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An analysis of sustainability practices in the construction sector: A critical review

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Abstract

As a major sector contributing to economic development, the construction industry also has substantial impacts on the environment and society. There are numerous environmental issues derived from construction activities such as outdoor and indoor environmental pollution, greenhouse gas emission, and influences on the ecological environment. As a response to these contests, the shift of the construction industry from the traditional paradigm towards more balanced development among the economic, social and environmental dimensions, i.e. sustainable development, has received global attentions. Even though many studies have been conducted on sustainable manufacturing, the critical assessment conducted in this study posits that there is much gap to be covered as far as research in this filed is concerned. Considering this gap, this study aimed at theoretically assessing sustainability in construction sector. The results of the critical appraisal of the current literature, clearly illustrate that there is a gap in the current body of knowledge particularly with SMEs. These can feed in future endeavours of crafting a framework for sustainable manufacturing for construction industry SMEs.

Keywords
Economic, Environmental, Construction sector, Social, Sustainable development,

1.0 Introduction

The World Commission on Environment and Development (1987) demarcated sustainable development as "the development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs" [1]. Sustainable development is a procedure, which tries to conserve a dynamic balance state in the long run [2]. It demands the human, financial and environmental disquiets to work together to guarantee 'unending life for the human race' in the global ecological system [3]. The term sustainable development should not denote to indefinite production of oil and gas in the oil and gas industry. The term speaks of sustainability of human existence by carefully balancing social, economic and environmental capital in a unceasingly changing world [4]. Historically, supply chain management (SCM) mostly dealt with the receptive and proficient system of production and delivery from raw material state to final state of the component. Nevertheless, these days, environmental issues in a supply chain are assumed of having vast importance [5]. The theory of sustainable development has been considered essential in terms of policy and research [6]. In the next few decades, it will become one of the largest opportunities in the history of commerce [7]. There will be a rise in the environmental standards and people will become more sensitive and concerned towards environmental deterioration as income increases [8]. Unless the society mounts up some amount of wealth to satisfy the basic needs of human, it will not allocate substantial resources towards sustainability. Sustainable practices are more likely to get executed if there are perceptible welfares such as cost savings or product/market disparity or risks from its inaction like reputational damage and loss of market share [9].

At present, we face two major global threats, which are allied, and both are due to overpopulation. The initial threat is the peaking of the production (tons per year) of fossil fuels [10]. The peak of petroleum production occurred in the year 1971 in the U.S [11]. From the year 1973, oil became pricey and in the same year, October, oil prices increased very rapidly, causing a colossal energy crisis around the globe. It was then that the governments of all the nations took this issue very seriously and a need for identifying and exploring alternate sources was perceived. Vast funds were assigned for the improvement of these resources. As a consequence, this year is considered as the year of the first oil shock. In 1979, in the same decade, one more oil shock quivered the world. The price of crude oil increased 19 times at the end of 1980, in a span of 10 years [12]. Global energy demand will rise by 1.2% a year throughout 2030 and the world will be consuming almost 35% more energy than it used in 2005. Moreover, there is a continuous increase in the prices of crude oil over the years [13]. Supplies are diminishing, but demand is cumulative and industrial society depends almost completely on petroleum. Thus, peak petroleum will speedily cause everything to peak [14]. It may be noted that modern agriculture is totally reliant on petroleum, so the peak of world petroleum production would certainly affect the world food production adversely. At the same time, population of the world will upsurge, creating a tough situation for the society [11].

As Heinberg [14] states, "the passing of the world peak of petroleum production will be a big milestone for the human race on the earth because it means that the tons per year of petroleum being produced all over the world will start to deplete to zero while the world population is expected to increase along with the demand for petroleum." This process will thrust energy prices higher, until sustainable sources supplant dependency on fossil fuels as the major source of energy [15]. The next threat is the rapidly mutable global climate. In 1950, the world's population has increased from 3 billion to 6 billion today and is projected to reach 9 billion in 2050. The prognoses based on the present report of birth rates indicate that the population will stabilize somewhere around 11 billion by 2100 [16]. Thus, the solution for the two above-mentioned global threats is sustainable practices. New strategies will be implemented in order to gain competitive advantage in the coming years by reducing waste and promoting green design [17]. The main reason for the change of climate is the tremendous growth rate of population, which in turn surges the consumption of the world's resources. The ancient research did not throw much light on the potential benefits of achieving competitive advantage using sustainable supply chain practices [18]. From the literature, it may be noted that the implementation of sustainable practices may solve the ecological, economical and social glitches or condense the same to a larger extent. The research paper focuses on the following objectives: to ascertain the critical success factors (CSFs) to implement sustainability from the industrial perspective; to determine the contextual relations between the CSFs; to propose a hierarchy structural model (ISM) of CSFs to implement sustainability in organizations; and suggest the managerial implications of critical driving forces/criteria for the implementation of sustainable practices. The implementation of sustainable practices directs in the efficient exploration and production, distribution, and reduces the ratio of energy input per unit output of the oil and gas. The venting and flaring get abridged which yields to less atmospheric pollution and saving of precious energy. It will lessen accidents (on shore and off shore), decreases oil spills, upturns production, and profits, and adds an enormous value the oil and gas supply chain.

1.1 Background

One of the main accusations levelled against the construction industry is the excessive consumption of global resources (Curwell, 1997; Uher, 1999; Ding, 2008) and this puts accumulating pressure on the industry to find ways of decreasing over reliance on natural resources (raw materials). In order to minimise the detrimental effects on the natural environment, there are concerns about how to improve construction practices (Cole, 1999; Holmes and Hudson, 2000 in Bogner, 2007). These concerns have led to the concept of sustainability in construction (Ding, 2008). To achieve effective and efficient short- and long-term use of natural resources, Sustainable construction management involves the efficient allocation of resources, minimum energy consumption, low embodied energy intensity in building materials, reuse and recycling, and other mechanisms (Demarco, 2008; Ding, 2008). According to (Shen and Tam, 2002), efforts towards practicing environmental management in the construction industry have been growing rapidly embracing all players in the industry pursuing the mission of sustainable development. All these efforts not enduring that it has been difficult to improve the way society uses resources, improve efficiency and diminish the environmental impacts associated with the flow of unwanted materials and energy (Strange, 2002). The construction industry is known to be a major producer of waste although waste generation is a general problem in almost all major industrial sectors.

2.2 Gap identification in the current literature

To begin with the critical assessment review on the sustainable development in construction sectors, the time frame was from 1997 to 2017. The search only focused on peer reviewed article published in English, falling under certain areas. The search resulted in 500 documents that we were critically assessed by means of title and abstract with the purpose of developing additional boundaries and eliminating incorrect entries (screening phase) throughout this phase, groups of inclusion and segregation standards were established, against which individually every single journal article was evaluated. Precisely, article assess are those, which clearly focus on the sustainable development of construction industries. It should be pointed out that studies that did not meet this requirement were not taken into account. This stage produces 367 focusing on sustainable development in construction sectors. These studies were labelled on the basis of a set of standards, for example, in this paper the studies that were assessed were selected based on the citation. To this end, the table 1 below shows the 15 best studies in the field of sustainable development that were critically analyzed.

Company	Size	Methodology	Social	Economic	Environmental	Country
Science	Large	Scientific	X	X	X	China
Construction	SME	Quantitative	X	X	X	Washington DC
Construction	Large	Content analysis	✓	✓	✓	China
Construction	Large	Descriptive statistics & cross-Tabulation statistical analysis	X	X	X	Washington DC
Construction	Large	Quantitative	✓	X	X	USA
Construction	Large	Quantitative	X	X	✓	United States
Construction	Large	Scientific approach	X	X	✓	California
Construction	Large	Delphi technique	X	X	X	United States (Columbia)
Construction	Large	Quantitative	X	X	X	US
Construction	Large	Quantitative	✓	✓	✓	UK
Construction	Large	Quantitative	X	X	X	UK
Biotechnology	Large	Quantitative	X	X	X	China
Construction	Large	BREEM	X	X	X	UK
Construction	Large	Delphi exercise	X	✓	✓	UK
Construction	Large	System Dynamics	X	X	X	China & Australia

Timothy et al (2018) used the concept of sustainable development. This study exploits scientometric review of global trend and structure of sustainability research in 1991e2016 by means of procedures such as co-author, co-word, co-citation, clusters, and geospatial studies. An overall of 2094 bibliographic proceedings from the Web of Science database were examined to engender the study's research power networks and geospatial map. The results expose an evolution of the research field from the definition of its concepts in the Brundtland Commission report to the current development of models and sustainability indicators. The most important contributions in sustainability research have initiated mainly from the United States, China, United Kingdom and Canada. The authors argued that the remaining studies in sustainability research emphasis primarily on subject categories of environmental sciences, green and sustainable science technology, civil engineering, and construction & building technology. Evolving trends in sustainability research were sustainable urban development, sustainability indicators, water management, environmental assessment, public policy, etc.; while the study generated 21 co-citation clusters. This study provides its readers with an extensive understanding of the salient research themes, trends and pattern of sustainability research worldwide. Despite that fact the authors raise awareness regarding the concept of sustainable development, but they failed to address real issues related to environmental, economic, and social in the construction small and medium enterprise. Thus, our study will attempt to address these flaws.

Sinem et al (2010) investigated that Sustainable high-performance buildings are being more broadly adopted around the world to diminish energy costs and improve the well-being of occupants. To attain the set goals for these building projects within realistic financial and time constraints, superior planning, design, and construction processes are required. The available literature absences the descriptive project delivery metrics identifying scientific methods for providing insight or feedback about the performance of project delivery processes for sustainable high-performance buildings. This paper defines an empirical study observing more than 100 variables in green project delivery to scientifically detect significant metrics. Restricted by a minor sample due to the quite young market of green buildings, the result of this paper, however, provides vital direction for the sustained development of meaningful metrics to succor in the founding of a decision making support tool for project teams to facilitate optimum project delivery processes for sustainable high-performance buildings. Apart from the high performance of buildings in sustainable development investigated by the author, he failed to discourse the three important critics of sustainability which is what our study will discuss in the small medium enterprises.

Liyin et al (2011) identified that infrastructure projects have main effects on implementing the principles of sustainable development. Infrastructure projects will carry on to be developed in the next years, particularly in developing countries such as China and India; as a result, it is significant to find methods and solutions for improving the sustainability of them. Though prevailing studies have suggested several methods for practicing sustainable development principles in the process of implementing infrastructure projects, effective assessment indicators are inaccessible, which presents a barrier to the effective assessment of infrastructure project sustainability. The study brings together key assessment indicators (KAIs) for evaluating the sustainability performance of an infrastructure project. The research data used for analysis were collected from a questionnaire survey given to three groups of experts, including government officials, professionals, and clients in the Chinese construction industry. The fuzzy set theory was used to create KAIs. A case study is used for the KAIs procedure. The research outcomes provide a substitute solution to evaluate the sustainability of infrastructure projects. This study discussed the important ethics of sustainability development identified in the infrastructure projects in the developing countries. It also addressed the vital methods of improving sustainability in the infrastructure projects but still failed to discourse the social, environmental and economic aspects of sustainability, which is the major principles of sustainability. Thus, our study will cover these principles in the small medium enterprises.

Patrick et al (2013) demonstrated that the use of building information modeling (BIM) has provided a means of cumulating total project quality, providing precise quantity take-offs, and improving scheduling, therefore lessening total project contingencies and costs. Even though BIM is a modern development, a lot of research has been conducted to further enrich the capabilities of BIM in design and construction. Conversely, there has been a slight research done on the influence that BIM has on sustainable construction practices. Henceforth, the goal of this research is to investigate the insights of the use of BIM for sustainable design and construction amid designers and constructors. A survey was developed and overseen through the Internet to determine the present trends of BIM application in overall

as well as its use as a tool in sustainable design and construction. The survey outcomes signposted that granting the preponderance of the respondents believed that sustainable design and construction practices were of significance within their company, many still believed that sustainability was not a crucial application of BIM and that project coordination and visualization were instead more essential. Although BIM is observed as a multidisciplinary tool, complications with interoperability continue to persevere among several BIM applications in the industry. In terms of project delivery methods, the mainstream of the survey respondents believed that design/build and integrated project delivery (IPD) are the prime project delivery methods to assimilate BIM as a sustainability tool. Although BIM is still a current development, as more design and construction professionals' cognize the prospective benefits presented through its use, BIM will become a vital tool for sustainable design and construction. Though sustainable development is discussed in this study, it focuses more on the BIM development which leaves behind the major principles of sustainability, be they; economic, social and environmental. Thus the aforementioned principles will be addressed in our study.

Rodolfo et al (2013) identifies 50 processes and classifies them into a framework for incorporating and evaluating social considerations in construction projects. These procedures focus on the planning and design phases because they offer the utmost prospective for swaying project enactment. The concept mapping research method was applied to develop this framework on the basis of input from 25 experts in academia, industry, and government. Multidimensional scaling and hierarchical cluster analyses were used to bring together the experts' input into six categories defining social sustainability in construction projects: stakeholder engagement, user considerations, team formation, management considerations, impact assessment, and place context. Although prior research has acknowledged social sustainability as a series of processes, this study is the initial to incorporate them into a comprehensive framework. Practitioners can profit from this framework, which will enrich existing sustainability assessment methods and help address the contest of developing truly sustainable projects. This framework also provides academics with a tool for hosting students to social sustainability in construction projects. Forthcoming research could use this framework as a baseline, developing metrics using the processes encompassed in the framework. The author only addressed one principle of sustainability; which is social. Therefore our study will address both economic and environment.

Chris et al. (2000) found out that decreasing the environmental effects of construction is an ongoing professional and social concern to promote sustainable development. In this paper, we approximate the major commodity and service inputs, resource requirements, and environmental emissions and wastes for four major U.S. construction sectors as well-defined by the Department of Commerce: (1) highway, bridge, and other horizontal construction [0.6% of the 1992 U.S. gross domestic product (GDP)]; (2) industrial facilities and commercial and office buildings (1.5% of GDP); (3) residential one-unit buildings (1.9% of GDP); and (4) other construction (towers, water, sewer and irrigation systems, railroads, etc.) (2.4% of GDP) .Our approximations consist of the entire supply chain of material, energy, and service suppliers for these sectors with the use of a detailed 1992 input-output model of the U.S. economy and publicly accessible environmental data. We discover that in general, the four major U.S. construction sectors seem to use scarcer resources and have lower rates of environmental emissions and wastes than their share of the GDP might suggest. The author of this paper investigated on the large construction companies, he evaluated that in order to promote sustainable development; the environmental effects of construction should be decreased. However, he did not touch on the key significance of sustainable development which is why our study will cover the key principles of sustainability on the SME's.

Rajendran and Gambatese (2009) extant a study to develop and authenticate a sustainable construction safety and health (SCSH) rating system. The rating system provides a platform to rate projects based on the prominence given to construction worker safety and health and the gradation of implementation of safety and health elements. A Delphi survey using an expert panel of 12 experienced safety and health professionals representing diverse sectors of the construction industry was employed to develop the SCSH rating system. The study resulted in a rating system comprising of a total of 50 safety and health elements organized into 13 classifications. Each category encloses safety and health elements which carry credits based on their effectiveness in inhibiting construction worker injuries and illnesses. The rating system was primarily corroborated based on data from 25 construction projects and found to precisely represent the safety performance of large projects. The SCSH rating system can be used as an operative tool to develop and plan construction safety and health programs and assess the prospective safety performance of construction projects. This paper only addresses the SCSH rating system of large construction projects but fails to discourse the three principles of sustainability; social, economic and environment; which is what our paper will discuss.

Aurora et al (2008). The design and construction industries have an accumulative interest in and responsibility for a building's environmental effects over its whole life cycle. Quantification of all building phases is significant in life-cycle assessments LCAs, especially for the construction phase, which is often omitted. This research uses an input-output-based LCA framework to create a more comprehensive guesstimate of the environmental effects of construction processes. The hybrid LCA model is based on Carnegie Mellon University's Economic Input- Output Life Cycle Assessment EIO-LCA tool and combines a new EIO-LCA "hybrid" interface with updated and reformulated environmental effect vectors for EIO-LCA's 13 construction sectors. Eight construction project case studies exhibited on the input-output I-O-based hybrid LCA framework demonstrate the model's broad applicability; gasoline, particulate matter, and global warming potential effects generally augmented across all construction sectors and case studies. The I-O-based hybrid LCA model for construction is projected to help decision makers make more conversant decisions concerning the construction industry, tallying environmental quality and sustainable development as project goals as a replacement for unintentional benefits of economic decisions. The study emphases on the input –output based LCA framework of construction processes. It fails to discuss the implementation of sustainable development in the SME's and the principles of sustainable development; which is what our study will emphasize on.

Burgan and Sansom (2006), discusses the significance of construction to the three rudiments of sustainable development, namely economic growth, social progress and effective protection of the environment. The paper goes on to detect the issues facing construction in meeting the sustainable development agenda; these include effectual use of natural resources, decreasing energy consumption, reducing emissions, lessening waste, more efficient land use, dropping the impact on construction sites and generating better employment conditions. The ways in which steel construction is addressing these matters are discussed. In the circumstance of new buildings, steel's impact on the construction process—namely speed, prefabrication, safety, waste minimization and factory and site conditions are defined. Ways, in which construction form can add to reducing the energy consumption in buildings, particularly during the "in-use" part of the building's lifecycle, are delineated. The role of steel in stretching the life of existing building stock is inspected and design features for allowing re-use of steel components are underlined. The paper completes with remarks on the extent to which constructional steel is recovered and reprocessed at the end of life of buildings. The author addressed the significant elements of sustainability; be they; social, economic and environmental, but only focused on the large companies. This is why our study will focus on the three elements of sustainability but on the SME's.

Baddoo (2008) examined that Stainless steel has an exceptional properties which can be taken advantage of in a wide diversity of applications in the construction industry. This paper reviews how research activities over the last 20 years have impacted the use of stainless steel in construction. Substantial technological advances in materials processing have led to the development of duplex stainless steels with exceptional mechanical properties; vital progress has also been made in the enhancement of surface finishes for architectural applications. Structural research programmes across the world have laid the ground for the development of national and international specifications, codes and standards straddling both the design, fabrication and erection processes. Commendations are made on research activities targeted at overpowering obstacles to the wider use of stainless steel in construction. New opportunities for stainless steel ascending from the shift towards sustainable development are reviewed, together with its use in nuclear containment structures, thin-walled cladding and composite floor systems. The author viewed the arising platforms of sustainable development in stainless steel in the construction industry, thus; our study will discuss the implementation of sustainable development and the three elements of sustainability in the Small Media Enterprises.

According to Achal et al (2015) modern civilization is facing the dichotomy of hasty development of infrastructure that makes concrete as most traded material on the earth other than water. However, the production of cement, crucial ingredient of concrete, issues roughly a ton of CO2 into the environment with each ton of cement production. The environmental anxieties and sustainability issues allied with cement and concrete necessitate alternative and better methodology in the construction. Nature, on the other hand, has surfeit examples of sustainable habitats such as coral reefs, silk webs and ant hills. Current advances in biotechnology have great potential of imitating nature's way of building in modern days infrastructures at a scale that would endure accumulating population. Furthermore, various biological materials of nature, be it ceramics or polymeric composites made in the process of bio mineralization, gives basis for sustainable construction. This paper expounds nature's way of construction based on bio mineralization and discourses the progress of diverse biological pathways for sustainable construction. Main milestones attained have been acknowledged and the effect of biological intervention on the properties of structural materials has been

emphasized. Diversity of applications of bio mineralization based technology in the construction has been conveyed. The paper concisely documents the future directions of the technology. This paper discourses sustainable development of construction material (concrete) in large construction enterprises. It fails to enclose the main vital rudiments of sustainability; be they; social, economic and environment. Thus our paper will enclose the above rudiments in the Small Medium Enterprises (SME's).

Demaid and Quintasi (2005) argued that the construction industry both the design and management processes vary considerably from the stylized models usually promoted in the academic and business press. To the intricacy that is normal business in construction industry projects add the doubt associated with the changing legal and ethical imperatives of sustainable development and the outcome is a mess. Innovative products, together with the companies that make them, are being built on the back of a rigged market in recycled raw materials and policy changes are spawning unpremeditated consequences. Making sense of those procedures that use knowledge about sustainability, at the level of the firm, is particularly formidable because companies behave inversely in different international contexts. The problem is further convoluted by the collaborative nature of projects; specialization and the need to communicate with and amid experts upsurge both costs and uncertainties. We discuss a fundamental tension amid understanding knowledge creation and use, and the drive to seizure processes in formal documents and systems. We propose resemblances between developments in the field of sustainability and developments in the field of risk, with risk having the benefit of being further down the evolutionary line. Both fields have strong dimensions of official rules and socio-economic behaviors. Such intricacy, we argue, requires a number of perceptions to make sense of how knowledge is used in construction and associated industries. This paper talks about the significance of sustainable development in the construction businesses and the mess it creates when changing legal and ethical imperatives of sustainability in large companies. However it failed to highlight the most vital principles of sustainability, thus our study will address these principles, be they; social, economic and environmental.

Edum-Fotwe and Andrew (2008) agreed that the social dimension of sustainability has been growing in importance as a criterion for evaluating the viability of projects in the construction sector. The authors present an ontology that can be employed to provide a systematic articulation to the issues that impinge on the social dimension of sustainability appraisals. The development of the social ontology was a consequence of a research project that explored the tools, metrics and models (SUE-Mot) employed in the evaluation of sustainability within the urban built environment. The development was achieved by the method of focus group interaction. The proposed ontology can be combined with the environmental and economic requirements of projects to assist developers and others stakeholders gain a more comprehensive and holistic view of the sustainable issues that attend construction and urban developments. The authors conversed on the three most important features of sustainability; however their research was based on the large companies. Thus our study will focus on the SME's instead.

Zhang et al (2013), there is a worldwide demand for an increasingly sustainable built environment. This has resulted in the need for a more accurate evaluation of the level of sustainability of construction projects. To do this it involves the development of better measurement and benchmarking methods. One approach is to use a theoretical model to assess construction projects in terms of their sustainable development value (SDV) and sustainable development ability (SDA) for implementation in the project life cycle, where SDA measures the contribution of a project to development sustainability and as a major criterion for assessing its feasibility. This paper develops an improved SDA prototype model that incorporates the effects of dynamical factors on project sustainability. This involves the introduction of two major factors concerning technological advancement and changes in people's perceptions. A case study is used to demonstrate the procedures involved in simulation and modeling, one outcome of which is to demonstrate the greater influence of technological advancement on project sustainability than changes in perception. The study touches the key sources of assessing construction projects through SDV and SDA, but still botched to disclose the three philosophies of sustainability; which is why our study will address these philosophies.

Provis et al (2009), presents a brief review of the role of particle technology in the development of low-CO2 alum inosilicate 'geopolymer' binders and concretes as an alternative to traditional Portland cement-based materials. The role of particle shape in particular is highlighted, both in the context of its effect on paste rheology and on water demand. The spherical particles of fly ash and the platy particles of metakaolin show opposite effects in each of these areas, and this must be understood and controlled if an effective geopolymer concrete is to be designed. The angular particles of blast furnace slag are also important in determining paste rheology and porosity. The selection of the correct combination of aggregate gradings is critical in maximizing concrete durability, as the ability of aggregates to pack sufficiently densely in a hardened concrete product then hinders the ability of aggressive external agents to

migrate into the concrete and cause structural damage to either the binder or the embedded steel reinforcing. This paper failed to address the basics of sustainability and the implementation of sustainable development in the construction industries. Hence our study will focus mainly on the social, economic and environmental principles of sustainability in the SME's in the construction industry.

Conclusion

As a major sector contributing to economic development, the construction industry also has substantial impacts on the environment and society. There are numerous environmental issues derived from construction activities such as outdoor and indoor environmental pollution, greenhouse gas emission, and influences on the ecological environment. As a response to these contests, the shift of the construction industry from the traditional paradigm towards more balanced development among the economic, social and environmental dimensions, i.e. sustainable development, has received global attentions. Although a number of studies have been conducted over the past two decades to address these issues but there is still a gap in the current literature review, therefore the aim of this paper was to hypothetically assess the theoretical framework. There is no deficiency of studies on the sustainability of the construction industries worldwide. Some studies focus on the social facet of sustainability. For instance, proposed there is lack of innovativeness in the Finnish construction sector, hindering the societal change towards sustainability. The implementation of corporate social responsibility (CSR) in Australian small and medium-sized construction firms. In Ghana,it is established that cost-effective construction firms place more emphasis on CSR issues than is the case with unprofitable firms. Most related studies investigate the environmental aspects of sustainability. For example, an awareness and actions of sustainable construction in the construction industry of Chile, under a narrow definition of sustainable. Furthermore, construction industries have important impacts on the economy, society and environment. To transmute construction industry towards sustainability, construction enterprises' perceptions and enactment on sustainability needs to be understood and evaluated, which has not been fully explored by existing studies. This study holistically inspects the construction enterprises' approach towards and performance on several aspects of sustainability (e.g. the economic, social and environmental aspects) in order to ascertain those aspects the firms perceive to be the most and least significant and those aspects the firms perform best and worst on. The relations amid the sustainability attitude, sustainability performance, and firm size are also explored. Based on the aforementioned, the outcome

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