MEETING CLIENT NEEDS – PRACTICAL APPLICATIONS OF R&D

Full Paper

VALUE MAPPING FOR MAJOR ECONOMIC INFRASTRUCTURE PROJECTS FOR THE AUSTRALIAN PUBLIC SECTOR

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ABSTRACT

Reporting on corporate objectives, relating to social and environmental responsibilities, has been gaining credibility since the 1990's. This has led to the need to identify, measure and report on previously unidentified elements of business' impacts.
How then is this being realised in the provision of urban infrastructure by Australian public sector agencies?
A review of literature identified limited research activity in this field and revealed that a comprehensive mapping framework, from corporate objectives to project outcomes and impacts has not yet been developed. Such 'value mapping' is however undertaken in other industries to improve production or service efficiencies, and to deliver on corporate responsibilities.
This paper reports on doctoral research, currently in progress, which will establish a value-mapping framework to be applied to major economic infrastructure projects. This will enable project teams to firstly, better identify, align and track this decision-making process, and secondly assist in managing medium to long term risk, thus minimising possible future harm to the environment and/or the community.

Keywords: value mapping, urban infrastructure, corporate responsibility

1.0 RESEARCH BACKGROUND

The practice of utilising social and environmental corporate objectives to inform business practice has been increasingly adopted since the early 1990's. This is witnessed through events such as the formation of the International Council for Local Environmental Initiatives (ICLEI) in 1990; the Rio Earth Summit in 1992; and the formation of the World Business Council for Sustainable Development that same year. The importance of this focus on social and ecological corporate objectives and responsibilities has been more recently highlighted through the emergence of standards (e.g. UN Global Compact), management systems (e.g. ISO 14000), and reporting frameworks (e.g. AA1000, SA8000 and the Global Reporting Initiative) to provide some common ground for regulatory and corporate dialogue that attempts to integrate social and ecological responsibilities into business goals that are primarily driven by economic considerations. This new focus on broad ranging corporate responsibilities reflects the need to identify, measure and report on previously unidentified elements of business' impacts.

How then has this move towards greater corporate responsibility become evident in the provision of major urban infrastructure projects?

This paper reports on doctoral research, currently in progress, which addresses this issue.

A review of literature was undertaken on links between corporate responsibility; project-based key performance indicators (KPIs) or critical success factors (CSFs); and the construction of urban infrastructure. Limited literature was discovered in this area. The search revealed that a comprehensive mapping framework, from an organisation's corporate economic, social and ecological objectives to intended, anticipated and actual outcomes and impacts has not yet been developed for the delivery of urban infrastructure. The 'mapping' methodology (either supply, demand or value chain) is applied in other industries (i.e. vehicle manufacture) or for other purposes (i.e. waste reduction) in order to improve production or service efficiencies but not to track corporate objectives to outcomes.

Four key drivers for the adoption of such a methodology in the delivery of urban infrastructure have been identified.

i. Adoption of the 'precautionary principle' in public sector administration suggests responsible and accountable action prior to a 'crisis point' should be considered in order to minimise potential risk and harm. A best case example of the application of the precautionary principal is the City of San Francisco, which, in 2004, adopted the Precautionary Principal Ordinance. This legislation included stated responsibilities for anticipatory action to prevent harm; community right to know complete and accurate information; examination of a full range of alternatives; full cost accounting; and a participatory design process (Mardegan, 2004).
ii. Corporate responsibilities require accountability to the community (including future generations) and the environment. With divestment of infrastructure project delivery responsibilities, from government agencies to private sector partners, accountabilities for corporate objectives are harder to track, and thus require better systems to do so effectively.
iii. Increased accountability is required of professionals responsible for delivering more complex projects. To this end, they require additional quantitative and qualitative tools to enable more structured and transparent decision-making to satisfy professional accountabilities and responsibilities.
iv. There is an accepted need for enhanced resource productivity, arising from emerging issues such as global warming and water scarcity. This need drives better environmental outcomes, increased productivity and additional value to the community.

The aim of this current research is thus to establish a value-mapping framework applicable to Australian public sector agencies in the form of a decision-making methodology which would enable project teams to (i) highlight and track key decision points and decision point options, from corporate objectives through to project outcomes/impacts; (ii) better identify and align project outcomes and impacts with stated corporate objectives; and (iii) assist in managing medium to long term risk and minimise possible ecological and social harm. Figure 1 (below) illustrating how the proposed mapping process will seek to track inputs from ecological, social, ethical and economic corporate objectives, through the various project phases, to project outcomes and impacts.

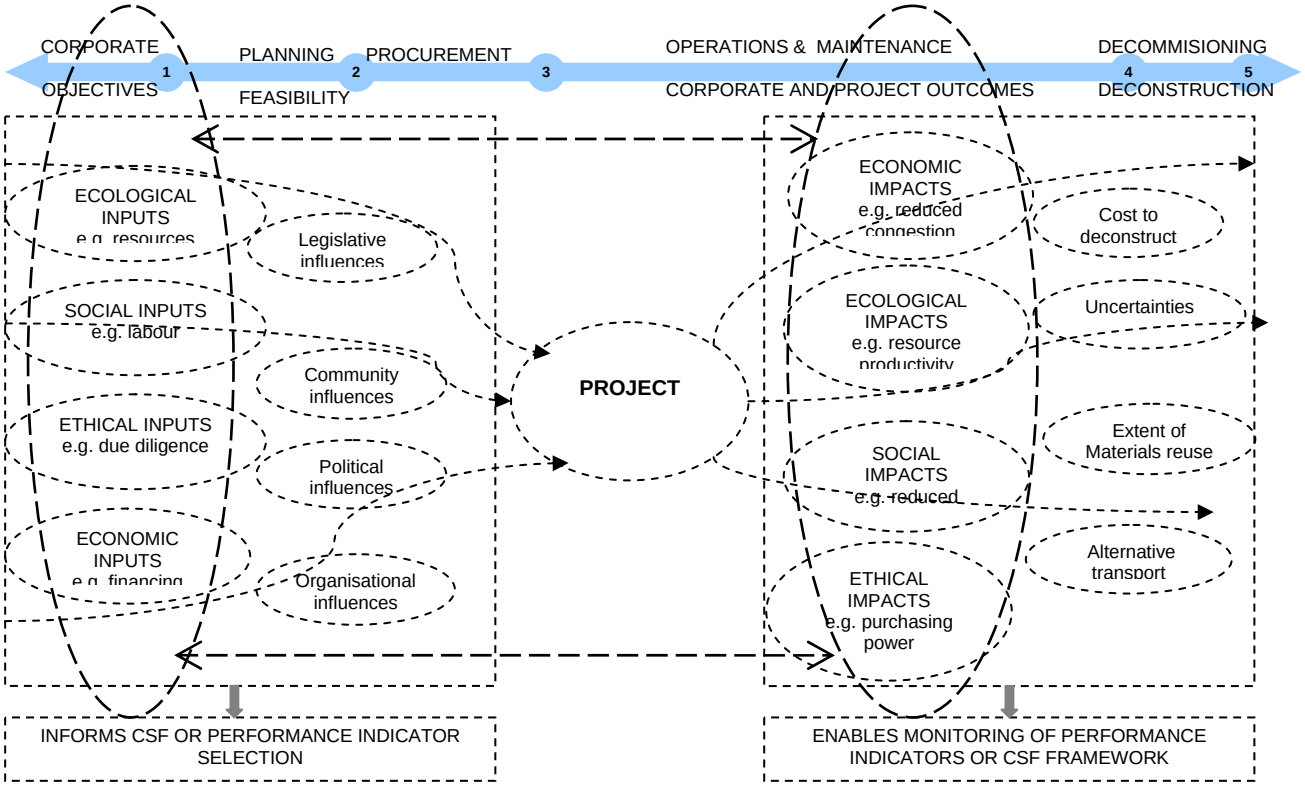

Figure 1 – Research Intent – Mapping corporate KPIs to project outcomes

This paper reports on research to date, which includes the development of the draft framework and application to an initial case study.

2.0 SIGNIFICANCE OF THIS RESEARCH

The significance of this research is three-fold.

2.1 CORPORATE RESPONSIBILITY

Whilst frameworks exist which can assist in managing these responsibilities in other sectors or for other purposes, this research did not discover any available tools to map the impacts of a construction project to the stated corporate objectives of the public sector agency undertaking this work. As discussed, such frameworks do however exist for other sectors or purposes. The World Business Council for Sustainable Development (WBCSD) introduced the concept of mapping the value chain as part of corporate social responsibility (CSR) reporting (Engen and DiPiaaza 2005). This approach has been implemented in many countries, by numerous large corporations to enhance their sustainability profile and reporting. In manufacturing the concept of value stream mapping was introduced by Toyota in the early 1990's in order to eliminate waste from the supply chain (Rother and Shook

2003). This is now an established methodology for understanding supply chains, and how to optimize them. Whilst the specific tools used in manufacturing cannot be applied to the construction sector, the underlying approach can provide a tested basis for the proposed construction based value mapping methodology being developed as a part of this research.

2.2 ENHANCING VALUE OUTCOMES

Enhancing 'project value', for the purpose of this research, and in the context of broader corporate responsibility, is about enhancing value through delivering on corporate objectives and outcomes previously established by a public sector agency, but which have not previously been tracked as a part of the project delivery process. The intent is thus to develop a framework which identifies and/or further clarifies pre-existing but untapped value drivers and integrates them with current project process.

This research is using two validated pathways in order to provide this additional value to the project delivery process. Firstly through accountability and stakeholder mapping (Holme and Watts 2000, pp.9-11) and secondly through process mapping as developed by lean manufacturing proponents (Jones and Womack 2002, Rother and Shook 2003, and Klotz, Horman and Bodenschatz 2007)

2.3 IMPROVED ACCOUNTABILITY

Accountability can be described as implying "acceptance by the company of its responsibility for any decision or course of action adopted by it, the consequences thereof, and a commitment to resolving any issues that arise as a result." [8] To better satisfy this imperative, with the inherent implications for corporate citizenship and risk exposure, this value mapping methodology is being developed to better ensure project delivery by Australian public sector agencies to stated corporate objectives and outcomes.

3.0 LITERATURE SEARCH

The initial broad aim of the literature search was to discover accounts of academic research that explored links between corporate responsibility, sustainability and critical success factors (or key performance indicators), in the delivery of urban infrastructure projects. Considerable literature was found when these fields were reviewed independently, however the search revealed limited literature that used corporate responsibility principles to provide guidance for the development of, or input into CSFs or KPIs, in the construction sector. Additionally literature relevant to both quantitative and qualitative measurement and decision-making was sought, in order to inform the development of the value-mapping methodology.

A number of relevant themes and sub-themes emerged in the course of this review, as detailed below.

Literature sourced on critical success factors (CSF) or key performance indicators (KPIs) had a specific relevance to public sector agencies and focussed on stakeholder requirements; the application on relationship-based contracting; and relevance at discrete project phases. Background literature relating to CSFs and KPIs included papers by Chan and Chan 2004, Morledge and Owen 1999, Yeo 1991. Literature relating specifically to stakeholder engagement included papers by Sanvido et al 1992, Parfitt and Sanvido 1993, Stevens 1996, Chua 1999, Jefferies et al 2002, Metri 2005. Research specific to relationship-based contracts (through which each of the case study projects are procured) is reported by Rowlinson and Cheung 2004, Cheng et al 2000, Chan et al 2001, Chan, Chan & Chiang et al 2004, Chan and Chan 2004, Li et al 2005, Zhang 2005a&b. Finally Qiao et al

2001, Chan, Scott and Lam 2002 provided relevant papers with a focus on specific project phases (which is important in the application of the methodology being developed in this research).

Corporate responsibility literature reviewed also had relevance to public sector reporting. The key themes which emerged from this literature included corporate social responsibility (Holme & Watts 2000, Holmes 2000, Engen et al 2005, Australian Government 2005, Panapanaan et al 2003, Husted 2007, Waddock 2007, Hahn and Scheermesser 2006, Welford et al 2007); global standards and frameworks (Global Compact 1999, Accountability 2006, Fox et al 2002, Oskarsson and Malmborg 2005); and the role of stakeholders (Badshah 1998, Carroll 1991, Birkin 1997, Irwin and Raganathan 2007).

Literature on measurement (relating to indicator reporting and materials/energy flow) was found by Warhurst 2001,Anderson 1991, Black et al 2002, Nicolas et al 2003, Chi et al 2005, Odum 2002, Huang 1998 & 2003, Bringezu 1993& 2003, and Harmaajarvi 2000, Palme and Tillman 2007, Cooper and Owen 2007.

Literature reporting on research related to non-analytical decision-making (multi-criteria decision making, cost benefit analysis and the role of uncertainty) was found by Rogers 2001, Asafu-Adaye 2005, Stirling 1997, Ellingham 2006 and Bell and Morse 1999.

The linkages which emerged between the key themes which formed the focus for this review include a shared focus on economic, social, and environmental issues; the relevance of stakeholder engagement; the need to better manage complex issues; the need to demonstrate value; and the need to provide a framework for the identification, monitoring, assessment and reporting of optimal outcomes.

A further review of literature was then undertaken to discover relevant research on value and value stream and supply chain mapping and the potential application of such tools from other fields to this area of research. Literature related to value chain mapping was found by Anderson 1991, WBCSD 2002, Cox 1999, Rainbird 2004. That related to value stream mapping was by Arbulu et al 2003, Rother and Shook 2003, Jones and Womack 2002, Hines and Rich 1997. Emmitt et al 2005 and Wandahl 2004 provide relevant literature on value.

4.0 RESEARCH METHODOLOGY

4.1 BACKGROUND TO RESEARCH METHOD

The methodology adopted to undertake this research includes a series of descriptive case studies, grounded on a soft systems methodological approach (SSM), using an action research process wherein a collaborative partner would provide both the technical expertise, and the opportunity for implementation and evaluation of the framework, on technically complex projects, in varying stages of development.

This approach has been adopted for a number of reasons. Firstly, it would enable the researcher to study and describe a complex phenomenon (i.e. both the project processes and the relationships) rather than to measure productivity or the like (i.e. performance to time and cost), which is currently effectively managed through existing critical success factors of KPIs.. Secondly it would facilitate engagement with the complexity of interactions due to the nature of the social and cultural issues which exist in an organisational setting (i.e. project delivery in public sector agencies driven by community and political agendas as well as value for money). Each of the case studies undertaken has been procured via differing mechanisms, enabling the research to test the applicability of the framework in differing organisational and contractual situations. Thirdly it facilitates close collaboration with a group

of practitioners to identify, test and evaluate links between corporate objectives and project outcomes and performance rather than take on a role as "an observer outside the investigation" (Checkland and Howell 2000, p.53). And finally, it enables validation of the framework and its implementation via the triangulation of data and information from a number of unique sources (i.e. three case studies); and using a number of differing data gathering methods (i.e. semi-structured interviews, review of project documentation, and from academic literature).

Checkland (2000, pp.67-68) describes four key activities which underpin a soft systems methodological approach. This research adopts this approach through (i) investigating the problem; (ii) developing relevant activity models (i.e. current state process maps of both corporate and project processes); (iii) using the models to find methods for process improvements (i.e. undertaking a gap analysis of current processes in terms of research objectives); and (iv) taking positive action through embedding the outcome in a real-world situation on construction projects (i.e. the implementation of the value mapping framework). These four activities outline a process which will enable capture of the richness and complexity of the problem being explored, and to collaborate with practitioners to develop a practical and academically sound approach to the value mapping framework proposed. Smith et al indicate the application of the SSM process "must be participative so that all parties involved make an input, even if they are not aware of the methodology or models employed." (Smith, Merna and Jobling 1999, pp.67-68)

4.2 THE CASE STUDIES

As the aim of this research is to develop a detailed understanding of a complex organisational process, in order to bring about improvement, it was determined that the establishment of an intensive action research based process on a number of case studies would serve the research intent. Thus, the empirical data underpinning this research will be obtained from a two year collaboration, on multiple infrastructure projects in varying stages of procurement. The public sector agency which is the project proponent for each of these projects is Brisbane City Council (BCC), Australia. This agency is Australia's largest Local Government Authority, being responsible for a population of nearly one million people, 5500 kilometers of roads, 550 kilometers of bikeways and over $15billion worth of assets including roadways, busways, vehicle tunnels and water infrastructure. BCC has procured several major economic infrastructure projects in the past decade, including three waste water treatment plants (via the Brisbane Water Enviro Alliance); and major transport system upgrades including the Coronation Drive upgrade, the Inner City Bypass, and the Green Bridge. BCC is also currently delivering its $2billion North South Bypass Tunnel through a PPP contract, with opening expected in 2010. The agency has a clearly articulated set of corporate themes and objectives, which address economic, ecological and social issues. Additionally BCC has agreed to provide the researcher with access to major projects at varying stages of procurement, and to key project staff. The three projects which are being studied are the Eleanor Schonnel Bridge (opened in January 2007); the Hale Street Link (currently being procured); and the Northern Link (currently in the detailed feasibility phase).

The value mapping framework to be developed will be generic in the sense that it will be applicable to any large organisation globally that is responsible for the provision of economic infrastructure, and interested in accounting for social and ecological impacts on projects. Its application however requires a detailed understanding of two key issues. Firstly it requires an understanding of an organisation's corporate objectives and how these are developed (i.e. have they been developed in a rigorous manner which enables them to underpin the value mapping process); and secondly, it requires the procurement process for the associated project to be clearly understood.

The interactions with the agency will draw upon the action research process recently exemplified by Lu and Sexton 2006, p.1269) in their work on innovation in small construction-industry based professional organisations. A similar cyclical collaborative research process is also outlined by Smith, Merna and Jobling (1999, pp.67-67), and whilst labels and structure vary slightly both these examples represent an action research processes that can usefully guide the current research. The following steps thus outline the process proposed for undertaking this research:

4.3 THE ACTION RESEARCH PROCESS

The methodology is based upon tested action research methodology (Baskerville and Wood-Harper 1996, p.235). The steps, as further detailed below, are:

- Project Diagnosis
- Action Planning
- Action Taking – Round 1
- Evaluating and Specifying Learnings – Interim
- Action Taking – Round 2
- Evaluating and Specifying Learnings - Final

The project diagnosis (or research focus) phase involved the identification of the problem to be addressed. This included consideration of data gathered from the preliminary literature review; interviews with BCC representatives; and preliminary investigation of agency corporate and project documentation and processes.

A draft conceptual framework for the value mapping model was then developed as part of the action planning (or exploratory) phase of the study. This drew upon models discovered in other relevant academic literature and industry best-practice documentation in both this and other relevant sectors. The process mapping methodology drew on previous relevant research in the fields of lean manufacturing, lean construction and resource efficiency. The value mapping methodology drew on corporate responsibility and performance literature in a variety of fields.

The first round of the action taking phase involved extensive data gathering, through semi-structure interviews and a review of project documentation, in order to construct draft process and value maps for the initial case study. The process maps were in turn verified with those project staff interviewed to ensure accurate representation; whilst the value mapping framework was tested with project team members for validity and applicability.

Once these draft maps were established, the draft framework was subject to review and evaluation; with specified learnings informing the next stage of development. The draft process and value maps were reviewed in collaboration with BCC management representatives, for verification purposes; to identify practical application issues; and to ready the framework for further implementation.

The second round of action taking involved a further two case studies. The first on the Hale Street Link project (a traffic bridge over the Brisbane River) procured via an alliancing arrangement with four private sector companies, and currently in a design development phase. The second case was the Northern Link project (a traffic tunnel linking Brisbane's western and north-eastern suburbs), which is in its detailed feasibility phase, with a procurement strategy yet to be finalised. Both process and value maps are currently being finalised for these projects.

The final evaluation phase of the first round of action taking will involve obtaining input from the active implementation of the value mapping framework on Northern Link, and eliciting

feedback from BCC as to the value of this tool. Feedback on the organisational impact to date, in terms of current processes and intended changes, as a result of implementing this framework, will be also be sought. The generalisability of results to the broader population of organisations responsible for the provision of economic infrastructure and interested in social and ecological impacts, will also be reviewed. The framework will be presented to four other Australian public sector agencies (in different States) for input and feedback as part of this process. Additionally, the contribution of this research to academic investigation in this field will also be explored.

4.4 DEVELOPING THE PROCESS AND VALUE MAPS

The following activities have been identified as part of the action taking process detailed above:

Developing the Process Maps

i. Map the corporate process (at agency and sub-agency levels)
ii. Map key project delivery processes and decision-making structures

Developing the Value Mapping framework

iii. Identify project objectives which align with stated corporate objectives, at the Pre-Feasibility phase of a project, at the latest.
iv. Map accountabilities for the delivery to each objective.
v. Map corporate objectives to stated corporate outcomes to identify key project-based indicators, and establish measurables and targets for these indicators.
vi. Link process and value maps – i.e. identify key intervention points along the project delivery process in order to establish active review, monitoring and reporting points for these indicators.

4.4.1 DEVELOPING THE PROCESS MAPS

Developing the corporate process maps

In order to enable the successful implementation of the framework being developed as a part of this research, an understanding of the corporate environment from which the projects are being delivered is required.

Semi-structured interviews were undertaken and corporate documentation was reviewed in order to establish the over-arching corporate objectives and framework within which BCC staff operated in order to deliver projects. This information was then compiled into an organisational flowchart which was then verified in discussion with BCC staff.

A similar process was undertaken in order to clarify the organisational environment of the Major Infrastructure Projects Office (MIPO), the sub-agency responsible for delivering the projects. This identified key project phases, definitions and interactions for generic application to the draft process maps.

Developing the project delivery process maps

The first step in establishing a project specific value map is to understand the existing delivery framework. This is done via the establishment of a series of process maps (Rother and Shook 2003) which simply articulate key processes.

Semi-structured personal interviews ranging from 30 to 60 minutes were undertaken with 18 key project personnel working on the initial case study project. Additionally background project documentation was also reviewed. This information was then distilled into a series of process maps which seek to capture key decision points throughout the process, which offer

potential intervention points at which the value mapping indicators will be reviewed, revised and reported upon.

It is important to note that the information mapped is a helicopter view of the process in order to avoid becoming enmeshed in the complexity of decision-making associated with this type of project. These process maps were then refined and verified through further interviews with project staff.

4.4.2 DEVELOPING THE VALUE MAPPING FRAMEWORK

Establishing the project objectives

Brisbane City Council's current corporate objectives and city-wide outcomes are established through a rigorous consultation process with community, political and organisational representatives. They are publicly referred to as the Vision 2026 themes and City-wide Outcomes. These will be used as the starting point for the development of the project-based objectives required for the next phase of this process.

Typically these project objectives are not developed until the Detailed Feasibility phase of the project. In reviewing documentation for this initial case study, several sets of project objectives were discovered. The only set to directly reference the corporate objectives was that contained in the Business Case for the project. These were adopted for the purposes of developing this framework.

As each of the case study projects are for transportation infrastructure, this set of objectives will be used initially for each of the projects, unless others are available or developed in the course of implementation. For future application of the framework to a broader population of organisations however, project pre-feasibility teams will need to develop these as a prelude to the following step. One outcome of this research will be a methodology for guiding this development.

Mapping accountabilities

Ensuring accountability for delivery on these objectives is a key driver for this research. Engen and DiPiaaza (2005, p.10) reported on an assessment published by the UK-based professional association AccountAbility, which noted that "Governance mechanisms need to embrace the broadening accountability agenda, and lead to decisions which change corporate behaviour."

To this end, this research is adapting three tools provided by the World Business Council Sustainable Development to assist organisations in better understanding their responsibilities, accountabilities and impacts. These are (i) Spheres of Influence; (ii) Accountability Mapping; and (iii) Stakeholder Footprint. These three tools will be used in parallel, in an adapted format, to inform the identification of indicators, measurables and targets which will form the basis of the value mapping process.

The 'Spheres of Influence' tool is used to build awareness of the extent of impact that organizational or project decisions can have, and provides a starting pointing for building awareness regarding accountabilities and impacts which may not be considered in the traditional view of an organisation or their activities.

The 'Accountability Mapping' tool will map accountabilities for each project objective. This will enable responsibilities to be clearly understood and assigned, so that sufficient rigour can be applied to the information and knowledge required to map and track the value map indicators.

The third of the tools requiring parallel consideration is the "Stakeholder Footprint" tool. The use of this tool is proposed in order to provide definition and rigour around the process of identifying who needs to be considered as the stakeholder base for the proposed project, and from whom information needs to be sought for the indicator development.

Mapping objectives to outcomes

This step involves the creation of a matrix linking project objectives and corporate outcomes in order to develop a set of key indicators, to which measurables and targets (both quantitative and qualitative) can be assigned for future monitoring and reporting. Measurables and targets will to be determined for each of these indicators. Some of these will be quantitative in nature, and others qualitative, hence the research will need to establish a suite of tools appropriate for measurement purposes, which are either accessible corporately or through the public domain. It is thus at this stage that a defined set of useable project-based indicators will be developed to enable reporting back to corporate objectives.

Linking process and value maps

The final step in the proposed process, is the monitoring, review and reporting against these indicators and measurables at subsequent phases in the projects delivery.

Collaborative outcomes to date have revealed that the set of relevant indicators is likely to number between 35 and 40 (that is four to five indicators for each of the eight themes associated with Vision 2026). It is not intended that these will be refined and consolidated for the sake of brevity. The outcomes are relevant for reporting and communicating (in the mode of the Global Reporting Initiative) rather than in the more politically oriented 'dash-board' or 'compass' reporting style. It is considered likely however that indicators will be coded according to relevance to each of the project delivery phases (i.e. what is reported in the procurement phase may not be directly relevant in the delivery phase). This will be further tested in collaboration with the case study project team members.

5.0 CONCLUSION

This research seeks to address an apparent gap in both research pertaining to this topic, and practical delivery processes for implementation on major economic infrastructure projects. The academic framework for this tool will continue to be developed over the course of the on-going case study activity.

At present, the draft framework is being implemented on the previously mentioned Hale Street Link and Northern Link projects. The project teams have both actively engaged with the researcher in implementing the framework discussed in this paper. Their feedback will be an important input into the further development of this research. It is anticipated that a working tool will be available by mid 2008, with the research findings consolidated later in that year.

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