

The Practice of Communication of Health and Safety Risk Information at Construction Sites in Tanzania

Sarah Phoya

Lecturer, School of Architecture, Construction Economics and Management, Ardhi University P.O. Box 35176, Dar es Salaam, Tanzania. Tel. +255 22 2775929. Mob +255754373321,

Abstract

Many workers in construction sites are still subjected to high health and safety risk despite of various efforts which are in place. However how workers in construction sites are informed on health and safety risks is obvious important factors in implementation of initiatives. This paper therefore aimed at understanding communication mechanism of health and safety risk information in construction sites. The essence is to examine what methods used for communication of risk information, the nature of these senders (communicators) and receivers (workers), the context of risk message and challenges on risk communication. A multiple case study strategy was adopted in this research whereby six large on-going construction sites were selected basing on convenient sampling techniques. Within the site, structured interview and focus group discussion were used. Non-participatory observation was also used to collect data. The study reveals that multiplicity of communication channels and methods play out simultaneously in communication of risk information within construction sites. However, toolbox meeting was predominantly methods. This being the case, the environment for conducting effective toolbox meetings remains a challenge on many sites. On the other hand, site officers were the main senders of communicating health and safety risk information to the workers. However, the quality of the sender in terms of health and safety skills as well as experiences was found to influences health and safety risk communication. The findings provide the basis for suggesting areas where employers and managers can make interventions to enable safe and healthy working specifically focusing on risk communication.

Keywords: Construction sites, communications, Health and Safety, Risk information

I. INTRODUCTION

Workers in construction projects are subjected to high health and safety risk factors when they perform their tasks. As results, there has been an increase of high number of accidents and ill-health problems in construction sites. With an increasing concern of reducing accidents and ill-health

problems in workplaces, it has been well-known that the most effective way of improving safety performance is preventing accidents and reducing uncertainty before it happens [1]. Communication of occupational health and safety information is critical to health and safety risk management [2] [3]. Through risk communication, project participants are informed and educated about risk and control measures, learning safe work practise and proper use of personal protective equipment, bring about attitude and behaviour change on risk perception, warned about disasters and given emergency information [4]. Communication also provides workers with ways to obtain added information about potential risk and their control. Therefore effective health and safety risk communication can improve performance of health and safety management in construction sites as well as performance of projects.

To achieve the foresaid health and safety performance, many initiatives have been implemented. For example in Tanzania, different regulations such as the Occupational Health and Safety Act, 2003; the Contractors Registration Board (CRB) Act No. 17/2010; and the Employment and Labour Relations Act (EALRA) No. 6/2004 have been formulated. In these regulations, the communication of health and safety risk information to the employees has been the cornerstone. They require every employer to provide information on: the potential health and safety risks, preventive and protective measures for those risks and emergency procedures to their employees. While the number of studies have focused on communication of health and safety risk information in construction [5], [6],[7],[8]-[9], however, there is a still a limited knowledge of health and safety communication in construction sites in sub-Saharan African countries. On the other hand, many studies focused on challenges facing migrant and minority ethnic workers in the context of developed countries whereby language became critical barrier for risk communication. This paper therefore contributes to the understanding of the practice of communication of health and safety risk information in construction sites in Tanzania. The paper specifically focuses on methods used to inform workers about hazards and

risks, how risk message are created and how workers respond on the communicated messages and what challenges encountered in communication of health and safety information

II. LITERATURE ON RISK COMMUNICATION

A. Risk communication definition

The definition of risk communication is multidimensional and nebulous concept as it is derived from multiple fields of inquiry. It is notably overlaps with definitions of and research on crises and disasters. Generally, risk communication has been defined as a process by which information about hazards to human health is shared between those with technical understandings of hazards and those who may become exposed to such hazards [10]. In other word is a social process by which people become informed about hazards, are influenced to change their behaviour and are enabled to participate in decision-making about risk issues [11], [12]). In accord with this definition, there is a general consensus that risk communication is an exchange of information between communicator(s) and recipients of the messages, leading to a better understanding and better decisions on nature, magnitude, significance, or control of a risk [12],[13],[14]-[15] . Other definitions emphasize on actual risks, the perception people have of them and their thoughts and comments and involving different messages and symbols [3], [16]. The definition adopted in this paper is that risk communication as a process of workers being informed about health and safety risk in construction sites.

B. Principles of Risk Communications in construction

The principle of risk communication is embedded in three approaches of communication theory. These approaches include the linear approach, the interactional approach, and the transactional approach [17]. The linear approach advocates that the person is only a receiver or a sender and the meaning is sent from one person to another [18]. In other world linear is regarded as “transmission approach”, which assumed that risk communication need only require the gathering of information about risks from a technical standpoint and the dissemination of that information to audiences [19]. This approach used when one wants to influence behaviour or state of mind of the other. Linear approach is regarded as top-down linear process of delivering message to the general public or workers [13].

The interactional approach of communication accentuates the two-way communication process between the communicators. In other words, communication goes in two directions and meaning is achieved through feedback of sender and receiver

which portray a circular process. On the other hand, the transactional approach underscores the simultaneous sending and receiving of messages in a communicative episode. Under this model the people build shared meaning. Thus sender and receiver are mutually responsible for the effect and the effectiveness of communication [17].

The aforementioned three approaches for communication forms an important part in risk communication, and there is no one approach which overrides the others as it will depend on the purpose of communication. For example linear approach may be used to inform and educate people about the risks or influence workers to adhere to wear personal protective equipment. Interaction approach may be used for encourages risk reduction behaviour by trying to influence perceptions of the audience, disaster warnings and emergency information. The transactional approach used joint problem solving and conflict resolution, which involves the workers in risk management decision-making and in resolving health and safety risks [20]. However, regardless of the purpose used for risk communication, all the three approaches have similar five components. These components include who (*sender*), what (*message*), whom (*receiver*), what channel (*with*) and what effect has to exist in communication [18].

1) Sender

The sender is the person who initiates the communication process and has a primary interest in making sure it's effective [17]. One can say that the sender is the person who delivering the message. In the context of health and safety risk in construction, this person may be supervisors, gang leaders, safety coordinators/officers and site managers [14]. The study of Chan *et al.*, [15] found that the ganger or leader is the bridge between management and frontline workers and have a potential of changing safety behaviour of the workers through communication. Likewise according to OSHA Act of 2003 in Tanzania, require employers to employ safety officers or safety committee on which one of the function is to communicate all issue related to health and safety risk information in construction sites. On the other hand, the study by Kines *et al.*, [3] reveals the potential of co-workers to exchange safety information. What is important from this discussion is that the sender can be anybody who is working at the construction sites. However, to achieve effective communication the sender needs to have health and safety knowledge and the committed to health and safety matters. According to HSE [14] the sender's experiences, attitudes, knowledge, skill, perceptions, and culture influence the message. In this regards, the sender must be trained and have the competence needed to communicate effectively. The receivers' perception of the source/sender influences the manner in which the communication is received,

interpreted and responded to. In other word, sender should design strategies to assist the receiver in understanding the problem at hand. According to Shepard *et al.*, [20] better risk communication should help its recipients to make better choices. Furthermore issues pertaining to trust and power have been identified as critical factors in the construction of effective risk communication strategies [21].

2) Message

The message is simply the information the sender wants to communicate to the receiver [18]. The message is usually verbal, but it can also be non-verbal. Accordingly, a verbal message is expressions made by words or text, which demands a usage of language [22]. Verbal communication can be oral, such as a conversation, or written letters. Nonverbal message is considered as all of a human being's responses, e.g. facial expressions, body language and glances, which are identified as the act of giving or exchanging information without using spoken words [18]. In the risk management context, audience should comprehend the message. Thus reading level, feelings about the risk, and experience with the hazards are important factors. To influence comprehension, the message needs to be coordinated, concrete, and consistent all the time, accurate, continual, and creative and contact making [23]. The language and the word have profound influence of outcome of safety communication. The need of choosing positive word can draw different response [20]. In this view the risk message need to demonstrate trustworthiness and an open, responsible, and caring attitude.

3) Receiver

The receiver is the individual to whom the message is directed. According to Sheppard *et al.*, [20] commented that the extent to which this person comprehends the message will depend on a number of factors, which include the following: how much the individual or individuals know about the topic, their receptivity to the message, and the relationship and trust that exists between sender and receiver. All interpretations by the receiver are influenced by their experiences, attitudes, knowledge, skills, perceptions, and culture. Effective communication is more likely when common ground or shared meaning or understanding exists or has been established between the sender and receiver.

In the construction sites the intended receiver is construction workers who are working in different activities in the site. Moreover, the workers are classified in four groups according to skill unskilled, Semi-skilled and Skilled. Several studies have indicated that majority of construction workers in Sub-Saharan developing countries have little

education [24]. Furthermore, it is noted that with increasing nature of subcontracting, majority of the workers are employed on casual/ temporary contract [24]. The study by Okoye, *et al* [25] reveals the correlation of causality and safety behaviour of the workers. Thus, the more employment system is being casualised in construction industry the more construction workers exhibit unsafe behaviours on site. In this view, the communication has to focus on changing workers behaviour on health and safety matters.

4) Message feedback

Feedback is the reaction the receiver has after seeing, hearing and/or reading the message [26]. In other word, feedback is regarded on how receiver responds to risk information which has been provided to them. These reactions can range from non-observable actions such as storing information in memory to taking immediate actions such as ordering a product seen, tone and body language when they give feedback. To improve safety communication, management should encourage feedback that provides cues notifying if explanation or clarification of safety issues is required [14]. Two way communications is also a valuable source of practical safety improvement ideas provided by site staff. Management should actively listen to site staff and aid them to provide feedback in a non-confrontational manner. This involves listening to message content, and actively responding to the message in the context intended by noting all verbal and non-verbal information cues provided during feedback [26]. However there is argument that how audiences perceived risks played a major role in how willing they would respond to the information [14], [20].

C. Channel and Mode of risk Communication

Channels are physical means by which signals are transferred [17]. Otter & Emmit, [23] have classified communication channels into three main fields: written (letters), electronic and oral. An example of written communication can be written correspondence such as letters and posters, safety manual, books. Email and fax are examples of electronic channels. Effective written messages are those that are short, use lay-language, do not capitalize on the public's fears, explain how risks were estimated, and provide risk comparisons. Notice boards should use to transmit information of short-term importance such as general safety performance, hazard refresher information, accident and incident report summaries, procedure updates, minutes of safety review meetings and safety inspection reports. Written circular/brochure that informs workers about the risks associated with their work has been deemed to be important to improve health and safety performance [27]. Newspapers and

safety newsletters play a major important part of written communication on health and safety risk especially if one wants to provide detailed safety information to employees. Safety signs and signals are also the example of communication methods of health and safety information in construction sites. According to the OSHA act 2003, employers are obligated to provide safety signs if there is no way of completely controlling a particular risk and the workforce needs to be warned of the presence of that risk. Signs need be placed in strategic locations so they can be seen and read easily.

Conversations or meetings such as toolbox or safety committee meetings are example of oral communications [9]. Accordingly, oral messages have the advantage of getting immediate audience feedback, moreover, these messages can easily be misunderstood if are not effectively communicated. HSE [14] highlighted the need for health and safety information to be verbally communicated to workers before changes are made to the way their work activities are executed. This communication can be face to face. The study done by Chan et al, [9] found that health and safety information communication was mainly through morning briefings, safety trainings, toolbox talks and informal discussions. However to have effective model of communication, the sender pay an important role [3].

D. Challenges on communication of health and safety.

The numbers of study have identified challenges affecting effective communication of health and safety information in construction sites [28], [29], [14]. Vecchio-Sadus [28] conducted a research on enhancing safety culture through effective communication in Australia. She found that lack of knowledge, lack of attention to details, unclear goal, selective listening, lack of empathy, self image, status prejudice, accents and differing perception are among the barrier for effective communication. In the same line of thinking Cigularov et al [29] on the study on the effects of error management climate and safety communication on safety: a multi-level study in USA found that supervisors such as foremen and gang leaders are posing pleasure to the employees which affected effective communication. Other challenges were reported by HSE [14] such as power conflicts, mistrust between sender and receiver, poor working environment and disturbance such as noises. Language barriers were also reported [9]

III. METHODOLOGY

The research used a multiple case study strategy whereby six large on-going construction projects

were selected basing on convenient sampling techniques. From each site, 20 workers were selected forming a total of 120 workers. Also twenty two (22) Safety offices and thirty (30) gang supervisors were also sources of data. Structured interview was conducted by a researcher personally asking the questions and recording responses with little scope for probing these responses by asking supplementary questions to obtain more detail to pursue new and interesting aspects. This was complemented with focus group discussion. The interview began by profiling the respondents in terms of their level of involvement in construction, gender, level of education, construction-related qualifications and experience, age and employment status, part two focused on communication process, and how they were involved on risk communication, how they plan to communicate, what methods they use to communicate and what challenges they face in communicating health and safety risk. Non-participatory observation was also used to collect data. Observation was made to describe the nature of communication process in the sites, for example, the arrangement of toolbox meetings. Note-taking and simultaneous recording helped to document generated interview data. Interview transcripts were manually coded for responses to communication-related questions.

Challenges mentioned by the workers on risk communication were ranked using 5-point likert scale in term of extent of challenge affected them as follow: very high, high, moderate, little and very little (on 5 to 1 point scale). The collected data were analysed using Statistical Package for Social Sciences and Relative Importance Index by using formula (1), the formula is used to rank the challenges facing the communication of risk information by

$$Importance\ Index\ (\%) = \sum a (n/N) * 100/5$$

Where; a is the constant expressing weighting given to each response (ranges from 1 for very little up to 5 for very high), n is the frequency of the responses, and N is total number of responses (120). The importance index for all factors was calculated.

IV. FINDINGS AND DISCUSSION

A. Demographic characteristics of the respondents

Results revealed that majority of respondents (72%) were men and majority 63% had ages ranged between 20 and 45 years. In term of education background, the results show that majority of the respondents (72%) had only primary education level and they had acquired their skills in construction informally on the sites. The scenario above shows

the extent of involvement of unskilled labours in construction industry.

In term of practical experience, the finding reveals that more than 70% of the respondents had practical experience of more than five years. Some reported that they acquired health and safety skills from different sites as they were working. The same findings were reported during the interview with one of the respondent said that:

...” ...”*Before I come here, I was working in another construction site where we had a proper safety system. We had people from South Africa and gave training on how we can simulate the nature of health and safety situation within the sites. Now I am using that experience in this project.*

The aforementioned quote illustrates the contribution of workers’ prior experience on health and safety risk knowledge and ability to use it in future. Practical experience has been pointed out as a profound factor for perception of risk [30], [31]. Sometime the risk perception may be negative as the confident and Superman syndrome may be influence some workers to practice unsafe act/behaviour [9]. This underscore that not always the practical experience have influence positive risk perception of the receivers, therefore there is a need tested before the communication of health and safety risk information made. Nonetheless; to what extent informal training from experiences covers the all aspect of health and safety on construction sites warrant further investigation.

B. Communication the sender and receiver

The finding reveals that that health and safety information was communicated either through safety officers or gang supervisors. Thus safety officers and gang supervisors were the main sender of health and safety information in construction sites.

During the interview, in one of the site, safety officers claimed that there is weak commitment and collaboration between gang supervisors and safety officers regarding to safety matters. Emphasis this, the safety officer said

“We normally communicate to the workers on important of wearing personal protective equipment all the time while they are in the site. Surprising when you go around for inspection you find some of the workers are not wearing PPE and their supervisors allow them to continue working without PPE”.

Further discussion in the focus group reveals that there was a clear separation of responsibilities between gang supervisors and safety officers when communicating with workers. While the safety officers communicated health and safety issues to workers, gang supervisors have to communicate quality and productivity. However during the observation it was revealed that supervisors were focusing more on meeting deadlines while health and safety issues were compromised. In some sites,

supervisors allowed workers to work without any personal protective equipment (PPE) claiming to keep time schedules. This finding is contrary to what have been found in study of [3] on improving construction site safety through leader-based verbal safety communication. They ascertain that group influence, both at the foreman and work gang level, likely plays a large role in behaviour and attitudes. The study Dingsdag et al., [32] and Cigularov et al. [29] provides evidence that foremen/supervisors have a stronger influence on construction workers’ safety attitudes than the workers’ colleagues. While supervisors seem to be the platform for shaping workers behaviour and attitude to risk issues, this has not been the case in Tanzania construction sites. Supervisors are concentrating more on information on productivity rather than safety information. This challenge has been reported also by Wadick [33]. The issue of risk perception, pressure of the work seems to influence this habit.

During the interview, workers were asked why they did not follow what have been instructed by safety officers on wearing all necessary PPE. One of the workers lamenting that;

‘Sometimes you need to come early in the morning and you had assignment which we did not finish yesterday. So when we come to the site we go straight to the working area as we already know our task and you have a lot of pressure from supervisor to finish the task’.....

“So going to safety office collecting PPE it takes long time and wasting our time”.

Another worker on emphasizing the pressure of finishing the task early, said;

What we agreed with our supervisor is piecework. Therefore the supervisors will authorise our payments when we finish the task. If we finish early we will get paid early

The foresaid finding portrays that supervisors had financial as well as expertise power which influence workers to listen to them. Thus workers have followed supervisors’ instruction rather than safety officers’ instructions. The power relation on risk communication has been argued to barrier for effective communication [16], [21], [33].

Moreover, trust was observed to be an important aspect in risk communication. An environment of trust and close relations was observed in different groups in two projects. The scaffolding teams were free to explain their daily situation to the safety team and supervisors. Therefore, it would seem a fair assumption that if one does not trust their co-workers, they may also not trust the risk messages they may present. Thus trust was important for workers to participate in health and safety risk communication. The finding is in corroborates argument with [21] that the active participation of

site workers in health and safety induction meetings depends on the working relations that exist between the owner/manager and his employees. Therefore, it would seem a fair assumption that if one does not trust their co-workers, they may also not trust the risk messages they may present.

C. Communication methods

The finding reveals that health and safety information was communicated through the main health and safety communication method is the toolbox meetings, informal discussion, written posters and symbols. However it was noted reported that toolbox meetings were the leading method used to communicate health and safety risk information.

During the interview regarding when do the toolbox meetings take place, one of the safety officers said;

Workers come early in the morning and they have to register at the gate (security). Every day they have to register stating at 7.00 am in the morning. At 7:15 they assemble at the meeting place. On Monday, Wednesday and Saturday we talk with them on health and safety issues. The main issue we discuss at the meeting is reminding them that there are a lot of hazards on the site, the importance of them wearing person protective equipment (PPE) all the time, keeping the sites tidy and reporting any incidents or accident

Further discussion during interview reveals that, two projects reported to use lunch talk meetings to communicate health and safety to the workers.

Through listening to some of the health and safety issues discussed at the toolbox meetings, it was revealed that workers were reminded about health and safety risks on construction sites and the importance of them wearing appropriate personal protective equipment (PPE) according to their task and to take care of the PPE. For example, scaffold workers, external plasterers and painters were obliged to wear flexible safety harness in addition to hard hat, overalls and safety shoes. Those working in dusty areas were reminded to wear masks and those doing manual handling were reminded to wear strong gloves. Workers were encouraged to report incidents and accidents to safety officers, and were also reminded of the punishment actions if they did not adhere to health and safety matter.

In one of toolbox meeting one safety officer as the following citation from one safety officer illustrates;

“if you are found not following health and safety instructions, you will be given a written warning, and if you have received three written warnings you will be dismissed from this site”

The above quote illustrate that some toolbox meetings were used to insist workers to conform to safety matters as communicated to them, also the consequence which will happen to them if they did not adhere to. This finding illustrates the linear approach whereby the intention was to change human attitude or behaviour. As discussed by

Cigularov *et al* [29] that cognitive efforts are required to change behaviour of the employees on taking risk seriously. Such efforts are a combination of positive approaches intended to “buy” support, such as rewards for those who comply with risk messages, and negative approaches, such as reduced work hours and dismissal, for those who do not comply. Figure 1.1 indicates one of the toolbox meetings in one site.



Figure 1: Safety officers communicating with workers at the toolbox meeting. Source fieldwork June 2015

From Figure 1 indicates that toolbox meetings cover a wide range of workers illustrating that many workers will receive the same message at the same time. Further observation reveal that some of the workers were not tentative listening to what have been communicated and they were doing different things such as talking with phones or taking to nearby friend. These finding are corroborate what Vecchio-Sadus [28] found as barrier for effective communication. On the other hand, assembly area was confined and was not shaded which affecting effective communication. Furthermore, the voice of the senders in some of the sites was very low compared to large group of workers, and this has challenging the communication of the workers (receivers). Further observation reveals the destruction of noise around the assembly area which also has impact on communication.

The finding underscore that despite toolbox meeting being the platform for educating large group of workers on safety risk, however it has profound with many challenges. Therefore focusing on addressing these challenges is essential. Apart from toolbox meeting, other methods such as posters, symbols were used for communication health and safety risk information. Figure 2 present one of the poster placed in one of the construction site.



Figure 2: A sample of safety information in one of the poster place in construction site.

Figure 2 indicate that the poster was practically written in easily readable letters and with eye-catching colours. The aim of the communication was educating purpose as information provided in the poster required workers to adhere to safety rule since the construction activities is dangerous

Responding to the question on which strategy or means of communication they preferred most, workers responded variably. However, toolbox meetings were highly preferred by both workers and safety officers. In these meetings, communication was face-to-face and interactive. Meanwhile, workers were allowed to ask questions while in some cases safety officers used workers to simulate and demonstrate a situation on which they can be harmed by health and safety hazard in sites. These demonstrations inspire workers to hear and see situations in which health and safety can cause accidents. It was further noted that body language and facial expressions, touching and tone of voice, eye contact as well as less obvious messages such as posture and dressing code in face-to-face communication engendered feelings and the extent of expected impact of risk. This finding is conforming to what Chan *et al* [9] found that oral messages have the advantage of getting immediate audience feedback.

D. Response to the communicating message

After toolbox meetings the researcher had an opportunity to walk through the site and observe on how workers responded to the message communicated in the toolbox meetings. Through observation, it was revealed that while some of the workers were wearing a full set of PPE, several of those who were provided with sets of PPE were not wearing them. The researcher wanted to know why they were not wearing their PPE, they responded that it was due to discomfort, hot weather in Dar es

Salaam and work pressure from supervisors as one of the workers remarked;

“This activity is stressful and we have a lot of pressure from our supervisors to finish this task. We work almost eight hours non-stop because we are required to finish in pouring concrete in this slab. We started at 8.00am and we are expected to finish around 3.00pm. With this heat we need good respiration, and feeling energetic while we are working. That why some of us we are bare-chaste”.

The aforesaid quote suggest that despite workers being informed on risk information, some of them did not implement what was communicated to them. Their reason reflects their risk perceptions. Hot weather and discomfort have been used as an excuse for not wearing PPE regardless of the information been provided to them and the importance of wearing PPE. Because of this, it is important to design the communication tools which will be able to change behaviour or influence perception of workers by considering their safety first instead of work first. Nonetheless, the pressure from supervisors is challenging the implementation of the risk information. Supervisors’ attitude towards safety issue has an influence on workers attitude [32]. The foresaid excuses existed because supervisors were not committed. These again underscore the importance of collaboration between safety officers and gang supervisors on workers safety.

In a focus group discussing ten challenges on risk communication availed. Workers were asked to rate the challenges. The results is indicated in Table 1

TABLE 1: RANKING OF CHALLENGES OF HEALTH AND SAFETY COMMUNICATION CONSTRUCTION SITE.

Challenges	Mean	IRR	Rank
Confined environment (spaces) for toolbox meetings	4.12	82.4	1
Senders factors (Low voice, credibility,)	3.72	74.4	2
Destructive environment such as noise, dust	3.64	72.8	3
Power differences	3.60	72.0	4
Poor attendance of the workers in toolbox meetings	3.60	72.0	5
Receivers’ factors (ignorance, attitude, not attentive to listen)	3.64	72.8	3
Poor understanding of the symbols and sign placed on the sited	3.08	61.6	9
The individual’s frame of reference=People interpret meaning in ways are shaped by their own frame of references	3.16	63.2	8

Ignorance of workers about rights	3.20	64.0	7
Cognitive dissonance; Receive information which conflicts with established beliefs.	3.24	64.8	6
Cognitive dissonance; Receive information which conflicts with established beliefs.	2.96	59.2	10
Absence of permanent health and safety officers in the construction sites	3.24	64.8	6

Table 1 indicates factors inhibiting the effective communication of health and safety risk information in Tanzania construction sites according to respondents. The factor which was rated most significant is ‘Confined environment (spaces) for toolbox meetings with a mean value of 4.12. The second highest ranked factor was found to be ‘Senders factors (Low voice, credibility). The factor Receivers’ factors (ignorance, attitude, not attentive to listen) and Destructive environment such as noise, dust were the third highest ranked factors. The fourth and fifth highest rated factors were Power differences and Poor attendance of the workers in toolbox meetings. These finding is in line with the finding from observation made by researcher. This underscore that to achieve effective risk communication there is needed to address the challenge mentioned.

V CONCLUSION

This study concludes that linear approach was predominating in communication of health and safety information in construction sites in Tanzania. Much risk information was intended to change human behaviour and attitude toward adhering on wearing personal protective equipments. Safety officers were the main sender of health and safety risk information. Despite gang supervisors have the potential to influence workers attitude on risk information, this opportunity was undermined. Supervisors’ attitude towards safety was low and this has manifested on worker’s feedback of risk information. Much effort of supervisors focused on meeting deadlines as results has culminated power conflicts between safety officers and gang supervisors on risk communication. To achieve effective risk communication the collaboration between safety officers and supervisors has to exist.

Regarding to communication methods, this research revealed that toolbox meetings were predominant methods used to communicate health and safety risk information in construction industry in Tanzania. Toolbox meetings accommodated a wide range of

workers and established a common understanding to a large group of workers. Nevertheless, toolbox meetings were compounded with challenges such as physical environmental where the toolbox meeting were taking places. The assembly areas were not shaded which was challenge during the rain and sunny days. Low voice of the senders inhibits effective communication as only few members were attentive. Loudspeaker/ microphones with more visual simulations such as video clips could be a plausible solution to attract the audience to be attentive.

In the view that toolbox meetings as the platform for educating workers on health and safety matters, the study recommend the future research on investigation of mechanism of designing best practice toolbox meetings. Another further research could on how health and safety risk information can be embedded in the supervisors’ responsibilities.

REFERENCES

- [1] Fung, I.W, Tam, V.W, Lo, T. and Lu, L. Developing a Risk Assessment Model for construction safety; *International Journal of Project Management* 28; 593-600, 2010.
- [2] Hampel, J Different Concept of Risk- A Challenge for Risk Communication; *International Journal of Medical Microbiology* 296; SI 5-10, 2006
- [3] Kines, P. Andersen P, Spangenberg, S., Mikkelsen K.L., Dyreborg, J. D. And Zohar, D. Improving construction site safety through leader-based verbal safety Communication. *Journal of Safety Research*,(41) 399-406 , 2010.
- [4] Argent, P and Forman, J, The Power of Corporate Communication: Crafting the Voice and Image of Your Business, McGraw-Hill, New York, . 2002
- [5] Loosemore, M. and Lee, P. Communication problems with ethnic minorities in the construction industry. *International Journal of Project Management*, 20, 517-524, 2002.
- [6] Trajkovski, S. and Loosemore, M. Safety implications of low-English proficiency among migrant construction site operative *International Journal of Project Management*, 24, 446-452, 2006
- [7] Alsamadani, R., Hallowell, M., and Javernick-Will, A, Measuring and modeling safety communication in small work crews in the US using social network analysis. *Construction Management and Economics*, 31 (6), 568-579. 2013
- [8] Guldenmund, F., Cleal, B. and Mearns, K. (An exploratory study of migrant workers and safety in three European countries. *Safety Science*, 52, 92-99. 2013.
- [9] Chan, Albert P.C., Javed, Arshad Ali, Wong, Francis K.W., & Hon, Carol K.H, ‘Improving safety communication of ethnic minorities in the construction industry of Hong Kong’, In: Wang, Y., Ye, H., Shen, G.Q.P., & Bai, Y. (eds.) *ICCREM 2014: Smart Construction and Management in the Context of New Technology*, American Society of Civil Engineers, Kunming, China, pp. 463-474 , 2014
- [10] Lundgren, R. E., & McMakin, A. H, .Risk communication: A handbook for communicating Environmental, Safety, and Health risks Ohio: Battelle Press, 2004
- [11] Bohrmann, B. A Socio-Psychological Model for Analyzing Risk Communication Process; *The Australian Journal of Disaster and Trauma studies*; 2000
- [12] Covello, V. T, Risk communication: An emerging area of health communication research. In S. A. Deetz (Ed.), *Communication year book* (15) 359-373. Newbury Park, CA: Sage. 1992

- [13] Caccia L.E. Risk communication in the Workplaces: An analysis of the Communication Toolkits as Rhetorical Practice. Doctorial Thesis. Kent State, 2009.
- [14] Health and Safety Executive. Improving Health and Safety: An analysis of HSE's risk communication in the 21st century; Research Report London, 2010
- [15] Palencher, M.L., Heath, R. L., Hocke , T. Corporate (social) responsibility, risk management and communication *Handbook of Communication and Corporate Social Responsibility*, 2010.
- [16] Morrow, B. Risk behaviour and risk communication: Synthesis and expert interviews. *Final report for the NOAA coastal services centre SocResearch Miami*, 2009
- [17] West, Richard and Turner, Lynn H., "Introducing Communication Theory: Analysis and Application (2013 Ed.)" (2013). Books by Marquette University Faculty Book 215, 2013
- [18] Shannon, C.E. and Weaver, W. The mathematical theory of communication. The Bell System Technical Journal, Vol. 27, pp. 379–423, 623–656, July, October, 1948
- [19] Vázquez, R. F., & Stalnaker, K., Latino Workers in the Construction Industry: Overcoming the language barrier improves safety. *Journal of Professional Safety*, (pp. 24-28). Retrieved March 19, 2017, from http://www.hacsc.com/site/osha/Docs/R_E_Reports/0604vasquez.p, 2004
- [20] Sheppard, B. Melissa J, and Brooke L. Understanding Risk Communication Theory: A Guide for Emergency Managers and Communicators,” Report to Human Factors/Behavioral Sciences Division, Science and Technology Directorate, U.S. Department of Homeland Security. College Park, MD, 2012.
- [21] Doloi, H, Relational Partnerships: The Importance of Communication, Trust and Confidence and Joint Risk Management in Achieving Project Success; *Journal of Construction Management and Economics* 27(11), 1099-1109, 2009.
- [22] Knapp, M, “Nonverbal Communication in Human Interaction”. Reinhart and Winston Inc, New York, 1972
- [23] Otter, A.D and Emmit, S. “Exploring effectiveness of team communication Balancing synchronous and asynchronous communication in design teams”. *Engineering, Construction and Architectural Management* Vol. 14 No. 5, pp. 408-419, 2007.
- [24] Ofori G, Nature of the Construction Industry, Its Needs and Its Development: A Review of Four Decades of Research *Journal of Construction in Developing Countries*, 20(2), 115–135, 2015
- [25] Okoye, P.U , Okolie, K.C and Y. W. Aderibigbe, Y.W, Correlation of Casualization Mechanism and Construction Workers Safety Behaviour, *International Journal of Engineering and Innovative Technology (IJEIT)* 3, (9), 135-141, 2014
- [26] Gibson, J.L. Ivancevich, J. M. and Donnelly, J. H. *Organizations: behaviour, structure and processes*. Boston, Mass.: Irwin. , 1994
- [27] Fernández-Muñiz, B., Montes-Peón, J.M., and Vázquez Ordás, C.J.. Relation between occupational safety management and firm performance. *Safety science*, 47, 980-991., 2009
- [28] Vecchio-Sadus, A, M. Enhancing safety culture through effective communication. *Safety science monitor* (Issue 3) Vol 11 article 2, 2007
- [29] Cigularov K. P, Peter Y. Chen P.Y.&, Rosecrance, J. (2010) The effects of error management climate and safety communication on safety: A multi-level study. *Accident Analysis and Prevention* 42 (2010) 1498–1506
- [30] Phoya, S., Eliufoo H., Pietrzyk, K. and Nyström, M.. Assessment of Health and Safety Risk Perception of Site Managers, Supervisors and Workers in Tanzania Urban Construction Sites; Conference Proceeding; Prevention: Means to the End of Safety and Health Incidents and Illnesses; Washington, DC 24th -26th August 2011
- [31] Musonda, I. Construction health and saety (H&S) performance improvement. A Client- centred Model; PhD thesis, University of Johannesburg, 2012
- [32] Dingsdag, D. P., Biggs, H. C., & Sheahan, V. L.. Understanding and defining OH&S competency for construction site positions: Worker perceptions. *Safety Science*, 46(4), 619–633., 2008.
- [33] Wadick, P.. Safety culture among subcontractors in the NSW domestic housing industry. *Journal of Occupational Health and Safety Australia and New Zealand*, 23(2), 143–152. 2007
- [34] Bakir, V and Barlow, M Exploring Relationships between Trust Studies and Media Studies. In *Communication in the age of Suspicion Trust and the Media* (Eds.), V. Bakir and D. M, Barlow 9- 24. UK, Palgrave Macmillan, 2007.