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ARTICLE

Critical Barriers to Social Sustainability: the Quantity Surveyors' Perspective

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ABSTRACT

Although the advocacy for Social Sustainability consideration in the construction industry has been on the rise, however, the practice of Social Sustainability (SS) is plagued with many barriers. The barriers that hinder practices of SS in the construction industry have to be identified and eliminated or mitigated. Notwithstanding, Not much research works have been conducted regarding the barriers that hinder SS in the construction industry. The study aims to explore the critical barriers to social sustainability from the perspective of the quantity surveyor. A comprehensive literature review was conducted and nineteen (19) variables (barriers) were identified. Structured questionnaires were designed and were answered by 110 out of a total sample size of 120 Quantity Surveying professionals recognised by the Ghana Institution of Surveyors (GhIS) representing approximately 92% response rate. The data collected were analysed using Factor Analysis. It was found that Socio-cultural barriers, Political and Technical barriers, knowledge or awareness barriers and financial barriers are the underlying group barriers for the 19 identified barriers. The study further revealed that, among the four underlying groups, Political and Technical barriers were the most dominant. This draws special attention to the government's position in ensuring effective consideration in promoting social sustainability practices as well as the technical knowledge needed in the SS practice in Ghana. The study as well raises the awareness and the need to ensure adequate education, training and professional development. Again, sustainability literature was enhanced by analysing the critical barriers to achieving social sustainability from the perspective of the Quantity Surveyor. The findings and recommendations of the study is expected to help practitioners and policy makers adopt appropriate measures to overcome the barriers and thereby promote the integration of social sustainability into professional practices.

1. Introduction

The call for sustainability integration into construction activities due to the issuance of the sustainable Development goal has massively increased. The awareness has caused the construction industry to give support to the sustainable development agenda and considering the social dimension throughout the life cycle of construction projects. Sustainability has gained focus in

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the construction industry through the initiation of "Agenda 21 for sustainable construction in developing countries", proposed by the United Nations and its organizations [1]. Social sustainability consideration has gained increased attention throughout the lifecycle of projects, that is, the design, construction, operation, and deconstruction stages [2]. Many books and articles on sustainable design and construction [3, 4, 5, 6, 7] have made a significant recognition of the fact that sustainability must be considered in all aspects of the design and construction of the built environment. Noticeably, the emphasis on such literature has been on environmental and economic aspects of sustainability without enough consideration of the social aspects.

The Brundtland Report 1987 defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The sustainability concept in recent times has been broadly acknowledged in the construction industry and is multidimensional with various dimensions bringing to light different discourses [8]. These dimensions are what is termed the pillars of sustainability and these include: social, environmental, economic and cultural sustainability which has recently been in the debate for its inclusion as a distinct pillar from social, which the researcher truly concur with those assertions. The description of sustainability becomes fully complete when these aspects are covered. Due to positive impact, sustainability has gained much acceptance in recent times on social, environmental and economic issues [9]. Social sustainability which has largely been neglected in mainstream sustainability debate is in recent times gaining considerable attention by construction stakeholders including the Quantity Surveyor.

Social sustainability is defined as the engagement among employees, local communities, clients, and the supply chain to ensure meeting the needs of current and future populations and communities [10]. A socially sustainable project should place more emphasis on the interests of end-users and consider the impacts on the surrounding community [3]. Social sustainability covers a wide range of dimensions in construction projects which includes the management of safety and well-being of the construction workforce [11]. Therefore, in the attempt to integrate social sustainability in the construction industry, safety of construction workers and project communities needs to be considered. Many works on social sustainability [7,12, 13, 14, 15] have identified the practices and the need for the various key stakeholders (Professionals) involvement in its realization. Most of those research works focus on the integration of sustainability knowledge in higher learning institutions but not much is covered with regards to the distinct roles to be performed by the construction professional in ensuring sustainability and its social consideration. QS Profession is more influential in the Construction industry. Although the QS profession is mostly known in the construction industry, other industries such as the insurance and the financial sector, oil and gas, have also massively acknowledged the contribution of the QS in recent times [16]. However the role of the QS is significantly important in the construction industry [17] and as such a significant proportion of construction stakeholders depend on the QS for construction cost information, advice, value management, procurement and lead consultancy. The quantity surveying practices have recently witnessed a paradigm shift from the traditional roles of preparing Bills of Quantities (BOQs) and building quantification to modern practices that are sustainability-focused including; lifecycle costing, cost advice, commercial management and facilities management [18].

Quantity Surveyors who are popularly known to be construction cost advisors have a major role to play in ensuring social sustainability. The Royal Institute of Chartered Surveyors expanded that one of the roles of the QS is to give expert advice on the capital cost of construction and whole-life cycle costs [19]. The QS professionals also have first-hand knowledge on contract administration, tendering and procurement of goods, works or services. Appropriate skills and knowledge is necessary for the implementation of sustainable development. Therefore, the literacy of the construction workforce on Sustainability is essential. The inculcation of social sustainability into the practices of the QS has not been an easy task due to some critical barriers. One of the barriers to sustainability adoption in construction is poor understanding of the concept of sustainability among construction workers including the QS [20]. In line with this, the achievement of sustainability in construction has been slow due the lack of sustainability literacy of construction professionals [21]. Studies undertaken on sustainable barriers were limited to consultants' views in general [20]. A comprehensive analysis of the barriers that influence QS on the path to social sustainability should therefore not be underestimated. Against this background, this study aims to to examine the critical obstacles to social sustainability from the QS point of view. The outcome of this research will not only bridge the knowledge gap on the barriers to social sustainability practices employed by the QS but also layout out valuable references to help decision makers and practitioners take action to address these barriers and thereupon improve social sustainability among the QS practices.

2. Literature Review

2.1 Overview of the Quantity Surveying Profession

Quantity Surveyors are ubiquitous in the construction in-

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dustry [22]. A report published by RICS in 1971, established that the quantity surveyor's role is to ensure that the resources of the construction industry are well utilized to the best advantage of society by providing the financial management for projects and a cost consultancy service to the client and designer during the whole construction process [23]. The Quantity Surveyor is the economist or the construction Cost Consultant offering accurate costing during all stages of the design and construction in the construction industry. The QS has a basic role in cost management (engineering) and is well recognised in the construction and its allied industry [19]. The Quantity Surveyor is central to the decision-making process throughout the development of a project and is mostly responsible for taking a lead role in ensuring value for money [24]. As such, the QS has the greatest opportunity to incorporate social sustainability at both the design and construction stage of a project through appropriate consultation procedures. The QS can achieve this by working closely with the Client and other stakeholders [25]. The QS has a primary role of cost management [26]. The Royal Institute of Chartered Surveyors classified the roles of the QS into competencies and further went on to describe the term 'competencies' as "the capabilities, behaviours, knowledge, skills and attitudes required to perform a specific function sucessfully and efficiently [19]. The traditional roles of the QS have been categorised according to research which included, but not limited to cost management, preparation of BOQs and other documents that can support the procurement process and non-traditional (evolved and emerging) roles which include Whole-life Costing (WLC) Assessments, BIM management, and Sustainability [27].

2.2 Social Sustainable Practices by the QS in the construction industry

Social Sustainability is defined as "a process for creating sustainable successful places that promote wellbeing, by understanding what people need from the places they live and work, and also combines design of the physical realm with design of the social world-infrastructure to support social and cultural life, social amenities, systems for citizens engagement, and space for people and places to evolve" [28]. Therefore, Social sustainability is basically about people and their interaction with the physical environment. Depending on the perspective of the stakeholder, the construction industry's concept of social sustainability can be defined differently and the factor of where it is implemented during the lifecycle of the project can also influence the definition [3]. Social Sustainability places greater emphasis on creating a built environment through the use of strategic building processes and services to increase overall efficiency and reduce risks to human beings and the environment [29]. The coming into force of these social criteria and the need to involve stakeholders in the planning of sustainability in the built environment have led to the development of more proactive management programs aimed at protecting the built environment while improving the financial benefits to the construction industry [30]. Social sustainability considers a range of processes to improve the health, safety and well-being of present and future generations [31]. Safety and well-being of workers, including safety management and reduction of injuries at construction sites, are important dimensions of social sustainability that apply to construction projects, and the industry must take into account the safety and the well-being of its workers [32]. Quantification of building materials required for construction projects and cost management are the core competences of the QS professions [33]. Also, the Quantity Surveyor is required to prepare the contract documentation and participate in the evaluation of the claims related to the contract (Contract Administration).

The QS is the key advisor at all phases of the project life cycle and has in-depth knowledge of technologies and innovations. The contemporary QS needs to keep pace with alternative building materials so as to provide accurate building cost advice and propose suitable construction methods or building material in support of environmental sustainability performance. The QS needs to progressively develop their skills and knowledge. Understanding eco-friendly products and materials are one of the key benefits of professionals, including the QS in promoting sustainability at their jobs [34]. Some of the practices identified from literature include; assessing the impact of project on surrounding communities, specification, accessibility consideration for the elderly and the disabled in society, life Cycle Cost appraisal, establishing requirements to assess the impact of the project on the health and safety of the final users, valuing sustainability of a property, estimating the consequences of the proposed project at the community level, Feasibility studies, Advice on Social Design Cost planning, estimating and control [34, 16, 35, 36, 37].

2.3 Barriers to Social Sustainability: QS point of view

The QS profession has a long history in the construction industry. As a result of changing client needs and the advance in technology, the profession faces a threat to its traditional functions and roles [38]. Notwithstanding, the QS profession is often faced with challenges and opportunities in new markets [39]. These are often overlooked, mainly because of the lack of relevant skills and training [40],

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and these challenges are not fully exploited unless these skills gaps are tackled. The QS in the 21st century must no longer just be no longer just a "thermometer" (temperature reader), but a "thermostat" (checker of the event) In that regard, there must be a cultural change and a concerted effort at the continuous professional development of the QS [41].

The Quantity surveyor is a specialist who tries to ensure that the scarce resources of the construction industry are used optimally by providing the financial management and consulting services to the customer during the process of construction [37]. The services provided by the QS includes but not limited to cost planning, cost estimating, advice on procurement methods, advice on contracting methods, procurement systems for construction works, tender document preparation, contract negotiation, interim valuation and payments, cash flow analysis and project cost [26]. Quantity Surveyor in performing his professional practice provides the above services to a wide range of projects, including structural, civil engineering, petrochemicals, mineral extraction and many more. These roles performed by the QS are influence by social, economic and environmental considerations. Social issues have been widely recognized in the construction industry, and many efforts have been made to identify the nature of social sustainability in the industry. Nonetheless, the practices of the QS to ensure social sustainability in many parts of the world, including Ghana, has not been smooth. Many studies undertaken on sustainability has summarised the barriers, challenges, obstacles (hereafter referred only to as barriers) to sustainability in the construction industry. A review of the literature shows that these barriers can be divided into six main categories: management/leadership barriers, technical barriers, financial barriers, political barriers, socio-cultural barriers, and knowledge/ awareness barriers. These clusters were derived mainly from similar categorisations of sustainability barriers in the literature [42,43,44,45]. The findings from a study by Ametepey, Aigbavboa & Ansah, established that the pertinence of sustainability approach in the construction industry presents challenges in terms of fear of higher investment costs, the fear of a long payback period, customer concerns about profitability and ignorance of life cycle costs and lack of financial resources are major bottleneck to the discharge of sustainability in construction. In addition, knowledge / awareness constraints such as lack of expertise lack of benefit awareness, misunderstanding of sustainability, lack of education and knowledge of sustainable design are the major obstacles to the implementation of sustainability in construction.

Challenges such as ineffective information technology, a lack of system knowledge, ignorance of lifecycle costs, lack of education and knowledge in sustainable design, and customer concerns regarding profitability and payback periods have also been identified as obstacles to sustainability [44]. In addition, awareness barriers, knowledge deficit, lack of legislation and lack of readily accessible guidance are some of the major barriers associated with sustainability integration in the construction industry [46]. Häkkinen and Belloni affirmed that the fear of higher investment costs for sustainable construction compared with traditional construction and the risk of unforeseen costs are often considered a challenge to sustainable construction [47]. Adjarko et al. also posited that in the Ghanaian Construction Industry, Quantity Surveyors rely heavily on the traditional means of communication such as paper take-off and traditional form of estimating due to lack of adoption of modern Quantity Surveying software as a result of lack information technology (IT) knowledge [48], and this has caused Quantity surveyors to using the traditional means to the delivery of their job which sometimes delays works when compared with using software.

3. Research Methodology

3.1 Identification of Barriers to Social Sustainability

Quondam research works [42,43,44] have reported that several barriers hinder the adoption of sustainability practices in the construction industry. In-depth reviews of previous studies identified 19 social sustainability barriers cataloged in Table 1. This is an index of factors chronicled in earlier studies and is, therefore, more accurate. For instance, in the literature, increase cost, inadequate information, and awareness, are generally recognized as crucial barriers to social sustainability practices. That is, the identification of the 19 potential obstacles was mainly focused on factors that have been used in the study of the barriers to sustainability in other countries and contexts. These factors give confidence in the variables identified and help to study the trend of the outcome of this research in relation to other findings in different countries. The factors are generalized and the outcome base on the respondents ranking gives more specified factors directly hindering social sustainability in the construction industry and from the perspective of the Quantity Surveyor. According to Rowlinson, the use of known factors for research is more appropriate as it allows the respondents to respond easily [49]. This also gives the researcher a firm basis for discussion of the results obtained from respondents.

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Table 1. List of potential barriers to social sustainability identified from literature

Potential barriers to social sustainability	References
Higher Clients' Requirements through the increasing complexity of modern construction projects	Ametepey (2015); Shi et al. (2013)
Lack of Professional Knowledge On Sustainability	Ametepey (2015)
Lack of awareness of benefits	Shi et al. (2013); Ametepey (2015)
Lack of easily accessible guidance	Ametepey (2015); Osaily, 2010
Lack of education and knowledge in Social sustainability	Ametepey, 2015; Ahn et al., 2013; Cotgrave & Kokkarinen, 2011; Chong et al., 2009; Wong et al. 2007
Lack of general awareness of the role of quantity surveyors in ensuring social sustainability in the construction industry	Ametepey (2015); Shi et al. (2013); Dzokoto & Dadzie (2013);
Inadequate Research and development on new construction processes	Ametepey, 2015; Shi et al. 2013; Dzokoto & Dadzie, 2013
Lack of awareness of the dynamics and Misunderstanding of Social Sustainability	Ametepey, 2015 Dzokoto & Dadzie, 2013
In sufficient ICT knowledge and skills on its use to facilitate work processes and search for information	Ametepey, 2015; Shi et al. 2013; Ayarkwa et al. 2015;
Cultural change resistance	Ametepey, 2015; Dzokoto & Dadzie, 2013
Fear of higher investment costs	Häkkinen and Belloni, 2011; Ametepey, 2015
Lack of awareness of clients	Ametepey, 2015; Osaily, 2010
Lack of demand for sustainable products	Ametepey, 2015; Dzokoto & Dadzie, 2013
Lack of sustainability measurement tools	Ametepey, 2015; Osaily, 2010 Dzokoto & Dadzie, 2013;
Ignorance or misunderstanding about Social Sustainability	Osaily, 2010; Ametepey, 2015; Shi et al. 2013;
Lack of building codes on sustainability	Dzokoto & Dadzie, 2013; Ametepey, 2015; Osaily, 2010
Lack of government policies/support	Ametepey, 2015; Shi et al. 2013; Osaily, 2010
Lack of sustainable construction projects for reference	Dzokoto & Dadzie, 2013; Ametepey, 2015; Osaily, 2010
Lack of technical ability	Dzokoto & Dadzie,2013; Ametepey, 2015; Osaily, 2010

3.2 Data Collection

Survey data was collected from Quantity Surveying professionals in Ghana. Quantity Surveyors in Ghana are those recognised by Ghana Institution of Surveyors and are in good standing. Tan postulated that a questionnaire survey is a methodical approach of collecting data from a sample [50]. Survey data has been largely employed in sustainability research to canvass professional opinions [47, 46, 51]. In this study, a questionnaire survey was conducted to examine the criticality of various barriers to social sustainability. Therefore, the research recorded in this article is based on quantitative research method [52]. The questionnaires for this research was developed from a thorough literature review. A two-step procedure was employed prior to the questionnaire survey. Initially, the questionnaire was reviewed by an international expert (a professor with many years of experience in sustainable construction) on the subject of questions construction and ambiguity. The second stage considered three Quantity Surveying professionals with considerable years of experience in the Ghanaian Construction industry. They were asked to assess base on their experience, whether the questionnaire shielded extensively on all potential barriers, taking into account the background of the practices of social sustainability in the construction industry, and whether a factor could be added to or removed from the survey. The feedback obtained helped in finalizing the questionnaire design. The questionnaire was designed to collect the demographic data of the respondents and their responses to the main objective of the study.

Respondents were then asked to rate the criticality of the 19 barriers to social sustainability practices using a five-point Likert scale (1 non-critical, 2 less critical, 3 neutral, 4 critical and 5 very critical). For a better understanding of the survey, see Appendix A for an example of the questionnaire. The target population of the research survey was identified from the list of Quantity Surveyors registered and recognised by the Ghana Institution of Surveyors (GhIS), Quantity Surveying Division. Information gathered from the secretariat shows that Ghana Institution of Surveyors (GhIS) as of 2018 had Four hundred and Twenty four (424) registered members in good standing in Ghana. Due to the large population size, a sample was obtained from the population. The sample size was determined using Kish 1965 formula and a sample size of one hundred and twenty (120) Key professionals in the Quantity surveying division was obtained using the formula. One hundred and thirty questionnaires were distributed by email and face-to-face, and one hundred and ten (110) collected for analysis. The distribution of 130 questionnaires

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was a strategy adopted in order to forestall the dangers of non-responses should it happen.

3.3 Data Analysis Techniques

3.3.1 Cronbach's Alpha Techniques

Cronbach-Alpha is one of the most prominent methods for determining the reliability of scales [51]. To assess the reliability of the questionnaire, Cronbach alpha is employed to determine the average correlation or internal consistency between factors in a questionnaire. The coefficient ά value of Cronbach alpha ranges from 0 to 1 and serves as the basis for describing the reliability of the extracted factors [54]. The higher the ά value, the more reliable the measurement scale used. Notwithstanding, the general rule noted in literature is that the ά value should not fall below 0.70 in other to conclude that the scale is reliable [55,56]. Statistical Package for Social Scientist (SPSS) version 23.0 was used and the calculated ά value for the 19 sustainability barriers was 0.879, indicating that the five-point Likert scale measurement was reliable at a confidence level of 5%. The sample collected can, therefore, be treated as a whole and is therefore suitable for further ranking and Factor Analysis (FA) [57].

3.3.2 Factor Analysis Technique

This study used factor analysis to identify the underlying grouped barriers for the critical social sustainability barriers identified in this research. Factor analysis is a statistical method that identifies a relatively small number of factor groups that can be used to represent relationships between sets of many interrelated variables [58]. Factor Analysis enables the aggregation of a large number of factors and curtails them into smaller and more critical values, which are determined by factor scores of responses [59]. Nonetheless, before applying FA, it must be checked if FA is suitable for factor extraction. Therefore the Kaiser-Meyer-Olkin (KMO) sampling and Bartlett's sphericity tests were used in this study to determine the adequacy of the FA. KMO measures the reasonableness of the sample that represents the ratio of the squared correlation between the variables to the squared partial correlation between the variables [60]. The value 0 indicates that the sum of the partial correlation is huge in relation to the sum of correlations, indicating diffusion in the correlation pattern and thus, making FA unsuitable [58]. Notwithstanding, a value near 1 indicates that correlation patterns are relatively compact and therefore, FA would provide a reliable and unambiguous factors [60]. The KMO value should be above 0.50 for a satisfactory FA to proceed [61, 58, 62]. Nonetheless, the degree of acceptance of the KMO value differs depending on the KMO values as shown in Table 2. Another statistical tool is the Bartletts Sphericity Test which highlights the existence a correlation between variables [51]. It is used to judge whether the original correlation matrix is an identity matrix, suggesting that there is no relationship between the variables and therefore FA would be inappropriate [63]. If the value of the sphericity test statistics is large and the associated significance level is small, then the population correlation matrix is not an identity matrix and therefore FA would be appropriate [64].

Table 2. Level of acceptance of KMO value (Field, 2009)

KMO value	Level of Acceptance
Above 0.90	Superb
0.80 – 0.90	Great
0.70 – 0.80	Good
0.50 – 0.70	Mediocre
Below 0.50	Unacceptable

4. Survey Results

The main approach used for the analyses of the barriers of Social Sustainability is Factor Analysis (Principal Component Analysis). This section presents the analysis of the results and discussion of the findings from the analysis of data collected.

4.1 Factor Analysis (FA) Results

To better appreciate the understanding of the barriers to social sustainability in the construction industry, the barriers identified were subjected to Factor Analysis. The value of the KMO is 0.580, which is acceptable because it meets the threshold of 0.50 as shown in (Table 2). A value below 0.50 would prompt the researcher either to collect more data or rethink the variables to be included [60]. The KMO value can be easily enhanced by deleting some of the variables for FA using certain exclusion criteria. When deciding to delete a variable, however, several factors should be considered, such as: For example, the contribution of variables to the interpretation of the factor group. It is recommended that variables with factor loadings above or near 0.50 be maintained as they achieved significant contribution to the interpretation of the factor group [65,66]. Table 4 shows that all factor loadings exceeded or approached 0.50, with 19 (100%) exceeding 0.50; Therefore, all variables have been included in the FA. In this study, the Chi-squared value in the Bartlett Sphericity Test is large (325,740) and the associated significance level is small (0.000), suggesting that the population correlation matrix is not an identity matrix, as indicated in Table 3,

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adequacy of use of FA. For factor extraction, a principal component analysis technique was used to identify the underlying grouped barriers.

Table 3. KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.580
Bartlett's Test of Sphericity	Approx. Chi-Square	325.740
	Df	171
	Sig.	.000

Table 4. Communalities

Critical barriers to social sustainability	Initial	Extraction
Higher Clients' Requirements through the increasing complexity of modern construction projects (B1)	1.000	.768
Lack Of Professional Knowledge On Sustainability (B2)	1.000	.841
Lack of awareness of benefits (B3)	1.000	.758
Lack of easily accessible guidance (B4)	1.000	.788
Lack of education and knowledge in Social sustainability (B5)	1.000	.772
Lack of general awareness of the role of quantity surveyors in ensuring social sustainability in the construction industry (B6)	1.000	.819
Inadequate Research and development on new construction processes (B7)	1.000	.808
Lack of awareness of the dynamics and Misunderstanding of Social Sustainability	1.000	.723
In sufficient ICT knowledge and skills on its use to facilitate work processes, search for information (B9)	1.000	.835
Cultural change resistance (B10)	1.000	.614
Fear of higher investment costs (B11)	1.000	.790
Lack of awareness of clients (B12)	1.000	.743
Lack of demand for sustainable products (B13)	1.000	.703
Lack of sustainability measurement tools (B14)	1.000	.731
Ignorance Or Misunderstanding About Social Sustainability (B15)	1.000	.633
Lack of building codes on sustainability (B16)	1.000	.740
Lack of government policies/support (B17)	1.000	.594
lack of exemplar 'demonstration project' (B18)	1.000	.683
Lack of technical ability (B19)	1.000	.762
Extraction Method: Principal Component Analysis.		

Source: field data 2018

Table 5 summarizes FA results after varimax rotation. Four underlying groupings with eigenvalues greater than 1 were extracted, accounting for 62.82% of the variance. This indicated that these four components account for the highest percentage (> 50%) of variance across SS barriers. Moreover, 62.82% of the total variances explained are favourable compared to 58.68% of the total variances explained in the previous study [42]. As indicated in Table 5, the 19 independent variables are divided into four meaningful groupings, where two variables belong to component 1, four belongs to component 2, three belong to component 3, and two belong to component 4, it is necessary to include the four extracted ones and rename components based on the analysis results. Therefore, the four underlying component barriers can be renamed as follows:

Component 1: Socio-Cultural Barriers
Component 2: Political and Technical Barriers
Component 3: knowledge or awareness Barriers
Component 4: Financial Barriers

Table 5. Results of FA on the barriers to Social sustainability

Code	Challenges to Social sustainability	PC1	PC2	PC3	PC4
Component 1: Socio-Cultural Barriers					
B10	Cultural change resistance	**.752**	-	-	-
B13	Lack of demand for sustainable products	**.643**	-	-	-
Component 2: Political and Technical Barriers					
B16	Lack of building codes on sustainability	-	**.770**	-	-
B17	Lack of government policies/support	-	**.721**	-	-
B14	Lack of sustainability measurement tools	-	**.721**	-	-
B19	Lack of technical ability	-	**.670**	-	-
Component 3: Knowledge or awareness Barriers					
B8	Lack of awareness of the dynamics and Misunderstanding of Social Sustainability	-	-	**.788**	-
B9	In sufficient ICT knowledge and skills on its use to facilitate work processes, search for information	-	-	**.768**	-
B15	Ignorance Or Misunderstanding About Social Sustainability	-	**.593**	-	-
Component 4: Financial Barriers					
B11	Fear of higher investment costs	-	-	-	**.857**
B1	Higher Clients' Requirements through the increasing complexity of modern construction projects	-	-	-	**.516**

5. Discussion of Results

In view of the critical examination of the inherent relationships between the variables under each component, the following interpretation was derived to represent the underlying dimensions of the components. For instance, component 1 was labeled Socio-Cultural Barriers; component 2 was labelled Political and Technical Barriers; component 3 was themed Knowledge or awareness Barriers; component 4 was themed Financial Barriers. Due to the interrelated characteristics and combination of variables

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with high factor loadings, these names were derived.

5.1 Component 1: Socio-Cultural Barriers

The first principal component (PC1) in Table 5 reported high factor loadings for the variables cultural change resistance (75.2%) and a lack of demand for sustainable products (64.3%). The numbers in parentheses indicate the respective factor loadings, which assume the relative importance of the variables in the component's record. The component (cluster of listed variables) accounted for 20.328% of the declared variance, as shown in Table 5. Socio-cultural barriers and the following interpretations. This component is easy to interpret, as resistance to cultural change traditionally suppresses the demand for sustainable products and practices. The effects of socio-cultural barriers on the success of sustainability implementation have also been extensively reported in the literature [44,67,68]. The Ghanaian construction industry has long been operating in a particular style and presents itself as an industry that is traditionally very difficult to modify, particularly in terms of the construction methods and materials used. This resistance to change means that customers and stakeholders have no demand for sustainable products. The findings support the proposition of William & Dair [69] as they cited the customer's lack of demand for sustainable products as a generally recognized obstacle. This barrier was also named by 84% of respondents as the most significant barrier because a construction project cannot be sustainably carried out without the full support of the owner or developer for sustainable concepts. These findings support the study of William & Dair [69] that the lack of customer demand for sustainable products as a generally recognised barrier makes the specification of materials difficult. No wonder that the Ghanaian construction industry has traditionally been very difficult to change, especially in terms of the construction methods used and the materials used [42].

5.2 Component 2: Political and Technical Barriers

Component (PC2) accounted for 17.183% of the variance (see Table 5). The reported factor loading for the variables are lack of building codes on sustainability (such as the standard method of measurement that incorporate sustainability) (77.0%), lack of government action/support (72.1%), lack of tools to measure sustainability (72.1%), and lack of technical skills (67.0%); and without difficulty the component was referred to as political and technical barriers. The impact of the political obstacles on the success of the implementation of sustainability is also well captured in literature [44,67,68,70]. This was supported by Dzokoto & Dadzie [46] that the success of sustainable construction is dependent on effective government policy/support in which the absence will retard the process. They also noted that lack of building codes for sustainability and the absence of commitments of the government, as well as lack of legislation, are critical barriers hindering the achievement of sustainability (social) in construction. [46] Dzokoto & Dadzie reiterated that the success of social sustainability in construction depends to a large extent on the commitment of the government and the formation of laws.

Also, the impact of technical barriers on the success of SS is well established [70, 68, 44]. Lack of tools to measure sustainability, lack of role models "Demonstration Projects", lack of accessibility, lack of technical skills, chronic skills and workforce bottlenecks are also obstacles to the implementation of social sustainability in the construction industry. These barriers are taken into account technically, because they have a direct impact on the success of SS. Therefore, the construction professionals including the Quantity Surveyor, must be fully and completely familiar with the principles of sustainability in order to implement it.

5.3 Component 3: Knowledge or Awareness Barriers

As shown in Table 5, component 3 is a lack of awareness of the dynamics and changing realities of practice (78.8%), ignorance or misunderstandings about social sustainability (59.3%) and sufficient ICT knowledge and skills looking for their use to facilitate work processes and information (76.8%); and without great difficulty, it was called a knowledge or awareness barrier, which makes up 11.428% of the total variance (see Table 5). Given the complex, dynamic, and challenging nature of construction projects, sustainability cannot be achieved without the knowledge or awareness of professionals for whom the QS plays a key role. Häkkinen & Belloni [47] said that, SS in construction can be hindered by ignorance or lack of a common understanding of sustainability. It was found out by a study conducted by William & Dair [69] that obstacles due to lack of information were an experience common to most stakeholders in the construction industry. Zhang et al. opined that the lack of sustainability expertise of construction professionals in sustainable technologies and green building regulations has led to slow progress in providing sustainable development, and the survey results confirm these factors as the barriers in the practices employed by the quantity surveyors in ensuring social sustainability [45].

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5.4 Component 4: Financial Barriers

Interestingly, PC4 was the last component to account for 7.667% of the declared total variance (see Table 5) and includes the fear of higher investment costs (85.7%) and higher customer demands due to the increasing complexity of modern construction projects (51.6%).

This component is not surprising in the sense that the additional financial cost of measures to improve the sustainability of buildings has been cited by many researchers as a major obstacle to the implementation of the sustainability approach. Fear of higher investment costs is one of the main obstacles previously identified, and this supports the findings of this research [47,70,71]. Higher customer demands due to the increasing complexity of modern construction projects, however, were not well-emphasized, but the results of the analysis ranked them as a major factor.

6. Conclusion

In order to implement sustainability in the construction industry, social sustainability has recently received a high level of global attention. Meanwhile, the practice of social sustainability in developing countries like Ghana is still in its infancy and faces numerous obstacles. These obstacles need to be addressed to promote the successful and widespread practices of the SS in the construction sector. To this end, this study aimed to examine the barriers to social sustainability from the Quantity Surveyor. To reach the goal, 19 barriers were identified from a comprehensive literature review. A questionnaire survey of 110 quantity surveyors in Ghana reduced the nineteen variables to four critical barriers to social sustainability. The essential contribution of this research to knowledge is demonstrated by the use of Principal Components Analysis, which provides a thorough understanding of the complex structure and relationship between the various fields of knowledge. The originality and values of this goal are embedded in the use of conceptual knowledge on contextual tasks to explain the four uncorrelated empirical benefits of the difficulties in providing social sustainability by the quantity surveyor. From the analysis using factor analysis (principal component), the identity of the factors were classified under four main headings and these are; socio-cultural, political and technical, knowledge awareness and financial difficulties. Cultural change resistance and Lack of demand for sustainable products were identified to be socio-cultural barriers. Lack of building codes on sustainability, Lack of government policies/support, Lack of sustainability measurement tools, Lack of technical ability and Ignorance or Misunderstanding of Social Sustainability were classified as political and technical barriers. Lack of awareness of the dynamics and changing environment of practice and Insufficient ICT knowledge and skills on its use to facilitate work processes and search for information were also classified as knowledge awareness while please change all capital letters to small letters fear of higher investment costs and higher clients' requirements through the increasing complexity of modern construction projects were classified as financial barriers.

Although the goal has been achieved, this study has some noteworthy limitations. These restrictions not only justify future research, but must also be considered when interpreting and generalizing the results. First, the criticality assessment in this study could be influenced by the attitudes and experiences of respondents, as it is subjective. Besides, although the sample size and the KMO values of this study were sufficient to perform statistical analysis, it is estimated that they are still relatively small. Increasing the sample could improve the KMO value. Therefore, future research with a larger sample would help determine whether the results differ significantly from the results reported in this study. In addition, the future study could analyze the strategies to mitigate these critical barriers to social sustainability from the perspective of construction professionals.

Ultimately, the results of this study could be useful for policy makers and practitioners in other developing countries, and data collected from different countries could give different results. Using the proposed critical SS barriers, similar studies could therefore be conducted in different developing countries to identify sectoral differences that would be helpful in developing industry-specific solutions to overcome the barriers. This paper reports on the partial results of large-scale research to promote SS practices in a developing country. While only listing the SS Barrier outcomes here, future research is proposed to report on the empirical outcomes of the Barrier-Overcoming Strategies, thus providing a broader understanding of how to ensure social sustainability in the construction industry.

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