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A framework towards health and safety knowledge transfer from the construction industry to the community in developing countries: a case study of Ghana

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ABSTRACT

This study aims at developing a framework to transfer health and safety knowledge (H&SK) from construction companies to project host communities as their corporate social responsibility (CSR) in a developing country. This study combined quantitative and qualitative enquiries into a mixed method. Face-to-face, semi-structured interviews were conducted in a case study of the Ghanaian community and a construction company. 250 contractors comprised 155 building contractors, and 95 road contractors partook in the study. One sample t-test and thematic analysis were the analytical tools employed for this study. This study found eleven enablers of knowledge transfer from construction companies to a project host community and nine enablers of diffusion of knowledge in the Ghanaian community. The study further found that H&SK is compatible with Ghanaian cultural norms and values and that Ghanaian citizens are willing to adopt and share H&SK with their neighbours. It further found that H&SK can be transferred through family ties. It is expected that the framework put forward by this study would provide construction companies with the means to carry out their CSR with little budgetary constraints. It will also help to address the challenges in CSR implementation in the industry in Ghana and countries alike and, at the same time, improve the well-being of the citizenry. The framework developed by this study is novel because this is the first time an attempt has been made to provide the construction industry with a means to carry out its CSR in Ghana and to also improve the well-being of the Ghanaian citizenry at the same time.

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Knowledge transfer; sustainability; health and safety; construction industry; corporate social responsibility

Introduction

Knowledge transfer is increasingly regarded as an essential factor of an organisation's competitiveness (Teixeira et al. 2019). Knowledge is generated to contribute to and assist the development of populations, improving their competitiveness and increasing their value (Firlej & Žmija, 2017; Liu, 2018). According to Teixeira et al. (2019), the relevance of the external knowledge transfer of collaboration, e.g. between businesses and society, is of significant value. Furthermore, Knowledge transfer can be understood as a voluntary and conscious act between individuals and organisations that results in the joint acquisition of intellectual property between the source and the recipient (Villani et al. 2017; Zheng & Hu, 2018).

There is clear evidence of health and safety knowledge improvement in the construction industry. Some authors found that H&SK in the construction industry has improved significantly in the last decades (Duryan et al. 2020; Esmaeili et al. 2012). The improvements in H&SK in the construction industry result from the increased adaptation of highly effective safety policies and techniques (Duryan et al. 2020 Esmaeili et al. 2012). Furthermore, H&SK in the Ghanaian construction industry has improved significantly than the Ghanaian Communities (Williams et al. 2020). Further, the similarities between construction hazards and that of a typical Ghanaian community have been found; juxtaposing these two, 26 construction hazards were

found to be present in a typical Ghanaian Community (Williams et al. 2020). Their study concluded that the transfer of improved H&SK from the construction industry to the Ghanaian Community has a better potential to improve H&SK in the Ghanaian communities. According to Wood et al. (1994), organisations and communities should not be seen as separate entities but interwoven. Hence any improvement in (H&SK) in any of these two social systems would significantly affect the other.

The motivation for this study stems from the fact that there is an urgent need to improve (H&SK) amongst the Ghanaian citizenry (Addai et al. 2016; Annan et al. 2015). Furthermore, some authors found that CRS initiatives in terms of impact and size of social investment in Ghana are done by telecommunication companies, banking institutions and companies in the extractive industries such as mining and oil and gas only (Dartey-Baah and Amponsah-Tawiah, 2011; Oppong et al. 2016). Lichtenstein et al. (2013) argued that CSR activities in the Ghanaian construction industry are spurs, and only a few academic works have advanced this course. Griffith, (2011) contended that construction projects place intrinsic and substantial demands upon contractors to maintain their corporate obligations. Smith and Rhiney (2015) argued further that it is time for companies to shift perception from profit maximisation and consider activities that would profit the communities in which they operate. Therefore, the question this study seeks to answer is.

What framework would help transfer the construction industry's H&SK to Ghanaian communities as part of the company's corporate social responsibility?

Theoretical background

Knowledge transfer has received much attention since the Nonaka and Takeuchi (1995) SECI model was put forward (Sun et al. 2019). This model displays four patterns of knowledge transfer: socialisation, externalisation, combination, and internalisation, and explains the process of knowledge flow among individuals, groups, internal and external organisations, and the effect on different members (Nonaka and Takeuchi, 1995).

On the other hand, Roger's (1995) diffusion of invention theory describes how, over time, a concept or product gains popularity and spreads across a particular population or social structure. The end result of knowledge transfer is that individuals, as part of a social structure, follow a new concept based on their perception of it being more advantageous to what they already have. This means a person must know something other than what they previously did. The key to adoption is that the person must have knowledge of the new idea behaviour, be persuaded by the new idea behaviour, make a decision to adopt the new idea behaviour, implement the new idea or behaviour and then confirm the new idea or behaviour. It is through this that diffusion is possible.

These two theories were combined to form a conceptual framework (Figure 1), showing the processes of transferring and diffusing knowledge from the construction industry to the community. The framework was adopted as the lens of this study.

Knowledge transfer in the construction industry

Construction firms must innovate to preserve their competitiveness owing to global competitive pressures (Liao et al. 2015). It has been argued that construction firms are hesitant to adopt changes that have the potential to improve their corporate image which has led to high levels of dissatisfaction among stakeholders (Shumank et al. 2019). The fact that critical knowledge exists in an organisation does not mean such knowledge would lead to the improvement of other stakeholders. Tan (2015) suggests that hoarding critical knowledge in an organisation to enhance job security and power would make it difficult for such an organisation to innovate and improve. Therefore, the key idea for organisations to innovate is to share critical knowledge (Shumank et al. 2019). In a study conducted in the United State small-medium construction companies, more than 90% of the respondents recommended the facilitation of knowledge to be shared among employees and project stakeholders (Hwang, 2022). Shumank et al. (2019) argued further that when it comes to project stakeholders it is the relationship between the client, contractor and community members. Chau et al. (2022) recommended the urgent need for construction organisations to develop appropriate knowledge management and training programs that take into account all the stakeholders. On the other hand, there are many frameworks in the knowledge management and transfer literature. However, these frameworks are limited to inter-intra organisational knowledge transfer and management. Some of the frameworks found are Schönbeck et al. (2023); Agrawal, (2019); Shumank et al. (2019); Williams et al. (2018); Owusu-Menu et al. (2018) Shibeika, (2014); Fellows and Liu, (2012); Esmaeili et al. (2012). These authors looked at transferring and managing

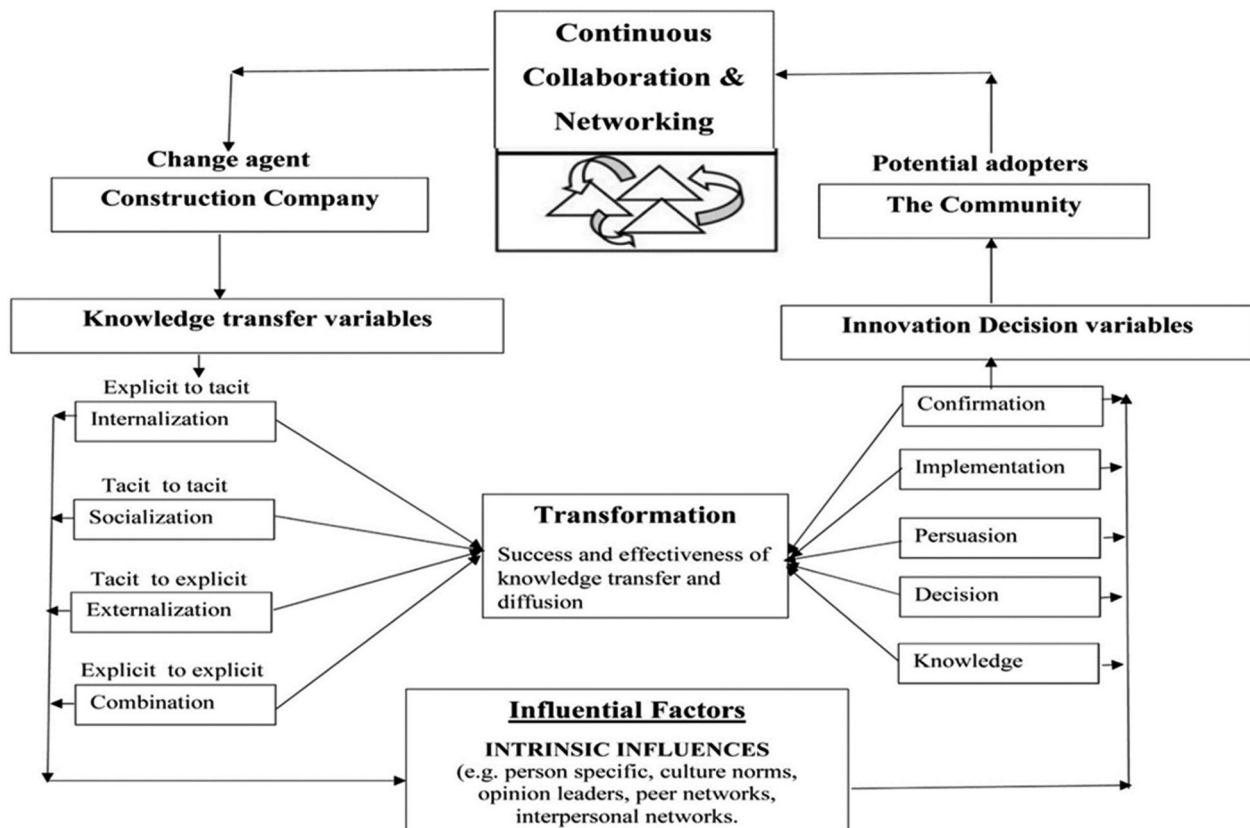


Figure 1. Knowledge transfer and diffusion – a conceptual framework (Adapted from Williams et al. 2018).

knowledge in the construction industry and have shown how knowledge can be transferred and managed in a construction organisation. Other authors such as Hwang (2022), Nonaka et al. (2000), as well as Liyanage et al. (2009) looked at how organisational knowledge is transferred through the various units and managed within the organisation in the area of business management. Phelps (2012) as cited in Renukappa et al. (2021) argued that there is little direct literature to review when it comes to knowledge transfer beyond the organisational level. Although there exist frameworks of knowledge transfer in the construction industry literature is still silent on a framework that would transfer external knowledge from a construction company to a community. Therefore, this paper aims to develop a framework to help transfer H&SK from a construction company into Ghanaian communities as a CSR of the companies.

Methodology

A mixed research method was adopted for this study. According to Creswell and Creswell (2018), it is not enough to only analyse qualitative or quantitative data. However, there is a need to integrate both methods into a single study for better insight. Therefore, mix method approach was adopted to answer the question or problem this study seeks to answer. Thus, what framework will enable the transfer of H&SK from a construction company to the Ghanaian community? A questionnaire survey and semi-structured interviews were selected as data collection methods to provide a better insight into how knowledge can be transferred from the construction industry to the Ghanaian community and its subsequent adoption.

A standardised questionnaire for the quantitative study and semi-structured interview guides for the case study designed explicitly for this study were employed for data collection. The questionnaire was structured into four sections; section A introduced the purpose and gave a brief background of the study. Section B solicited the background information of the respondent. Section C elicited information on Knowledge Transfer Enablers from a Construction Company to the community, while the final section D was on Knowledge Diffusion Enablers in the Ghanaian Communities. The questionnaire was delivered through online platforms and hand-delivered with the help of 3 research assistants. For this study questionnaire was adopted as the data collection instrument to enable the researchers to reach enough respondents within a short period of time. Reduce cost and obtain accurate data for generalisation.

Taherdoost (2016) argued that content validity must be applied when developing a new data collection instrument. This author further recommended that to ensure content validity of an instrument; there must first be a comprehensive review of the literature to extract the relevant items; the instrument should be sent to experts in the field of study and then pre-tested before administering. Based on the above recommendations, the development process of the data collection instrument for this study was evaluated and validated using facial and content validity, as shown in the following steps. First, exhaustive literature was reviewed such as, (Rogers 1995; Nonaka and Takeuchi 1995; Sun et al. 2019; Firlej & Zmija 2017; Bellini et al. 2016; Okere 2017; Jing Yang et al. 2020; Dang et al. 2022; Martin & Emptage 2019) which provided the theoretical framework for the instrument and its items. Secondly, two professors evaluated the instrument regarding its relevance, clarity, and meaningfulness. Thirty theoretical questions were formulated and presented to them for evaluation. After several encounters, the questions were filtered

from thirty to twenty questions. These questions were further divided into knowledge transfer processes and knowledge diffusion processes. Thirdly, the instrument was piloted in June 2020 with two H&S consultants selected purposively due to their expertise in the subject under study and six fourth-year PhD candidates of the Kwame Nkrumah University of Science and Technology Kumasi, Ghana. They provided feedback, suggested changes to some terminologies, and sought explanations for some unclear terms. The PhD candidates were chosen because they were pursuing their PhD in Construction health and safety and in their final year so are in a position to better appreciate the questions and provide insightful contributions.

The analytical methods employed in this study included a one-sample t-test for the quantitative data analysis and thematic analysis for the qualitative enquiry. The one-sample t-test was used to ascertain the statistical significance of the mean values relating to the various knowledge transfer enablers from a construction company to the community and enablers of diffusion in the Ghanaian community. Thematic analysis was performed to identify themes and patterns or make sense of the data that are important to address the issue of knowledge transfer and diffusion between a construction organisation and a community.

The study population involves all contractors registered with the Association of Building and Civil Engineering Contractors of Ghana (ABCECG) and the Association of Road Contractors (ASROC). The stratified random sampling technique, a probability sampling technique, was employed to select companies within the sample frame. Each unit in the sample thus had an equal chance of being included in the survey. The Stratified random sample was chosen because when the population is heterogeneous, or the variability in the population values is large, simple random sampling is not suitable for selecting the sample units. Thus, it may be possible that all the units from the same group will be selected, and the sample will not be representative of the population (Saunders et al. 2016).

A list of an uneven distribution of construction companies registered with ASROC and ABCECG across the country in good standing as of December 2017 was realised from the association's secretariat. In the list received from both associations, some members could not be contacted through the addresses provided. Those companies were removed from the list. Through recommendations from other contractors in the association, certain contractors not found on the original list but part of the associations in active operations were contacted and subsequently included. This resulted in a sample frame of five hundred and twenty-seven (527) road contractors and six hundred and fifty-three (653) building contractors. These two strata were employed in the stratified random sampling of respondents.

Sample size determination

To determine the study's sample size, Yamane (1967) formula was adopted. The formula was adopted due to its ability to work well with the random sampling technique (Israel 1992). The formula is as follows.

$$n = \frac{N}{1 + N(e)^2}$$

Where:

n = the sample size

N = the population size

e = the level of precision (0.5)

A confidence level of 95% and $p = 0.5$ degrees of variability were assumed for the equation (Israel 1992). Based on the equation, the sample size was determined as follows:

$$n = \frac{1180}{1 + 1180(.05)^2}$$

$$n = 298.73$$

To improve the number of responses, the sample size of 298 contractors was increased by 20% and eventually came to 357 contractors. This is because the construction industry is known for poor responses to questionnaire surveys. Three hundred and fifty-seven (357) construction companies were given questionnaires to answer, out of which two hundred and fifty (250) responded and returned the questionnaires.

Case study

A case study strategy was adopted for the second part to achieve an in-depth empirical understanding of how H&SK can be transferred from a construction company to a Ghanaian community (Yin, 2018). The data was collected using a semi-structured interview guide for the community and the construction company. All interviews were electronically recorded, and notes were taken as well with the consent of the participants. The interviews lasted approximately 30 to 40 min.

Before the interviews were conducted, letters were sent to the opinion leaders in the community and MW&H classified building and civil engineering contractor with a D1K1 financial class undertaking a construction project in that community. One community leader was assigned to the researcher to coordinate his work with the community representatives with H&SK and the D1K1 construction company with an H&S department. An agreement was reached regarding when to come to the community and how to locate the H&S expertise in the community.

Table 1 shows the themes and questions used in eliciting information on each theme. The target community for this study was selected purposively because it was influential based on having persons with H&SK and willingness to participate in the study. Its leadership structure with opinion leaders willing to assist in the study. The community also had a D1K1 construction company undertaking a live construction project with a H&S department and was homogenous in their cultural norms and values; therefore, it can be described as a typical Ghanaian

community setting. The construction company was also selected because it was the only D1K1 construction company with a H&S department in the community. The study followed a holistic multiple case study design and comprised the two (2) cases mentioned above. This design's choice was based on the fact that the evidence from multiple cases is considered more convincing and robust in its logic of replication (Yin, 2018). Ten H&S professionals, six from the community and four from the construction company were interviewed. Although the four persons work in the same organisation selected for this study, their work experiences and tacit knowledge gain vary and hence provided different responses to the same questions. These ten persons were interviewed because they were the only persons with sufficient H&SK in the community and could better appreciate the questioning and provide valid responses. According to Cresswell (2008), a sample size of 5 to 25 persons is adequate to justify a case study.

Data analysis and discussion

Table 2 shows the frequency and percentage distribution of the characteristics of the respondents, contractor category, job position, educational level, years of experience, and years of existence of the company.

The dominant educational level of the respondents surveyed is the bachelor of science (BSc). Most of the respondents are project engineers. A significant number of the respondents have worked in the construction industry for eleven to fifteen years, and most companies have existed for between 5 to 10 years. This implies that all the respondents have significant experience in the construction industry to ensure the reliability and accuracy of the data.

Knowledge transfer enablers from a construction company to the community

Respondents were asked to indicate knowledge transfer enablers from the construction industry to the Ghanaian community. These knowledge transfer enablers were mapped on Nonaka and Takeuchi's (1995) knowledge transfer and conversion model. The analytical method was One-sample t-test. The knowledge transfer enablers were ranked on a five-point Likert scale where

Table 1. Themes and questions used to collect field data.

Theme	Questions used to compile each theme
Health and safety Knowledge	do you have any knowledge in health and safety? from whom did you first hear about health and safety? where do you normally get your information from?
Persuasion to adopting Health and safety Knowledge	have the opinion leaders in your community ever introduce you to a new knowledge? what would make you to adopt H&S knowledge in your community? what advantages do you think the introduction of H&S knowledge in your community would have over your current state how complex do you perceive H&S knowledge adoption in your community? how compatible is H&S knowledge with existing Ghanaian cultural norms and values?
The Decision to adopt health and safety Knowledge	what in your opinion would inform the decision to adopt H&S knowledge in the Ghanaian community? from whom do you seek advice before adopting a new knowledge? what questions or clarifications do you seek prior to adopting a new knowledge?
Implementation of health and safety Knowledge	is your decision to use new knowledge introduced to you individual or collective? by your own experience do you think Ghanaian citizenry has the ability to implement H&S knowledge in their daily routine? why would you accept and implement H&S knowledge in your daily routine?
Confirmation of Health and safety knowledge	would you seek advice from a colleague, friend or neighbour before implementing H&S knowledge? how successful do you think H&S knowledge transfer would be amongst Ghanaian citizenry? would you want to introduce a neighbour to H&S knowledge? by what means would you introduce your neighbour to H&S knowledge? do you think the Ghanaian community need H&S knowledge at all?

Table 2. Background Information.

	Frequency	Percent
Respondents' category		
Road	95	38
Building	155	62
Total	250	100
Job Position		
Director	22	8.8
Managing Director	14	5.6
Safety Officer	38	15.2
Project Engineer	73	29.2
Project Manager	53	21.2
Others	50	20
Total	250	100.0
Educational Level		
PhD	3	1.2
MSC	64	25.6
BSC	91	36.4
B-TEC	30	12
HND	42	16.8
Others	20	8
Total	250	100.0
Years of Experience		
Less than 6 years	54	21.6
6-10 years	79	31.6
11-15 years	87	34.8
16-20 years	30	12
Total	250	100
Years of the existence of the company		
5-10 years	63	25.2
11-15 years	62	24.8
16-20 years	57	22.8
More than 20 years	56	22.4
Others	12	4.8
Total	250	100.0

5 = strongly agree, 4 = agree, 3 = somehow agree, 2 = don't agree, and 1 = strongly don't agree. A theoretical mean of 3.5 was set for the study, which means that any observed mean less than 3.5 is not an enabler, and any mean greater than 3.5 is an enabler. From Table 3, it was observed that all the eleven knowledge transfer enablers indicators had a high mean score more significant than the 3.5, indicating agreement. The statistical test demonstrated a highly significant level of agreement to the knowledge transfer enablers indicator, t-values with associated p-values < 0.05 (significantly high). Thus, all the eleven processes of knowledge transfer enablers from a construction company to the Ghanaian community were considerably supported.

The findings of this study established enablers of knowledge transfer from a construction company to the Ghanaian community. The results from Table 3 provided processes of sharing knowledge between a construction organisation and a typical Ghanaian community to help enhance the safety knowledge of the community members. The findings of this study also meant that socialisation, externalisation, combination and internalisation processes, as theorised by Nonaka and Takeuchi (1995), are applicable in the Ghanaian communities. According to these authors, tacit knowledge can be externalised and made explicit for others to see and adopt. This, by implication, means that knowledge of H&S is gained through experience, and therefore, tacit knowledge can be externalised by construction workers for the community members to see and emulate. Furthermore, the SECI model process puts knowledge transfer from person to person as a liner process Liu (2018), which is widely cited as the most influential and adopted theory in knowledge management studies. Hence, the contextualisation of this theory would help move H&SK from a construction organisation to the Ghanaian community, which is vital in the H&SK transfer process.

Table 3. Knowledge transfer enablers.

	Mean	Std. Dev.	t-value	p-value
Socialisation				
Employ a quota of both skilled and unskilled labour from the community intended for the health and safety knowledge transfer	3.81	0.865	5.705	0.000
Making use of local community members in and around the construction site and allowing a representation of the community leaders on the project team	3.90	0.811	7.878	0.000
Trained in health and safety knowledge in line with the construction company's policies and code of conduct	4.18	0.817	13.081	0.000
Externalisation				
Construction companies join forces with community leaders to propagate health and safety knowledge	4.24	0.859	13.626	0.000
Construction companies join forces with religious leaders to propagate health and safety knowledge	4.20	0.780	14.113	0.000
Combination				
Construction company and community leaders discuss, share and learn from each other	3.83	0.891	5.822	0.000
Groups meeting to discuss among themselves to enrich their understanding from the perspective of their peers	3.92	0.926	7.239	0.000
Internalisation				
Both parties' willingness to either transfer or receive new knowledge	3.80	0.954	4.906	0.000
The construction company's workers willing to participate in the transfer process	3.93	0.788	8.585	0.000
The community members willing to receive the knowledge transfer from the construction companies' workers	3.88	0.839	7.088	0.000
Celebration of safety weeks, conversations and integrating both community members and workers to share experience	3.78	0.943	4.627	0.000

Knowledge diffusion enablers in the Ghanaian communities

Respondents were asked to indicate knowledge diffusion enablers in the Ghanaian communities. The knowledge diffusion enablers were mapped on Roger's (1995) Innovation diffusion theory. One sample t-test was used to analyse the responses. The knowledge diffusion enablers were ranked on a five-point Likert scale where 5 = strongly agree, 4 = agree, 3 = somehow agree, 2 = don't agree, and 1 = strongly don't agree. A theoretical mean of 3.5 was set for the study, which means that any observed mean less than 3.5 is not an enabler, and any mean greater than 3.5 is an enabler. From Table 4, it was observed that all the nine knowledge diffusion enablers presented have mean scores high,

Table 4. Knowledge diffusion enablers.

	Mean	Std. Dev.	t-value	p-value
Persuasion				
Community members being persuaded of the compatibility of health and safety knowledge to Ghanaian cultural norms and values	4.004	0.747	10.666	0.000
Construction company presenting the relative advantage of health and safety knowledge to the community members.	3.904	0.749	8.528	0.000
Community members observing others use health and safety knowledge in their neighbourhood.	4.052	0.870	10.036	0.000
Decision				
Community members seeking advice from opinion leaders prior to the decision to adopt health and safety knowledge	3.844	0.876	6.212	0.000
Demonstrating the relative advantages of health and safety in the lives of the community members and laying bare the cultural compatibility of health and safety knowledge to their cultural norms and values	3.980	0.828	9.161	0.000
Implementation				
Community members using health and safety knowledge on trial basis prior to full implementation	3.948	0.910	7.782	0.000
Community members seeking advice from colleague, friend or neighbour before implementing health and safety knowledge	4.292	0.775	16.151	0.000
Confirmation				
Community members seek reinforcement of the transferred of health and safety knowledge from their neighbours	3.688	0.891	3.336	0.001
Construction companies making deliberate effort to reward safe working employees in the community while giving incentives to some of the community members who have also implemented health and safety practices to a large extent in their daily activities	3.732	0.903	4.062	0.000

indicating the participant's agreement with the statements of knowledge diffusion enablers in the Ghanaian communities. The test statistics, thus, one-sample t-test showed high t-values and p-values < 0.05 indicating the responses were statistically significant. This meant that the observed mean scores were significantly greater than the 3.5 test score threshold. Therefore, the respondents agreed that all the nine knowledge diffusion enablers indicators were practised in the Ghanaian community.

The findings of this study established enablers of knowledge diffusion in the Ghanaian community. It uncovered the activities that could lead to sharing H&SK among Ghanaian community members. The findings also reinforce that persuasion, decision,

implementation and confirmation processes, as theorised by Rogers (1995) are applicable in the Ghanaian communities. According to this author, the key to adoption is that the person must know the new idea, be persuaded by the new idea, decide on adopting the new idea, implement the new idea and then confirm the new idea (Rogers 1995). It is through this that diffusion is possible. Paola et al. supported this finding further by arguing that community members who strongly perceive that new knowledge introduced to them is in line with their community orientation tend to develop more affection for such new knowledge. And would easily adopt such knowledge.

Qualitative data analysis

This section presents the themes extracted from the in-depth face-to-face semi-structured interviews. The data was analysed using thematic analysis with the aid of Nvivo software. The study confirmed five pre-determined themes from the adopted conceptual framework in Figure 2. Whiles one theme emerged from the study showing the sources of information in the Ghanaian community. The themes were presented alongside relevant quotations extracted from the interviews. It is worth noting that the code INT (followed by a number) denotes the interview from which the evidence quotation was taken. For example, if a quote was extracted from interview four, the text presentation will be 'the quotation' (INT - 4).

All ten interviewees have had training in H&S. Therefore; they can provide valid and credible responses to questions posed to them. A question was asked to determine the source of the H&SK of the interviewees. One of the respondents said: 'I did my master's project work in H&S, and I am still pursuing my PhD. in H&S, so I am very much into H&S (INT-5)'. Interestingly, another respondent had this to say: 'Actually, I started at home because my mother is a nurse and a safety officer, so she trained me from home before I proceeded for further training (INT-2)'. The response from the interviewee (INT-2) clearly shows that H&SK can be transferred through formal, informal education and family ties. It further indicates that H&SK transfer from the construction industry to the community is noticeable and can be diffused exponentially, which can trickle down to the literate and illiterate in the Ghanaian communities (Figure 3).

Theme 1:H&S knowledgeability

The aim of this section is to identify the existence of H&SK in the Ghanaian construction industry. Most of the respondents agreed with the existence of H&SK in the Ghanaian construction industry. Responding to this question, a respondent said, 'Yes, the knowledge is there, not a master in that field, but the one to enable us to work in the industry is there' (INT-4). This confirms the existence of H&SK in the Ghanaian construction organisations, which can be transferred to their various communities. This finding is supported by Duryan et al. (2020); Esmaili et al. (2012) who also found that H&SK has improved in the construction industry due to the implementation of good safety policies. The responses show that one need not be a master of H&SK to transfer the same. However, once individual has the knowledge and can apply it to their daily activities, they can also transfer it to others. The interviewees further agreed to the need to have H&SK amongst the Ghana citizenry for them to be able to protect themselves from harm. Alluding to this, an interviewee said, 'Once in a human organisation, there is the need that you have knowledge in H&S to take precaution and how you can treat

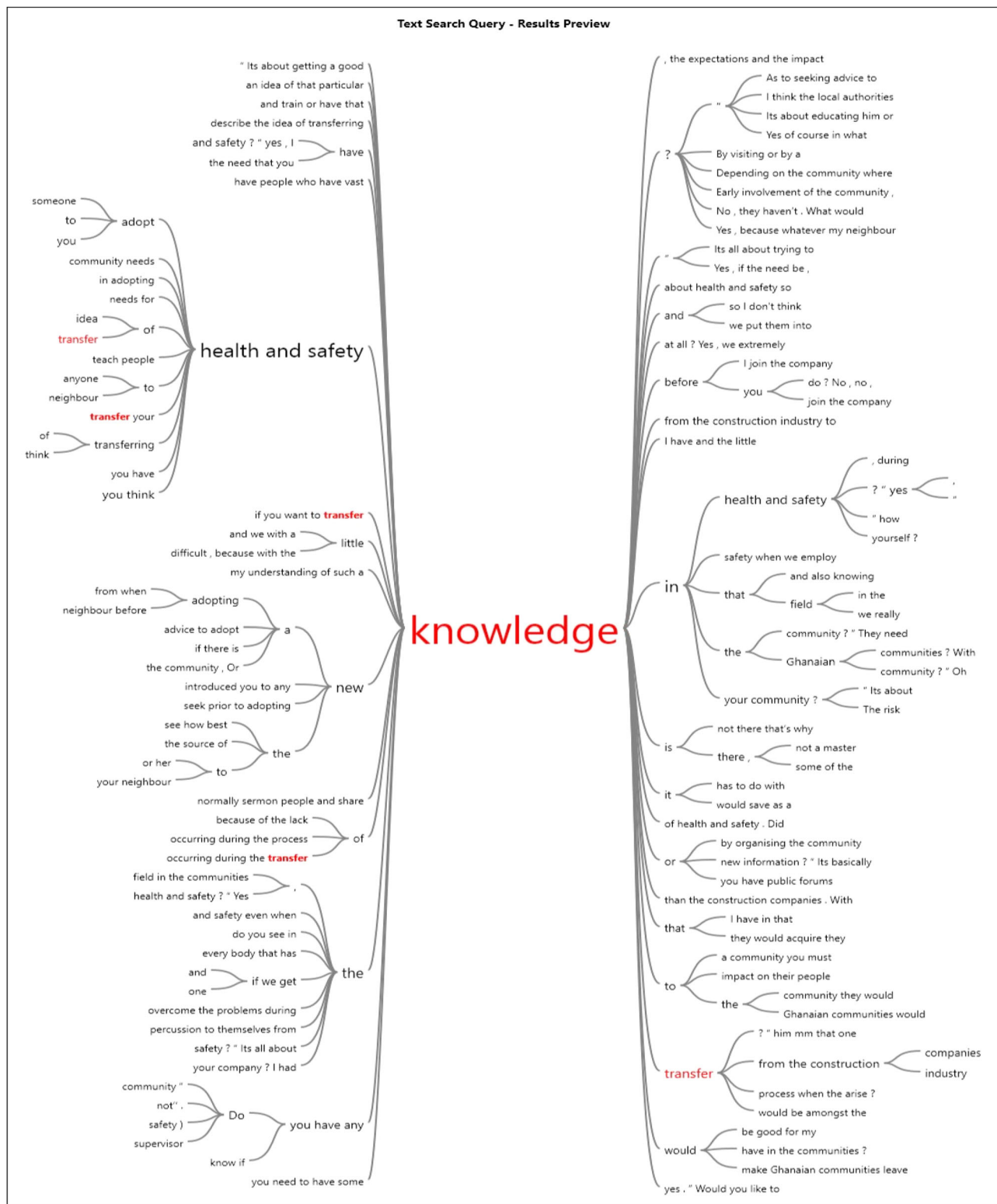


Figure 2. Text search query results extracted by N Vivo 10.

emergencies. (INT –6)'. The finding of this study is consistent with Rogers (1995), who posited that knowledge starts when a decision-making unit is exposed to new knowledge and understands how this new knowledge works. Therefore, the most important thing is to expose the Ghanaian citizenry to construction H&SK to understand and employ the same in their daily activities.

Theme 2: decision to adopt H&SK

The study sought to understand decisions that would inform the adoption of H&SK amongst Ghanaian citizens. All the respondents agreed that construction companies H&SK introduction into the Ghanaian communities would positively influence their lives. One of the interviewees noted, "The challenges that you face to

H&S even when the knowledge is there, but some appreciable percentage can say 60% will be able to (INT-2)'. Another interviewee summed it all up by saying that H&SK adoption 'Depends on the individuals, but I believe we can do it, we have the ability to implement H&SK. It would help us in so many ways (INT-3)'.

Theme 5: H&SK confirmation

The study went further to determine the wiliness of Ghanaian community members to share new knowledge with their neighbours. The responses found that Ghanaian community members are willing to share H&SK with their neighbours. Responding to a question on this, an interviewee had this to say. 'Yes, of course. In whatever form I would introduce them (INT-4)' Another answering the same question said: 'Yes because whatever my neighbour does may have a repercussion on me as a neighbour, I would definitely introduce my neighbours to H&S (INT-10)' Individual willingness to share knowledge is the beginning of transferring knowledge from one point to another. This is a critical determinant of successful knowledge transfer because knowledge transfer thrives on networking. e.g. personal networking, community networking and social networking (Williams et al. 2018).

Theme 6: Sources of information in the Ghanaian communities

This section seeks to elicit information from the participants about where and how they are often introduced to new knowledge in their Communities. As a response, one of the participants said:

'It is basically through the people in the community, many at times in the community there are opinion leaders, we also have some elders in the community (INT-8). Rogers (1995), posited that the opinion leadership position is gained and maintained by technical competence, social accessibility, and adherence to the system's norms.

In summary, it is interesting to note the findings of this study agreed with Rogers (1995). This author theorised that individuals predisposed to new knowledge will adopt an innovation earlier than those less predisposed. Williams et al. (2020) argued further that the intrinsic influences of a successful knowledge transfer are person-specific. Because all persons have different absorptive rates, some can codify and understand new knowledge faster than others (Figure 4).

Stage by stage knowledge transfer framework (SSKTF)

It has been discussed earlier in this work that H&S practices amongst the Ghanaian Community is low. Accordingly, such poor H&S culture amongst the Ghanaian citizenry has been with them for a long time. Therefore, changing such a culture will require an excellent systematic effort over time and education to reverse such a culture. Hence, a stage-by-stage knowledge transfer and diffusion framework are advanced.

The independent variable in the conceptual framework adopted by this study in Figure 1 was tested during data collection to see its applicability in the Ghanaian context. From the findings, actors such as socialisation, externalisation, combination and internalisation as theorised by Nonaka and Takeuchi (1995) were identified as knowledge transfer processes from the construction industry to the community. Again, as theorised by

Rogers (1995), persuasion, decision implementation, and confirmation were also identified as the stages Ghanaian community members would go through in deciding to adopt or reject H&SK. Hence, these stages were retained as the main elements of the framework.

The framework approach

Before describing the framework elements, it is imperative to emphasise that the required time to accomplish the transfer process using the proposed framework relates to the effort and time employed by the change agent.

The stage-by-stage knowledge transfer framework (SSKTF) should be implemented, bearing in mind two considerations: the source of the H&SK (transfer Unit Process) and the adoption unit (Adoption & diffusion process). Each consideration carries a message. Whereas the transfer stage (aims to enhance the foundation of awareness and the introduction of H&SK and its onward transfer within a section of the community members. The adoption & diffusion process seeks to embed the culture of H&SK sharing and to enhance its practice as their way of living. Both approaches have the same goal and interlink and serve the same function of creating a culture of knowledge transfer and sharing the results for creating safer Ghanaian communities. the socialization, externalization, combination and internalization processes as shown in the framework are the stages the construction companies would go through in sharing their H&SK with the members of the community members. Also, persuasion decision implementation and confirmation are the processes the community members would go through before deciding to adopt or use the H&SK being introduced to them.

The SSKTF proposes that the community members must first come into contact with the H&SK Socialization (the first persons to come into contact with the H&SK). This group of persons must be persuaded of the advantages of H&SK, its compatibility with their cultural norms and values for them to be able to decide on the implementation of H&SK on trial bases. From the socialization stage is the externalisation stage where persons close to the first group also become aware of the H&SK. Combination stage is where more community members become aware of the H&SK and lastly internalization stage where efforts are made to bring the last group of the community members into the transfer process. This group would only adopt when they see others making use of the H&SK. In all these stages, they would all have to go through the adoption and Diffusion processes as described earlier before adoption hence the interlinkages in the framework.

Health and safety knowledge transfer stages

Socialisation

Socialisation is when the construction workers and the community members create and exchange knowledge through guidance, imitation, and observation. Construction companies should first employ skilled and unskilled labour from the community intended for the new knowledge transfer. They should also use local community members in and around the construction site and representatives of the community leaders on the project team. The community leaders should liaise with the community and the contractor to make them aware of the planned program. At this stage, the local employees and community leadership representatives who serve as the agent (innovators) must be trained in H&SK per the construction company's policies.

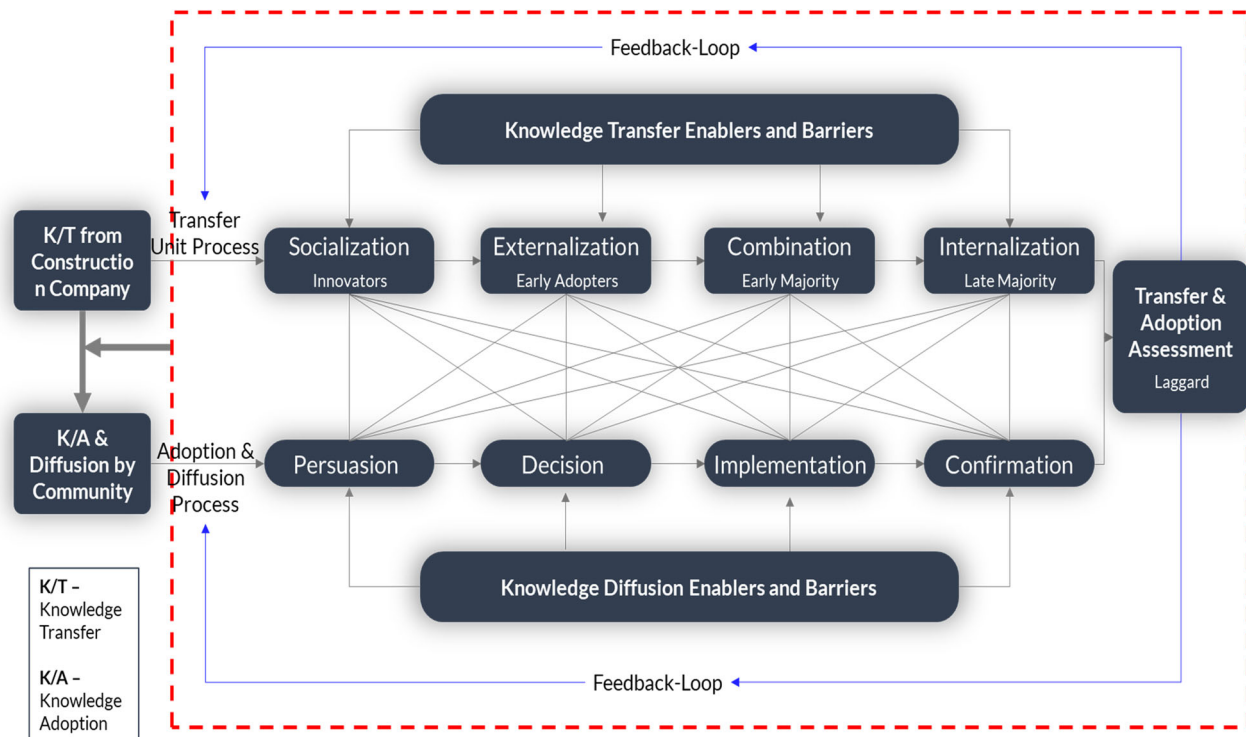


Figure 4. Stage by stage health and safety knowledge transfer framework.

Externalisation

At this stage, the innovators and the early adopters representing the construction companies should join forces with the community and religious leaders in organising social groups to propagate H&SK.

This is the stage where the first group's families, the innovators, having also received H&SK, and are encouraged to go and transfer their acquired knowledge to their friends, neighbours and colleagues. Through the organisation of fora to speak to the community members, visit churches, mosques, schools, and floats through the community's principal streets to propagate the planned transfer. This is where construction workers share their experiences with the community members, resulting in transferring their tacit knowledge into the explicit knowledge of the community members.

Combination

Groups meet to discuss, share, and learn something new or innovative. Therefore, having gotten H&SK, group members meet to discuss amongst themselves to see the benefits it has brought to their existing ways of doing things. At this point, they can discuss amongst themselves to further enrich their understanding of their peers' perspectives. They can reinforce or reject the new knowledge depending on individual conviction, thereby sharing explicit and explicit knowledge.

Internalisation

More people are brought into the planned transfer program at this framework stage. This can be done through meetings with the community members, celebrating safety weeks, conversations, and integrating the workers into the community. Both the community member and construction workers share experiences, resulting in sharing explicit knowledge to tacit knowledge between themselves. This is the point at which many more

community members who are yet to be exposed to the H&SK are eventually exposed, leading to their adoption of the new knowledge.

Health and safety knowledge diffusion stage

Persuasion

The persuasion stage is when the community members, having been aware of H&SK, would start asking questions about the benefits of H&S to their existence. The construction company has introduced H&SK to the community at this stage. Construction companies should make every effort to let the community members see H&S compatibility with their cultural norms and values. They should try to present to the community members the advantages of H&SK adoption. They should make sure the people are carried along.

Decision

At the decision stage, individuals in the community are going through the mental exercise of accepting or rejecting the H&SK being introduced to them. At this stage, it is only the individual's action and sometimes in consultation with their friend, families, neighbours and respected people in the community who they perceive as being knowledgeable, capable and trustworthy in their judgment to seek advice from them. At this stage, the construction company would have introduced H&SK to them, demonstrated the relative advantages of H&S in their lives and laid bare the cultural compatibility of H&SK to their cultural norms and values.

Implementation

This stage is vital because as the education and awareness increase, people would begin using the new knowledge on a trial

basis. At this point, the mental exercise of retaining the knowledge or rejecting it is ongoing. So, construction companies must drive home the importance and the need to maintain H&SK.

Confirmation

Confirmation in this framework is where the community members try to reinforce the transferred H&SK. At this point, the construction companies should make a deliberate effort by rewarding safe working employees in the community while giving incentives to some community members who have also implemented H&S practices to a large extent. This should be at the recommendation of the community members on the project committee and the social groups formed in the community. These would go a long way to motivate others who want to be recognised in the same way and serve as the tipping point of the entire process.

Assessment of the transfer program

This is the stage at which the construction company measure the transfer process's success and the rate of adoption. This can be done by using a questionnaire to measure the success of the transfer and the number of people who have adopted the H&SK. To determine the rate of adoption as feedback while efforts are made to bring in the rest of the community members who would be waiting to see the result of the H&SK on those who have already adopted and implemented the new knowledge.

Validation of the stage-by-stage knowledge transfer framework

Eight professionals working with KID1 construction companies validated the framework developed in this study. There were two quantity surveyors, two civil engineers and four architects. Two of the participants also double as lecturers in two universities in Ghana.

The first question posed to the focus group discussants was, 'Does the framework provide an adequate process for transferring H&K from the construction industry to the Ghanaian Community? If YES, how is this indicated in the framework? If NO, kindly explain why and show how this can be achieved. The aim was 1. To identify to what extent the framework is clear in terms of its interlinkages in the knowledge transfer processes. 2. To ascertain how easily Ghanaian contractors can implement the framework. 3. To determine their understanding of the framework and obtain their inputs, if any.

All eight participants agreed that the knowledge transfer processes are clear and their interlinkages are easy to understand.

One of the participants stated: 'Yes, I see this to be a perfect framework if only it would be effectively implemented. Taking the community through the stages of socialisation, externalisation, combination, and internalisation will enable them to understand and use the framework to their advantage'.

Another participant said: 'Yes, it produces a necessary stage of knowledge transfer that can be absorbed by all and sundry irrespective of their level of education. The socialisation, as well as the internalisation steps, make it very possible for the transfer of knowledge between different classes of working groups'.

The second question was: 'Does the framework provide an adequate knowledge transfer process to enable contractors to transfer their H&SK to the community? If YES, how is this

indicated in the framework? If NO, kindly explain why and indicate how this can be achieved'.

This question is aimed at investigating if the knowledge transfer processes in the framework are easy to identify and whether they are adequate and fit for purpose.

All eight participants responded that the knowledge transfer processes are easy to identify. One of the participants noted: 'Yes. There could be more processes to transfer knowledge, but these provided in the framework are exhaustive. If these transfer factors are run through the various processes, they tend to give it more voice and substance at the various stages or processes'.

The third question was: 'Does the framework provide adequate processes for making H&SK decisions before adopting or rejecting it by Ghanaian community members? If YES, how is this indicated in the framework? If NO, kindly explain why and indicate how this can be achieved'. Exciting discussions arose on each decision-making process together with the linkage.

All eight participants identified the four stages as influential and practical in real life. One of the participants had this to say: 'YES; the framework provides adequate processes of H&SK diffusion in our communities. It makes things simple for the community members to decide whether to adopt or reject the knowledge that is being transferred'.

The fourth question was, what is your assessment of the application of the framework? This was to be answered with one of the following three optional statements: 1. Easy to implement by contractors 2. easy to implement by academics 3. Very practical.

Five out of the eight participants said that the framework is very practical to implement by the contractors. Three also chose the first optional answer, which says the framework is easy to implement by contractors. Three of the participants in academia noted that the framework would be easy to implement by academia.

Conclusion

In conclusion, construction projects negatively impact communities in and around the project catchment wherever they occur. Hence this study's objective was to develop a framework to help construction companies transfer their H&SK to project host communities as their CSR. The objective was met. The study provides an innovative way of creating H&S awareness in Ghanaian communities by construction companies and provides ways by which construction organisations can carry out their CSR more cost-effectively. Through the framework advanced by this study. The study concludes that H&S practices are compatible with Ghanaian cultural norms and values. Ghanaian community members can assimilate and implement H&SK in their daily routine. However, the implementation depends on individual capabilities. It also concludes that Ghanaian citizens are willing to adopt and share H&SK with their neighbours.

Therefore, Construction companies in Ghana and countries alike should adopt the framework put forward by this study as a guide to help them overcome their CSR challenges by transferring their valuable (H&SK) to give back to society and report the same as their CSR.

By so doing, these companies would be seen as good corporate citizens and become part of the community; this would make them feel welcome in these communities while getting a peaceful atmosphere to carry out their projects in harmony.

Theoretical implication: This study contributes to knowledge in external knowledge transfer from the construction industry to

the community. It also contributes to knowledge transfer and management studies by providing one of the complex social systems (the construction industry) the avenue to transfer and diffuse knowledge smoothly between two social systems (construction industry and the community).

Implication for practice: The knowledge transfer process in this framework should be integrated into the overall project planning to prevent the obstruction of other project activities. Management should make sure allocation is made for the employment of the community members and adequate training given to them in H&S to champion the whole transfer process.

Academia: the framework developed in this study would influence the teaching and learning of external knowledge transfer from the construction industry to a different social system.

Society: This research provides an innovative way of disseminating or creating H&SK awareness amongst Ghanaian citizenry to help prevent domestic, industrial and institutional accidents while improving their well-being.

Recommendation for Further Studies: Further study should be conducted on the construct linking the knowledge transfer unit and the adopting unit processes to understand their actual linkage and dependency. Further study should also be undertaken to understand the exact time or duration a construction company would take to transfer and diffuse H&SK into project host communities.

Limitations

The limitation of this study was that there were inadequate persons with (H&SK) in the Ghanaian communities to appreciate better questions posed to them and give valid answers. Also, this framework can only be implemented in long-term projects. Further, this study was conducted in a developing country; hence, it can only be adopted in developing countries with similar attributes.

Disclosure statement

No potential conflict of interest was reported by the authors.

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