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Sustainability of construction procurement practices in Canada: An industry review

Rajeev Ruparathna¹, Kasun Hewage²

^{1,2} School of Engineering, University of British Columbia (UBC), Okanagan, Kelowna, Canada

Abstract: Sustainability is a predominant concept in the modern era, which affects and is affected by construction industry. In making construction practices more sustainable, procurement is identified as a main driver. However traditional construction procurement practices are criticized for the disregard over sustainability. At present, there is a gap of knowledge on use of sustainability initiatives for procurement in the Canadian construction industry. In addition there is a lack of resources available for sustainable procurement. Therefore this study undertakes a baseline survey on sustainability initiatives used in construction procurement practices in Canada. This survey is conducted through an analysis of procurement documents supported by the perspectives of construction managers and clients. Based on extensive analysis of procurement documents and interviews it was identified that a limited number of sustainable procurement practices are used in Canadian construction industry. In addition empirical evidence showed that the main emphasis is on environmental sustainability while less interest was observed is an economic and social sustainability. Furthermore, this paper proposes a conceptual framework to implement sustainable procurement in construction projects.

1 Introduction

The Brundtland Report defines sustainable development as meeting the needs of today without compromising the needs of future generations (World Commission on Environment and Development 1987). Sustainable development is a prime concern in all contemporary organizations, who strives to achieve the same by numerous means (Spence and Mulligan, 1995). Robinson (2004) and McMichael et al. (2003) stated that an integrated approach combining multiple disciplines is required to achieve sustainable development.

Adetunji et al. (2003); Häkkinen and Belloni (2011) identified project procurement as a main driver in integrating sustainability initiatives into construction projects. Procurement is a primary process in every construction project which includes sourcing, purchasing and all activities related to providing knowledge, manpower, construction equipment, materials, supplies, supervision, and management services necessary to accomplish the project objectives (Martins, 2009; Sears et al. 2008). According to Rowlinson and McDermott (1999) project procurement process should consider a vivid range of factors such as contract strategy, client, law, conditions of contract, performance, culture, sustainability, economics, political environment, learning, leadership, satisfaction, self-esteem and motivation. Therefore procurement is a perfect multi disciplinary mechanism for improving sustainability of construction projects.

Traditional procurement practices have primarily focused on selecting the bid with the lowest initial cost (Hampton 1994; Walker and Hampson 2008). Consequently, this practise has created an adverse effect on the environment and society since contractors focus on the cheapest alternative (Walker and Hampson 2008). Continued use of traditional construction procurement methods causes environmental

degradation, the effects of which will ultimately be borne by supporting communities rather than the entities that are responsible for the root cause (Walker and Hampson 2008). In addition the above can result in indirect costs for project owners for rectification (Walker and Hampson 2008). A movement towards a sustainable procurement practice is hindered by many factors such as, lack of funding, lack of awareness, lack of research and development, etc. (Sourani and Sohail 2011; Walker and Hampson 2008).

There is a keenness within the construction industry to improve the sustainability of project procurement practices (Meehan & Bryde 2011; Sourani & Sohail 2011). United Nations (2002) in world summit on sustainable development, recommended to take sustainable development considerations into public procurement. According to Price Water Coopers (2009), in Europe, incorporating green procurement policies in the construction industry have enabled 70% CO₂ emission reductions and 10% of life cycle cost reductions, suggesting sustainable procurement as a lucrative potential initiative. Meehan and Bryde (2011) studied sustainable procurement within UK housing associations in a nationwide survey and found that even though organizations have established sustainable procurement policies, the same are less likely to be found in strategy and practice. However no construction industry wide information is available for sustainable procurement in Canada. In addition, limited resources are currently available for implementing sustainable procurement.

The objective of this paper is to review the use of environmental, social and economic sustainability criteria in Canadian construction procurement. Findings of a comprehensive industry review will be a wake up call for the construction industry since it will identify deficiencies in current practise and opportunities for improving sustainability of the project through procurement . Furthermore a conceptual framework will be proposed for implementing sustainable procurement in construction projects. This information will be useful for project owners and their representatives in creating a sustainable project procurement process.

2 Literature review

According Sustainable Procurement Task Force (2006), sustainable procurement should consider generating benefits to the organisation, society and the economy; minimizing environmental impact and generating value for money in whole lifecycle basis. Sustainable Procurement is a still a developing concept gaining the acceptance of a wide range of industries. Recent academic research and construction industry developments related to sustainable procurement are presented below.

Prior scholarly publications related to sustainable construction procurement have predominantly concentrated on environmental criteria and project life-cycle cost. Due to its complexity, social sustainability through procurement was rarely being researched (Sarkis et al., 2012). Ofori (2000) studied the feasibility of using environmental criteria for construction supply chains in Singapore. He identified, designing a proper supply chain and overcoming the traditional attitudes within the construction industry as the main obstacles. Mustow (2006) studied the importance of focusing on ethical considerations in construction procurement. He identified lack of information as the main hurdle for adhering to ethical considerations. Adetunji et al., (2008) studied social factors related with construction supply chains in a case study based research on road maintenance projects. Varnäs et al. (2009) developed a conceptual framework for improving environmental performance through procurement in the construction industry. Tysseland (2008); Gransberg et al. (2005) conducted case studies on using life-cycle cost based approaches for procurement decisions in the construction industry. Sarkis et al. (2012) developed a decision model and framework for contractor selection using triple bottom lines of sustainability.

Recently there has been an increasing trend towards incorporating environmental criteria in the procurement process (Tysseland 2008; Price Water Coopers 2009). However no significant evidence is available on the success of the above. In 2006, European Union targeted to achieve 50% of their total procurement packages incorporated with pre-defined green initiatives by 2010. They eventually end up achieving only 26% (Price Water Coopers 2009). The procurement framework of London Olympic Park 2012 obtained the ISO 14001 certification (i.e. ISO certification for environmental management) (Epstein et al., 2011), which is an evidence of success of green procurement. Many government institutes peruse

best value as the basis of procurement decisions (Langdon and Everest 2004). However still no holistic achievements on sustainable procurement can be observed within the construction industry.

As resources for sustainable procurement, the government of Canada had prepared the “green procurement policy” to protect the environment and support sustainable development through public procurement (PWGSC 2012). This policy provides a guidance to public sector purchasers to improve the environmental performance of the purchase through procurement. In addition many public sector entities have developed sustainable procurement policy documents for their operations (E.g. Government of Manitoba, Government of Nova Scotia, Metro Vancouver etc.).

Internationally there have been several developments in resources for sustainable procurement. International Council for Local Environmental Initiatives (ICLEI) developed “Procura +” as a guidance document to implement sustainable procurement. This manual contains specific guidance for construction procurement (ICLEI 2007). Furthermore United Nations and the World Bank have developed sustainable procurement guidance documents for good and services procurement. The British Standards Institute developed BS 8903 (i.e.: Principles and framework for procuring sustainable), a framework to implement sustainable procurement across all supply chains. According to the above resources sustainability issues that can be addressed through procurement are categorized in Table 1.

Table 1 : Sustainable procurement initiatives (data from United Nations 2011; ICLEI 2007; PWGSC 2012)

Environmental sustainability	Social Sustainability	Economic sustainability
Reduce GHG emissions	Comply with minimum labour standards	Improve fairness, integrity and transparency of procurement
Recycling and reducing waste	Diversify the supply base	Ensure best value for money
Reduction in power consumption	Design considering requirements of disabled users	Consider the whole life cycle costing
Reduction of use of toxic chemicals	Ensure fair wages and conditions for workers in the supply chain,	Ensure effective international / national competition
Eradicate of Ozone depleting chemical	Comply with the legal and quality standards	Job creation
Improve resource efficiency	Promote workforce welfare	Stimulate economic development
Use of renewable energy	Provide benefits to the community	Training employees
Reduction of toxic emissions		Supporting small and medium enterprises

3 Methodology

A multi method qualitative design was used to realize the research objective. Document analysis and semi-structured interviews were used as the research tools for this study.

3.1 Document analysis

Document analysis is a qualitative research method used to gain understanding and create empirical knowledge. According to Bowen (2009) document analysis is reviewing and evaluating printed and electronic documents. Documents associated with a project procurement process includes bid notices, request for proposal (RFP), tender documents, request for qualifications (RFQ), contract documents, etc. (Heldman and Mangano 2011; Ra and Nocíra 2012). A total of 165 from following procurement documents were reviewed to identify sustainable procurement initiatives.

i Bid notices

Bid notice is an owner’s advertisement calling to submit bids for a project.

ii Request for qualifications (RFQ)

The RFQ is issued before the issuing of a request for proposals (RFP). RFQ ensures that potential bidders for RFP are qualified to submit a detailed technical proposal (Hearn 2007).

iii Request for proposal (RFP)

The RFP is a request made by an owner requesting proposals to be developed and submitted specifying alternative means by which objectives of the project will be best achieved through incorporating specified mandatory requirements (PWGSC 2011)

iv Tender documents

Tender documents define technical specifications and the manner in which owner and contractor should share responsibility. Tender documents include an invitation to tender, instruction to bidders, conditions of contract, technical specifications, drawings, bill of quantities and tender form (Mishra and Soota 2008).

v Contract documents

Contract document includes the agreement between owner and contractor which sets out basic provisions of the agreement describing the legal terms and conditions (Klinger and Susong 2006).

3.1.1 Obtaining the procurement documents

MERX is the leading e- procurement web site, listing bidding opportunities within the Canadian public sector and the private sector. Furthermore “BC Bid” lists British Columbia bid information and “Alberta purchasing connection” lists Alberta bid opportunity information. Construction products and services were searched in above web sites and Bid notices, RFP and RFQ documents were downloaded. In addition RFQ and RFP documents were obtained from municipalities around Canada. 10 random municipalities from each province were selected and request for proposal documents were downloaded from selected municipality web sites. Tender documents and contract documents were obtained from civil engineering related consulting engineering companies around Canada. Requests were made from 276 potential respondents around Canada to obtain geographically dispersed sample of tender documents and contract documents. Only 2 have provided with procurement documents. All electronic and printed materials reviewed in this study are categorized according to the province is stated in Table 2.

Table 2 : Procurement documents categorized according to the location

Province	Bid Notices	RFQ documents	RFP documents	Tender documents	Contract documents
British Columbia	18	15	11	6	10
Alberta	9	5	6	4	6
Manitoba	4	1	2	3	3
Ontario	12	5	6	4	6
Quebec	3	1	1	1	1
Saskatchewan	6	1	1	2	1
Newfoundland and	2	2	0	0	0
Nova Scotia	1	0	0	0	1
New Brunswick	3	0	1	1	0
Total	58	30	28	21	28

Table 3 categorizes procurement documents according to construction product or service. The categories were new building projects, renovations and additions, infrastructure projects (e.g. Road projects and municipal engineering projects), demolition projects, and construction services (e.g. Consultancy)

Table 3: Procurement documents categorized according to the project

Projects	Buildings	Renovations	Infrastructure	Demolitions	Services
Bid notices	16	25	6	5	6
RFQ	5	10	8	1	6
RFP	8	10	3	0	7

Tender document	4	10	6	1	0
Contracts document	5	11	5	3	4
Total	38	66	28	10	23

3.2 Semi-structured interviews

The sampling frame for semi-structured interviews were obtained from a list of construction industry professionals and project owners operating in Okanagan, British Columbia. The reason for selecting a specific geographic location was convenience of access. Total 20 construction managers and project owners were randomly selected from the sampling frame. The potential respondents were invited to participate in interviews. After 4 weeks three potential respondents had agreed to participate in the survey. Three respondents comprised of 2 construction managers and a project owner operating in Okanagan. Respondents were provided with the interview script which contained both objective and open ended questions. The questions were designed to obtain information on procurement procedures used by respondent institutions; sustainability initiatives used for procurement and respondent's perception on sustainable procurement.

4 Results

4.1 Observations from document analysis

Sustainability initiatives observed within construction procurement documents were categorized according to the document (Table 4) and project type (Table 5).

Table 4: Sustainability initiatives categorized according to document type.

Initiative	Bid notices	RFP	RFQ	Tender documents	Contract documents
Incorporate LEED	1	5	3	2	4
Ensure work place safety	1	28	0	21	28
Comply workers compensation act	0	28	0	21	28
Environmental stewardship	0	4	3	3	11
Create employment opportunities	0	1	0	0	0
Reduce toxic substances	0	1	0	1	2
Transparency	0	28	26	15	0
Experience in sustainable construction	0	1	2	0	0
Waste Management and recycling	0	1	0	1	1
Worker training	0	0	0	0	1
Fair wages to the workers	0	0	0	1	1
Energy use standards	0	1	0	0	0
Average number of sustainability clauses per document	0.03	3.27	1.21	3.10	2.71

Table 5: Sustainability initiatives categorized according to the project type.

Initiative	Buildings	Renovation	Infrastructure	Demolition	Service
Incorporate LEED	8	4	1	1	1
Ensure work place safety	18	31	14	4	11
Comply workers compensation act	17	31	14	4	11
Environmental stewardship	2	5	10	1	3
Create employment opportunities	0	1	0	0	0

Reduce toxic substances	1	2	0	1	0
Transparency	14	28	16	1	10
Experience in sustainable construction	1	0	1	0	1
Waste Management and recycling	1	1	0	1	0
Worker training opportunities	0	1	0	0	0
Fair wages to the workers	0	2	0	0	0
Energy use standards	1	0	0	0	0
Average number of sustainability clauses per project	1.66	1.61	2.00	1.30	1.61

4.2 Interview feedback

Semi structured interviews allowed more descriptive investigation on the required information. A summary of the responses obtained from the semi structured interviews are as follows:

4.2.1 Interview 1

The respondent is a senior manager of a medium scale multidisciplinary civil engineering company in British Columbia. The organization acts as a contract administrator on behalf of clients. Procuring and recommending the contractors are the major functions of the organization. According to him similar organization has a limited opportunity in implementing sustainability initiatives, since they are constrained by budget restrictions of the owner. This organization does not consider sustainability criteria in bid evaluation. The above organization implements initiatives such as, electronic procurement and quality assurance of drawings to support sustainability. The respondent favours the application of sustainability aspects into the procurement process.

4.2.2 Interview 2

The respondent is a project manager of a private company which was formed as a construction arm of a public sector non engineering organization. The company uses construction management as the procurement method to deliver the infrastructure needs of the parent organization. The organization regularly incorporates sustainability initiatives such as LEED, specification of less toxic material during project procurement. However no sustainability criteria are considered in bid evaluation. The manager is favourable towards incorporating sustainability aspects into construction procurement.

4.2.3 Interview 3

The respondent is a director of facilities management division of a public sector organization. The organization mainly uses design bid-build method of procuring for construction. The above organization follows sustainability guidelines published by the organization in defining the requirements for procurement. During procurement process this organization had specified sustainability initiatives such as LEED guidelines, reducing energy usage, recycling of waste. In addition this organization considers sustainability criteria in tender evaluation. Project proposals are evaluated by a committee appointed by the director of the division. They allocate a predefined weightage for sustainability initiatives when evaluating bids. According to the respondent owners' commitment is the key for sustainable procurement.

5 Sustainability framework for construction procurement

Current sustainable procurement guide documents are not comprehensive and contain limited guidance for construction. As a potential solution Figure 1 proposes a conceptual framework which can improve the sustainability of construction project through the procurement process.

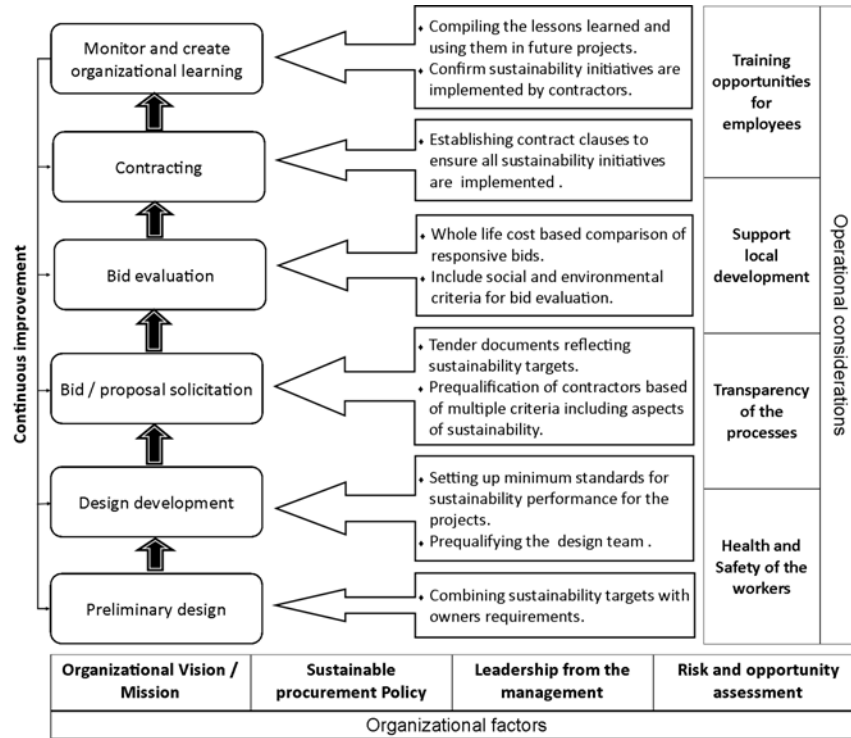


Figure 1: Sustainability framework for construction project procurement

The bottom tier of Figure 1 represents the organizational factors required for sustainable procurement. Considering the organizational factors, the drive for sustainability should be reflected in the organizational vision / mission and management should take the leadership in implementing the above initiatives. In addition sustainable procurement should be developed through a central policy. Furthermore proper risk assessment should be conducted before implementing sustainability initiatives.. The flow chart shows processes required and initiatives needed in each stage of the procurement process for sustainable procurement. The column to the right shows the operational factors which create procurement process more sustainable. The operational initiatives are transparent processes, workplace safety, local development initiatives and training opportunities for staff. The framework suggested in Figure 1 can be an implementation support tool for sustainable procurement in construction projects.

6 Discussion

This study reviewed the status quo of sustainable procurement in the Canadian construction industry. A multi method qualitative design combining document analysis and semi structured interviews were used for this research. Document analysis was done on 165 construction procurement documents, covering 58 bid notices, 30 RFQ documents, 28 RFP documents, 21 Tender documents and 27 contract documents.

Procurement documents contained 12 sustainability initiatives. Out of the 12 initiatives observed, 6 initiatives addressed environmental sustainability, 3 initiatives addressed economic sustainability and 3 initiatives addressed social sustainability. Workplace safety, good standing with workers compensation board and transparency were the most frequently observed initiatives in construction procurement documents. A notable observation here was that legislation makes the inclusion of initiatives such as complying with the workers compensation act and occupational health and safety regulations mandatory. In the meantime voluntary sustainability initiatives were seldom observed in procurement documents.

Five different genres of procurement documents were studied in this study. On average, RFP documents contained more sustainable procurement initiatives followed up by tender documents, contract documents, and RFQ documents respectively. Bid notices contained least number of sustainability

initiatives. Considering the construction project or the service , procurement documents of infrastructure projects contained most number of sustainability clauses on average per document, followed up by building projects, renovation projects, services and demolition projects respectively.

Interview respondents were two private sector construction managers and one public sector project owner. Based on the interview responses 6 sustainability initiatives were observed namely, LEED initiatives; energy use standards; internal quality assurance; material specification; e-procurement and waste management. All three respondents were in favour of sustainable procurement. However based on their feedback, a major deficiency was observed in evaluating environmental and social criteria of bids. Furthermore one respondent stated that project owners' leadership is the key to implement sustainable procurement.

The interview feedback had complemented observations made through document analysis. According to interviews and document analysis, currently a minimal effort is reserved for sustainable procurement. Majority of sustainability clauses concerns about environmental sustainability. Limited evidence was observed in use of sustainable procurement policy documents. For example, one RFP document and an interview respondent stated adhering to sustainable procurement guidelines published by the owner as a requirement for the project. However, no evidence was observed of a holistic system of sustainable procurement.

Previous experience of the contractor is an added advantage if the owner intends sustainable construction. Only 3 out of 165 documents requested previous experience in sustainable construction. However qualification based selection can be argued to be favourable towards large scale organizations in the supply sector, since small and medium companies are lagging in management and financial resources compared to established firms. This difference makes qualification based procurement less socially sustainable and curtails a fair competition.

Sustainable procurement is a concept with growing interest in many industries. Industries such as manufacturing, information technology and services are currently following sustainable procurement initiatives. The Green procurement policy is an acceptable document containing guidance for sustainable procurement in Canada. However yet use of this policy has been voluntary for public sector procurement. According to the literature review and interviews currently there are no widely accepted guide documents available in Canada which considers the triple bottom line of sustainability. In addition guidance available for sustainable procurement such as "buying for a better world" by the United Nations and "green procurement policy Canada", are mainly focused towards general goods and services procurement (United Nations 2011; PWGSC 2012). Out of the documents reviewed, only "Procura+" manual contained a section on the construction procurement. Moreover the prime emphasis of guidance documents is still towards environmental sustainability. Therefore more resources focused on triple bottom line of sustainability are required for construction procurement.

According to Robichaud and Anantamula (2011) sustainable development targets and initiatives should be stated in the initial stages of the project. Since the procurement process starts from requirement definition, sustainable procurement can be a perfect mechanism to improve the sustainability performance of the construction industry. However since construction works have not yet been carried out, many parameters are unknown at the time of procurement (Varnäs 2008). This unique situation makes predicting the effect sustainable procurement initiatives on a project performance extremely challenging.

This research was a qualitative study to identify sustainability initiatives within construction procurement. Since the external validity of qualitative studies is weak (Trochim and Donnelly 2008), two research methods were used to improve the validity. The reliability of a qualitative study is generally established based on the repeatability of the same measure (Trochim and Donnelly 2008). Since similar conclusions could be made with observations from document analysis and semi structured interviews it is reasonable to assume that reliability is established.

It was possible to conduct only three interviews because of time restrictions and poor response rate . In addition due to ease of access and budget constraints semi-structured interviews were conducted with a sample of respondents from the Okanagan region. This is not an adequate sample nor fair representation

of construction industry professionals. If more interviews were conducted with respondents from other provinces, it would have improved the generalizability of the findings from interviews. Therefore interview responses were only used to validate the results of the document analysis and no conclusions were made solely with interview responses.

7 Conclusions and future work

This research is a qualitative study of sustainable procurement in Canadian construction industry. Document analysis and semi structured interviews were used to realize the research objective.

Analysis of procurement documents showed that limited sustainable procurement initiatives are implemented in the Canadian construction industry. In addition, mainly environmental sustainability is given priority in construction procurement. Therefore a significant potential exists with procurement to improve the sustainability of a project by considering all triple bottom line of sustainability.

Sustainable procurement is a well suited mechanism to integrate sustainability initiatives into construction projects. Therefore project owners and construction managers should provide more attention to sustainability initiatives during the project procurement process.

The conclusions of this study were made and validated using two qualitative method methods. A mixed method design, combining qualitative and quantitative methods will provide a better indication of the current status of sustainable procurement. As a quantitative study, a Canada wide questionnaire survey would provide views of diverse respondents. Therefore a country wide questionnaire survey is now underway and the results of which will be published in the future.

Currently less guidance is available for organizations who wish to implement sustainable procurement. In support of that the framework proposed in this study is specifically designed for construction projects. This framework needs validation. Therefore further research is recommended on the adaptability of the framework within the Canadian construction industry.

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