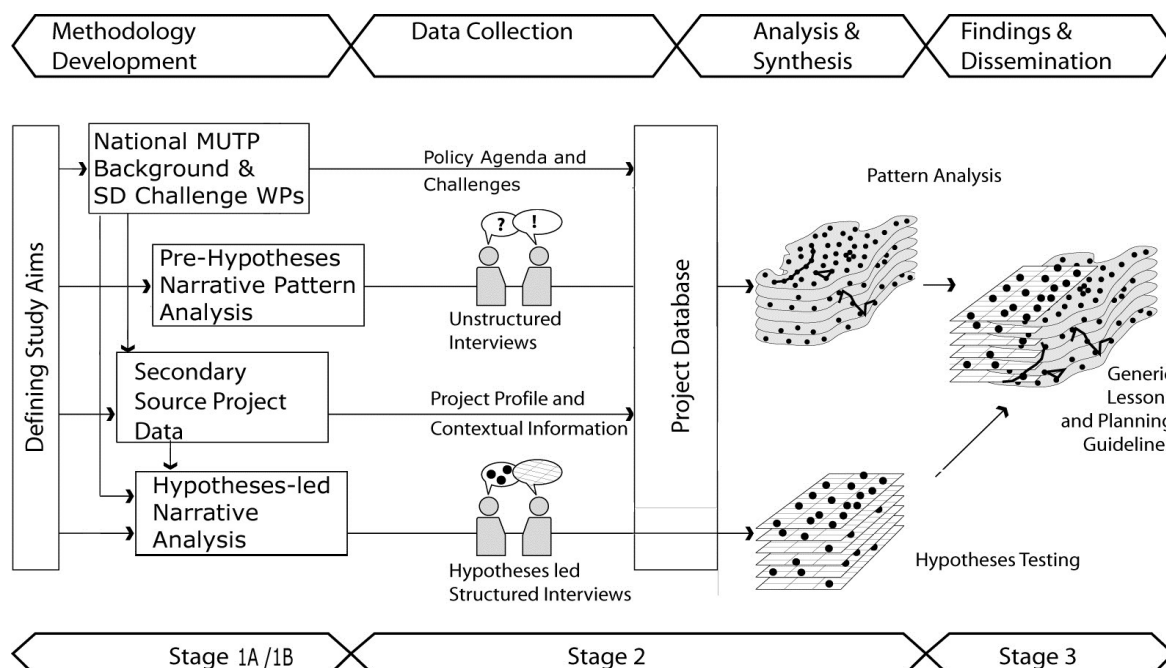
The Study methodology for the OMEGA 2 Project comprises three principal stages (see Figures 3.2); namely:

- **Stage 1A & 1B: The definition of study aims, methodology development, and preparation of key supporting Working Papers by the CoE and all OMEGA Academic International Partners** on 'National MUTP Backgrounds' (WP Series #1) and 'MUTP Sustainable Development Challenges' (WP Series #2) (see Appendix 12), as well as the collection of secondary source data on case study projects, resulting in

the preparation of detailed project profiles and project timelines for each of the 30 case study projects (see http://www.omegacentre.bartlett.ucl.ac.uk/studies/by_place_2.php). A very significant component of this process was the formulation and agreement of a *common* approach to the collection of interview data using innovative pre-hypothesis ('storytelling') methods *as well* as more traditional hypothesis-led techniques. This enabled the consistent application of data collection and analysis methods across the Academic Partner Network for all case studies. Another major set of inputs in Stage 1 were key findings from Working Papers of the OMEGA 1 Project (the VREF 'Smaller Project') on the 'Treatment of Risk, Uncertainty, Complexity and Context' (see Appendix 13) as they relate to these decision-making concerns which informed the focus and content of the hypothesis-led investigations undertaken and the formulation of normative criteria for assessing MUTP achievements in a later stage of the Study.

- **Stage 2: The collection and analysis of interview data from key stakeholders involved in or affected by each case study project** using pre-hypothesis and hypothesis-led techniques, together with the consolidation of the OMEGA database which also includes project profile material collected in Stage 1. In summary, the pre-hypothesis/storytelling investigations involved 'naïve' face-to-face interviews with a diverse range of (typically 10-15) key stakeholder representatives where the emphasis was on the sharing of case study project-related experiences. Narrative data was then transcribed verbatim and analysed using a combination of 'sense-making' software developed by Cognitive Edge Plc. and manual oversights of these transcripts to determine key patterns of knowledge that could be extracted. Similarly, hypothesis-led investigations comprised structured interviews with a diverse range of (typically) 10-15 key stakeholder representatives who were requested to respond directly to the OMEGA research questions and hypotheses, *as well* as a range of project-related hypotheses formulated by individual Partners and the CoE. Again, narrative data was transcribed verbatim and analysed by the research teams, to determine patterns of responses to the OMEGA Overarching Research Questions (ORQs) and Overarching Research Hypotheses (ORHs) (see Section 3.2), plus any other additional insights of importance to the 'sense-making' of the case study projects. The key output from this component of Stage 2 comprises a 'Country Synthesis Report' compiled by each Partner (and the CoE for the UK case studies).

Figure 3.2: Study methodology for the OMEGA 2 Project



Stage 3a: The identification and write-up of OMEGA findings in the form of a Draft Final Report and an on-going commitment to the dissemination of research programme lessons through:

- **teaching on the newly launched MSc programme** and via specialist modules in other UCL MSc programmes;
- **contributing to a variety of outreach initiatives** in the form of continuing education programmes (CPDs);
- **preparing publications and conference papers** (see Appendix 14); and
- **performing numerous advisory roles** as they arise for various parties in the public and private sector and for international development agencies (see Appendix 15).

The purpose of the Draft Final Report is to prepare a full account of what are considered to be key generic and context-specific lessons of the research programme, drawing initially from evidence-based findings derived from the three UK case studies and then cross-checking these with the analysis and synthesis of the international case study findings. In the following steps, the sequence of comparative analysis is reversed, whereby the findings of the international case studies are examined in terms of how they resonate (or otherwise) with the UK case study findings. It is important here to note that in *both* cases these findings draw heavily from the submitted Country Synthesis Reports prepared by the OMEGA Academic Partners. These provide the basis of the research programme's conclusions presented at the last of the OMEGA Workshops in Perth, Australia (in July 2011) where participants were invited to provide feedback to the Draft Final Report.

Stage 3b: The identification and write-up of the final OMEGA research programme findings in the form of a Final Report following receipt of feedback from OMEGA's Academic International Partners and the incorporation of this feedback where feasible into a finalised document that identifies and elaborates on generic and context-specific international lessons. It should be noted that this stage of the research programme was completed as part of an approved three year extension of VREF CoE funding for the CoE within the first year of this extension.

3.2 Overall research hypotheses and questions

The OMEGA 2 research programme adopts three overall research questions (ORQs) and three overall research hypotheses (ORHs). The former include:

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

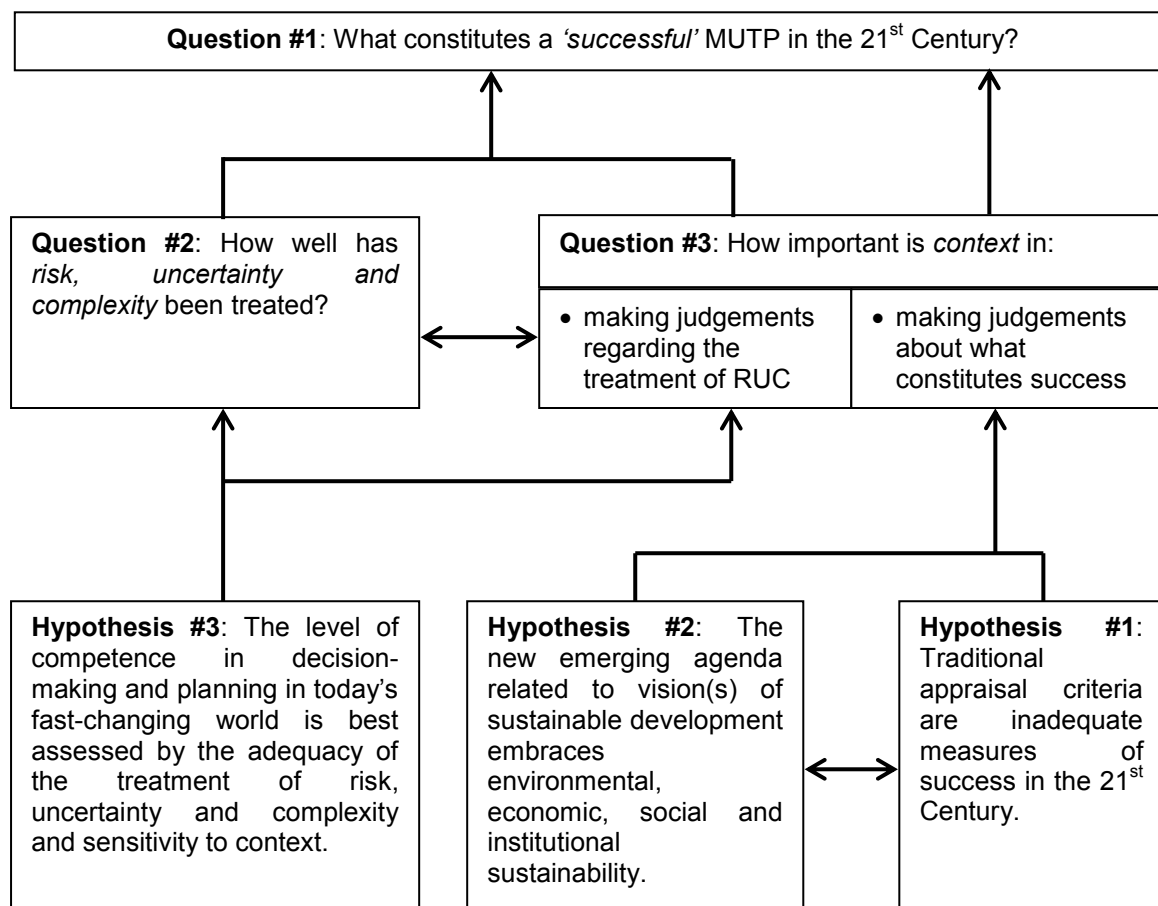
The latter include:

- **ORH #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.
- **ORH #2:** The new emerging international and local agenda related to vision(s) of sustainable development are multi-dimensional and go beyond notions of environmental sustainability, as critical as this may be; it *also* concerns inter-related concepts of economic sustainability, social sustainability and institutional sustainability.
- **ORH #3:** The level of competence in decision-making in today's fast-changing world is best assessed by the adequacy of the treatment of risk, uncertainty and complexity plus

sensitivity to context(s); all of which constitute important demands on strategic planning and tests of resilience.

The relationships among these ORQs and ORHs are shown in Figure 3.3 below.

Figure 3.3: Overall research questions and hypotheses



3.3 Overall research premises and underlying arguments

The importance of the subject matter addressed by the OMEGA research programme is premised on the fact that few attempts have to date been made (beyond traditional project management concerns) to bring about institutional learning from the growing international experience of planning, appraising and delivering MUTPs. This makes the utility of this research programme potentially invaluable for future developments in its investigation of:

- how decision-making of principal stakeholders for MUTP developments typically seek to address intended project objectives;
- the criteria by which MUTP successes and failures should be evaluated; and
- which MUTPs may be considered successes or failures in the context of sustainable development visions of the 21st century, and the reasons for their status.

On the basis of the above, and bringing together the research programme's principal research questions and adopted hypotheses, the OMEGA 2 Project is premised by the following underlying arguments (UAs):

- **UA #1:** There is potentially great value in placing in the public domain an international data base of gathered MUTP profiles (and narratives) that help summarize key planning, performance and impact features in order to facilitate comparative analysis, lesson-sharing and learning for future MUTP development exercises.

- **UA #2:** While the contributions that MUTPs make to economic growth (measured typically in terms of construction cost savings, travel time savings, GDP growth etc.) have been the primary overriding measure of judgements about the ‘success’ of such projects in the 20th Century, this emphasis has been overtaken in the 21st century by concerns about the ability of such projects to effectively respond to broader and fast changing sets of priorities that increasingly need to address the risks, uncertainties and complexities of the evolving vision(s) of sustainable development.
- **UA #3:** The relevance of 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 greatly benefit the future advancement of MUTP planning, appraisal and delivery.
- **UA #4:** The impacts on, and contributions to, sustainable development by MUTPs are poorly understood and are therefore in need of further analysis, particularly in light of the different interpretations of the sustainable development vision(s) over time and place.
- **UA #5:** The build-up of a significant new body of knowledge about decision-making in the planning, appraisal and delivery 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 when complimented with the analysis and findings of more traditional hypothesis-led investigations.
- **UA #6:** The drawing-up of generic and context-specific lessons from the case study research will greatly assist the better understanding of the importance of ‘context’ in MUTP planning, appraisal and delivery, as well as the appreciation of appropriate bundles of criteria to better guide judgements about the success of such projects in different contexts.
- **UA #7:** There is a dearth of generic and context-specific tools and guidelines (beyond project management areas) to assist the public and private sectors in the planning, appraisal and delivery of MUTPs which especially focus on the risk, uncertainty and complexity that such projects typically encounter.
- **UA #8:** There is an *urgent* need to build-up the institutional and professional capacities in MUTP decision-making on an international scale for the future enhanced development of such projects and that while this can commence with the setting-up and sustaining of a knowledge-building networks of experts (especially trained individuals such as those participating in the OMEGA Centre and its international network), this needs to be also complimented by formal international education and training programmes (CPDs) that draw upon on-going MUTP evidence based research.

3.4 Study methodology in data collection, analysis and synthesis

3.4.1 Use of secondary source information

As indicated earlier, the OMEGA 2 Project study methodology (see Figure 3.2) has a multi stranded approach to data collection, with the majority of primary data yielded from both unstructured and structured data collection methods, complimented by data sets made up of a mixture of the two.

The prerequisite for the primary data collection phase was the gathering of secondary data via a literature search of public domain available sources, including books journals and web-based materials (see Appendix 16). Literature searches were undertaken by each Academic International Partner to help provide data for the following outputs:

- **OMEGA Working Paper Series #1:** presenting for each OMEGA Partner country the backgrounds to national policy, planning and funding frameworks for mega project developments post 1950 (see Section 4.2.1).

- **OMEGA Working Paper Series # 2:** presenting selected 21st Century sustainable development challenges facing MUTPs across the OMEGA Study case study countries and beyond (see Section 4.2.2).
- **Project Profiles:** containing the MUTP profiles, features and contextual background(s) to each of the MUTP projects under study in the form of a checklist of data items common to all the projects (see Sections 5.2 & 6.3).

Without doubt, one of the most important if not critical secondary data sources for the Study has been the project profiles database it has generated (see http://www.omegacentre.bartlett.ucl.ac.uk/studies/by_place_2.php). This is perhaps the most detailed database of its kind ever produced internationally. The MUTP project profile template developed by the OMEGA Centre aims to provide the first level of contextual background information to each of the 30 MUTPs under study based on a checklist of project data items that are largely common to all the MUTPs studied. This includes information regarding:

- development and institutional contexts,
- project timelines of key events and decisions impacting on outcomes,
- project planning features and challenges,
- implementation features and challenges,
- project costs, funding, finance and operations,
- environmental and community impacts, and
- the principal risks, cost-overruns and project delays encountered.

The Study collected both qualitative and quantitative data regarding the above in order to build the most informative project profiles possible following a common template designed by the CoE of required information which was circulated to all Academic International Partners early in 2007. The template for the profiles plus guidelines provided by the OMEGA Centre to its Partners for their completion is given in Appendix 20. It should be mentioned that the development of the project profile template was seen as an iterative process in so far as discussions took place between the CoE and its Academic Partners regarding its contents, initially at the OMEGA Workshop in Naples and subsequently throughout the pilot phase of the Study via the OMEGA Centre *moodle*. These discussions enabled significant generic improvements to be made and to allow its accommodation of differing project typologies, whilst ensuring key generic information is gathered and compared. The principle sections of the Project Profiles of the 30 case studies are outlined in Appendix 17 based on the guidance provided by the CoE in July 2008.

All project profiles were completed by March 2010 - these have been subsequently reviewed for their accuracy and completeness by the OMEGA UCL Team during early 2011, with versions finalised following in most instances additional data requests to Academic International Partners up until March 2011. The completed project profiles facilitate both the comparative analysis of the 'vital statistics' of projects as well as assist in the identification of useful lesson-sharing and learning experiences. These profiles hold extensive quantities of information, in some cases they are over 100 pages long. To facilitate access to such data, a series of two-page summary reports have thus been produced for this report, which hold the most key numerical data and summaries, normalised in a manner that has made them largely directly comparable across all 30 case studies. These two-paged summary reports are featured in Appendix 18. These same project summaries and related project profiles (with a significant global spread) have been placed in the public domain on the OMEGA website in order to create a database of international MUTP profiles with what is believed to be an *unprecedented* level of detail in one place (see http://www.omegacentre.bartlett.ucl.ac.uk/studies/by_place.php).

3.4.2 Use of primary source information

3.4.2.1 Pre-hypothesis-led interviews

The Pre-hypothesis research (PHR) represented the first primary data collection phase to be undertaken by the CoE and the OMEGA Academic International Partners. In accordance with the Study methodology (see section 3.1.) care was taken to ensure that PHR data collection was finalised *before* any Hypothesis-led research was undertaken so as to avoid cross contamination between the two methodologies. The PHR interview technique was seen as a relative innovative approach to data collection. The fundamental components of pre-hypothesis research and interview techniques which differentiate it from other methods are as follows (see Appendix 19 for comprehensive documentation from Cognitive Edge on the PHR interview technique):

- **Gather experiences rather than statements.** Here the field under study is researched by gathering and making sense of rich, illustrative anecdotal experiences provided by those who are responsible for, involved in or affected by the field. This delivers a rich context, a deep understanding of the issue and encourages the interviewee to provide genuine evidence that illustrates why they have formed the perspective they have.
- **Focus on qualitative data** PHR collects qualitative data first, often alongside quantitative data. It helps to better understand the root cause of issues and devise more insightful interventions.
- **Initial hypotheses are not formed** as these are considered to restrict the scope of enquiry (they blind the research to unexpected possibilities). Conclusions are only formed once data has been gathered and interpreted.
- **Bias is minimised** by engaging people who are good interviewers, but who have no prior experience (or hypotheses about) the field under investigation. This keeps the data gathered unbiased. Limiting the number of interviews conducted by any individual prevents them from forming and re-enforcing hypotheses.
- **Weak signals** can be as important to spot as strong trends – in complex situations small, seemingly unimportant events or pieces of information can have significant impacts and repercussions. When interpreting pre-hypothesis data both weak signals (outliers) as well as strong trends are considered equally important.

The PHR phase involved the collection of narratives from key stakeholders about their experiences regarding the Case Studies under investigation by the CoE and OMEGA partners. The narratives are elicited from interviewees via a series of questions designed to prompt the interviewee to share stories (see Appendix 20 for an example of the pre-hypothesis questionnaire). Once the interviewee has responded to each question, they are asked to index their response to capture data concerning their perceived importance or relevance of the story (see Appendix 20 for the pre-hypothesis indexes). The approach emphasises the importance of discovering patterns of knowledge through the analysis of such narratives and their accompanying indexes - as a result, hypotheses are *not* formed and tested up-front but are instead created *after* exploring and analysing the narrative data.

As the PHR phase comprises a somewhat innovative form of data capture, great care was taken in first learning the narrative capture method to be used and then coaching and mentoring Partners in its application. This required a certain amount of trial and error as the OMEGA study represented the first time this methodology, developed by the Complexity Interest Group (Cognitive Edge Pty), had been applied to such a diverse group of stakeholders from such a large range of multiple organisations. Previously, the method had been applied to large numbers of respondents within single corporate organisations via online surveys, often under the authority of the organisations CEO. Also, the OMEGA study's breadth of inquiry was considerably wider than previously undertaken by Cognitive

Edge Pty, requiring a detailed set of indexes for the questionnaires to capture the multiple themes and situations relevant to MUTPs which was much longer than usual.

The CoE Team conducted a Pilot PHR Study in May 2007 on its first UK Case Study (the Channel Tunnel Rail Link [CTRL]) so as to fine-tune the approach to the PHR phase. This Pilot Study consisted of data capture using two methods; namely: an automated web-based questionnaire and a face to face interview. The web-based questionnaire (see Figure 3.4) was sent to 200 stakeholders identified as holding key decision making positions in relation to the CTRL, however, only 11 responses were received which yielded around 14 data points which was considered too few for data analysis using only this data source. Data capture using the pre-hypothesis methodology with face to face interviews was found to be more successful in capturing large amounts of anecdote rich data. The data processing required the audio interviews to be transcribed verbatim and transcripts to be broken up and returned to interviewees for checking and indexing. Returned indexes were entered into the CIG SenseMaker Collector database by hand. Those transcripts which were not indexed by interviewees were indexed by the CoE as a group effort. The CoE used voice recognition to speed up the transcription process to good effect, however data capture using the face to face approach was found to be a time consuming process.

Figure 3.4: Sensemaker collector web based questionnaire

The screenshot shows a web browser window with the URL <http://apps.sensemaker-suite.com:8888/OMEGA?page=6>. The page is titled "SenseMaker - OMEGA - PRE-HYPOTHESIS RESEARCH QUESTIONS (6/10)". The main heading is "omega centre" with the subtitle "Centre for Mega Projects in Transport and Development". The question is "Which of the following themes are relevant to this story?". There are four themes listed: "Public sector power", "Private sector power", "Political intervention in the project", and "Political will". Each theme has a slider bar with a house icon in the middle, and a "1" on the left and "10" on the right. Below each slider is a checkbox labeled "Does not apply". At the bottom are "Back" and "Next" buttons.

The findings of this Pilot Study and resulting sets of indexes and methodological adjustments were then discussed with the Academic International Partners in the Naples Workshop in July 2007, where/when several refinements were agreed including changes to the probing questions and the number of interviewees to be contacted for each case study. The methodology was then rolled out across all partner case studies.

PHR data collection for all three case studies was completed by most partners in 2010. This was significantly behind schedule due to numerous problems with the software developed by Cognitive Edge to allow data entry and extraction from a customised database.

3.4.2.2 Hypothesis-led interviews

CoE work on the pilot design of the hypothesis-led questionnaire commenced as early as the Spring of 2007 in preparation for a presentation to Partners at the Naples Workshop in July 2007. This work drew on:

- material reviewed for the VREF Smaller Project,
- a literature review in MUTP planning, appraisal and evaluation, and
- a review of literature on the CTRL case study.

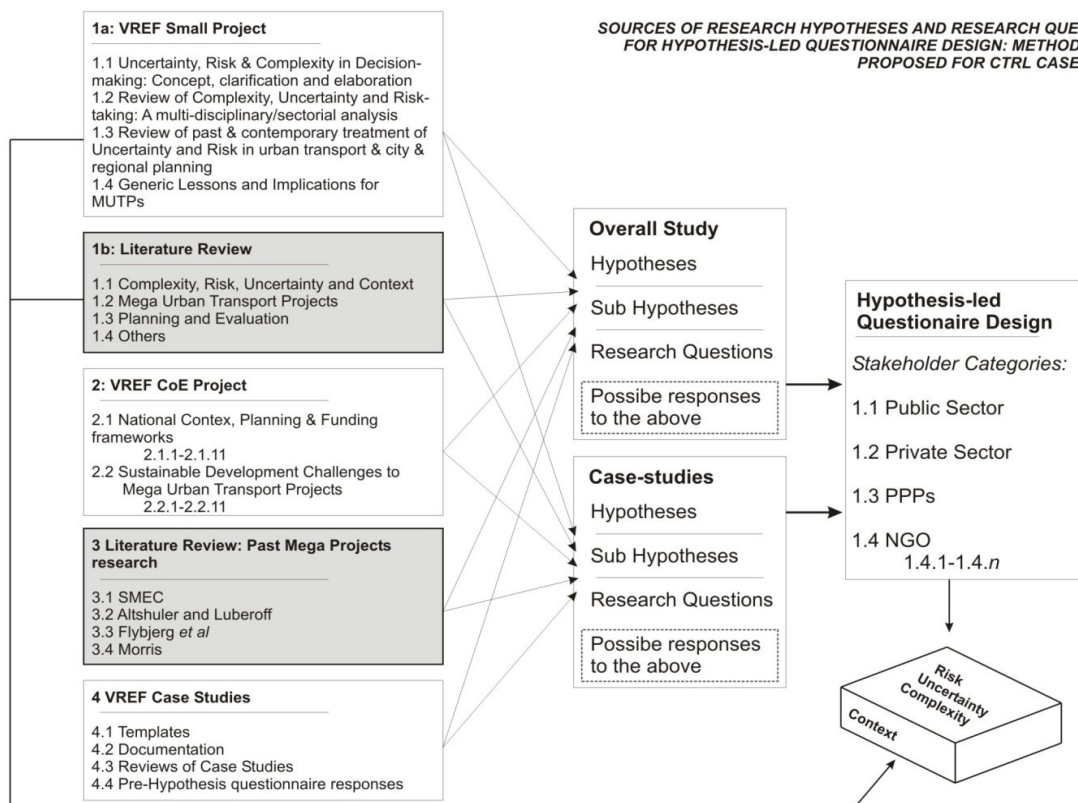
Subsequent work was undertaken between November 2007 and February 2008, employing the questionnaire design principles and frameworks advocated by J. W. Cresswell in his book entitled *Research Design: Qualitative, quantitative and mixed methods approaches*, Sage Publications, London, 2003. The hypothesis-led questionnaire for CTRL was finalised in May 2008 and used for both 20 face-to-face and a number of postal interviews conducted throughout from May 2008 to September 2008. Transcripts were prepared for analysis by the end of 2008.

The CTRL hypothesis-led questionnaire (Appendix 21) was structured into three parts:

- **Section 1:** which poses overarching questions that relate to the overall research programme;
- **Section 2:** which poses hypotheses and related questions *specifically* concerning the CTRL, and;
- **Section 3:** which poses questions that seek to extract generic lessons from the case study.

The questionnaire and its underlying design methodology (see Figure 3.5) were presented to Partners at the Volos in May 2008 as a pilot for their questionnaire design.

Figure 3.5: Sources of research hypothesis and research questions for hypothesis led questionnaire design: methodology proposed for CTRL case study



Discussion as to the extent to which the questions posed in Section 1 were acceptable as overarching questions for all Partner case studies ensued both at the Workshop and in *moodle* discussions that followed. This led to the preparation by the Australian Team, in July 2008, of a paper which highlighted key issues that arose from the CoE Volos presentation on hypothesis-led questionnaire design (see Appendix 9). A response to this was prepared by the CoE in early August 2008 (see Appendix 9) with a view to settling-on a common set of Section 1 questions for *all* hypothesis-led case study questionnaires. The common section 1 questions were adopted by the Centre and Partnership in November 2008 for their remaining HLR interviews (see Appendix 22). Academic International Partners were left to devise their own questions for Section 2 related to the themes of mutual interest to the OMEGA Centre and its Partners. The CoE and OMEGA Academic International Partnership also agreed to conduct a minimum of 10 PHR interviews per case study, as opposed to 15, due to the intensive nature of processing interview transcripts and the OMEGA studies time constraints.

3.4.3 Analysis and synthesis of consolidated information sources

3.4.3.1 Background literature reviews and working papers

Throughout the OMEGA 2 Project, a number of background literature reviews have been utilised and incorporated to inform the Study or undertaken by the CoE and Academic International Partner network as part of the Study or as spin-off studies. Summaries of the principle literature reviews employed are outlined below:

- **General literature review of key seminal publications:** The seminal work reviewed in support of the research programme essentially fell into four categories: (1) literature about mega project planning, appraisal and delivery; (2) literature about the treatment of risk, uncertainty, complexity and context in decision-making; (3) literature about innovation, technology, society and project development; (4) literature about sustainable development and role/contribution/impact of major infrastructure on sustainability challenges of 21st century (see Appendix 12); (5) literature about corporate social responsibility; and (6) literature about governance and institutional planning and regulatory frameworks of mega projects (see Appendix 12).
- **Literature review associated with VREF OMEGA ‘Smaller Project’ (OMEGA 1 Project):** The ultimate aim of this project was ‘to contribute to the advancement of the art and science of planning, appraising and evaluating the impacts of mega land-based transport infrastructure projects in major urban and metropolitan regions of the Developed World’ (see Section 4.1). The underlying premise here is that ‘much can be learned (and gained) from an examination of contemporary thinking about the treatment of *complexity*, *uncertainty* and *risk-taking* in fields outside the transport infrastructure sector where these concepts have long been central to complex problem solving. To this end, the project commissioned nine Working Papers from renowned professionals and academics in a number of diverse fields, and used these as a resource to draw out from them lessons that are potentially transferable to MUTPs. These contributions were complimented by six further contributions of past and contemporary uses of these concepts in transport policy-making, city and regional planning and urban development from which additional lessons have been derived. These two sets of lessons, subsequently written-up in an executive summary, have provided significant inputs to the CoE project and its efforts to develop generic normative criteria for the evaluation of case study project responses to the treatment of risk, uncertainty, complexity and context in MUTP decision-making.
- **Literature review associated with OMEGA 2 Project WP Series #1:** The purpose of Working Paper #1 Series was for each Academic International Partner to provide a country-based historical and contemporary overview of the main policy, planning and funding frameworks that have driven and determined the planning, appraisal and delivery of MUTPs since World War II. The intention of these papers was to ultimately

compare and contrast developments/ outcomes across the ten OMEGA case study countries, and to arrive at on the basis of this generic and context-specific observations and lessons regarding planning framework contexts (see Section 4.2.1 for further details) as outlined in the country synthesis reports (see section 3.3.3).

- **Literature review associated with OMEGA 2 Project WP Series #2: Report on write-up, peer reviews and synthesis:** When and where MUTP delivery is obliged by government and civil society to also contribute to visions of sustainable development, there typically arises much confusion as to which dimensions of the sustainable development agenda should ultimately prevail - and, where/when/how comfortably they fit with the more traditional economic growth agenda. Given these circumstances, the purpose of the Working Paper #2 Series (see Section 4.2.2 for further details) was for each Partner to provide an insight into a selected international key challenge (or cluster of challenges) that MUTPs inevitably encounter when pursuing goals of sustainable development. These are challenges derived from the applicants previous research that have been pre-selected by Partners on the basis of their existing knowledge/ research capital and have been used to inform the development of normative Criteria for aspects of the country synthesis report (see section 3.3.3 for further details).
- **Literature review associated with OMEGA RAMP Study (OMEGA 3 Project):** The Institution of Civil Engineers (ICE) and the Actuarial Profession (AP) decided in 2008 to revise their handbook on Risk Analysis and Management for Projects (RAMP), in order to address the appraisal and management of environmental and social risks. They commissioned the OMEGA Centre to carry out a study and to provide recommendations on how better to incorporate environmental and social dimensions of sustainable development into the planning, appraisal and delivery of major infrastructure projects (see Section 4.3). This project yielded 6 background papers, a workshop, 40 interviews with senior stakeholders and a final report, the insights from which have been highly relevant for the OMEGA CoE project

3.4.3.2 Case study project profiles

As stated earlier in Section 3, the Project Profiles were intended as consolidated sources of secondary contextual information to support all phases of data collection, analysis and synthesis. In particular, the analysis of the Template data was seen to:

- **Inform the Hypothesis-led analysis** and responses to the three Overall Research Questions and Hypotheses; and
- **Provide a source of comparable data** to allow the synthesis of project data, concerning such matters as project: cost, duration and quality information, principle and secondary project objectives, key project stakeholders, sources of finance, key events and processes. The profiles were also employed to explore this data in terms of principle MUTP contexts in terms of such aspects as project type, location and function.

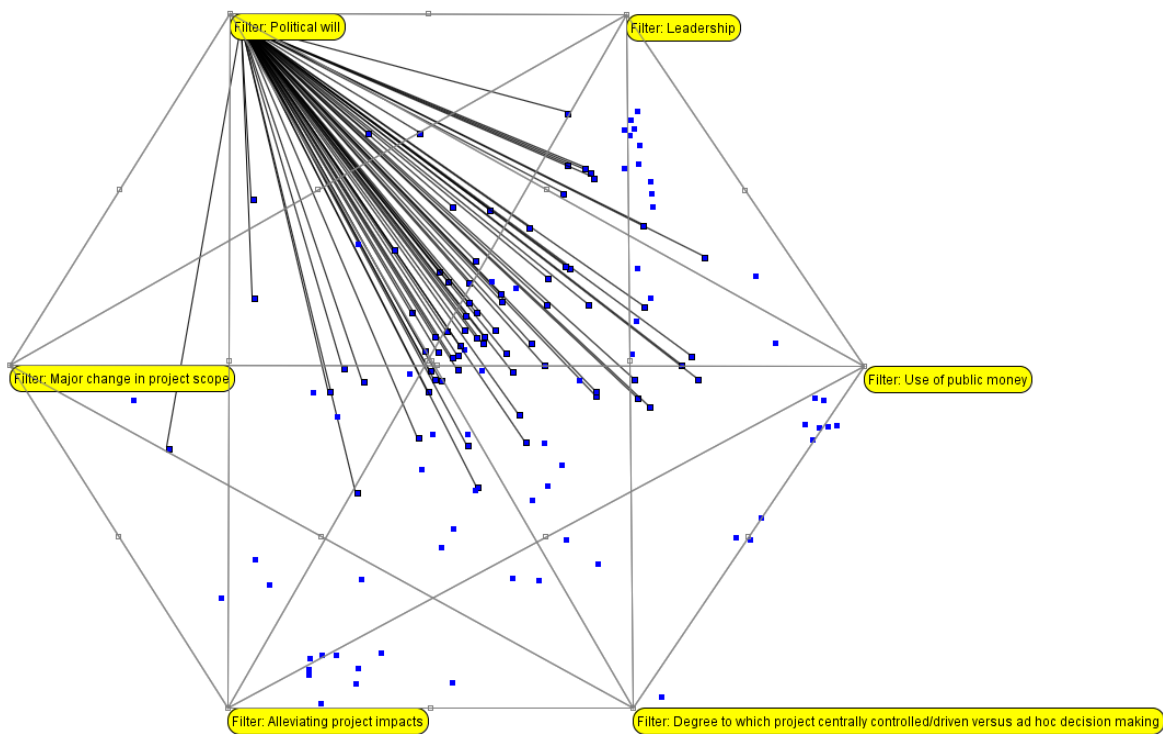
Guidance was sent to Academic International Partners (in March 2009) setting out both how Project Profiles could be used to inform the examination of ORQs and ORHs (see Appendix 9) and how the Quantitative Analysis of Omega Project Profile Templates could be used to support case study analyses and syntheses (see Appendix 9). The latter introduced a recommended quantitative dataset to be extracted from project profile templates and project timelines so as to provide directly comparable quantitative evidence to support the analysis and synthesis stages of the OMEGA Project

3.4.3.3 Case study Pre-hypothesis interviews

The analysis and synthesis of data collected via the face-to-face Pre-hypothesis interviews required the use of two pieces of software developed by Cognitive Edge Pty. Together, these formed part of their suite of 'Sensemaker' software. The first was the 'Sensemaker

Collector' which is a web-based graphical user interface (GUI) shared database for collecting the indexed anecdotes. The second was the 'Sensemaker Explorer' which was a piece of software employed for the analysis of the pre-hypothesis data. This contained a range of analytical and interrogation tools that allowed both the recall and interpretation of Sense Making Items (SMIs). Together the software facilitated the extensive use of visualisation to allow complex patterns and exceptions to be discovered of the kind illustrated in Figure 3.6).

Figure 3.6: Cluster analysis using the Sensemaker explorer tool



As reported in the Progress Reports of the time, the analysis of collected data for PHR was in delayed as a result of the unavailability of the necessary software from Cognitive Edge Pty (CE) due to contractual and technical issues. Technical problems were principally attributed to CE upgrading its data collection software (Sensemaker Collector) between March 2008 and June 2009. This involved a corrective process which took considerably longer than expected to reach a stable platform for the CoE and its Academic International Partners to use the software for data entry purposes, hence interrupting the smooth progression up to then of moving from the Pre-hypothesis phase to the Hypothesis-led phase, thereby overall delaying the Pre-hypothesis data extraction and analysis process.

During the pilot use/testing of the software the OMEGA Team at UCL was expected to prepare a draft Sense-making Report on patterns of knowledge emanating from its first Case Study and then pass on the requisite software and advice to Partners (by September 2008). The Academic International Partners were then expected to complete similar Sense-making Reports on their first Case Study (by mid-October 2008) with all Pre-hypothesis work completed by June 2009. In actual fact, the CoE completed its first draft Sensemaker Report in December 2008, while the upgrade of the SenseMaker collector system meant Academic International Partners were *not* able to commence their data analysis stage for any of their case studies before December 2009. The CoE subsequently wrote and distributed a set of guidelines (in January 2009) which set out a detailed methodology for the use of Cognitive Edge Explorer software to input and analyse the collected PHR data. Due, however, to the continuing problems with CE's upgrading of its Sensemaker Collector System, the CoE devised a 'manual' method of data analysis which did not rely on partners inputting data into

the SenseMaker Collector or using the Sensemaker Explorer software for data analysis. Partners who opted to use this manual method were also asked to input their data into the anecdote database via Sensmaker collector (by the end of 2010) to enable the CoE to undertake synthesis on the entire dataset during 2011.

3.4.3.4 Case study Hypothesis-led interviews

Guidelines setting out the recommended approach to data analysis were circulated to partners (in March 2009) based on the OMEGA Centre Team's experience in extracting and analysing data from the (pilot) CTRL Case Study (see Appendix 9). This built upon the background note entitled 'Hypothesis-led Research Questionnaire Design: Application of Cresswell's Principles to CTRL Case Study', prepared by the Research Programme Director for presentation to the OMEGA Centre Team (in January'08) and was subsequently amended (in June' 08'). A finalised version of the HLR questionnaire was then sent to all Academic International Partners (in October'08) with an accompanying e-mail note on its use.

The guidelines split the analysis of the Hypothesis-led data into four generic steps as follows:

- **Step 1:** Data extraction and analysis to inform ORQs;
- **Step 2:** Data extraction and analysis to inform ORHs;
- **Step 3:** Consolidation of data extraction and analysis to inform the Hypothesis-led research phase; and
- **Step 4:** Consolidated data extraction and analysis for all sources.

The guidelines gave detailed guidance on how the above four steps could be applied to the three sections of the Hypothesis-led questionnaire. The guidelines to support the analysis of Part 1 of the HLR questionnaire, for example, included:

- Flow diagrams to show how individual questions supported overall ORQs and ORHs;
- Guidance on how to extract the relevant data using a recommended data extract frame; and
- Guidance on how to present an analysis of the data summary tables.

3.4.3.5 Case study synthesis: The 4 test report

Guidance documents were sent (in July 2009) to Academic International Partners by the CoE explaining how to conduct its proposed appraisal of results, employing what was referred to as 'The Four Tests'. This followed extensive discussions at the Lund OMEGA Workshop and subsequent moodle/e-mail exchanges on this subject which sought to consolidate the information and guidance concerning these tests as follows:

- **Test 1: Project objectives:** Here project 'achievements' were analysed relative to: original project objectives set when the project commenced; and new project objectives that 'emerged' during the course of planning and implementation (thereafter referred to as 'emergent objectives'). This test also sought to identify preliminary 'lessons' which showed how project performance could have been/could be further enhanced in relation to the setting of objectives.
- **Test 2: MUTP sustainable development challenges:** Here an analysis was undertaken of project 'achievements' relative to identified visions, challenges and issues of sustainable development as represented by normative values and criteria for 21st Century MUTPs. This was drawn from OMEGA Working Paper Series #2 referred to earlier and other cited literature, including the UN Millennium Development Goals. This test also sought to formulate preliminary 'lessons' that identified how project performance could have been/could be further enhanced in relation to the normative values for 21st Century MUTPs.

- **Test 3: Treatment of risk, uncertainty, complexity and context on MUTP decision-making:** Here an analysis of project 'achievements' were undertaken relative to:
 - treatment risk, uncertainty and complexity in MUTP decision-making, and
 - treatment of context in MUTP decision-making - with particular attention paid to the context of pivotal decisions in the project's history).

From the above tasks preliminary 'lessons' were identified, indicating how project performance could have been/could be further enhanced in regard to the treatment of risk, uncertainty, complexity and context in such decision-making.
- **Test 4: Synthesis of tests 1-3 for each case study:** Here an examination was undertaken of the:
 - **Chief 'context-specific' influences on project achievements** - i.e. the identification of those context-specific forces that determined the relative performance levels of the project relative to existing project objectives and new 21st Century normative goals and related criteria.
 - **Chief 'generic' influences on project achievements** - i.e. the identification of those forces considered generic that determined the relative performance levels of the project relative to existing project objectives and new 21st Century normative goals and related criteria.
 - **Principal stakeholder 'winners and losers' associated with project performance levels** - the definition of 'winners and losers' in relation to MUTP outcomes is still under examination by the CoE and Partners.
 - **The responses to the ORQs and ORHs** - in the form of 'provisional' lessons considered to be of: 'context-specific' relevance that could enhance Case Study project planning and delivery of other MUTPs in similar contexts; and 'provisional' lessons considered to be of generic relevance that could enhance Case Study project planning and delivery of other MUTPs universally. All these are to include an assessment of opportunities and threats associated with 'external' influential factors such as policy and planning blocking and inducement mechanisms.

3.4.3.6 Country case study synthesis: The country synthesis reports

Guidelines for Academic International Partners regarding the preparation of Country Synthesis Reports were presented at the Lund OMEGA workshop in April 2009 (see Appendix 9) with more detailed information following on *Moodle* in July 2009. Whilst it was appreciated that the content of the individual Country Synthesis Reports would clearly vary between Academic International Partners, the guidelines emphasized the importance of following a consistent structure/format and guidance on content, to ensure consistency and to facilitate the CoEs synthesis work.

The Country Synthesis Report was presented by the OMEGA Team to the Academic International Partners as the principal data source for the bulk of the research programme's synthesis work. The *critical* importance of establishing a common and consistent basis for reporting this data was emphasised and to assist Partners in the task of producing such documents, the CoE provided a six part generic outline and structure of the kind illustrated in Appendix 23

3.5 Overview of research work programme

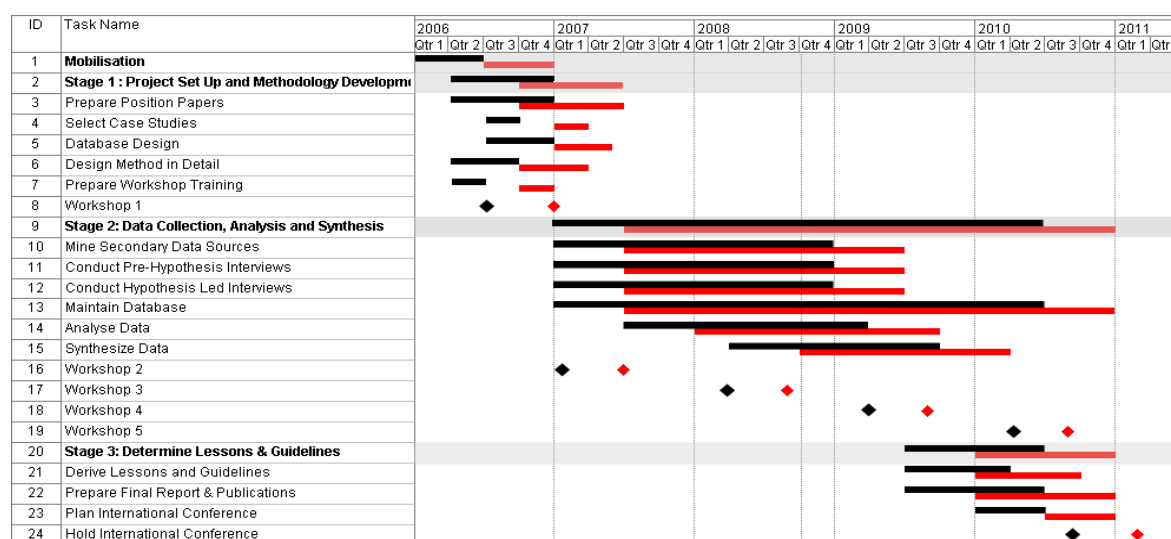
3.5.1 Initial programme

Since progress on the OMEGA 2 Project has been regularly reported to VREF via Annual Progress Reports (the latest being submitted in September 2009) and generally through six-monthly progress meetings with VREF representatives, the following account highlights only the more significant achievements and programme deviations. From these one may note

that the research programme was ultimately completed three months later than initially envisaged – i.e., in September 2011 as opposed to July 2011.

The initial work schedule had the OMEGA research programme commencing operations in July 2006, following the award of the five-year CoE research grant by VREF in January 2006. Following its establishment, the OMEGA Centre commenced by mobilizing its nine Academic International Partners who commenced their engagement with the research programme in January 2007. Establishing the administration/financial procedures within UCL, making CoE Research Fellow appointments and awarding PhD scholarships and appointing Research Assistant positions were all generally straightforward. Interfacing with the varying protocols of the international Partner universities, however, was far more challenging. It ultimately led to delays in getting all international Partner teams up to full strength until later in 2007. This effectively placed the research programme approximately six months behind the schedule of the original Proposal to VREF (see Figure 3.7). For purposes of this report, the six month delayed start has been taken as the new baseline against which subsequent progress is reported (again see Figure 3.7).

Figure 3.7: Original project work programme both with and without the six month adjustment.



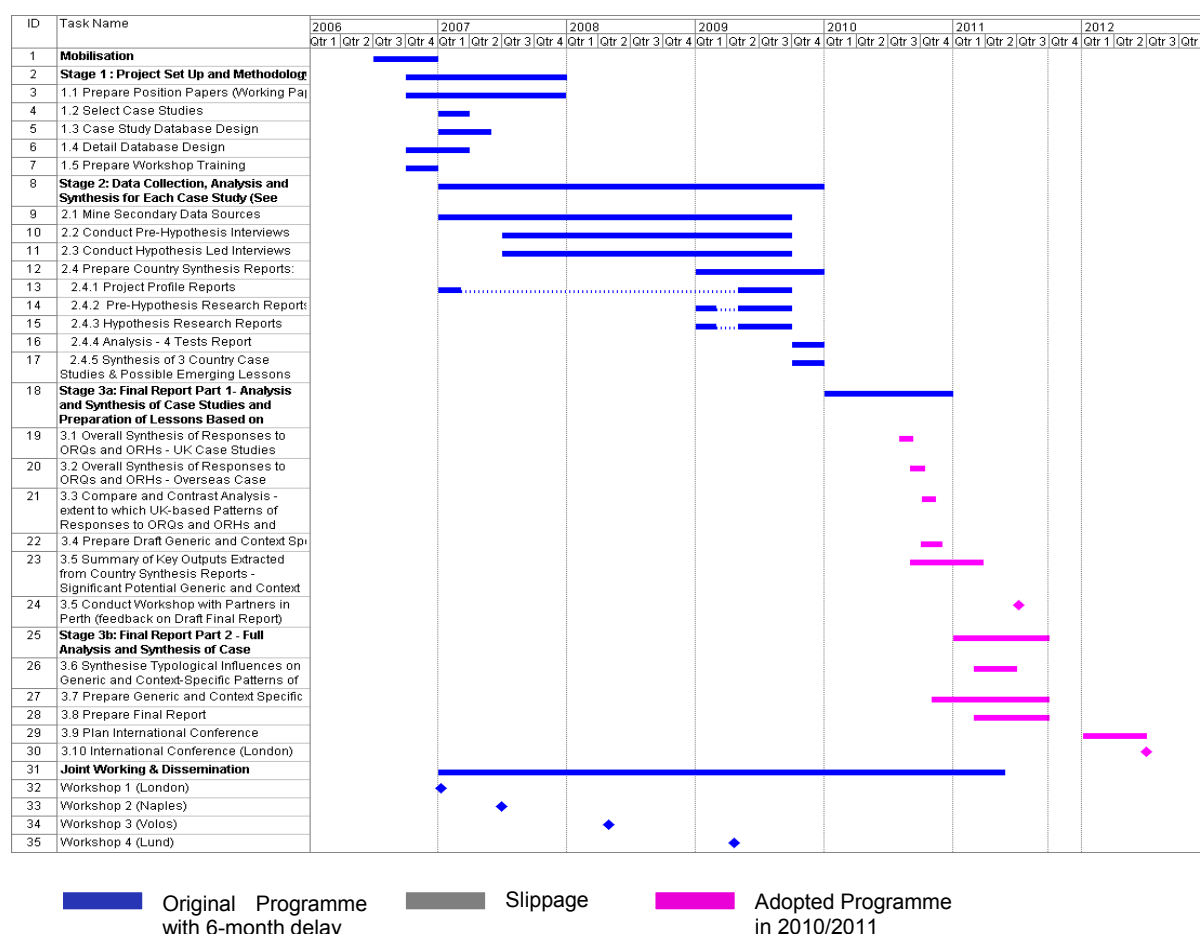
3.5.2 Finally adopted programme

The work schedule as it ultimately transpired at completion of the Study is illustrated in Figure 3.8. This shows that the OMEGA 2 Project was ultimately completed approximately six months behind schedule - primarily due to the late delivery of Partner's Country Synthesis Reports which were due to be completed by late 2009 but were in fact finished in all but one case by a revised deadline of late February 2010. Following the receipt of this documentation by the OMEGA Centre Team, it became clear upon closer scrutiny of the submitted material that most of the submissions did *not* fully meet expectations. As a result, the CoE wrote to Partners in early March 2010 pointing out those areas where their Country Synthesis Reports in particular were deficient and required full rectification by end-April 2010. Most Partners delivered sufficient material to enable the CoE to undertake a meaningful overall analysis and synthesis of findings in the remaining period up to the end of 2010, and subsequently by mid-2011. The CoE communicated to Partners that any contribution delivered *after* the April 2010 deadline was likely to be excluded from the overall synthesis stage. The German Team were the only Partners to miss this final deadline due to major internal staffing difficulties leading to an even later completion of their contribution in May 2011.

As shown by Figure 3.8, most project deliverables were completed in line with the envisaged study programme as rolled forward to the new baseline mentioned above. The major exceptions were as follows:

- **Working Paper #2 Series:** Actual delivery was completed some 12 months behind schedule. However, it should be acknowledged that this was primarily as a result of the agreement with Partners to initially focus on the preparation of a 'new' Working Paper #1 series on country contexts which although not cited in the original Proposal was seen as *essential* background to the research.
- **UK Case Studies 2 & 3:** Data collection and analysis for UK Case Studies 2 & 3 were completed by the expected date of mid-2009. The 'actual' date shown in Table 2 reflects the fact that such data had to be written-up in a Country Synthesis Report, which did not feature in the original CoE Programme.
- **Partner Case Studies 2 & 3:** As already indicated it had been expected that all Academic International Partner case studies and Country Synthesis Reports would be completed by December 2009. Partners clearly, however, experienced considerable difficulties in meeting these deadlines while simultaneously producing findings of sufficient breadth and depth to enable subsequent analysis and synthesis by the CoE. Under these circumstances, the CoE extended the deadline for submission of the Partner Case Study and Country Synthesis documentation until the end of April 2010.

Figure 3.8: Finally adopted research programme



- **Final Reports:** The baseline date for completion of the Final Report was September 2010. As indicated above, in light of primarily the late Partner case study submissions, the CoE agreed with VREF to initially prepare two Final Reports: a Part One document by December 2010 and a Part Two document by June 2011 with the former essentially

focusing on the three UK findings and how they resonate with international case study findings, and the latter focusing on a compare and contrast analysis of the 30 international case studies. This meant that the dissemination of all key findings was completed some six months behind schedule. With the award by VREF of a three year additional grant in December 2010, VREF subsequently informed the Centre that it no longer sought two documents but the entire completed Final Report by 1st October 2011; some three months later than the submission date in the original research programme Proposal.

3.5.3 Programme budget

In terms of the research programme budget and expenditure, the OMEGA 2 Project was completed within a budget that was SEK 1.5 million *less* than that envisaged cost cited in the research programme Proposal, albeit with SEK 2 million additional funding from VREF above its initial SEK25 million CoE grant ceiling offered at the outset of the research on an account of the Centre not being able to raise sufficient additional funds to meet the funding gap that existed in December 2010.

Figure 3.9 provides a summary of annual expenditure totals against the VREF generic model for CoE grant disbursements. This shows that the OMEGA research programme was somewhat atypical in its profile on account of the front-loading of much of its expenditure as compared to those assumed by the grant provider and in need of additional grant support, the request for which was submitted in 2011.

Figure 3.9: Summary of annual expenditure totals against VREF generic model for Original CoE grant disbursements of SEK 25 million

