Scholars Bulletin *(Management)*

An Official Publication of "Scholars Middle East Publishers"
Dubai, United Arab Emirates
Website: http://scholarsbulletin.com/

ISSN 2412-9771 (Print)
ISSN 2412-897X (Online)

Stakeholders and Sustainable Construction of Building Projects: A Literature Review and Research Agenda

Raphael Mono Owoko*[1], Dr. Paul K. Sang[2]
[1]PhD Student, Kenyatta University, Kenya
[2]Lecturer, Management Science Department, Kenyatta University, Kenya

***Corresponding author**
Raphael Mono Owoko

Article History
Received: 11.03.2018
Accepted: 21.03.2018
Published: 30.03.2018

DOI:
10.21276/sb.2018.4.3.4

Abstract: The construction industry is a key sector in any economy. Worldwide the sector contributes to the gross domestic product (GDP) and provides employment, yet it encounters many impediments that work against its success. The construction of buildings is a major consumer of energy and natural resources and can negatively affect the environment if the process is not properly managed. Stakeholders in the construction industry have diverse interests which compete against each other and inhibit the achievement of project objectives. The objective of the study was to review existing theoretical and empirical literature on the effect of stakeholder engagement on sustainable construction of building projects. The study reviewed relevant underlying theories and empirical research. The stakeholder theory was identified as key, however, other relevant theories reviewed are contingency theory, systems theory, and sustainable concept. Empirically, a six-step process of stakeholder management was contemplated and the key stakeholders linked with sustainability principles. The key elements of sustainable construction and sustainable performance of construction projects during project life cycle phases was also discussed. These studies address each element independently in detail but fail to provide a link if any between stakeholder management and performance of sustainable construction projects. The sustainability requirements are applicable to all the project lifecycle phases and the stakeholders should participate in all these phases to execute a sustainable building. The findings of the study confirm that there is need to study an empirical model to determine the role of stakeholders in sustainable construction of building projects.

Keywords: Stakeholders, sustainable construction, stakeholder theory, system theory environment sustainability, economic sustainability and social sustainability.

INTRODUCTION

The construction industry is a key sector in any economy. Worldwide the sector contributes to the gross domestic product (GDP) and provides employment. According to Ofori [1], studies have revealed that the construction industry globally contributes about 5-10 percent of GDP and 10 percent employment out of the total working population. The industry also has a multiplier effect by contributing to other sectors like the manufacturing and transportation sectors.

Construction projects require considerable investment. Further by their nature these projects are carried out on sites remote to the contractors head office and are exposed to the environmental elements compared to other projects like Information Technology projects or change management projects. The operations are usually hazardous and therefore issues of health and safety are of significant importance. Like all projects, construction projects undergo the same project life circle. Each stage requires the participation of many different specialists and players, therefore, require rigorous management and coordinated communication. These specialists make up the key stakeholders in the delivery of construction projects.

Traditionally, project success including construction projects focuses on the delivery of a quality product in time, and within budget. However, sustainable construction requires that there is minimum resource depletion, minimum environmental degradation, and a creation of a healthy built environment in addition to the traditional criteria [2]. This is a new paradigm and the construction industry's contribution to Sustainable Development Goals adopted by member states of the United Nations [3].

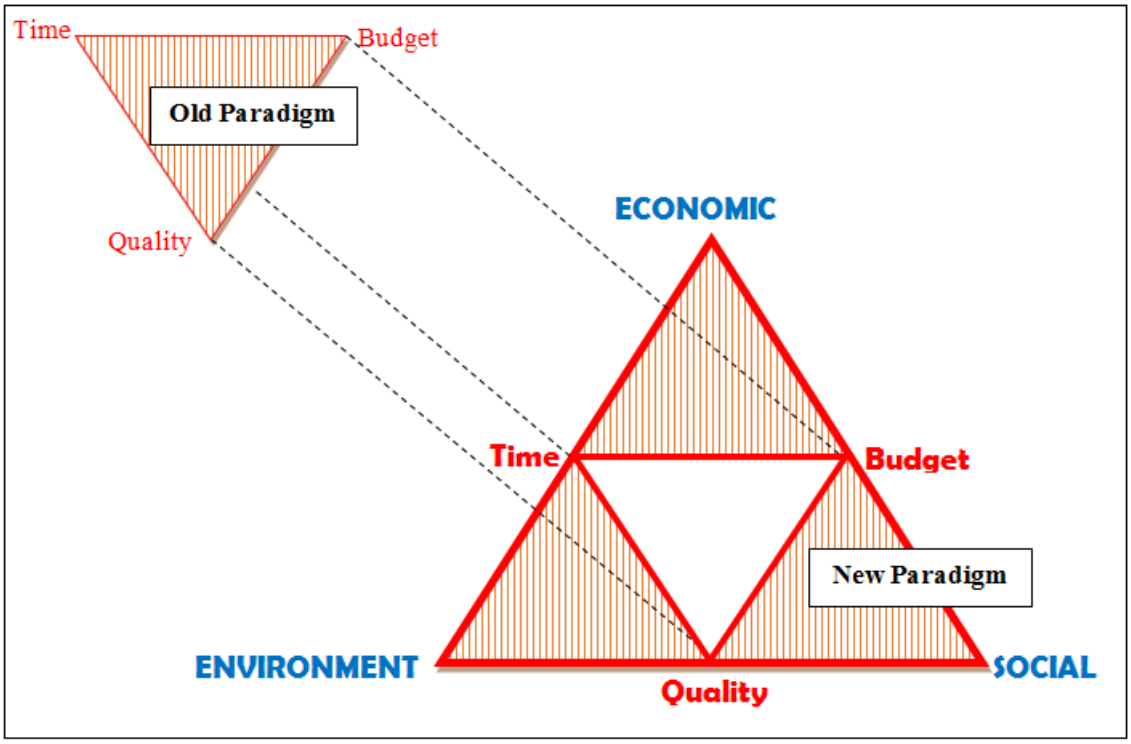

Fig-1: The new paradigm of construction success: Sustainable Construction
Source: Augenbroe & Pearce [4].

Project management is, therefore, a key process in achieving positive results in delivery of construction projects. Traditionally this has been pegged on the iron triangle of timely completion on budget and the designed specification. However, with the recent developments, the paradigm shift is to measure success, not only against time, budget and quality, but to incorporate the concept of sustainable construction. Sustainable construction concept stipulates that the project should be able to offer economic, social as well as environmental benefits from the project's initiation to completion and during its lifespan.

Statement of the Problem

Construction process involves activities which cause physical changes to the landscape and affect the environment leading to depletion of resources for future generations. According to Chalmers [5], the world's buildings account for 32 percent of global final energy use and 19 percent of energy-related greenhouse gas emissions. However, energy use varies widely from region to region. There are further indications that buildings' energy use in developed countries is generally very wasteful and inefficient, although mounting evidence shows this need not be the case [5]. The trend should be checked to avoid the risk of developing countries falling into the same pattern as their economies and populations grow. To reverse this pattern, nations need to adopt sustainable construction process since this process can guarantee clean environment, prudent use of resources while addressing the needs of the stakeholders.

Stakeholders in the construction industry have diverse interests which sometimes compete against each other and impede the achievement of the project objectives. As construction projects generally exploit the natural environmental resources and involve various stakeholders, therefore there is a need for proper coordination of stakeholders to balance between achieving the immediate objectives and the long-term objectives of the built environment. There is, therefore, need to study the role of stakeholders in sustainable construction of building projects to harness the key role the construction industry plays in the socio-economic development of an economy.

The Objectives of the Study

The general objective of the study is to review existing literature on stakeholders and sustainable construction of building projects. The specific objectives of the study are; to review existing theoretical and empirical literature on the effect of stakeholder engagement on sustainable construction of building projects; to identify emerging theoretical and empirical gaps that forms the basis of research agenda on stakeholders and sustainable construction of building projects; and to propose a conceptual framework to respond to the identified gaps. The outcome of this study will be useful in developing a conceptual framework to investigate the role of stakeholders in the adoption of sustainable construction of building projects

in Kenya. The study will be limited to the theoretical and empirical literature review and critique.

THEORETICAL REVIEW

Theoretical literature is flooded with management theories [5-14]. Some of the management theories relevant to this study are stakeholder theory, systems theory, contingency theory, and sustainability concept. This section captures the detailed discussion on each of these theories.

Stakeholder Theory

It is commonly acknowledged that the stakeholder theory was first brought into the management domain by the Stanford Research Institute in 1963 [11, 15-19]. The theory was developed further in the '80s through the works of Freeman [15] and Freeman and Reed [20]. Sciarelli and Tani [18] add that the core point in the theory is that the creation and the ongoing operations of each enterprise is the result of several actors' activities. The basic idea of stakeholder theory is that organisations, whether permanent or temporary have relationships with many constituent groups [15, 21].

Donaldson and Preston [22], have stated that stakeholder theory is based on three main perspectives; that is, descriptive, instrumental and normative. Firstly the descriptive perspective mainly describes what the organisation is; the way they work and their impacts on the wider environment. The perspective also identifies the possible stakeholders and interactions between the project and the stakeholders [23]. Amaeshi [24], adds that the descriptive perspective is to show that theory corresponds to observed reality and it is neither judgemental nor prescriptive. The instrumental perspective on the other hand is about examining the consequences of corporate stake-holding [24]. Further, Jones, Felps and Bigley [25] believe that this perspective is reinforced by the theory that meeting stakeholder needs could be driven by instrumentalists' goals and objectives. The instrumental perspective, therefore, creates a framework for checking the connections between the practice of stakeholder management and the success of a project's performance.

Lastly, the normative perspective views stakeholder theory largely as fundamentally and originally rooted in norms and traditions. In this perspective, stakeholder theory accepts that stakeholders have legitimate stakes in corporate activity based on their interest and that stakeholders have intrinsic value [22]. In a broad sense, stakeholder theory is managerial since it is descriptive and enables predictions to be made and can make recommendations. It is for these reasons that this theory contributes immensely to the present study.

Freeman [15] advanced the theory and developed the initial thinking to define stakeholders [26-28, 12]. Since then many papers focusing on stakeholder definition have appeared in various journals [29]. Stakeholders have in variously been defined as "any group or individual who can affect or is affected by the achievement of the firm's objectives" [15]. According to Mitchell, Agle and Wood [30], this is a very broad definition since it can involve virtually anyone. Others have defined stakeholders as constituencies that are affected favourably or adversely [31]. Bresnen *at al* [32] thought it was necessary to distinguish stakeholder from the term client, while Dinsmore [33] described stakeholder as "the ones who bring home the bacon".

According to Aaltonen and Kujala [34], the main objective of stakeholder theory is to enable managers to understand and therefore manage stakeholders more strategically. This leads to stakeholder management which is at the very heart of project management [34]. More recently Project Management Institute (PMI) [35] has defined stakeholders with reference to projects as "individuals and organisations who are actively involved in the project, or whose interests may be positively or negatively affected as a result of project execution or successful project completion." This definition directly impacts on project management. The stakeholder theory will, therefore, contribute immensely to the current study.

Looking at the study through the stakeholder theory lens will then be appropriate since projects according to Lundin and Soderholm [36] and Packendorff [37] are temporary enterprises and are affected or influenced by diverse organisations or individuals. They are very much reliant on their organisations and individuals' contributions, skills and capabilities.

Contingency Theory

Contingency theory is a behavioural theory developed by Woodward [38]. The basics of the contingency theory state that there is no one best way of organizing or leading an organisation and that the optimal way of organizing or leading is contingent upon the internal and external situation [39, 40]. The term contingency as used in contingency theory may therefore be parallel to its use in direct practice. For over half a century, contingency theory has influenced organisations and management theory and practice [41, 10]. Hanisch and Wald [41] further state that contingency theory is a broad field and can materialise in different forms and therefore can be applied to the field of project management. Indeed according to Turner and Muller [42], one of the most common approaches to research of project success or failure has been the identification of critical success factors. Hanisch and Wald [41] add that contingency theory extends this approach by including the project

environment into consideration. Contingency theory thus endeavours to link research on many variables in the management field and lets you examine a situation and determine what variables influence the decision with which you are involved.

The essence of contingency theory is that best practices depend on the contingencies of the situation. According to Luthans and Stewart, [43], contingency approach is generically situational in orientation, but much more exacting and rigorous. Contingency approach is defined as identifying and developing functional relationships between environmental, management and performance variables [43].

Systems Theory

Systems theory was introduced by biologist L. von Bertalanffy in the 1930s as a modeling device that accommodates the interrelationships and overlap between separate disciplines. The basis of this concept is that a living organism is not a conglomeration of separate elements but a definite system, possessing organisation and wholeness. Systems theory focuses on the relations between the parts that is the arrangement of parts and the relations between them and how they work together as a whole [13]. This often referred to as a holistic approach to understanding phenomena.

Flood and Jackson [44] define a system as “a complex and highly interlinked network of parts exhibiting synergistic properties which is that the whole is greater than the sum of its parts”. On the other hand, Johnson, Kast and Rosenzweig [6], define a system as “an organized or complex whole; an assemblage or combination of things or parts forming a complex or unitary whole.” To break down this definition; a system is a set. The set is made up of interrelated parts of components. These components are capable of working together in a particular environment to perform the desired function. The system is therefore required to achieve a certain objective and operates in an environment with both internal and external components. A system's external environment is that part over which it has no control, but it still affects the requirements and performance of the system.

Another underlying principle is the distinction between open, closed and isolated systems. In open systems, there are exchanges of energy, matter, people, and information with the external environment. Among others, there are open system theory, viable system model, and viable system approach. Open systems look at the relationships between the organisations and the environment in which they are involved.

Systems theory represents a broad field of research with different views and areas of emphasis [45]. Within management, several authors have adopted a vision of organisations as systems [6, 13]. The theory is a useful way of thinking in management as it provides a framework for envisaging internal and external environmental factors in organisations. In terms of management, the system refers to a set of different parts that are independent but work together in an interconnected manner to accomplish a whole resulting in synergism. For instance, an organisation is formed by different departments, sections, and units composed of individuals and groups which are independent but working together to achieve a common goal with the objective of turning organisational vision into reality.

The project as a temporary organisation is a man-made system which has a dynamic interplay with its stakeholders. Furthermore, the business organisation is a system of interrelated parts working in conjunction with each other in order to accomplish a number of goals, both those of the organisation and those of individual participants or stakeholders in the organisation.

Construction projects have inputs which are processed into outputs; the key product and other by-products. They cannot exist in isolation. According to Howes [7], most construction projects can be represented by a generalised model capable of being broken down into prime subsystems which interact with each other according to the project timescale. This is an important basis from which the unique requirements of the project can be accommodated. According to Almahmoud and Doloi [46], the concept of sustainable development is premised on system theory. The system theory is therefore critical for the current study.

Sustainable Concept

The sustainable concept can be explained by sustainability which can be defined from two angles. First, sustainability can be defined from the perspective of individual projects. Khan [47] has defined sustainability in relation to a single project as “the ability of a project to maintain its operations, services, and benefits during its projected lifetime”. On the other hand, International Fund for Agricultural Development (IFAD) [48] defines sustainability as “Ensuring that the institutions supported through projects and the benefits realized are maintained and continue after the end of the project implementation period.” However Tango International [49] expands this definition to include other aspects of sustainability like political, social, economic and environmental sustainability. In effect sustainability in a project environment is the ability to enjoy the benefits of the outcome of a project long after the departure of the project sponsors. Second, sustainability can also be viewed through the lens of sustainable development. In this perspective, sustainability or sustainable development (the two can be used interchangeably) was defined by World Commission on Environment and Development (WCED) [50] as “development that meets the needs of the present without compromising the ability of future

generations to meet their own needs". It is from this latter definition that the sustainable concept is derived [51].

PMI [52] adds to the list of definitions by stating that "sustainability is about how organizations manage financial, social and environmental risks to ensure their business can continue to operate, regardless of obstacles such as resource shortages, environmental disasters, and social and political events". From the definition, the concept has developed into two major areas. First is the interpretation in terms of three dimensions which should be in harmony; that is social, economic and environmental. The concept of sustainability, therefore, links together the three aspects of ecology, economic and social well-being. The second interpretation is based on soft and hard sustainability. According to Du Plessis [53], weak sustainability is the idea that different kinds of capital are fully interchangeable and that natural capital can, therefore, be used up as long as it is converted into manufactured capital of equal value while strong sustainability represents the view that certain functions performed by the environment are essential for the welfare and survival of the human species, and cannot be duplicated by humans.

The WCED [50] definition, however, contains two essential concepts; that is the concept of needs and the idea of limitations [54]. The objective of sustainable concept is therefore to promote economic advancement and progress while at the same time protecting the long-term value of the environment and improving the quality of life.

Indeed Emas [55] states that economic tools used to protect the environment could also promote innovation and turn a profit. With regards to needs, the focus is on the poor being given priority while limitations arise from the effect of technologies and social structures on the ability of the environment to satisfy present and future needs [54]. The sustainable concept is therefore relevant to the current study as it identifies and clarifies the dependent variable and the expected goals which must be achieved in the union.

The concept as illustrated in figure 2 above, was explained by Adams [56], from the three core components; economic development, social development, and environmental protection. He used a model of interlocking circles to show that the three objectives need to be better integrated to achieve sustainability. An intersection between social and environmental development is only bearable thus publicly acceptable in terms of maintaining the development. On the other hand, an intersection between social and economic development is just equitable that is; publicly fair for all in terms of its usage. While the intersection between environmental and economic aspects is viable that is; publicly acceptable in terms of future investment. The ultimate goal is to achieve the union between the three; environment social and economic to achieve sustainable development.

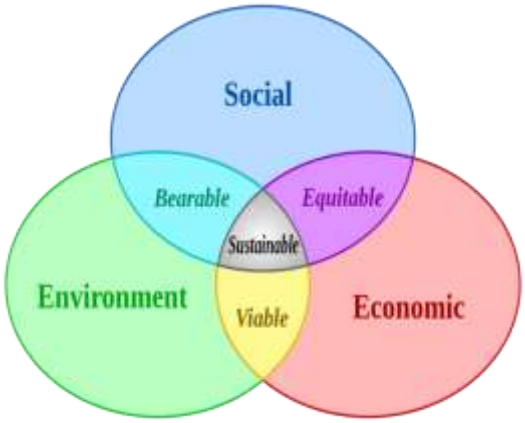

Fig-2: Sustainability concept
Source: Adams [56]

EMPIRICAL REVIEW

Several studies have identified the key elements of sustainable construction [57-60, 2, 28]. On the other hand key stakeholders and their interest in sustainable construction have also been identified and classified [61-63, 28, 17]. However, most of these studies have not attempted to link the sustainable construction practices with the roles of these key stakeholders. Some of the data analysis methods in these studies are; factor analysis and multivariable regression modeling correlation analysis and sample t-tests [60]. This chapter reviews some these studies.

Stakeholders in Construction Projects

Construction projects go through many stages in their development from inception to completion and operationalisation [63]. Through this process, various specific parties or institutions get involved. They may

have different diverse expectations which can affect the outcome of the projects. Alternatively, they can be negatively or positively be affected by the same project. Moreover, projects by their nature can have positive or negative impacts on society at large [64]. Diverse scholars have identified these individuals and institutions as project stakeholders [65, 29, 34]. PMI, [35] defines project stakeholders as "individuals and organisations who are actively involved in the project or whose interests may be affected by the execution of the project or by successful project completion". Other scholars [66, 28] have stated that stakeholders can affect a projects' functioning or goals positively or negatively. They are therefore either beneficial if they aid the project in achieving its goals or antagonistic when they oppose the objective of the projects.

As a result of the diverse number of stakeholders involved in a single project, the project manager must put in place a mechanism for managing them to expect positive results from the project. Stakeholder management is of identifying key stakeholders, assess their interests and latent impacts of the project on these interests, assess their influence and importance and outline a participatory strategy [67]. PMI [35] has defined stakeholder management as "the process required in identifying the people, groups or organisations that may have an impact on or be impacted by the project, analysing their expectations and their impact on the design and developing appropriate management strategies for their engagement".

In a study carried out by Heravi, Coffey and Trgunarsyah [63], the following project stakeholders were identified and labeled as key stakeholders in a building construction project; client, project management team, consultant and designing team, contractors, subcontractors, suppliers, employees, local communities, funding bodies and government authorities. The study then grouped them into four key stakeholder groups including; owner/developer, construction/project management, designer, and contractor. Hwang and Lim [68] agrees with this grouping and states that this group has the highest influence on construction projects and their results. However, this grouping only has what other scholars have referred to as internal stakeholders [9, 27]. The group can be expanded to include all external stakeholders.

In their study, Chan and Oppong [62] have used a classification model based on internal and external stakeholders. The external stakeholders who include local and national governments, professional organisations, social organisations, political organisations, local communities, the general public, environmentalists, trade and industry, and the media are those who are affected or can affect the outcome of the objectives of the construction projects [69]. On the other hand, internal stakeholders, who are mainly contractual project participants, include clients, project owners, financiers, project leaders, designers, contractors, subcontractors, and suppliers [70].

Sustainable Construction

Sustainable construction is attained if the process meets environmental challenges, responds to social and cultural demands and delivers economic improvement [28]. Sustainable concept links together the three aspects of ecology, economy and social well-being and sustainable construction or buildings encompasses all these aspects, not only as green or ecological buildings Tessema, Taipale and Bethge [71] have singled out two key definitions of sustainable building construction. First, they define sustainable buildings as zero impact buildings; that is buildings that have no negative environmental, social or economic impacts. They are buildings that do not pollute water, they process all energy they require and recycle all waste they produce. Their second definition of sustainable building and construction is based on the premise that these buildings fulfill their performance requirements with minimum adverse environmental impacts while encouraging improvements in economic, social and cultural conditions at local, regional and global levels [71]. It is noteworthy that impacts of a building often occurs over time and involves a great number of actors. The impacts affect individuals and their welfare or extend to local neighbourhoods and urban centre levels and can have global levels in terms of climate change.

The scales of impact can, therefore, be at individual scale, local scale or regional/global scale [71]. At the individual scale, the focus is on the overall quality of life and health risks of building workers during construction and for occupants at completion mainly influenced by fresh water, sanitation, clean energy, air quality, thermal conditions lighting and noise levels. On the local scale, the key focus is on the surrounding neighbourhood, village or urban centres and the resultant effects. The construction process shares local infrastructure and services, supports the local economy, impacts on the natural environment, traffic greenhouse gas emission, wastewater and solid waste and water resources. Finally, on a regional or global scale, the construction process involves the extraction, manufacture, and transportation of raw materials. Use of non-renewable energy resources, emission of carbon dioxide, contributing to climate change and raw materials use leading to resource depletion. Sustainable construction as an approach for the construction industry to contribute to the effort to attain sustainable development seeks to mitigate these impacts on social, economic and environmental spheres.

Some researchers agree that applying sustainable construction has some benefits including, shortened construction time, lower overall construction

cost, improved quality especially air and water quality protection, enhanced durability, better architectural appearance, enhanced occupational health and safety, material conservation, less construction site waste including solid waste reduction, less environmental emissions thus ozone layer protection, and reduction of energy and water consumption [72-76].

In a study conducted by Enshassi, Kochendoerfer and Ghoul [76], the results revealed that among the ten most important factors affecting the sustainable performance of construction projects during the project life cycle phases, five of the ten factors were classified under the construction phase. This confirms that the construction process has the most impact on sustainable construction performance. This is validated by Hussin, Rahman and Memon [2]. Meanwhile, three of the ten factors were classified under inception phase indicating that the inception phase plays a key role in the project sustainability performance.

Social Sustainability

The site and construction method of a building can affect not only the environment but also the social fabric of the site and its environs. Sarkis, Meade and Presley [78] states that social impacts of the built environment are evidenced at both local and global levels and further observe that at local level, social impacts generally relate to the building's direct and indirect effects on the residents who exploit the environment and on the community in which the building is constructed [78]. They identify the key indicators as comfort and health (artificial lighting, cross ventilation and indoor quality of air, noise abatement, adequate heating, and cooling); public participation (user is best experts of their own needs, should be involved in decision making); inclusive environments (accessible to all including special needs); access to services (access to public services, health, schools, shopping as well as public transport, promote social interaction and reduce automobile use); working conditions (safe working conditions, adequate pay for work done and no child or forced labour) and construction work and project procured transparently without corruption. Tessema *et al* [71] to an extent is in agreement with them as they indicate that these indicators include employment stability, employment practices, health and safety, capacity development, human capital, productive capital, community capital, information provision and stakeholder influence.

Economic Sustainability

In the economic category, the identified indicators measure the interaction with relevant customers and markets that contribute to financial goals of the organisation. Direct financial and business performance measures like net present value (NPV), return on investment (ROI), quality of the product, flexibility in use, time and cost can be utilised [57]. Additionally, indirect economic and business performance measures such as those related to processing performance and supply chain interactions can also be incorporated. In effect, financial performance, market presence, and indirect economic inputs are the key indicators in this area. Tessema *et al*., [71] recognises that sustainable construction will have an impact on the local economy (benefits from the construction activities); however, efficiency of use (buildings cost money and consume resources, need to be efficient); adaptability and flexibility (enables cost-effective and uncomplicated adaptation to new requirements); ongoing costs (to be minimised) and capital cost (require large capital investments; should be cost efficient) must be given adequate attention to benefit from the construction process.

Environment Sustainability

According to Aigbavboa, Ohiomaha and Zwanea [58], the impact of construction activities on the environment has put the construction industry under focus since diverse stakeholders including legislators, clients, building occupants and investors are becoming more cognisant of the environment. Construction projects have a negative influence on the environment as it consumes large amounts of natural resources and generates enormous amounts of noxious waste [2]. Most participants in construction projects (stakeholders) assume that a construction site is only a temporary organisation lasting for a short period hence much attention is not given to its effects, yet the effects last a long time.

Therefore the impact of the construction industry on the environment is far-reaching and readily recognisable. Some notable examples include the emission of carbon dioxide by buildings which contributes to the global warming and extreme weather change all over the world. Construction also involves timber harvesting which leads to the loss of natural forests [2]. Other impacts of construction activity include quarrying, production and use of cement, use of water (wastage use) and the widespread use of materials with toxic chemicals like paints.

In a study by Enshassi *et al*., [77], on factors affecting sustainable performance of construction projects, they found out that of the 53 initial factors, the top ten were classified as follows: 5 factors among the top 10 were classified under the construction period, 3 factors under the project inception period and one factor each during the operation period and the demolition period. The key factors under the environmental pillar were to be given due attention were; maintenance of stable resource base, avoidance of over-exploitation of renewable resources and depleting non-renewable resources, waste management, prudent use of resources (water, energy, material, and labour) and avoid pollution. The overriding principle is to leave the earth in as good or better shape for future generations [77].

Stakeholders and Sustainable Construction

Sustainable construction involves the building and use of spaces as well as the construction process including the surrounding built environment. Almahmoud and Doloi [46], have stated that the definitions of sustainable construction highlight three communities of stakeholders. They have identified the stakeholders as, users' community, industry community, and the neighbourhood community. Users' community is the end users of the building while industry community is the stakeholders who are involved in the delivery of the building. The neighbourhood community represents the stakeholders who share the built environment with the new users. The interest of each of these stakeholders differs from one another. For example, the interest of the industry community inevitably is to make money while the interest of the users' community is the functionality and comfort of the building. The neighbourhood community, on the other hand, involves people around the building affected by the project location like transportation, waste disposal, and other changes brought about by the presence of the new neighbours.

Various researchers have adopted different ways of classifying stakeholders in sustainable construction. Fageha and Aibinu [61], adopted a classification of stakeholders according to their role noting that stakeholders can be either internal or external. Internal stakeholders are also known as primary stakeholders and include owners, financiers, customers, employees, and suppliers. They are formal members actively and directly involved in project activities [66]. The external stakeholders, on the other hand, are also referred to as secondary stakeholders and include the neighbourhood, local community, the general public and industry actors [79]. Other researchers have included contractor, end users, facility manager, and neighbours or nearby residents as external stakeholders while owner, project management team, and financiers are classified as internal stakeholders.

Other tools for stakeholder identification and analysis include the stakeholder salience by Mitchell, Agle and Wood [30] which focuses on power, legitimacy, and urgency. Johnson and Scholes [67] used the power and interest matrix, while Ward and Chapman [80] modified this tool to an impact and probability matrix. McElroy and Mills [81], on their part, classified stakeholders according to their position towards the project. They identified five levels as active opposition, passive opposition, not committed, passive support and active support.

The key focus of this study is to identify key stakeholders and relate their interest in sustainable construction, thus the relevance of the tools and classification process. Bal, Bryde, Fearon and Ochieng [28], has identified six stages in identification and classification of stakeholders in sustainable construction as; identification, relating stakeholders to different sustainability-related targets, prioritisations, managing, measuring performance and putting targets into action. Heravi *et al* [63] identified ten groups as; client, project management team, consultant and designing team, contractor, sub-contractor, supplier, employees, local communities, funding bodies and government authorities. However the ten groups can be grouped into four larger groups, that is, project developers, project consultants, contractors and the society.

Project Developers

This stakeholder group can also include financing agencies who are brought on board very early in the project initiation phase. The project developers are usually the initiators of a construction project. They view the construction project as an investment, either short or long term. Their interest is, therefore, a positive return on investment (ROI). However, to have a bankable project, they must rely on the expertise of the project consultants, the workmanship of the contractor under strict controls of the society. According to a study by Fageha and Aibinu [61], the owner category of stakeholders is one of the main groups that shape the strategy and owners' philosophy that entails reliability, maintenance, operating and design philosophies of the construction project. They are also key in shaping scope elements in the project.

Their input into the project starts from their business case, which must be translated into a design brief and communicated to the contractors through drawings and specifications. They would, therefore, understand the adoption of sustainable concepts into the design and documentation of the project. However, Aigbavboa *et al*., [58], states that from the results of their study some of the key hindrances to the adoption of the sustainable construction concept are additional initial building costs and limited understanding of the benefits of sustainable construction. They need education and training to understand these benefits [82].

Project Consultants

The project consultant stakeholder group has the experts in the building development. This is the group that has the project manager, architect, engineers, quantity surveyors and the estate or facilities manager [63]. It is also a group that is involved in the project from inception to completion and goes through the planning phase, the execution phase and the operation phase under the facilities manager. Heravi *et al*., [63] report that project consultants make their most critical input into a construction project during the project establishment phase. However, their input is equally important during the construction phase.

The key interest of this stakeholder group is to ensure that the owners' brief is clearly understood and well interpreted to respond to the business case in a sustainable built form. They are responsible for

adequate site analysis and building orientation, choice of materials and method of fabrication as well as the functionality of the built form, aesthetics and manage the construction process to deliver a sustainable building. Akadiri, Chinyio and Olomolaiye [83] have identified methods through which economic sustainability, environmental sustainability, and social sustainability could be attained by this stakeholder group through the life cycle phases of the construction project. As professionals, their key interest is to deliver a project that will meet the expectation of the owners, yet they have a duty of care to the larger society. Their actions are therefore controlled by the society stakeholder group.

Project Contractors

Almahmoud and Doloi [46], have categorised project contractors under a group of stakeholder community they refer to as industry community. Their classification is rather large because they have grouped construction project stakeholders into three communities, that is, industry community, user's community, and neighbourhood community. They report that the interest of the industry community is to make money from the project [46]. The expectation of this stakeholder group is profitability, yet they have to address several issues in the performance of their duties. Key among their responsibilities are to ensure the health, safety, and welfare of the workers and any other third party within the construction site. Above all, he owes the owners and financiers the delivery of a project that is functional, marketable and environmentally acceptable.

Heravi *et al*., [63], report in their findings that contractors are hardly involved in the initial phases of construction projects. They are procured when all plans and approvals are ready for the purpose of fabricating the building. Their input in the planning of the building is missed yet the quality of a construction project is a certain extent dependent largely on the performance of the contractors and material suppliers. The critical sustainability elements faced by the contractor include usage of materials, treatment of the building site, handling of waste and pollutants during construction. Enshassi *et al*., [77] add that health and safety of workers is a key factor for this stakeholder group.

Society Stakeholder Group

The stakeholder labeled society includes legal authorities, regulators and government establishments whose interest is to monitor economic activities and supervises the interest of society [27]. The assumption is that these organisations are supported by the majority of the population to act on their behalf. Their role is both moral and legal, but they act on behalf of society. According to Sallinen, Ruuska and Ahola, [27], these stakeholders possess all the salience attributes which are; urgency, legitimacy, and power [30]. On the other hand, the end-users and the neighbourhood who are part this stakeholder group can also express their interest directly, or through the above organisations to enforce their interests in the construction project.

When these organisations act on behalf of society, their actions can have both restrictive and enabling means [27]. Restrictive means because they administer safety, enforce fulfillment of building regulations to ensure an orderly environment and insist on mitigation measures before occupation permit or licenses can be issued for use of the building. On the other hand, these organisations are responsible for approvals during the commencement of construction thus their enabling means. According to Were, Diang'a and Mutai [82], if these organisations enforced sustainable building policies, the process of adoption would be much faster since regulatory and control measures are probably the most effective way to implement sustainable construction principles.

The expectation of the society through the various organisations are diverse. However the key ones according to research carried out by Chan and Oppong [62] are; economic contribution of the construction project, increase in taxes and safeguard on waste and other poisonous chemicals, safety management, economic benefits to the local community, comfort levels for end users and improved quality of life for the neighbourhood. Yang, Wang and Jin [84] add that for the local community, their interest transcends the construction period. The expectation of the affected community includes the use of materials, the change in economic value of the real estate, pollution, and mitigation measures and the management of the resultant transport system [84]. The user community, on the other hand, is interested in the functionality and comfort of the project outcome.

The involvement in the project is mainly during the planning stage when approvals and issuing of licenses are required and during the operational phase after completion. However, if their stakes are not addressed, they can cause cost and time on a project. According to Fageha and Aibinu [61], the end users are key in contributing to shaping the strategy of the project. However, they have a minimal contribution to project execution plan.

CONCLUSION AND RECOMMENDATION

Conclusion

Construction projects are important in the development of a nation. However, these projects must be well managed or they may cause damage to the natural environment and the resultant built form may not meet the intended objectives by the stakeholders. There is, therefore, need for a paradigm shift from the traditional to sustainable construction practices. Further, in managing construction projects, stakeholder management as a component is very central. The stakeholder theory is therefore key in laying the

foundation for this study. The other theories which are relevant and have been reviewed are contingency theory which demonstrates that there is no one best way to manage a process; and systems theory which identifies the construction process as an open system in relation to the environment in which it is built. The sustainable concept finally defines the parameters under which a construction project is considered sustainable.

The reviewed literature has revealed a six-step process of stakeholder identification as; identify key stakeholders, relate the key stakeholders with sustainability principles, prioritise stakeholders, manage stakeholders, measure their performance and put targets into action [17]. However, this study did not demonstrate this process empirically. Other studies have simply classified stakeholders as external and internal stakeholders, while others have focused on specific stakeholders and their participation in traditional construction projects [27, 62, 46, 28]. Heravi *et al*., [63] however have evaluated the involvement of stakeholders during the planning process of building projects. This activity addresses the planning phase only yet the critical process of fabricating the building is not discussed. Were *et al*., [82] have studied the challenges faced by the practitioners in the adoption of green building concepts. These concepts are part elements of sustainable construction. However, the participation of stakeholders, save for practitioners are not addressed. Finally, Enshassi *et al*., [77] addressed the sustainable performance of construction projects during project life cycle phases. Their study does not link stakeholders through the life cycle phases of sustainable construction. The studies, therefore, address each of the elements independently in detail but fail to link the relationship if any between stakeholder management and performance of sustainable construction projects.

Recommendation

From the reviewed literature, a lot of work has been done on stakeholder management and sustainable construction on their own. Conversely, very little attempts have been made to try to link the participation of stakeholders in realising sustainable construction of building projects. The sustainability requirements are applicable to all the project lifecycle phases and the stakeholders should participate in all these phases to execute a sustainable building. The study of an empirical model is, therefore, necessary to determine the role of stakeholders in sustainable construction of building projects.

Proposed Conceptual Framework

The proposed conceptual framework is illustrated below. The independent variables are; project developers, Project Consultants, Contractors and the society. Conversely, the dependent variable is the sustainable construction of building projects.

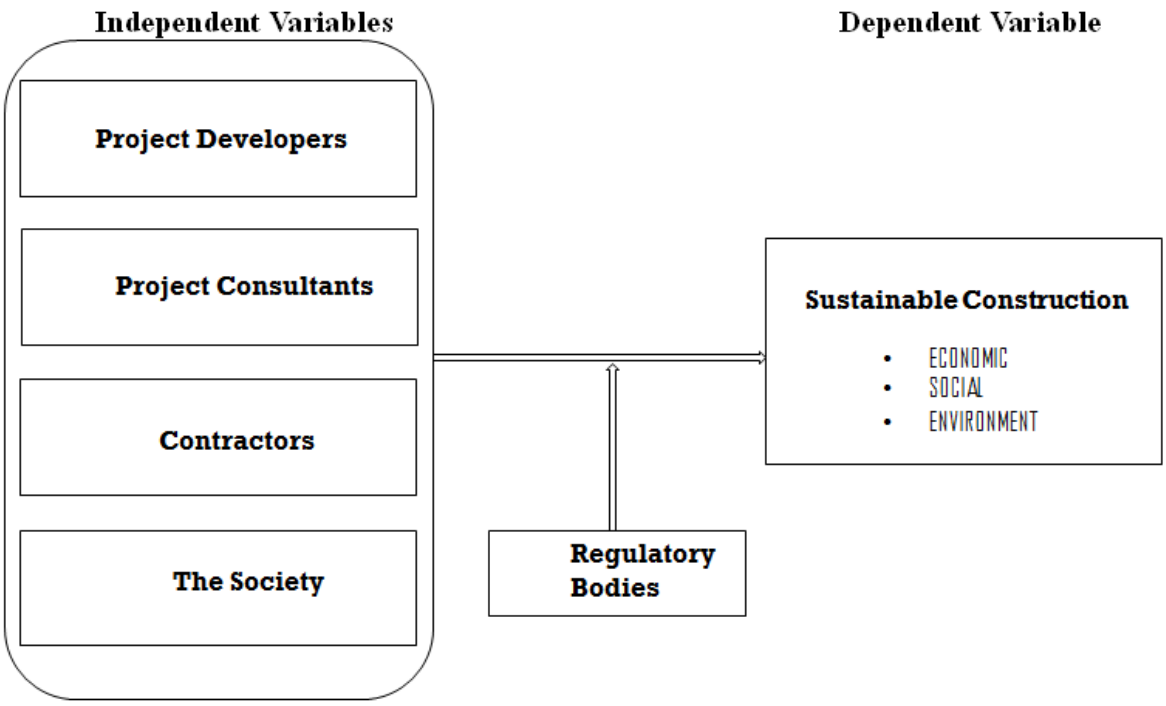

Fig-3: Conceptual Framework
Source: Author (2018)

Proposed Methodology

The proposed study will adopt positivism philosophy. Positivism assumes reality exists independently of the phenomena being studied. The philosophy generates hypotheses that can be tested and allows explanations that are measured against accepted

knowledge. This position creates a body of research that can be replicated by other researchers to generate similar results. The emphasis is on quantifiable results that lend themselves to statistical analysis. In terms of approach, the study will adopt deductive approach as opposed to inductive. This is informed by the adoption of positivism philosophy. The deductive approach requires that the study commences with a hypothesis or question and the study tries to answer it. The thought process of deductive approach moves from theory to the hypothesis, to data collection, findings to a rejection or confirmation of the hypothesis. According to Sneider and Larner [85], the deductive approach is best suited for the positivist approach. In contrast, inductive approach means that you are researching to create a theory. The process moves in the opposite direction to the deductive approach.

This study will adopt a survey strategy as it is often associated with a deductive approach [86]. This is the research style that will be used to collect and analyse data and is associated with different philosophical standpoints. The survey strategy offers a highly economical way of collecting large amounts of data to address the subject of the study and can, therefore, generate rich statistical data. The study will further adopt the mixed-methods and cross-sectional time horizon. Cross-sectional designs can use qualitative and quantitative research and they measure an aspect of the behaviour of many groups or individuals and at a single point in time.

The study will implement probabilistic sampling and use a semi-structured questionnaire to collect primary data from respondents. The data collected through the survey will be analysed to test the hypothesis. The data analysis will include descriptive statistics, normality tests, hypothesis testing, using correlation analysis and chi-square test as well as multiple regression analysis. This technique and procedure fit in with positivism philosophy, the deductive approach, the survey strategy, the mixed method choice and cross-sectional time-horizon.

REFERENCES

1. Ofori, G. (2012), *Developing the Construction Industry in Ghana: the case of a central agency*.
2. Hussin, J. M., Rahman, I. A., & Memon, A. H. (2013). The way forward in sustainable construction: Issues and challenges. *International Journal of Advances in Applied Sciences* (IJAAS), Vol. 2, No. 1, 15-24.
3. United Nations, (2015). *Transforming Our World: The 2030 Agenda for Sustainable Development.*
4. Augenbroe, G., & Pearce, A. R. (2006). *Sustainable Construction in the United States of America. CIB-W82 Report, 1998*.
5. Chalmers, P. (2014). *Climate Change: Implications for Buildings.* Cambridge Institute for Sustainable Leadership.
6. Johnson, R. A., Kast, F. E., & Rosenzweig, J. E. (1964). Systems Theory and Management, *Management Science*, Vol. 10, No. 2, 367-384.
7. Howes, R. (1996). Critical Systems approach to construction project management. *CIB W89 Beijing International Conference*, 21-24 October 1996.
8. Freeman, R. E., Wicks, A. C., & Parmar, B. (2004). Stakeholder theory and the corporate objective revisited. *Organisation Science* 15(3), 364-369.
9. Mainardes, E. W., Alves, H., & Raposo, M. (2011). Stakeholder theory: issues to resolve. *Management Decision*, Vol. 49 Issue: 2, 226-252.
10. Islam, J., & Hu, H. (2012). A review of literature on contingency theory in managerial accounting. *African Journal of Business Management*, Vol. 6(15), 5159 – 5164.
11. Walley, P., (2013). Stakeholder management: the socio-dynamic approach. International *Journal of Managing Projects in Business.* 6 (3), 485-504.
12. Chung, K. S. K., & Crawford, L. (2016). The role of social networks theory and methodology for project stakeholder management. *Procedia - Social and Behavioural Sciences* 226 372 - 380.
13. Chikere, C., & Nwoka, J. (2015). The systems theory of management in modern day organisations: A study of Aldgate Congress Resort Limited Port Harcourt. *International Journal of Scientific and Research Publications*, Volume 5, Issue 9, 1-7.
14. Pandey, V., & Gupta, S. (2016). Understanding G2G e-government project impasse: a stakeholder theory perspective. *Information Development*. Sage. 1-14.
15. Freeman, R. E. (1984). *Strategic Management: A Stakeholder Approach*, 1st ed.; Pitman Publishing: Boston, MA, USA, 24-25.
16. Mok, K.Y., Shen, G. Q., & Yang, J., (2015). Stakeholder management studies in mega construction projects: a review and future directions. *International Journal of Project Management.* 33 (2), 446 - 457.
17. Eyiah-Botwe, E., Aigbavboa, C., & Thwala, W. D. (2016). Mega construction projects: using stakeholder management for enhanced sustainable construction. *American Journal of Engineering Research (AJER)*. Vol. 5, Issue 5, 80-86.
18. Sciarelli, M., & Tani, M. (2013). Network approach and stakeholder management. *Business Systems Review*, Vol. 2 Issue 2, 175-190.
19. Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research Methods for Business Students 5th. Ed.* Prentice Hall, Inc. London.
20. Freeman, R. E., & Reed, D. L. (1983). Stockholders and stakeholders: a new perspective on corporate governance. *California Management Review*, Vol. 25 No. 3, 83-94.
21. Jones, T. M., & Wicks, A. C. (1999). Convergent stakeholder theory. *Academy of Management Review*. 24 (2), 206-221.

22. Donaldson, T., & Preston, L. E. (1995). The stakeholder theory of the corporation: concepts, evidence, and implications. *Academy of Management Review* 20 (1), 65-91.
23. Henjewele, C., Fewings, P., & Rwelamila, P. D. (2013). De-marginalising the public in PPP projects through multi-stakeholders management. *Journal of Financial Management of Property and Construction*, Vol. 18 Issue: 3, 210-231.
24. Amaeshi, K. (2010). Stakeholder management: theoretical perspectives and implications. *Construction stakeholder management*, 13-40.
25. Amadi, C. J., Carrillo, P. M., & Tuuli, M. M. (2014). Stakeholder management in public private partnership projects in Nigeria: Towards a research agenda.
26. Jones, T. M., Felps, W., & Bigley, G. A. (2007). Ethical theory and stakeholder related decisions: the role of stakeholder culture. *Academy of Management Review*, Vol. 32 No. 1, 137-155.
27. Yang, J., Shen, Q., & Ho, M. (2009). An overview of previous studies in stakeholder management and its implications for the construction industry. *Journal of Facility Management.* 7, 159-175.
28. Sallinen, L., Ruuska, I., & Ahola, T. (2013). How governmental stakeholders influence large projects: the case of nuclear power plant projects. *International Journal of Managing Project in Business*, 6 (1), 51- 68.
29. Bal, M., Bryde, D., Fearon, D., & Ochieng, E. (2013). Stakeholder Engagement: Achieving Sustainability in the Construction Sector. *Sustainability 2013*, 6, 695-710.
30. Yang, H., Yeung, J. F. Y., Chan, A. P. C., Chiang, Y. H., & Chan, D. W. M. (2010). A critical review of performance measurement in construction. *Journal of Facility Management.* 8, 269 - 284.
31. Mitchell, R. K., Agle, B. R., & Wood, D. J. (1997). Toward a theory of stakeholder identification and salience: defining the principle of who and what really counts. *Academy of Management. Review.* 22 (4), 853–886.
32. Clarkson, M. E. (1995). A stakeholder framework for analysing and evaluating corporate social performance. *Academy of Management Review*. 20 (1), 92-117.
33. Bresnen, M.J., Haslaam, C.O., Beardswoth, A.D., Bryman, A.E. & Kei, E.T. (1990). Performance on site and the building client. *CIOB Occasional paper, No. 42, Chartered Institute of Building,* Ascot.
34. Dinsmore, P. C. (1999*).* Winning in Business with Enterprise Project Management. *American Management Association,* New York, NY.
35. Aaltonen, K., & Kujala, J. (2016). Towards an improved understanding of stakeholder landscapes. *International Journal of Project Management* 34 (2016). 1537-1552.
36. PMI. (2013). *A Guide to the Project Management Body of Knowledge:* (PMBOK Guide).Project Management Institute, Newtown Square, PA. 5th Ed.
37. Lundin, R., & Söderholm, A. (1995) A Theory of the Temporary Organisation. *Scandinavian Journal of Management* Vol 11, No 4. 437- 455.
38. Packendorff, J. (1995). Inquiring into the temporary organization: New directions for project management research. *Scandinavian Journal of Management*, 11 (4), 319-333.
39. Woodward, J. (1958). *Management and technology.* London, England.
40. Burns, T., & Stalker, G. M. (1961). *The management of innovation*. London England.
41. Woodward, J. (1965). *Industrial organisation: Theory and practice.* Oxford University Press, U.K.
42. Hanisch, B., & Wald, A. (2012). A bibliometric view on the use of contingency theory in project management research. *Project Management Journal*. Vol. 43, (3), 4-23.
43. Turner, J. R., & Muller, R. (2005). The project manager's leadership style as a success factor on projects: a literature review. *Project Management Journal,* 36 (2), 49-61.
44. Luthans, F., & Stewart, T. I. (1977). A General Contingency Theory of Management. *The Academy of Management Review,* Vol. 2, No. 2, 181-195.
45. Flood, R. L., & Jackson, M. C. (1991). *Critical systems thinking, Chichester:* John Wiley.
46. Senge, P. M. (1990). *The Fifth Discipline, the Art and Practice of the Learning Organization.* New York: Doubieday Currency.
47. Almahmoud, E., & Doloi, H.K. (2015). Assessment of social sustainability in construction projects using social network analysis, *Facilities*, Vol. 33 Nos 3/4, 152-176.
48. Khan, M. A., (2000). *Planning and monitoring of project sustainability: a guide on concepts, issues and tools.*
49. International Fund for Agricultural Development (IFAD). (2007). *IFAD Strategic Framework 2007-2010*. Rome.
50. Tango International. (2009). *Sustainability of rural development projects.* Asia: International Fund for Agricultural Development.
51. World Commission on Environment and Development (WCED). (1987). *The Brundtland Report,* Available at: http://www.un-documents.net/our-common-future.pdf [Accessed on 12/12/2017].
52. Kuhlman, T., & Farrington, J. (2010). What is sustainability? *Sustainability 2010*, 2, 3436-3448.
53. PMI. (2017). *Sustainability.* Available online at: https://www.pmi.org/learning/featured-topics/sustainability. [Accessed on 17.12.2017].
54. Du Plessis, C. (2002). *Agenda 21 for Sustainable Construction in Developing Countries: A discussion document.* United Nations Environment

Programme/International Environmental Technology Centre (UNEP-IETC).

55. Ciegis, R., Ramanauskiene, J., & Martinkus, B. (2009). The concept of sustainable development and its use for sustainability scenarios. *Engineering Economics* (2). 2009, 28-37.
56. Emas, R. (2015). *The Concept of Sustainable Development: Definition and Defining Principles.* Brief for Global Sustainable Development Report 2015. Available at https://sustainabledevelopment.un.org/content/documents/5839GSDR%202015_SD_concept_definiton_rev.pdf. [Accessed on 13.12.2017].
57. Adams, W. (2006). *The future of sustainability: Rethinking environment and development in the twenty-first century.* Department of Geography, University of Cambridge, U.K.
58. Afzal, F., Lim, B., & Prasad, D. (2017). An investigation of corporate approaches to sustainability in the construction industry. *Procedia Engineering 180* (2017) 202-210.
59. Aigbavboa, C., Ohiomaha, I., & Zwanea, T. (2017). Sustainable construction practices: a lazy view of construction professionals in the South Africa construction industry. *Energy Procedia 105* (2017) 3003 – 3010.
60. Ogunbiyi, O., Goulding, J. S., & Oladapo, A. (2014). An empirical study of the impact of lean construction techniques on sustainable construction in the UK, *Construction Innovation*, Vol. 14 Issue: 1, 88-107.
61. Akadiri, P. O., & Fadiya, O. O. (2013). Empirical analysis of the determinants of environmentally sustainable practices in the UK construction industry, *Construction Innovation*, Vol. 13 Issue: 4, 352-373.
62. Fageha, M. K., & Aibinu, A. A. (2016). Identifying stakeholders' involvement that enhances project scope definition completeness in Saudi Arabian public building projects. *Built Environment Project and Asset Management*, Vol. 6 Issue: 1, 6-29.
63. Chan, A. P. C., & Oppong, G. D. (2017). Managing the expectations of external stakeholders in construction projects. *Engineering, Construction and Architectural Management*, Vol. 24 Issue: 5, pp.736-756.
64. Heravi, A., Coffey, V., & Trgunarsyah, B. (2015). Evaluating the level of stakeholder involvement during the project planning processes of building projects. *International Journal of Project Management*.
65. Sun, J., & Zhang, P. (2011). Owner organization design for mega industrial construction projects. *International Journal of Project Management*. 29, 828-833.
66. Atkin, B., & Skitmore, M. (2008). Editorial: stakeholder management in construction. *Construction Management and Economics 26* (6), 549 - 552.
67. Leung, M. Y., & Olomolaiye, P. (2010). *Risk and construction stakeholder management* (pp. 75-98). Wiley-Blackwell.
68. Johnson, G., & Scholes, K. (1999), *Exploring Corporate Strategy, 5th ed*., Prentice Hall Europe, London and New York, NY.
69. Hwang, B., & Lim, E. J. (2013). Critical success factors for key project players and objectives: case study of Singapore. *Journal of Construction Engineering and Management. ASCE* 139, 204-215.
70. Winch, G., & Bonke, S. (2002), *Project stakeholder mapping: analysing the interests of project stakeholders*, in Slevin, D.P., Cleland, D.I. and Pinto, J.K. (Eds), The Frontiers of Project Management Research, Project Management Institute (PMI), PA, 385-405.
71. Manowong, E., & Ogunlana, S. (2010), *Strategies and tactics for managing construction stakeholders*, in Chinyio, E. and Olomolaiye, P. (Eds), Construction Stakeholder Management, Wiley-Blackwell, New York, NY, pp. 121-137.
72. Tessema, F., Taipale, K., & Bethge, J. (2010). *Sustainable buildings and construction in Africa.* German Federal Ministry of Environment (BMU).
73. Landman, M. (1999). *Breaking through the barriers to sustainable building: insights from building professionals on government initiatives to promote environmentally sound practices.* Unpublished MA. Thesis, Department of Urban and Environmental Policy, Tufts University, U.S.A.
74. Jaillon, L. & Poon, S. (2008). Sustainable construction aspects of using prefabrication in dense urban environment: a Hong Kong case study. *Construction Management and Economics*, Vol. 26, No. 9, 953-66.
75. Chen, Y., Okudan, E., & Riley, R. (2010). Sustainable performance criteria for construction method selection in concrete buildings. *Automation in construction*, Vol. 19, No. 2, 235-244.
76. Yu, C., & Kim, J. (2011). Building environmental assessment schemes for rating of IAQ in sustainable buildings. *Indoor and Built Environment*, Vol. 20, No. 1, 5-15.
77. Akadiri, O., & Olomolaiye, P. (2012). Development of sustainable assessment criteria for building materials selection. *Engineering, Construction, and Architectural Management*, Vol. 19, No. 6, 666-687.
78. Enshassi, A., Kochendoerfer, B., & Ghoul, H. A. (2016). Factors Affecting Sustainable Performance of Construction Projects during Project Life Cycle Phases. *International Journal of Sustainable Construction Engineering & Technology*, Vol 7, No. 1, 50 - 68.
79. Sarkis, J., Meade, L., & Presley, A. (2009). *A Sustainability Decision Model for the Built*

Environment. GPMI Working Papers No. 2009-08 October 2009.

80. Olander, S. (2007), Stakeholder impact analysis in construction project management. *Construction Management and Economics*, Vol. 25 No. 3, pp. 277-287.
81. Ward, S., & Chapman, C. (2003), Transforming project risk management into project uncertainty management. *International Journal of Project Management*, Vol. 21 No. 2, 97-105.
82. McElroy, B., & Mills, C. (2000). Managing stakeholders. *Gower handbook of project management*, 757-75.
83. Were, S. W., Diang'a, S. O., & Mutai, A. K. (2015). Challenges faced by practitioners in the adoption of green building concepts: A case of Nairobi City County. *International Journal of Engineering Research and Technology (IJERT)*. Vol. 4 Issue 02, February 2015, 1157 -1162.
84. Akadiri, P. O., Chinyio, E. A., & Olomolaiye, P. O. (2012). Design of a sustainable building: A conceptual framework for implementing sustainability in the building sector. *Buildings*, 2, 126-152.
85. Yang, R. J., Wang, Y., & Jin, X. H. (2014). Stakeholders' attributes, behaviours and decision-making strategies in construction projects: Importance of and correlations in practice. *Project Management Journal*, Vol. 45, No.3, 74-90.
86. Sneider, R., & Larner, K. (2009). The Art of Being a Scientist: *A Guide for Graduate Students and Their Mentors*, Cambridge University Press, 16.