Risk in Front End Working group

Ivana Burcar Dunović
Content

+ Introduction
+ Research questions and deliverables
+ Progress
Introduction

+ Initiation – Dubrovnik, 30. september. 2013
+ 1.meeting – Brno, 14.02.2014.
+ Seminar – Megaproject Risk Assessment & Simulation – Edinbourgh, 30.05.2014
+ Conference and 2. meeting – Burgas 06.-07.07.2014.
Research questions

1) What does current literature say about risks in megaprojects?

2) What is the common experience in the MEGAPROJECT portfolio of risks in megaprojects?

3) From the above, what is the different between risk in the front-end of megaprojects and risk in the front end of projects?

4) What are possible ways of dealing with risk in the evaluation of megaprojects in the front-end?
Deliverables

+ Literature review paper
+ Paper about MEGAPROJECT portfolio and gap between theory and practice
+ Another paper being ‘mega’
+ Internal report
+ Practitioner usable guidelines
+ EU regional investments policy recommendations, concerning the risk management in the implementation of the cost benefit analysis (CBA)
Group members

**Members**
- Milen Baltov-Bulgaria
- Rafaela Alfalla-Luque – Spain
- Miljan Mikic – Serbia
- Joao Abreu E Silva – Portugal
- Marisa Pedro – Portugal
- Alex Stamov – Bulgaria
- Konrad Spang – Germany
- Vit Hromadka - Czech Republic
- Zhen Chen - UK
- Luís Loures

**Supporting Members**
- Jana Korytarova
- Ana Irimia Dieguez
- Alvaro Cazorla
- Alison Hood
- Aldo Gebbia
Evaluation of current progress
Literature review on risk in megaprojects

+ Papers by Dr. Rafaela Alfalla-Luque, Dr. Ana Isabel Irimia-Diéguez et. all
  – Analysis of the bibliometric characteristics of the papers focused on risk management in megaprojects
  – Systematization of the risks in megaprojects and areas requiring research
Literature review on risk in megaprojects

- 83 references in 47 journals
  - 28.92% on the planning/development phase,
  - 16.87% on the construction/execution/realization phase, and
  - 13.25% on the operational phase.

- Transversal (or cross-sectional) studies (92.77%), vs. longitudinal studies (7.23%)

- Rail and road are the sectors more analyzed
Bibliometric characteristics

+ 65% - qualitative focus
+ 20.5% quantitative analysis
+ 14.5% qualitative and quantitative

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<tr>
<th>Type</th>
<th>Number of references</th>
<th>Percentage</th>
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<td>Models and simulations (M/S)</td>
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<td>28.92%</td>
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<td>Field research / Field experiments</td>
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Methods of information resourcing

- Document analysis: 28 (37.8%)
- Interview: 19 (25.68%)
- Survey: 10 (13.51%)
- Expert group: 7 (9.46%)
- Observation: 6 (8.11%)
- Database: 4 (5.41%)
## Representation of sectors and type of risks

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<thead>
<tr>
<th>Type of risk</th>
<th>Aeronautic</th>
<th>Airport</th>
<th>Building</th>
<th>Energy</th>
<th>Rail</th>
<th>Refinery</th>
<th>Road</th>
<th>Space exploration</th>
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<th>Non-specific</th>
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<td><strong>5</strong></td>
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<td>Force majeure</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1.28%</td>
</tr>
</tbody>
</table>
Risk management methodologies for large projects

+ most of methodologies consider risk management process in already known way
+ only some have reflected to large projects
  - OGC Management of risks
  - ATOM – David Hillson
  - RAMP
  - PRAM
  - SHAMPU – Chapman and Ward
Megaproject Risk Assessment & Simulation Seminar

- Practice vs. theory and research
Practice - Offshore Wind Programme – Crown Estate

risk governance – risk registers, risk reviews
- **identification and evaluation**, -
  - Corporate Plan, Balanced Scorecard, risk assessment criteria, risk profile based on PxC matrix
- **Assessment of how Risks are managed** –
  - mitigating controls
- **Identification of action to enhance management of risks**
- **Risk Reviews & Reporting** –
  - Management Board/ Audit Committee reporting

+ **risk assessment criteria** -
  - revenue, cost, property value,
  - publicity, customer impact/brand,
  - health&safety, staff impact,
  - Legal & Regulatory Compliance
Practice - Offshore Wind Programme – Crown Estate

+ **project delivery sequence** – zone appraisal, zone development
+ **Political support/commitment**
+ **Strategic challenges to programme delivery**
  - Planning and consenting
    - *UK Fishing information mapping project*
  - Supply chains and skills
    - *Supply chain gap analysis / health check*
  - Health and safety
  - Grid and technology
  - Project economics and finance
    - *Cost Reduction Pathways project*
A9 Dualling Perth to Inverness

- integrating cost, value and risk
- Pestle approach
- risk governance – risk registers, process
- risk culture
Practice - Some Key Aspects in Managing Risks when delivering Transport Megaprojects (Tony Francis)

+ keep in mind continually the **reason for the project and the outputs**
+ **communication** - Listen and accept that you may be wrong on occasions!
+ **contingency for unknowns** - Better to over price initially and then declare a lower budget requirement later
+ **legal aspects** - ensure you are as open as possible with all aspects of a project
+ **interfaces** - mistakes have easily occurred
+ **use of technology** –
  – preferred is used,
  – for new technology, ensure that manufacturers take full liability for proving robustness and “fit for purpose”
+ **sustainability of services**
  – to meet market expectations
  – future requirements – construction will take 10 years but result will be there forever
Strategic risk management in major water infrastructure projects

Strategic Risk Management

Risk Tolerance

H&S
- Healthier customers
- Improved drinking water
- Reduce flood risk

DW Quality
- Carbon reduction
- Manage Waste
- Asset resilience

Enviro
- Mains Rehab Km
- Disinfect upgrades
- Lead pipe replace

Finance
- Asset flood protection
- Reduce discharge
- Commercial

Project
- Project lifecycle
- Design
- Procure
- Construct
- Operate

Risk

Opportunity

Best Commercial outcome

Turner & Townsend
Strategic risk management in major water infrastructure projects

+ **Challenge**
  
  – Provide strategic support in risk profiling and deploy **contract assurance**
  
  – Produce a **contract strategy** that clearly allocates and defines the risks
  
  – **Mitigate risks** that could materialize later in the life cycle as a result of a planning decision
  
  – Focus on **strategic tender questions in advance** of tender issue
  
  – **Analysis of tender** to identify and assess the risk to the client
  
  – Support the identification of the preferred bidder
Practice - Strategic risk management in major water infrastructure projects

Benefits

- NEC Option C Target Cost form used to facilitate collaborative risk management
- NEC and the Geotechnical Baseline Report (GBR) combined to clearly allocate ground risk
- Completing early risk planning identified variant options to reduce client risk
- Expedited tender analysis
- Identified contractors “hidden” risk allocation – negotiation always required!
- Transparency of risk cost, risk ownership, and risk-return trade-offs
- Mitigated potential ambiguities following contract execution and construction
- Identified the best deal for the client
Practice - Risk Management in Mega Oil Pipelines Construction Projects

+ Three challenges: design, construction, operational
+ Three types of risks
  - Risks of economic losses
  - Risks of environmental impact
  - Risks of personnel safety
+ Three the most severe risks
  - Interference from clients / consultants leading to delays
  - Overseas Operations (non-familiar location)
  - Delay in project execution due to final project approval from client.
+ Risk Identification Tool – personal experience, SWAT
+ Risk Measurement Tool - Risk Return Analysis, Task analysis
Research – STEEP risk assessment (Zhen Chen)
Research – STEEP risk assessment (Zhen Chen)

**ANP models**

<table>
<thead>
<tr>
<th>Levels of applications</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 5</td>
<td>Embedded solutions into other commercial solutions</td>
</tr>
<tr>
<td>Level 4</td>
<td>Reliable solutions with fast data collection and process</td>
</tr>
<tr>
<td>Level 3</td>
<td>Reliable models with quality criteria, &amp; higher reliability</td>
</tr>
<tr>
<td>Level 2</td>
<td>Integrative models with ANN, Fuzzy logic, QFD, etc.</td>
</tr>
<tr>
<td>Level 1</td>
<td>Simple models with horizontal expansion</td>
</tr>
</tbody>
</table>
Research - Dynamic Systems Approach to Risks Assessment in Megaproject (Prince Boateng)

- system dynamics ANP model to predict time and cost overrun
  - (ANP) model for prioritizing risk factors
  - System Dynamics (SD) for simulating risks overtime

- 85% accuracy
Research vs Practice

**Research**
- assessment
- tools and methods

**Practice**
- risk governance
- project governance
- contract
- tendering
Front-end vs project execution
Large and megaproject front-end

+ is all about
  - ambiguity
  - Uncertainty and risks
  - complexity
  - knowledge

+ The level of uncertainty is extremely high because of
  - the large number of potential sources of risk,
  - the projects’ visibility,
  - their innovativeness.
Halmarks of IMEC study on Large engineering projects

<table>
<thead>
<tr>
<th>Product of negotiated compromise</th>
<th>70,9%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customized to meet clients requirements</td>
<td>64,4%</td>
</tr>
<tr>
<td>Integrated parts of networks</td>
<td></td>
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</table>

**Contested externalities**

| Facing extensive community opposition | 40,3% |
| Facing international pressure groups | 31,9% |

**Crafted over many years**

| Average front-end period (search) | 79 months |
| Average EPC period (sprint) | 49 months |

**Exposed to political risk**

| Political considerations influenced initiation | 43,8% |
| Viewed as viecele for economic developement | 51,1% |
| Facing bureaucracy with strong expertize | 69,8% |

**Facing coherent regulatory frameworks**

| Facing highly developed regulatory frameworks | 61,8% |
| Having to deal with multiple uncoordinated agencies | 38,3% |

**Large, irreversible commitments**

| Average cost | 985 milions $ |
| Built ahead of demand | 35,6% |
IMEC - lessons learned

+ The development of the project during the front-end phase
  - time-dependent,
  - non-linear,
  - and iterative process,
+ during which the project was formulated, tested, challenged, and reformulated through a series of episodes.
  - Unforeseen risks and issues emerge in successive episodes and must be managed
  - Each project encountered an average of 4 unforeseen and potentially catastrophic events during their long life cycles
Front-End of project (IMEC)

Management of this phase showed significantly more impact on project performance than engineering, procurement, and construction phase.

- Up to 33% of total budget
- Average duration is 7 years
- Essential to ensuring project success
- Extremely high level of ambiguity
Total uncertainty over time

+ distribution of different part of uncertainties in total uncertainty is not equal during the life cycle of the project
+ it depends on degree of knowledge in the project
Researching practice in megaproject portfolio

+ MEGAPROJECT portfolio
  - no info on risks, only overruns

+ Questionnaire
  - project based vs opinion based
  - project data – basic data, financing, contracting, technology,
  - success factors, success criteria, tolerance and deviations, constraints
  - feasibility documents and methods
  - risk governance, risk management context and documents
  - major sources of uncertainty in front end
  - risk management tools and techniques known by PM and applied
  - risks in front-end and risks in execution phase
  - major challenges of risk management in megaproject
Future steps

+ Literature review
  – Systematic literature review of risk management
  – A comparison between risk management in megaprojects and projects
  – more in-depth qualitative literature review

+ Questionnaire
  – data collection
  – data analysis

+ EU major projects
  – data
  – challenges with evaluation practice
How we proceed

+ Back to the cases and case authors
+ external COST action stakeholders – Practitioners
+ cooperation with other groups