THE MEGA INVESTMENT PROJECTS AND PROGRAMMES IN THE INDUSTRIES AND THE BUSINESS INFRASTRUCTURE

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МЕГА ИНВЕСТИЦИОННИ ПРОЕКТИ И ПРОГРАМИ В ИНДУСТРИЯТА И БИЗНЕС ИНФРАСТРУКТУРАТА

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Abstract: *Megaprojects are extremely large-scale investment projects typically costing more than € 0,5 Billion. They include power plant (conventional, nuclear or renewable), oil and gas extraction and processing projects, transport projects and even cultural events such as the Olympics Games.*
Megaprojects are complex because they have long projects and product life-cycles, they are also unpredictable in term of time and scope, moreover they have substantial irreversible commitments, high probabilities of failure and skewed reward structure. It is their scale and their extreme complexity in both technical and in human terms, due to the huge involvement and the number of regional, national and international partners, that distinguishes megaprojects from traditional projects.

Key words*: Financing megaprojects, Megaprojects in energy, Roles in megaprojects, Complexity of project*

Megaprojects are extremely large-scale investment projects typically costing more than € 0,5 Billion. They include power plant (conventional, nuclear or renewable), oil and gas extraction and processing projects, transport projects and even cultural events such as the Olympics Games. Megaprojects are complex because they have long projects and product life-cycles, they are also unpredictable in term of time and scope, moreover they have substantial irreversible commitments, high probabilities of failure and skewed reward structure (Turner, 2012). It is their scale and their extreme complexity in both technical and in human terms, due to the huge involvement and the number of regional, national and international partners, that distinguishes megaprojects from traditional projects. These project-based alliances constitute hybrid organizations that combine features of conventional hierarchical management with those of networks (Kickert, et al., 1997). In addition, many megaprojects are characterized by a high degree of uncertainty, as well as a mixture of joint organization and sub-contracting of elements of the workflow to legally separate partners, which, together, make a high degree of complexity (Clegg, et al., 2002). Flyvbjerg et al. highlights a megaproject paradox in that the growth of megaprojects continues despite the poor performance record of many of these projects (Marrewijk, 2007).

This paper belongs to the research agenda of the „MEGAPROJECT: The Effective Design and Delivery of Megaprojects in the European Union" action, which in turn is part of the research program of the European Cooperation in Science and Technology (COST).

Themes in existing literature

Despite the proliferation of research on megaprojects, very few studies have attempted to bring together large bodies of empirical data on which to make their conclusions. Three studies that stand out in this respect are of Merrow, of Flyvbjerg, Bruzelius & Rothengatter and of Miller & Lessard D.

Merrow E. (2011) „Industrial Megaprojects: Concepts, Strategies and Practices for Success", Wiley: Cases comprise 318 projects in 77 organisations from the oil, gas, mining, power and chemical sectors. Flyvbjerg B. Bruzelius N. Rothengatter W. (2003) „Megaprojects and Risk: An Anatomy of Ambition", Cambridge University Press: Cases comprise 270 projects (though these were not all strictly 'megaprojects' by the MEGAPROJECT definition) road and rail transport projects. Miller R. Lessard D. (2000) „The Strategic Management of Large Engineering Projects", MIT: Cases comprise 60 projects from the power generation, transport and water sectors.

The following themes are supported by or postulated from the empirical evidence gathered by the above studies:

- ✓ Megaprojects perform very badly in terms of adherence to delivery schedule and budget.
- ✓ Poor performance is due to 'optimism bias' in both initial estimates of the need for the megaprojects (e.g. forecasting transport flows) and in predicting the time and resource needed to complete the project.
- ✓ Poor performance is a result of not spending enough time and resource in the 'front-end' of the project before the detailed planning and construction begin.
- ✓ Poor performance is due to the lack of competency of project sponsors who fail to 'shape' an appropriate business case and configuration for the megaproject at the start of its lifecycle.
- ✓ Poor performance is due to an inability to effectively resource the project during the planning and construction part of its life-cycle.
- ✓ Poor performance is due to the choice of an inappropriate governance structure for the megaproject (though opinions differ on what an appropriate contractual structure would be).
- ✓ Poor performance is due to turbulence in the external environment for which inadequate risk provision has been made.
- ✓ Poor performance is due to an incorrect team configuration.
- ✓ Performance in megaproject provision is improved by transparency in the decision making process.
- ✓ Performance in megaproject provision is improved by the use of 'reference class forecasting.'

There is a significant amount of other literature relating to megaprojects which tends to be based on a limited empirical dataset (e.g. a single illustrative case). Emerging themes from this type of literature are presented below. (N.B this is not exhaustive and is indicative only):

- Contractual frameworks matter to megaproject performance (Yakowenko 2004; Anderson Jr, Douglass et al. 2006);
- Organizational culture matters to megaproject performance (Van Marrewijk 2007);
- Systems engineering techniques (such as hierarchical decomposition) can assist in project managing megaproject (Fiori and Kovaka 2005; Davies, Gann et al. 2009);

- Governance impacts on megaproject performance (Haynes 1999; Miller and Hobbs 2005);
- Information flow impacts on megaproject performance (A Bishop and B Gembey 1985; Eweje, Turner et al. 2012);
- Novel forms of financial relationships may improve megaproject performance (Garvin 2007; Veenswijk, Van Marrewijk et al. 2010; Little 2011);
- Megaprojects are often constructed for centralised client agencies and do not deliver benefits to the wider society (Sovacool and Bulan 2011);
- Megaprojects benefit from better 'fuzzy' decision-making processes (Mojtahedi, Mousavi et al. 2008);
- Viewing as a megaproject improves the implementation of integrated urban and transport development (Hale 2010);
- Megaprojects are usefully viewed as societal conflicts (Jia, Yang et al. 2011; Novy and Peters 2012);
- Reducing complexity aids megaproject performance (Giezen 2012).

Themes emerging from the energy working group

Cases Portfolio from which the themes were derived The emergent themes presented based on the cases discussed in Energy Working Group Megaproject Case. Those are: Flamanville New Build Nuclear Power Plant, France; Adriatic LNG Re-gasification Plant, Italy; Greater Gabbard Offshore Wind Farm, UK; Hinkley Point New Build Nuclear Power Plant, UK; Mochove New Build Nuclear Power Plant, The Slovak Republic; EON Datteln.

Emergent themes (either in terms of tentative hypotheses or in terms of common patterns) from these discussions are presented below. The cases from which the themes are derived are given by the case identifier. An emergent themes was only identified when more than one case exhibited the same characteristics. Energy Megaproject Heuristics/Hypotheses:

The more unemployment in the megaproject's local environments, the less resistance to it from local residents. The dispersion of different social classes in a location of implementation impacts upon the social acceptance process. (i.e. The 'higher' the social class of local residents, the more opposition the projects faces. The more local residents perceive property values to increase/decrease, the less/more resistance to the megaproject. The more spending by the megaproject on the local community/ the more the local community experiences direct benefits such as a bridge built connecting towns hitherto. This is true only in Europe. Other parts of the world will have similar patterns of actors but different actors in them e.g. Samsung, Hyundai

Optimism Bias – energy Megaprojects do demonstrate optimism bias in the forecasts of leadtime and costs for completion but the reason for this is not clear. (It does not seem to be for reasons of misrepresentation to create a business case c.f. Flyvbjerg)

Lack of Scope Change. Energy megaprojects don't seem subject to scope creep (e.g. target for MWe seems to remain the same throughout the project) This may be something to do with the clarity of purpose. Energy megaprojects are often simply about generating electricity and do not have the complexity of objectives such as cultural events of the Olympics or even iconic transport projects. And they might be connected to policy targets and as such have a binding MWe target. And of course the selection of most important technologies involves often proven and consolidated technology that sets the MWe target and cannot be altered easily.

Similarities in Scale. Energy megaprojects in Europe seem to be of a similar scale. They take about 10 years from the first project idea to full operation. They involve a peak of 3000-5000 person months/years? in construction. They cost €2bn-€7bn.

The more trust the general population has in regulators and licensing authorities, the less opposition to megaprojects. The successful completion of a megaproject requires a specific articulation of national government support. The more 'mega' the megaproject, the more difficult to identify the stakeholders and the more likely for the stakeholders and their needs to change during the lifecycle of the megaproject. The more innovative the megaproject, the more likely to fail to meet iron triangle success criteria. The more experienced a project manager the more successful the implementation (in terms of duration of the project) is.

The historical experience of end-users/end-stakeholders of the project (inhabitants) with similar projects and or with the contractor, both on the national level and on the local level impacts the social acceptance or lack thereof. (F,H)

Formation of project based organisations. There is frequently a joint venture organisation (often an equity joint venture) formed between organisations to be the client/owner for the megaproject. The degree to which this is a 'real' organisation (staffed with people and with project management responsibility) or a 'ghost' organisation (not staffed with the project activities still being undertaken by the owners varies.

Financing of Megaprojects. Most megaprojects are financed by consortia of organisations and not by a single organisation.

Similar Patterns of Actors. Energy Megaprojects in Europe have a similar pattern of stakeholder actors and those actors are often act in the same capacity across a number of cases: Owners (either directly or of temporary project organisation): Trans-European Energy Companies with a substantive state ownership, e.g. E-ON, RWE, EDF, ENEL. Prime contractors: Turbo-machinery (Siemens, Rolls-Royce, Alstom); Nuclear Steam Systems (Arreva); EPC (Aker, Fluor, AMEC, Saipem.

Megaproject portfolio analysis

The results are classified according to the only data that are a common background to each of the 20 cases of the Megaproject portfolio are about the typologies and the lists of internal and external stakeholders, plus their having been cited eitheras groups or individuals. What first need to highlight is that the 67% (over 400 potential data) of the information regarding the cited dimensions is existing.

The overall distribution of all the categories of stakeholders, both internal and external, in the Megaproject portfolio. The biggest presences of stakeholders regard, in order:

Local Government (10%), Financier and First Tier contactor (9%), and Principal contractor and Second Tier consultant (8%). All the other typologies are present for less than 6%, going down to presences of 1%.

Of course, the amount of stakeholders belonging to a certain category doesn't imply anything about for example their power or influence, but it is still an indicator of a general dimension of presences regarding the overall picture of stakeholders in a megaproject.

One further important consideration regards the identification of a particular stakeholder as a group (e.g. Municipalities) or as a single (e.g. Municipalities of Seville): the majority of the stakeholders (84%) are listed as single.

The consideration of a stakeholder as a single or as a group identifies that particular stakeholder as a group, it is not a complete and pure generalization of an information but it is a perceived consideration about the impact, influence, power and other variables of an external entity.

The distribution of the stakeholders classified as internal and external, respectively subdivided into demand and supply side, and private and public. The distribution is relatively

homogenous: the majority of the stakeholders (29%) belongs to the internal demand-side category, a quarter each (26%) to the internal supply-side category and the external public one, and a minor part (19%) belongs to the external private one.

If in every case there are data regarding the categories and the amount of stakeholders, it is not the same for most of the stakeholders attributes. Only 14 cases out of 20 have information regarding the following external stakeholders variables: interest, attitude, influence, impact on project, project impact on stakeholders and achieved perceived performance.

In order to avoid any misalignment on the definition of the cited terms, below there is an explanation of each of them:

Interest: it can be defined as the willingness to engage to the project. Stakeholder interest in a project is considered by many researchers to be a factor affecting the success outcome of a project and it is often cited in stakeholders definitions. Stakeholders may have an interest in a project for numerous reasons such as mission relevance, economic interest, legal right, political support, health and safety, lifestyle, opportunism and survival. Hence, it can be said that interest is an important driver of the stakeholder–project relationship (Nguyen, et al., 2009).

Attitude: it refers to whether a stakeholder supports or opposes the project (McElroy & Mills, 2000). Stakeholders may have negative or positive impacts on projects, so it is important for managers to determine objectors or supporters and where do they fit this scale (Nguyen, et al., 2009). A negative attitude to a project by stakeholders likely causes conflicts and controversies that in turn might reflect in cost and time overruns.

Influence: it is the level of involvement the stakeholder has, and it is related to the power that astakeholder has over a project to control what decisions are made, facilitate its implementation, orexert influence that affects the project negatively. It is the extent to which the stakeholder is able to persuade or coerce others into making decisions and following certain course of action (DFID, 2003).

Impact: it is due to the combination of different attribute, i.e. power level, urgency level, legitimacy level, and knowledge level and proximity degree.

Power is defined by Mitchell, et al. as „a relationship among social actors in which one social actor, A, can get another social actor, B, to do something that B would not otherwise have done". Urgency instead is the degree to which a stakeholder claims call for immediate attention. Legitimacy is the „generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions" (Suchman, 1995). Legitimacy gains rights through power, and voice through urgency. Knowledge deals with the fact that today stakeholders tend to be more and more sophisticated, informed and vocal, seeking information from numerous sources. It is an important factor to take into account because the more knowledge a stakeholder has about the project, the more he is able to influence it. Then the proximity is due to a stakeholder being closely associated or relatively remote from the project.

Achieved perceived performace: given a stakeholder original aims of project involvment, this variable deals with the achievment or not of these aims. In these analyses the information regarding the stakeholders relationship maps – and so the relative variables of density of the stakeholder network and centrality of the focal organization – are not taken into account because the data gathered show only the relationships from few perspective (mainly only from the client one) and so the network relationships are not complete and can be misleading.

Regarding the attitude, and so the positive or negative interest in a project, only the 43% of the information are available. Figure 4 shows external stakeholders positive attitude. What results from the analysis is that the highest positive attitude is the one of the Local Governement, followed by the other positive one: National Government, other external public categories (mainly identified with the EU), regulatory agencies and local resident. What need to be pointed out is that this potive group coincides with the public external stakeholders. Among the stakeholders with the highest negative attitude mainly 2 categories need to be highlighted: Local Landowners and Environemntalist. Also Conservationist and Archeologists have an attitude value, but the number of information for these two is not significant.

Conclusions

The driver for all the analyses above is a specific stakeholder variable. Looking at the results from another perspective – stakeholder category – what can be highlighted are the following considerations. The most critical stakeholder is the National Government. His positive attitude and his effective impact are among the highest, and the same is true for his influence on time performance.

Moreover he has the highest influence on the overall project goals, and he is the stakeholder with more power and urgency. Still his satisfaction is not always positive. Another note needs to be added about the EU – in the case studies clustered as other external public categories. His value regarding impact, influence and impact are the same as the National Government. What mostly differentiate them is the achievement of perceived performances, which is on average gained for the EU. Local Government has also similar values of the previous mentioned ones about attitude, influence and impact. His peculiarity is that, together with the client's customer, he has on average the highsatisfaction level.

The last consideration needs to be added regarding the Environmentalists whose influence, power and impact are usually the lowest, and they result often to be not satisfied and not to reach their aims. They seem not to be key stakeholders, but every stakeholder still need to be taken into consideration especially if he has a negative attitude towards the project.

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