

Client led innovation on megaprojects: novel low-energy cooling system case study in Singapore's SportsHub

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Abstract

Innovation requires a social governance environment that supports creativity. This research examines the governance context on megaprojects focussing on the client's role. We present the preliminary results of a case study client involved with the finance, design, build and operation of an innovative megaproject in Singapore. It is the largest sports facilities infrastructure Public-Private-Partnership (PPP) project in the world. It is also the largest and first PPP project in Singapore. PPP projects have multiple 'clients'. In this study the client network comprises the sports government agency responsible for setting up the project framework and the various PPP consortium stakeholders. A narrative analysis approach is employed drawing from the theory of cultural political economy and the concept of governmentality. The innovation explored in this paper is the creation and development of a low energy cooling system used in the National Stadium. The novel cooling system, which relies substantially on air movement, aims to provide a comfortable spectator environment in the country's challenging tropical climate. The innovation was initiated by the sports government agency, designed and developed by various interdisciplinary consultants and regulated by a government agency. The process in which the innovative cooling system was designed and developed to overcome conflicting priority agendas and achieve spectator comfort, sustainability objectives and regulatory approval is described in this paper. The findings indicate that although formalised structures and protocols were established for project coordination and communication decision-making was deeply influenced by informal communication embedded in multi-level networks. Power was constantly exercised and exchanged through various instruments of power including legitimate or position power, expert power and strategic games. The findings demonstrate that decision-making often occurred outside the pre-established structures and that the advancement of specific interests were facilitated by the political economic decisions of players in hierarchical positions of power. The social network analysis (SNA) method is proposed to demonstrate how the structure of networks influences the delivery of innovations such as the bowl cooling system on megaprojects.

Keywords: cultural political economy, governmentality, innovation, megaproject clients, social networks

1. Introduction and background

Megaprojects offer a range of opportunities for innovations to be implemented. The megaproject environment provides a fertile ground for innovations to take place since it is generally perceived that its success relies on signature design, high publicity of idealistic visions and grandeur project scale – key characteristics which call for innovative ideas and solutions (Boyd and Chinyio, 2006). Strategic decisions are made on megaprojects due to interests and motivations which are often not found on typical projects. Innovation requires a social governance environment that supports creativity. Clients play a critical role in driving the direction of megaprojects and in leading innovations (Nam and Tatum, 1997; Manley, 2006; Hartmann et al, 2008). It is thus important to understand the behaviour of clients in terms of the decisions made to support or suppress innovations on megaprojects.

This paper is positioned within an ongoing PhD study which aims to examine the governance context on megaprojects. The study explores the sophistication of megaproject clients who are often made up of representatives across multiple units or political groups in large-scale corporations or government agencies at the strategic, managerial and technical levels. Clients in the architectural, engineering and construction (AEC) sector particularly within the international context occupy a distinctly different position as the initiator of the construction supply chain. Therefore clients experience and respond to project matters based upon their own business environment and not the construction industry environment. There is a critical need to develop a greater understanding of the complex client decision-making environment within megaprojects. Past megaproject research (Priemus et al, 2008) focussing on the industry's role has very little relevance to the actual, daily activities of clients. Client priorities set the boundaries within which decisions affecting innovations, budgets, project organisational structure and team membership throughout the project lifecycle are made.

There has been relatively little recognition within the megaproject discourse of the power structure and social networks which affect client decision-making and the influence clients have in shaping the political economy of megaproject collaborative practice (Siva and London, 2010). Decision-making on construction projects is not wholly predetermined by contracts but instead often emerge from the use of power (Flybverg et al, 2003). There is often a discrepancy between the reality of power structures on projects and those formally prescribed by governing contracts (Loosemore, 1999). Although there is extensive literature on briefing and client participation methods seeking to guide clients as well as tools and methods to achieve successful megaprojects there is little theorising that links these issues coherently. There appears to be little research that approaches the problem from a cultural political economy perspective. This research seeks to address this gap by investigating the diverse forms of power, authority and subjectivity exercised in the client's everyday practices related to megaproject decision-making. We report early observations of one case study of a megaproject client in Singapore. The innovation explored in this paper is the design and development of a low energy bowl cooling system. The process in which the cooling system was designed and developed to overcome conflicting priority agendas and achieve regulatory approval is described. Prior to this an analytical model based upon cultural political economy theory and the concept of governmentality is proposed to frame the exploration of power relationships in relation to megaproject governance.

2. Cultural political economy

Cultural political economy (CPE) is defined as one which (Sayer, 2001, p. 688): “emphasises the lifeworld aspects of economic processes – identities, discourses, work cultures and the social and cultural embedding of economic activity, reversing the pattern of emphasis of conventional political economy with its concern for systems...[it] deals with the level of concrete and hence with firms, bureaucracies and households embedded in the relationships and meanings of the lifeworld...it should combine and “work up” abstractions of both system and lifeworld”. The term lifeworld encompasses the informal aspects of life which is the product of the relation between embodied actors and the cultures into which they are socialised. Systems are the formalised rationalities which have a logic and momentum of their own, going beyond the subjective experience of actors to routinise or govern specific actions through signals and rules such as prices, money, bureaucratic processes and procedures (Sayer, 2001). A key characteristic of CPE is its examination of the “embedded” nature of economic action in terms of how they are set within social relations and cultural contexts that impact upon those economic processes (Sayer, 2001). CPE analysis offers a way of demonstrating how the advancement of specific interests is facilitated by the political economic decisions of key players in positions of power (Anderson, 2004).

The CPE of megaproject environments is composed of power relations among a diverse range of stakeholders such as clients, project managers, architects, users, property owners, financiers, regulatory bodies, local communities – each attributing their own value at various stages of a project. A range of activities and processes are typically conducted particularly on such large undertakings as megaprojects including briefing, stakeholder management and community participation, aimed at aligning project objectives and stakeholder requirements. Such efforts, however, may not prevent stakeholders from pursuing their self-interests. Power differentials on projects cause stakeholders to employ various strategies or tactics to place them in positions of advantage. A series of important questions to this research follows: *How do ideas get disseminated, accepted or rejected on megaprojects? How is power created, nurtured and employed on megaprojects? What other forms of power are available for various stakeholders on megaprojects? How do responsible AEC professionals who can contribute to the quality of built environments enhance their power on projects to improve project performance?*

3. Governmentality

The concept of *governmentality*, developed by Foucault (1979) in the 1970s through his investigations of political power offers a useful language for exploring both the macro spaces of megaproject governance frameworks as well as the confined locales of client workplaces and the everyday practices and networks where various forms of power come to be created, distributed and exercised. Foucault (1993) defined government as “the conduct of conduct”, which is a form of activity seeking to shape or guide the actions of others through the exercise of various techniques (Christie, 1982) While the word *government* may imply a strictly political meaning today, Foucault (1993) placed the problem of government in a more general context embracing philosophical, religious, medical and familial sites (Lemke, 2008). By widening the context of governmentality the

conception of “governmental authorities” is extended to include families, churches, experts, professions and all the different powers engaging in “the conduct of conduct”.

The concept of governmentality deepens our understanding of power by demonstrating that power not only resides at the centre of a single body but is also present in diverse locales (Garland, 1997; Rose et al, 2009). Power is visible in both everyday life and institutions (Rose and Miller, 1992; Donzelot, 1979). It should not be assumed that the mere existence of a structure within a network implies an acceptance or implementation by members. Whilst such formalised structures appear highly visible, there are also other less visible relationships and dealings occurring where power is constantly exercised and exchanged. Foucault traced a movement between the 16th and the 18th century and identified two distinct rationalities of governing practiced by state and other agencies: the sovereign and family model, which he positioned at opposite ends of a spectrum. Whilst the former was concerned with abstract and rigid ways of thinking about power the latter model was devoted to matters to enrich the small family unit (Foucault, 1979). Distinctly, he identified a third form of rationality which took place from mid 18th century onwards, governmentality, which viewed power in terms of its populations with its own realities, characteristics and requirements; independent of government yet at the same time requiring government intervention (Rose et al, 2009). These populations cannot simply be controlled by implementation of the law or programs nor be thought of as a type of extended family. Foucault highlighted that populations have their own characteristics which need to be understood through specific knowledges and it is through these emergent understandings that the “art of governing” is formulated.

The practices within the social realm of government are undertaken in their complex relations to the various ways in which “truth” is conceived by the different agents (Dean, 2010). Within the context of megaproject decision-making, how clients govern themselves and others relies on what they see to be ‘true’ about who they are which is in turn influenced by the rich and complex social networks, cultural norms and social obligations they are embedded within. It is thus important to capture what rationalities of governing are implicit in the client’s practices and how they relate to those of project team members working on megaprojects. How do clients who are at the top of the governance structure of megaproject decision-making understand their powers and the impact of their practices? Governmentality should not be viewed as a theory of power or governance. Instead “it asks particular questions of the phenomena that it seeks to understand, questions amenable to precise answers through empirical inquiry” (Rose et al, 2009, p. 3). The governmentality perspective seeks to pose questions relating to power without attempting to prescribe a set of principles or ideology for governing others and oneself. In doing so, we are practising a form of criticism which makes explicit the taken-for-granted character of these practices (Foucault, 1988) in terms of how clients govern and are governed and in the ways by which they do. Through this we open up for analysis various forms of strategic games in terms of contestations and negotiations between stakeholders on megaprojects.

4. RESEARCH METHODS

This study employs a case study strategy through the use of the narrative inquiry (NI) and social network analysis (SNA) methods for collecting and analysing empirical material. Firstly the NI

approach allows for an investigation of how megaprojects are shaped within the structure of power relations, that is, the *nature* of power relations. It seeks to uncover stories which highlight changes in decision-making brought about by contact between stakeholders. NI enables a systematic study of the key events within the client’s decision-making experience to connect and see the consequences of those events and actions. Secondly SNA is used to identify the interdependency between stakeholders, that is, the *structure* of power relations. SNA’s main point of difference from other types of analysis of social phenomena is its focus on the *structure* of relationships between actors instead of the *attributes* of actors (Davies, 2009). Diversity in methods and tools for data collection and analysis is critical in the production of accurate and reliable representations of social reality. The methodological value of the social network perspective in the analysis of the cultural political economy of megaprojects lies in its ability to complement the qualitative method of NI to enhance understanding and provide interdependent explanations of the power structures underpinning client decision-making.

This paper reports early observations made from one case study of a megaproject client in relation to the design and development of an innovative bowl cooling system. This preliminary analysis sought to test initial assumptions and to refine the data collection tool made up of an interview schedule and questionnaire. Sixteen interviews have been conducted to date with a range of participants (refer to Table 1). In keeping with the narrative inquiry approach, the interview instrument was designed to be broad and open-ended to provide participants the opportunity to express themselves in their own words without being influenced by suggestions from the researcher as well as to invite participants to tell their own stories. Participants were asked questions in relation to three broad areas: their role in the organisation and on the megaproject; stories in relation to project issues experienced and how decisions were made to resolve issues and their relationship with other project stakeholders. The observations reported in this paper are the result of the preliminary analysis of the interviews. Stories told by individual participants relating to the design and development of the innovative bowl cooling system were identified and “open coding” was conducted based on the loose association of themes and concepts. Following this axial coding was conducted involving the arrangement of data according to dominant themes that emerged. The next stage of analysis will involve detailed narrative analysis of the stories, and then followed by the administration of a questionnaire to map the structure of power relations through the SNA approach.

Table 1: Interview participants

<i>Participant</i>	<i>Organisation</i>	<i>Role</i>
<i>P1</i>	<i>Singapore Sports Council</i>	<i>Project Director, SportsHub</i>
<i>P2</i>	<i>Singapore Sports Council</i>	<i>Deputy Director, Operations & Programming, SportsHub</i>
<i>P3</i>	<i>Singapore Sports Council</i>	<i>Project Director (former), SportsHub</i>
	<i>Venue operator</i>	<i>Asst General Manager</i>
<i>P4</i>	<i>Design & Build contractor</i>	<i>Contracts Director</i>
<i>P5</i>	<i>Design & Build contractor</i>	<i>Sr Design Manager</i>
<i>P6</i>	<i>Architecture firm</i>	<i>Associate Director</i>
<i>P7</i>	<i>Special purpose vehicle</i>	<i>Chief Executive Officer</i>

<i>P8</i>	<i>Special Purpose Vehicle</i>	<i>Chief Operations Officer</i>
<i>P9</i>	<i>Design & Build contractor</i>	<i>Technical Director</i>
<i>P10</i>	<i>Singapore Sports Council</i>	<i>Sr Manager & Head, Design & Technical, SportsHub</i>
<i>P11</i>	<i>Singapore Sports Council</i>	<i>Sr Director, Sports Pathway Development, Sports Development Group</i>
<i>P12</i>	<i>Singapore Sports Council</i>	<i>Asst Director, Events Portfolio Management, Sports Business</i>
<i>P13</i>	<i>Singapore Sports Council</i>	<i>Project Director (former), Sports Hub</i>
<i>P14</i>	<i>Singapore Sports Council</i>	<i>Sr Executive, Operations & Programming, SportsHub</i>
<i>P15</i>	<i>Singapore Sports Council</i>	<i>Sr Manager, Contract Compliance, SportsHub</i>
<i>P16</i>	<i>Sports Architecture Firm</i>	<i>Sr Associate</i>

5. RESULTS

The case study is a 1.33 billion SGD multi-use, multi-sport and entertainment complex in Singapore. The project seeks to encourage large numbers of people to adopt and pursue sports and to draw international events to its world class facilities, which is part of the government's broader vision of creating a thriving sports, entertainment and lifestyle ecosystem (Sporting Singapore, 2001). The project involves the demolition of an existing National Stadium and the construction of new buildings including a national stadium, multi purpose indoor arena, aquatic centre, water sports centre, Singapore information and resource centre, sports promenade and commercial space/retail mall. It also incorporates the use of an existing multi purpose indoor arena. It is the largest sports facilities infrastructure Public-Private-Partnership (PPP) project in the world (SSC, 2012). The project is also the first PPP project in Singapore. A Special Purpose Vehicle (SPV), SportsHub Private Limited, was formed to finance, design, build and operate the facility in partnership with the Singapore Sports Council (SSC) over a 25-year period. The SPV invests in equity and utilises bank debt financing to build the facilities (Singapore Parliament Report, 2009). Upon completion of the contract the facility will be handed over to the SSC.

PPP projects have multiple 'clients'. In this study the client network comprises the sports government agency responsible for setting up the project framework, SSC, and the various PPP consortium partners which have varying levels of involvement (refer to Figure 1 in appendix). All the PPP partners are bound to the Project Agreement and the various protocols set out in the Interface Agreement. Formalised structures and protocols have clearly been established by the SSC and SPV for project coordination which are aimed at achieving control of accountability of decision-making as well as respecting the roles and boundaries of various parties. Indeed these formalised structures and protocols offer clear traceability in terms of lines of official document exchange between project stakeholders. However, what these official documents fail to record are the informal negotiations and dealings occurring in multi-level networks whereby power is constantly exchanged and exercised. Past research has identified that these informal networks and communications are equally, if not more, important than pre-established structures (De Blois et al, 2011). Preliminary analysis of the SportsHub case study supports these past findings in relation to two key areas: indirect or non-expert participants

can sometimes act informally as client representatives and influence the direction of projects; and informal communication and decision-making are often made outside pre-established structures (Siva and London, in press).

Given the significance of the SportsHub project a high level of interest was received from various government agencies including the Building and Construction Authority, Urban Redevelopment Authority, Land and Traffic Authority and National Security agency which were informally drawn into the project process thereby influencing how decisions were made on several occasions. Different regulatory bodies were able to drive the direction of the project to support or suppress innovations. To demonstrate this in greater detail the following section outlines the process involved in the creation and development of an innovative low energy bowl cooling system whereby decisions were often made outside the pre-established structures and the advancement of specific interests were facilitated by the political economic decisions of players in positions of power.

5.1 Low energy bowl cooling system innovation

The centrepiece of the SportsHub is the National Stadium which is a 55,000 spectator, multi-sport stadium featuring a retractable roof, configurable arena seating and an innovative bowl cooling system. The novel cooling system, which relies substantially on air movement aims to provide a comfortable spectator environment in the country's challenging tropical climate. The system provides cooling by treating the microclimate immediately around the spectator rather than the entire volume of the semi-enclosed stadium thus significantly reducing energy usage. The cooling system is aligned with the consortium's contractual commitment to SSC to achieve a GreenMark GoldPlus award, which is the second highest ranking achievable under the country's ranking system for evaluating environmental performance of buildings. At the time of the interviews the design team was undergoing the final review process with the government body governing building and construction regulations in Singapore, the Building and Construction Authority (BCA) prior to being awarded the GreenMark GoldPlus. The interview participants explained that the lengthy process they underwent to arrive at this milestone was one characterised by uncertainty and complexity. The design manager explained that a key challenge was the need to incorporate the needs of not only the formal client, the SSC, but also those of the BCA:

“...we had instructions from one part of government – and that necessarily creating a PR problem for another part of government” (Senior Design Manager, Design and Build contractor)

Shortly after finalisation of the Project Agreement in 2010, the BCA expressed concern regarding the bowl cooling scheme. BCA has been actively discouraging the spillage of air conditioning from indoor spaces to outdoors, both through improved regulation and enforcement, and advised that they were considering further retroactive regulation to control this practice. While the bowl cooling system is not air conditioning *per se* – unlike air conditioning, no dehumidification is provided and a substantial part of the spectator comfort is created by air movement as opposed to air temperature – BCA expressed concern that the bowl cooling system may be perceived as air conditioning by the general public. Providing regulatory approval for the use of the bowl cooling system may thus be seen

as a precedent for provision of air conditioning to outdoor spaces thereby undermining BCA's efforts to eliminate this unsustainable practice. Therefore at one stage the bowl cooling system was, as described by the design manager, "going off the rails" and "up in the air" whereby there was little clarity in terms of whether it was allowed for use in the National Stadium given that it was seen as an illegal practice by the BCA. For months the design team found themselves defending the scheme to the BCA by presenting a series of arguments from a technical perspective in terms of the efficiency of the scheme, which unfortunately was not accepted during the initial stages. The design team's frustrations are reflected in the following quotes:

"we could've arrived at a solution which would've used our modelling and calculations 2 or 3 times as much energy...but that generally wasn't accepted...There are comparisons to other projects where semi outdoor spaces have been cooled and the BCA hasn't allowed that and that is part of the reason why this has become sensitive issue." (Senior Associate, Sports Architecture Design Firm)

"What we're doing is the most efficient thing but from their point of view not to hinder this other law it'll be better if we built an enclosed dome and use four times the energy...we didn't anticipate this...political wrinkle" (Senior design manager, Design and Build contractor).

The design team's frustrations seemed to stem from their inability to put forward an argument in support of the bowl cooling system based on a rational and technical perspective. Through extensive computer modeling and calculations the design team presented what they worked out to be "the most efficient" means of providing spectator comfort. However, it was felt that a less innovative scheme using "four times the energy" would have been better received by the authorities simply because it would not create a public relations problem for the BCA as the bowl cooling system presumably would. Eventually though the BCA provided clearance of the scheme from a regulatory point of view. The design manager indicated that the SSC played a critical role in facilitating the approval process:

"SSC was working behind the scenes to work through that. They weren't involved with the day-to-day technical aspects but we keep them very aware and they do kind of help go to government departments and help smooth things out" (Senior design manager, Design and Build Contractor)

The Senior Manager from the SSC who leads the design and technical sub-division within the SSC's SportsHub division confirmed that the SSC were involved in a number of informal negotiations with the BCA to help achieve regulatory approval for the bowl cooling system. Given the innovative nature of the cooling system the Senior Manager indicated that there was a need for the local authorities to be less rigid about complying strictly to local guidelines and to treat and assess the system based on a separate set of criteria or conditions which needed to be negotiated:

"BCA came to SSC, "is this really part of the client requirement?" and we said "yes...sometimes when...they [design team] need some help...SSC being one of the government agencies can...lend them some support...even in parallel we'll go behind them and talk to the agency like in this case... that's why we were able to convince them ...But of course we had to pre-agree with them...on how we can operate it (Senior Manager and Head of Design and Technical – SportsHub, SSC)

Clearly the discussions between the SSC and BCA influenced the ultimate outcome of the bowl cooling system approval process. However the Senior Manager also pointed out that the efforts of the design team in providing quality information to BCA in support of the innovation also helped to facilitate the process. According to the Senior Associate from the Sports Architecture firm the type of information as well as the frequency and timing within which information was provided by the design team to the BCA was something which was well thought through and organised:

“We have to do a little bit of talking about what the expectations of what the authority is going to want to see...you have to continually manage that to get people recognising that we’ve got this “package A” which we use for the authority and we’ve got this package B or C or D in some areas which is already advanced to a slightly different form” (Senior Associate, Sports Architecture Firm)

Furthermore in order to ensure that the right type of information was obtained from the various parties within the design team the Senior Associate indicated that conversations were often “held quietly” to “attune” others to “the message they want to hand over to the authority”. Key people in positions of power were also clearly recognised as those who can help achieve the desired outcome:

“some conversations are held quietly to try and prepare to get someone else ready to be bringing the information out in the form which is going to work for everybody...We can use people like XXX...to help our cause...he is a very effective operator in that position” (Senior Associate, Sports Architecture firm).

After the BCA granted regulatory approval for the use of the bowl cooling system further negotiations were undertaken to agree on how the system will be operated. During an initial assessment of the design team’s application for the GreenMark GoldPlus award the BCA advised that in order for the SportsHub to achieve a GoldPlus award, the energy usage of the bowl cooling system must be 100% offset by renewable or waste-generated energy sources. The issue of a major project associated with the Singapore government creating a public relations problem for BCA’s enforcement efforts to stamp out purposeful spillage of air conditioning to the outdoors is thus resolved by the ability to advise the public that energy used for the bowl cooling system is completely offset by renewable energy. Following this the design team and consortium partners spent considerable amount of time exploring the means of financing and installing sufficient PV cells to offset the power anticipated to be consumed by the bowl cooling system. Because the cost of this installation was not anticipated at the time of the contract preparation, schemes by which third party investors purchase the PV installation and sell back the power generated are currently under investigation.

5.2 Instruments of power

The problem of conflicting priority agendas in relation to the bowl cooling system was eventually overcome but not without a series of negotiations between stakeholders. Clearly, the negotiations and relationships are not reflected in the formal structures prescribed in the contractual agreement. These informal networks and various forms of instruments of power, however, have been demonstrated to have a significant impact on how the project was shaped in relation to the design and development of the cooling system. The process in which the cooling system was initiated, developed and accepted by

the regulatory authority highlights how the actions of stakeholders were deeply embedded in the hidden exercise of power. A number of emerging themes can be observed including:

- the use of legitimate or position power appeared to be more effective than expert power in achieving regulatory approval for the bowl cooling system;
- the effectiveness of legitimate or position power is increased on megaprojects and strategic release of appropriate information and
- strategic games in the use of key people in positions of power to facilitate the approval process.

Legitimacy or position power was demonstrated to be an important form of power whereby the SSC, by virtue of being a government agency, were able to exercise their invisible rights to engage in negotiations with the BCA on the same level of authority. Approval for the bowl cooling system was only provided following SSC's private discussions with the BCA. Even though the design team had spent considerable amount of time defending the scheme the BCA appeared to place much more weight in SSC's justifications of the system. There appeared to be a degree of trust shared between government agencies in Singapore which is demonstrated by how the BCA approached SSC to seek confirmation that the bowl cooling system was a part of the brief requirements even though the design team had already indicated this. The process in which the bowl cooling system achieved regulatory approval demonstrates that the exercise of political power can overrule rationality in certain situations. The design team's expert power in presenting an innovative and efficient system was less effective than the SSC's legitimate power related to their position within the network of government agencies. This is of course not to say that stakeholders should ignore the environmental, social, moral and professional arguments in support of their respective positions. Rather a strict adherence to rationality and logic alone without adequate acknowledgement and understanding of other forms of power will unlikely lead to successful outcomes as the case of the bowl cooling system has shown. It is thus important to understand the various strategic games stakeholders employ in the exercise of power in megaproject decision-making and how this influences the delivery of innovations.

The very nature of an innovation necessitates a change from the norm whereby it is unlikely that project innovations will comply with existing codes or regulations. Given that megaprojects are characterised by innovations, code compliance and achieving regulatory approvals can often pose as a key challenge. The design team found themselves in a difficult position of getting the bowl cooling system accepted by the local authorities even though the efficiency of the system far exceeded the basic requirements of the building regulations and codes. The provision of regulatory approval for innovations on megaprojects thus can become a grey area with little clarity in terms of what is required and the process in which project participants need to comply with in order to achieve successful outcomes. This lack of clarity gives rise to a situation where those responsible for providing regulatory approvals gain increased power to dictate and impose their requirements upon other stakeholders who in turn become highly vulnerable. Ultimately the drive to successfully deliver project innovations falls onto the responsibility of key stakeholders within the project team. In the case of the bowl cooling system there was a strong desire by the client network comprising the formal

client and design team to implement the bowl cooling system despite the challenges encountered. The power domination of the regulatory context associated with the approval of innovations in Singapore does not appear to be a conducive environment for innovations to be successfully delivered and is perhaps worthy of further exploration.

The design team found that they needed to respond to not only the requirements of the ultimate client, the SSC but also the BCA. In dealing with the authorities the design team clearly understood the need to adopt a considered approach in presenting the type of information which is aligned with the expectations of the authorities. Furthermore in order to ensure that the right type of information was obtained from the various parties within the design team there was clear recognition of specific people who were felt to be in influential positions to facilitate the process. The use of certain relationships and networks can thus be more effective than others depending on situational needs. This demonstrates that there are ways in which those in weaker positions of power can achieve stronger positions through smart linkages. This also demonstrates that despite the importance of organisational and project structures in formalising communication flows and coordination, how work is carried out on a daily basis tends to have more to do with the informal relationships and interactions between members within and across organisations as they strategically assess and “work out deals” to better achieve what they require.

6. SUMMARY AND FURTHER RESEARCH

This paper described an analytical model which was developed based upon cultural political economy theory and the concept of governmentality to examine megaproject client governance and its relationship with the delivery of innovations. The early observations of the case study of the Singapore SportsHub in relation to the innovative bowl cooling system confirmed initial assumptions made that although formalised protocols were established for project communication and coordination decisions were often made outside of the pre-established structures. Furthermore decision-making was influenced by informal communication embedded in multiple levels of social networks comprising various stakeholders in positions of power who at times act as “clients”. These observations highlight the significant influence of the structure of networks on decision-making and the delivery of innovations on megaprojects. Megaproject decision-making is thus a network problem requiring an understanding of social structures. Different types and forms of social networks may be essential for achieving different project outcomes in relation to the delivery of innovations at various stages of project decision-making. The structure of social networks embedded in the multilevel environment in which client decision-making is undertaken may contribute towards understanding the way decisions and actions occurring at the confined locales of client workplaces can impact on project outcomes at higher levels. However, to date there is still little known in terms of the nature and structure of power relations in megaproject client decision-making where various forms of power come to be created, distributed and exercised. Therefore the next stage of analysis involves a social network mapping of the informal links between stakeholders to highlight how the structure of power relations influences decision-making and in turn the delivery of innovations on megaprojects.

7. REFERENCES

- Anderson, T., 2004, "Some thoughts on method in political economy", *Journal of Australian political economy*, 54, p. 135-145.
- Borgatti, S., Molina, J.. 2002. What can SNA do for management consulting. In: Building Effective Networks Conf, Academy of Management, Denver, Colorado, pp.9–14.
- Dean, M., 2010, *Governmentality: power and rule in modern society*, Sage Publications, London.
- Donzelot, J., 1979, *The Policing of families*, Pantheon Books, New York.
- Flyvbjerg B., N. Bruzelius, and W. Rothengatter, 2003, *Megaprojects and risk: an anatomy of ambition*, University Press, Cambridge
- Foucault, M. 1979, "Governmentality", *Ideology and Consciousness*, 6, pp. 5-21
- Foucault, M. 1991, "Questions of Method", in: Burchell, Gordon and Miller (eds.) *The Foucault Effect: Studies in Governmentality*, Chicago University Press, Chicago, p.73-86.
- Garland, D., 1997, "Governmentality and the problem of crime: Foucault, criminology and sociology", *Theoretical Criminology*, 1(2), pp. 173-214
- Lemke, T., 2000, "Foucault, governmentality and critique", *Rethinking Marxism Conference, University of Amherst, September 21-24*
- Loosemore, M. 1999, "Responsibility, power and construction conflict", *Construction Management and Economics*, 17, pp. 699-709
- Priemus, H., Flyvbjerg, B. and van Wee, B. (2008) Decision-making on mega projects: cost-benefit analysis, planning and innovation, Edward Elgar, Cheltenham, UK.
- Rose, N. and P. Miller, 1992, "Political power beyond the state: problematics of government", *British journal of Sociology*, 43, p. 173-205
- Sayer, A., 2001, "For a critical cultural political economy", *Antipode*, 33(4), p.687-708
- Siva, J and K. London, 2010, "Client management on international mega projects: investigating the client's complex decision-making environment and its relationship with project performance", *The 1st international conference on sustainable urbanisation, 15-17 Dec, Hong Kong*
- Siva, J and London, K (in press) "Client decision-making to support innovations on megaprojects", 7th International conference on innovation in architecture, engineering and construction, Sao Paulo, 15-17th August 2012

8. APPENDIX

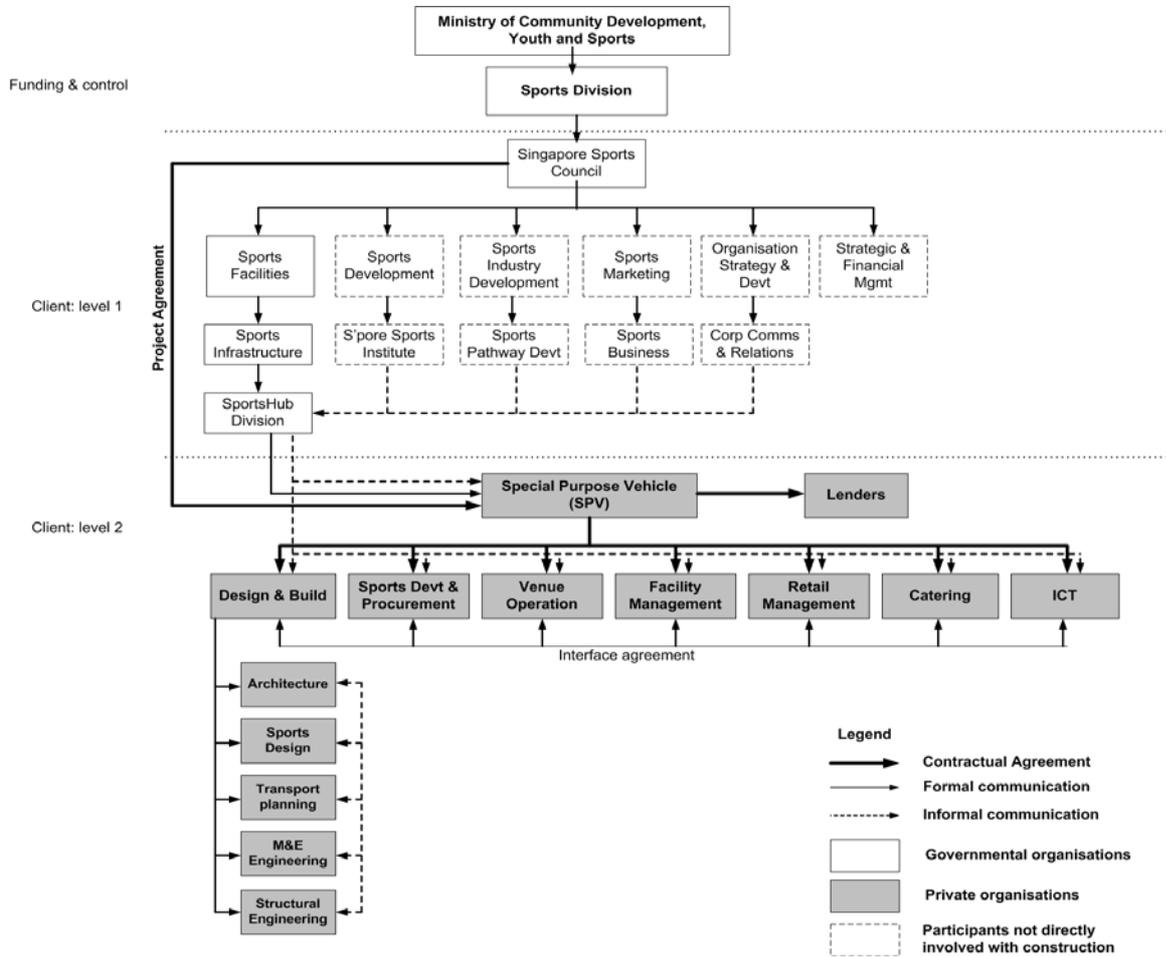


Figure 1: PPP Structure of the SportsHub project (Siva and London, in press)