Analysis of Different Views towards Social Sustainability in Construction

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ABSTRACT

The objective of sustainability in construction is generally stated as achieving a balance between economic, environmental and social impacts of projects. However, while significant literature is available on economic and environmental impacts; little has been done to investigate social impacts of construction projects and methods for evaluating such impacts. This is partly due to lack of consensus about social sustainability indicators and their relative importance in different projects. On the other hand, social sustainability is directly related to how people are affected by a project and therefore may be perceived as a highly subjective concept. This paper presents a comprehensive list of social sustainability indicators, as provided in available literature, for use in different phases of a construction project's life cycle. In addition, the results of a systematic survey conducted to verify these indicators and evaluate their relative importance from perspective of construction industry professionals and academics are presented.
Keywords -
Social Sustainability Indicators; Construction Projects; Project Lifecycle

1 Introduction

The concept of sustainability was initially emerged in the United Nations Conference on the Human Environment (1972) in "eco-development" term as 'an approach to development aimed at harmonizing social and economic objectives with ecologically sound management'. Sustainable construction generally aims to achieve a balance between economic, environmental and social impacts of a project, which are commonly referred to as three pillars of sustainability. Due to its significant and direct effects on the economy, society and environment, construction industry has been a major focus of sustainable development research and policy making.According to World Watch (2002),Construction activities account for roughly 40% of the materials flow entering the world's economy. A report published by International Council for Research and Innovation in Building and Construction (CIB1998) in 1998 shows that, 54 percent of the energy consumed and about 7.5% of employments in the U.S. were related to construction activities.

Enhancing sustainability in construction requires the availability of standard methods for evaluating the economic, environmental and social impacts of projects and the effects of different design and construction strategies on the latter. Shen et al. (2006) developed a framework of sustainability performance checklist to help understanding the major factors affecting a construction project sustainability performance across its life cycle, namely, inception, design, construction, operation and demolition [3]. Sanchez and Lopez (2010) developed a methodology to identify, classify and prioritise sustainability indicators in the life cycle of civil engineering projects based on risk management standards [4]. Shen et al. (2011) introduced key assessment indicators (KAIs) for assessing sustainability performance of an infrastructure project in three main categories of economic, social and environmental, using experts' opinion including government officials, professionals, and clients in the Chinese construction industry [5]. Taheriattar and Farzanehrafat (2014) identified, categorized and prioritized a set of 64 factors affecting sustainable construction performance at project-level from construction managers' perspective [6].

Since the publication of Brundtland Report in 1987, there has been an increasing awareness that construction industry must support sustainable development vision by including social considerations, which concentrate on the impacts of a construction project on people, within and in the surroundings of the project, from inception to the end-of-life phase of a project [2, 7]. Despite the difficulties in representation of social sustainability criteria due to context dependency and interconnectivity of its aspects, a number of attempts have been made to contribute to conceptualization and better understanding of the interpretations of social sustainability. These have been summarized in Table 1. Valdes-Vasquez and Klotz (2010) divided social sustainability into four conceptual areas: community involvement, corporate social responsibility, safety through design and social design [8]. Also, Vallance et al. (2011) presented a threefold schema comprising 'development', 'bridge' and 'maintenance', examining diverse literature to clarify the scope and objectives of social sustainability.

With evolution of concepts and scope of social sustainability in construction, the focus was then shifted towards developing social sustainability assessment frameworks and consequently on developing a reliable set of indictors based on which the assessment or implementation can be pursued. Global Reporting Initiative (2013) categorised social sustainability indicators into four main categories including; labour practices and decent work, human rights, society and products responsibility [10]. Valdes-Vasquez and klotz (2013) developed a framework for integrating and evaluating social considerations in just planning and design phases of construction projects through identifying 50 processes in the planning and design phases and categorizing them into six major categories, namely stakeholder engagement, user considerations, team formation, management considerations, impact assessment, and place context [9]. However, achieving social sustainability requires considering other phases of the project life cycle on top of the design and planning phases. There is currently a lack of well-defined set of social sustainability indicators across the entire life cycle of a construction project. In addition, previous studies have mainly focused on the perspective of a particular group of people involved in the construction project, overlooking the broad spectrum of people with different backgrounds and roles affected by a construction project. Social impacts of construction should be evaluated by taking into account the collective impact on different groups of people involved in construction projects.

Through a comprehensive literature review, this paper presents a list of social sustainability indicators for use in different phases of project life cycle. In addition, the results of a systematic survey on the relative importance of identified social indicators in different phases of construction projects are presented. The effect of participants' role in the construction community on their view point towards importance of individual indicators is evaluated by comparing the viewpoints of academics, industrial professions and students.

2 Research Methodology

The procedure undertaken to achieve the objectives of this study is illustrated in Figure 1. The main steps are described in subsequent sections.

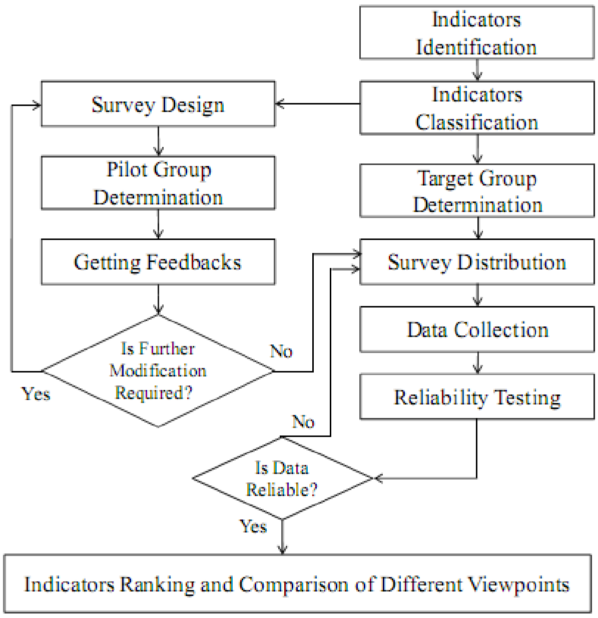

Figure 1. Research Methodology Flowchart

2.1 Social Indicators Identification and Classification

To identify and extract social sustainability indicators of construction projects, recent literature was reviewed. The identified indicators were grouped into relevant life cycle phases and repetitive or conceptually same indicators were merged. The list of 30 social sustainability indicators identified and categorised into five phases of construction project's life cycle namely Inception, Design, Construction, Operation and End-of-life is presented in Table 2.

2.2 Surveying

A self-administered web-based survey was prepared to derive comparable data across subsets of the chosen sample so that similarities and differences can be found.

The participants were provided with a list of 30 identified social sustainability indicators applicable to each phase of the project life cycle and were asked to indicate the level of importance of each indicator for addressing social sustainability by using a 0-5 Likert scale (0 for the indicator which has to be removed, 1 for the least and 5 for the most important respectively). To ensure comprehensiveness of indicators, additional option (i.e., "if other, please specify") was also included [14]. The adequacy and readability of the questionnaire

Table 1. Definitions of Social Sustainability in Construction

Source	Definition
Hill and Bowen [2]	to improve the quality of human life, to make provision for social self-determination and cultural diversity, to protect and promote human health through a healthy and safe working environment, to implement skills training and capacity enhancement of disadvantaged people, to seek fair or equitable distribution of construction social costs and benefits, and to seek intergenerational equity
Herd-Smith and Fewings [12]	the engagement among employees, local communities, clients and the supply chain to ensure meeting the needs of current and future populations and communities, a definition that more fully reflects the different perspectives of the stakeholders of a project
Vasquez and Klotz [8]	a series of processes for improving the health, safety, and well-being of current and future generations.
Business Dictionary [13]	the ability of a community to develop processes and structures which not only meet the needs of its current members but also support the ability of future generations to maintain a healthy community
Vasquez and Klotz [9]	as the engagement among employees, local communities, clients, and the supply chain to ensure meeting the needs of current and future populations and communities
Surbeck and Hilger [10]	the social, societal, and human engagement, impact and vulnerabilities in a project

were tested with a pilot study. It was administered to four experts and their comments were incorporated into the final questionnaire.

2.2.1 Target Group Selection and Sampling

Participants were selected from individuals directly involved in construction activities including industry professionals, academic and students. Participants were contacted through email and social network media, particularly construction related groups in LinkedIn and Yahoo. In addition, to take advantage of snowball sampling method, participants were asked to provide the email address of any construction expert who might be interested to participate in this survey and whose viewpoint can contribute to this research's outcomes. More than 3000 potential participants were invited to participate in the survey. A total of 117 invitees accepted the invitation and a total of 43complete responses have so far been collected. Figure 2 shows the distribution of respondents in terms of their position in the construction field. The collected responses were analyzed statistically.

2.2.2 Test of Validity and Reliability

The validity of the questionnaire was tested with a pilot study. Cronhach's alpha coefficient, which has widely been used for reliability testing, was employed in this study to ensure the reliability of the survey outcomes [15]. According to DeVellis (2003), ideally an alpha coefficient higher than 0.7 indicates an acceptable level of reliability [16].The Cronbach's alpha coefficient for collected data was estimated to be 0.91.

Table 2. Identified Social Sustainability Indicators

No.	Social Sustainability Indicator
	Inception Phase
1	Stakeholder's Engagement
2	Cultural Impacts
3	Local Community Changes
4	Safety Measures
5	Local Infrastructure Development
6	Social Considerations in Bid Requirements
	Design Phase
7	Safety & Health Design
8	Stakeholder Engagement in Design
9	Social Equity
10	Considering Spiritual needs in Architectural Design
11	Considering Sense of community
12	Biodiversity Protection
13	Site Layout
	Construction Phase
14	Employment opportunity
15	Conflict Management among Stakeholders
16	Minimizing Neighbourhood Disturbance
17	Health & Safety in Construction
18	Using Local Resources
19	Job Satisfaction Achievement
20	Community Participation
21	Socio-economic upliftment
	Operation Phase
22	Local Community Development
23	Public Accessibility
24	Privacy & Security Considerations
25	Health and Safety Considerations
26	Social Equity
	End-of-life Phase
27	Local Development Opportunity
28	Job Opportunity
29	Public Health & Safety
30	Minimizing Neighbourhood Disturbance

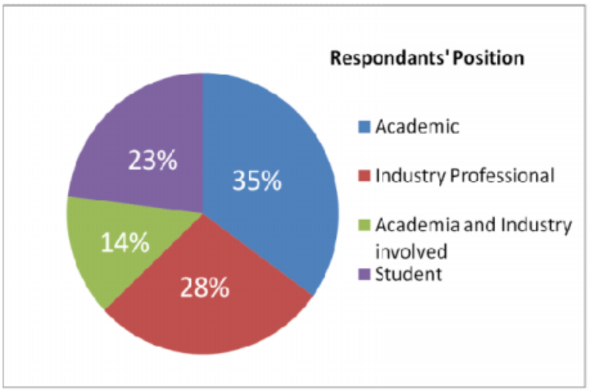

Figure 2. Participants' Position in Construction

3 Results and Discussion

The results show that respondents stated high level of importance for majority of indicators across project life-cycle with the average of 3.65 out of 5 (Figure 4). Figure 4 also shows that health and safety considerations were generally considered as the most important indicators in life cycle of the project. Apart from the inherent importance of health and safety, the high ratings given to these indicators could be partly due to existence of relevant regulations and higher level of education and awareness with regards to these factors.

The importance score of each indicator from different respondents' viewpoints were examined and compared. As shown in Figure 2, to investigate the effects of respondents' background on their viewpoints towards social sustainability, respondents were grouped into four categories including "Academics", "Academics with regular interactions with industry, Industry Professionals with regular interactions with academia", "Industry Professionals" and "Students".

Inception Phase

Figure 3 compares the importance ratings given by different groups of participants to each indicator in the inception phase. As can be seen, the importance rating given by academics was higher than industry professionals in three indicators namely: "Stakeholders' engagement", "Local community changes" and "Social considerations in bid requirements". Moreover, participants identifying themselves as industry professionals with close link with academia (or vice versa) gave a higher rating to these indicators than both academics and industry professionals.

"Cultural impacts" and "Local infrastructure development", were ranked as more important by academics when compared to industry professionals. In addition, the ratings given to these indicators by participants with both academic and industry experience were on average in between those given by industry professionals and academics. This may stem from the fact that despite regular citation of these indicators as important social sustainability criteria in the scientific literature, there is a lack of guidelines and regulations encouraging enhancing these aspects in practice.

"Safety measures" was the only indicator achieving a higher importance rating from professionals than academics. This could be due to the fact that industry professionals have usually, to some extent, experienced the dire consequences of lack of safety measures in a project and the impact an incidence can have on the success of the project. Students were found to give generally a higher ranking to all social sustainability indicators than other groups of participants. This could be either due to better education of future generation of engineers in sustainability or lack of understanding about difficulties in meeting the requirements of these indicators in practice.

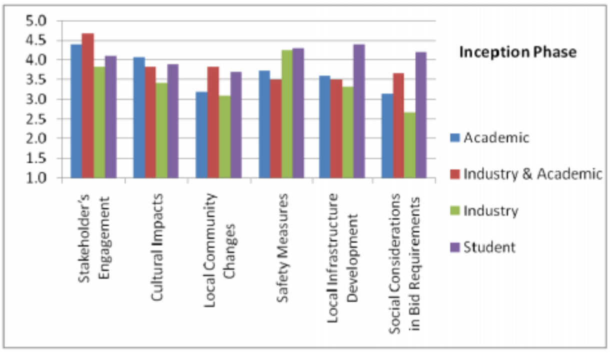

Figure 3. Respondents' Viewpoint on Inception Phase Indicators

Design Phase

Comparing the importance ratings given by different groups of participants to each indicator in the design phase in Figure 5, industry professionals ranked four indicators at higher level of importance than academics. For these four indicators namely: "Stakeholders engagement in design", "Considering spiritual needs in architectural design", "Considering sense of community" and "Biodiversity protection", industry professionals with close link with academia (or vice versa) cited more importance than those who exclusively contributed to academia. This could be the result of practical characteristic of these indicators.

On the other hand, "Social equity" and "Site layout" gained more importance from academics' viewpoint in comparison with industry professionals. While social equity has been significantly considered more important by those involved both in academia and industry, site layout is less important for those academics that have experienced industry as well. Concluding that, the industry professionals need to be more educated about the impacts of social equity while site layout may not be of very importance in practice.

Figure 4. Importance of Life Cycle Indicator

In addition, “Health and safety design” as the most important indicator of design phase gained almost same importance rank from different points of view. Regarding the students, it seems they are well informed and educated about almost all social sustainability indicators of design phase as they have ranked approximately same as others except for one indicator which is stakeholders engagement in design. This could be due to the practical characteristic of this indicator which supports the idea of mandatory internship for students in order to experience and better percept the difficulties of industry in practice.

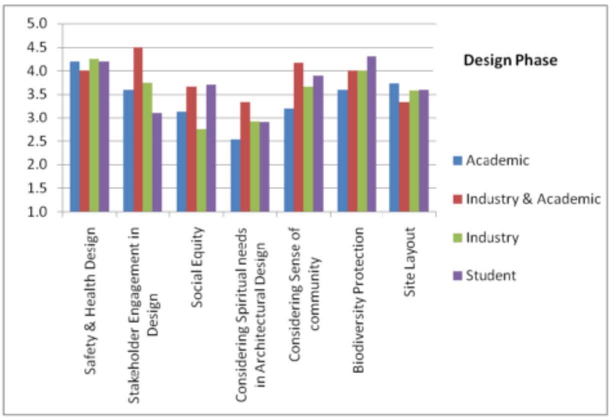

Figure 5. Respondents’ Viewpoint on Design Phase Indicators

Construction Phase

Figure 6 compares the importance ratings given by different groups of participants to each indicator in the construction phase. There are two indicators which gained higher importance rank in academics’ opinion than industry professionals’ namely: “Employment opportunity” and “Job satisfaction achievement”. Since those who are involved in both academia and industry ranked these two of higher importance, cooperation of academia and industry seems to be required for give more information about the importance of these indicators as well as ways for their implementation.

As seen academics and industry professionals have gave approximately same importance rank to “conflict management among stakeholders”, “minimizing the neighbourhood disturbance”, “Using local resources”, “Community participation” and “Socio-economic upliftment”. For all of these indicators except minimising the neighbourhood disturbance; those involved in both academia and industry significantly gave higher importance rank. This may mean incorporating academic knowledge into industry experience would result in a better perception and consideration of social sustainability indicators of construction phase.

Unlike so far phases, it can be understood from the bar chart that students have lack of knowledge or perception for some of construction phase indicators (including employment opportunity, conflict management among stakeholders, minimizing the neighbourhood disturbance, using local resources and socio-economic upliftment) which could be due to the more practical characteristic that makes them more considerable by gaining more experience or deeper research conductions.

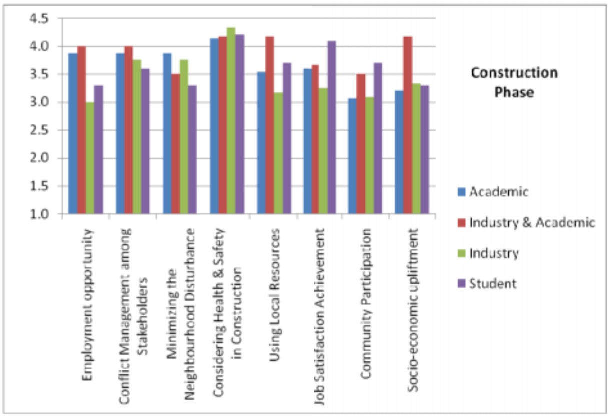

Figure 6. Respondents’ Viewpoint on Construction Phase Indicators

Operation Phase

According to Figure 7,comparing the importance ratings given by different groups of participants to each indicator in the operation phaseacademics ranked “Local community development”, “Public accessibility” and “Social equity” of higher importance than industry professionals. While importance of social equity and local community development is more from the viewpoints of those involved both in academia and industry, it is not of as much importance as academics’ opinion regarding public accessibility. So, cooperation should be made between academia and industry to improve local development opportunity and social equity considerations as well. In terms of “Privacy and security consideration”, almost same importance rank has been given from industry professionals and academics. While there is a fall when it comes to those involved in both academia and industry.

It can be seen that the only indicator of operation phase which is more important from industry professionals’ viewpoint than academics is again “Health and safety considerations”. This could be due to the main responsibility of this indicator implementation which goes to construction firms and thus more percept by industry professionals. Regarding students opinion, bar chart suggests that they are well educated and informed as they have ranked all indicators except one (local development opportunity) same or more important than other participants.

End-of-life Phase

Figure 8 suggests that there is a consensus among respondents of different positions about the importance level of “Public health and safety”. While academics ranked “Local development opportunity”, “Job opportunity” and “Minimizing the neighbourhood disturbance” at a higher level of importance. This could be due to lack of knowledge and information of industry professionals which emphasize the necessity of incorporating academics knowledge and research outcomes into industry for better achievement of social sustainability indicators.

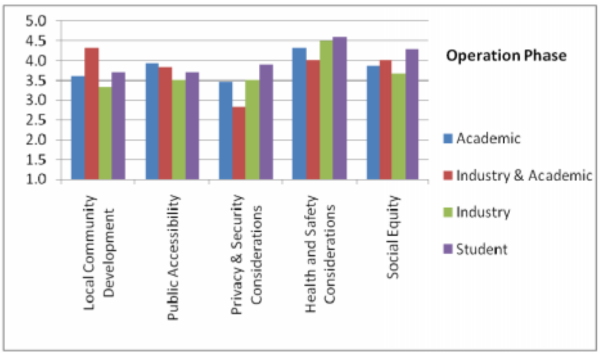

Figure 7. Respondents’ Viewpoint on Operation Phase Indicators

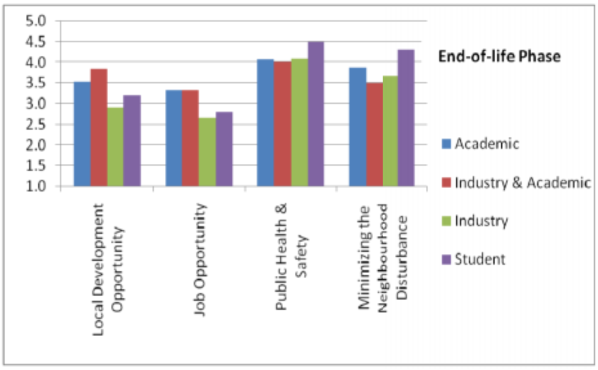

Figure8. Respondents’ Viewpoint on End-of-life Phase Indicators

4 Conclusion

A sustainable project requires achieving a balance between economic, environmental and social impacts. A great deal of effort has been made to identify environmental and economic sustainability challenges; however, little has been done to identify social sustainability indicators partly due to lack of consensus about social sustainability indicators. As a result, a comprehensive set of social sustainability indicators across construction project lifecycle, namely Inception, Design, Construction, Operation and End-of-life, developed in this thesis based on the previous literature. Different views towards importance of social sustainability indicators in construction were compared using the data from a web-based survey. The validity and reliability of data collected from the survey has been tested by Cronbach’s alpha coefficient and Statistical analysis of data has been carried out.

Based on the research outcomes, rather entire indicators were attributed substantial importance, verifying reliability of the identification stage. Despite this, the highest relative importance belongs to stakeholders’ engagement and public accessibility, health and safety for all project phases. However, end-of-life phase indicators captured the least importance relative to the other phases. Although there is a considerable consistency regarding each indicator importance between different respondents’ viewpoints, indicators perceptible in practice such as “health and safety considerations” were assigned more importance in industry professionals’ opinion while this attitude is balanced for the respondents involved in both industry and academia.

The findings of this research help all academics with a tool for introducing students to social sustainability and giving ideas for improvement of existing sustainability rating schemes. As future research, recognition of rating schemes efficiency and stakeholders who bear the main responsibility of social sustainability indicators implementation of each project phase can be targeted.

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