

Knowledge Diffusion to Workplace Safety and Health Improvement

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Abstract

The purpose of this study is to develop a conceptual model of Workplace safety and Health Knowledge diffusion. As workplace safety is becoming a global issue in the competitiveness of the business environment, knowledge diffusion model to workplace safety is found as a mandatory tool to create awareness of the society, and so, conceptual model is developed. Literature review was conducted for collecting data. Different journal articles were reviewed regarding occupational safety and health and knowledge diffusion. The interview and personal experiences are also included in the methodology. Findings show that in today's manufacturing industries, globalization and industrialization have resulted in increasing societal economic development. With this globalization effect, workplace hazards are increased from time to time, and they impose many challenges on society. Some of them are workplace safety hazards, high costs, loss of productivity, and organizational competitiveness advantage. These challenges emanated from the absence of awareness creation. The literatures' finding ratifies that the global occupational safety knowledge diffusion is found to be at its infant stage. The research implementation is conceptual model development process, ideal for developing economies, unless the awareness of the workplace safety will be conducted in line with the model. In practice, the finding solves retiring industry-university linkage, weak top management commitments, and weak awareness scenario of the employees of any organization. In order to censor these workplace safety improvement hampering situations, a clue is disclosed for knowledge diffusion, and the way to diffuse workplace safety and health knowledge is forwarded. Finally, the originality/Value shows that even though existing research studies' contribution to workplace safety is undeniable, many of the studies overlooked the knowledge diffusion process through phase analysis model development. Therefore, this study reveals to fill the gap found in the studies.

Keywords: Occupational safety, Knowledge diffusion, Occupational health, Knowledge management.

1. Introduction

Nowadays, work place safety is considered by World Health Organization (WHO) a priority setting for health promotion in the 21st century (Takala, 1999; WHO, 2010). In order to bring about an accelerated sustainable economic and social development, a country needs to have health and safety-certified workforce to improve productivity. Workplace safety and health impact is one of the main factors for driving economic and social development pillars. Previously, it has been given less consideration due to the fact that the focus was on the short-term profit of business than safe workplace consideration. Thus, workplace safety and health was given less courtesy for a long period of time. International Labour Organization (ILO) and WHO reports indicated that in manufacturing industries, many employees suffer from workplace injuries and property damage resulted in economic crisis (ILO, 2010; WHO, 2010). Safe workplace and safe work is necessary for reducing those sufferings and increasing productivity; hence, promotion

and protection of safe work and workplace is the complementary aspect of industrial development (Takala, 1999). In Sub-Saharan African countries, about 54,000 fatal and approximately 42 million occupational accidents happen annually that results in at least 3-day absence from work of every worker (Tetemke *et al.*, 2014).

The ILO has estimated that the total costs of such accidents and ill health amount to approximately 4% of the world's Gross Domestic Products (GDPs) (ILO, 2006; Kharbanda and Stallworthy, 1998). Limited financial resources and lack of adequate data have hampered the efforts to combat the problem of industrial and occupational accidents in developing countries (Kharbanda and Stallworthy, 1998). This is not only hampering, but also hindering knowledge transfer.

The importance of work place safety is not questionable in the eyes of the professionals and researchers' environment, but the issue in focus is on how to diffuse the knowledge to the whole society. It is shown that many

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studies have not conducted, or carried out research, on diffusion of Occupational Safety and Health (OSH) knowledge to the industrial sectors. Many studies agreed that developing countries, in general, have conducted few research studies on OSH concerns. In order to run intensive studies and continual workplace safety improvement, management and society awareness creation are key elements. As research findings showed, in developing countries, top managements have neglected workplace safety and health impacts on productivity and health though developing countries have cheap labour forces.

Therefore, in order to speed up the research in developing countries, a driver should gain knowledge, and then diffuse it. Output dissemination of these studies has many ways to diffuse knowledge to society. Some of them are published in peer-reviewed journals and to present research at conferences, provide training, and workshops. Traditional OSH knowledge diffusion is time-consuming and is expensive to obtain the source from the publications and journals. Most of the time, these types of resource are used for consumption of professional improvement. Diffusion of scientific OSH knowledge is very fast and time-saving as in interpersonal communications. According to many literature reviews, developing countries have no access to obtain published research studies, unless and otherwise top management creates linkage with higher institutions. There is weak integration, linkage, awareness, collaboration, and culture of using research outputs between higher institutes and industries. This could not be imagined in a developing economy as top management commitment is toward exchanging information than focusing on hardware of the organization.

As a result of few conducted studies, knowledge diffusion and dissemination, or communication channels, are very slow. Sometimes, due to high illiteracy among workers, the safety issue is not even taken seriously by the workers themselves (ILO, 2010; Kharbanda and Stallworthy, 1998). Thus, knowledge diffusion in this study is to mean that the transfer of knowledge regarding OSH principles. New knowledge emerging from research holds great potential to expand horizons and create significant impact. Knowledge translation (KT) is about harnessing that potential and bridging the gap between what we know and what we do (Kharbanda and Stallworthy, 1998).

Thus, in summary, this study identified common problems such as workplace safety hazards, high costs, loss of productivity, organizational competitiveness advantage, and top management awareness. The cause of these all challenges is absence of awareness of how to prevent or minimize workplace safety hazards. The big unruly is the absence of collaboration among universities, industries, and top management commitment to conduct workplace safety and health. In solving these problems, the conceptual model development uses policy,

knowledge, dissemination, enlargement or enforcement, implementation, evaluation, and impact phases.

2. Global Status of Workplace Safety and Health

The fatality rate in Sub-Saharan African countries is 21 per 100,000 workers and the accident rate per 100,000 workers is 16,000 (Takala, 1999). In Ethiopia, rate of the fatal occupational accidents is 5,596 per year with a fatality rate of 21.5 per 100,000 workers and an accident rate of 16,426 per 100,000 workers (Takala, 1999). Accordingly, if people are not safety-conscious, then no gadgetry, safe failure devices, and back-up alarms can ensure their safety (Kharbanda and Stallworthy, 1998; Zewdie *et al.*, 2011). In recent years, occupational health and safety of the workers has improved and has been relatively satisfactory in developed countries, whereas in developing countries, occupational health receives little attention and comes at low level in the list of national priorities (Perrow, 1984). Studies showed that there are baskets of measures providing information on a range of health and safety performances (HSE, 2001; Yessuf *et al.*, 2014). Most business sectors prefer a single OSH performance measurement. It would be optimal if such a measure was to be found, but in occupational health and safety, no such single measure can be completely adequate to measure occupational health and safety (Gallaghe *et al.*, 2001) in solving the challenges.

Many studies indicate that where there are people and complex technologies, there are always safety problems and accidents where these systems are operating (Perrow, 1984). The findings of this researcher conclude that the risk can never be eliminated, but it can be minimized. Again, another study indicate that in developing countries, safety management and measurement is at its infancy (Alkilani *et al.*, 2013; Goldstein *et al.*, 2000; Zewdie *et al.*, 2011). This study concludes that there is lack of government commitment exemplified by the inability to enforce regulations, policies, and legislation. This limits the operational efficiency of government department responsibility for OSH. Most of African countries are noted for poor occupational health and safety practices (Bill and Samuel, 2012; Gyekye, 2006; Peter, 2006). The focus on occupational safety and health practices is less than 1% of organizational and national research issues (Barling *et al.*, 2002). Promoting occupational health and safety practices, such as OSH promotion, OSH awareness, OSH research, and OSH education, require a broader platform (Alkilani *et al.*, 2013; Goldstein *et al.*, 2001; Gyekye, 2006). Majority of African countries have poor health and safety culture (RCAR, 2004). These countries focus more on increasing productivity and profitability due to colonialism and its effects on socio economic development. Such views of people will change upon knowledge diffusion to their workplace and on what they must focus.

Until now, only 24 countries have ratified the ILO Employment Injury Benefits Convention (No. 121), adopted in 1964, which lists occupational diseases for which compensation should be paid, and only 31 have ratified the Convention on Occupational Health Services (No. 161) (Roberto and Leslie, 2014). The adoption of these conventions should be the first step toward the implementation of an OSH system. OSH regulations cover only about 10% of the population in developing countries (Roberto and Leslie, 2014). These laws omit many major hazardous sectors like agricultural and domestic works, typically not considered "industries." Only 5% to 10% of workers in developing countries and 20% to 50% of those in industrialized countries have access to adequate occupational health services (LaDou, 2003; Zewdie *et al.*, 2011; WHO, 2004). Although in a survey among International Commission on Occupational Health members from 47 industrialized and industrializing countries, 70% reported OSH being in place and 80% noted the existence of a national institute for OSH, the estimated coverage of workers with OSH services was only 18% (Hamalainen *et al.*, 2006; Rantanen, 2013). WHO and ILO have elaborated programs to foster the development of international occupational health, but the real effect of this effort is still not optimal, it is likely due to insufficient funding (LaDou, 2003). This lack of funding is not by itself the reason, but globalization and industrialization have a strong impact on development of OSH hazards development. There are many varieties of workplace safety hazards causing factors (Yessuf *et al.*, 2014).

Although ILO is an important reference for OSH standards, conventions and recommendations require national ratification and the lack of ratification and subsequent enforcement undermine the impact of the conventions (Roberto and Leslie, 2014). Moreover, some have criticized the shift in ILO standards away from specific measures with high levels of accountability toward promoting high-level global labor standards that allow for flexibility in application, ostensibly to allow countries with different levels of economic development to adapt standards to their local context (Roberto and Leslie, 2014). This, in practice, allows greater accommodation of management discretion at the workplace (Hilgert, 2013). Here, it is understood that ILO standards settlement alone is not an efficient goal of OSH problem-solving target. Therefore, it requires another supportive method for settlement of workplace hazards and improves workers' living standards.

3. Knowledge Diffusion Ideology to Workplace Safety and Health

In order to create awareness and flow of knowledge to the industrial sectors, knowledge diffusion regarding the impact of OSH is a mandatory principle. Knowledge Management (KM) is the process of capturing,

developing, sharing, and effectively using organizational knowledge (Rantanen *et al.*, 1994; Regional Committee for Africa Report, 2004). It refers to a multi-disciplined approach to achieve organizational objectives by making the best use of knowledge (Roberto and Leslie, 2014). Personal KM term was introduced in 1999 referring to the management of knowledge at the individual level (Wright, 2005; Ismail, 2006). KM efforts typically focus on organizational objectives such as improved performance, competitive advantage, and innovation, sharing of lessons learned, integration and continuous improvement of the organization (Ismail, 2006). The diffusion of new technologies often depends upon the interrelations between social and technical aspects (Cantono, 2009). This definition reveals that knowledge diffusion is the best policy to transfer knowledge to the society concerning how to use new technologies that import hazards during adoption in protecting workplace problems and saving of hazards cost.

Following the equation of maximized profits prompted by the inhibition of OSH is an old practice that has proven to cause significant costs to societies in the developed world (Roberto and Leslie, 2014). It is now an urgent priority to stop this process and promote a harmonized global market where the health of workers is guaranteed in the global perspective (Goldstein *et al.*, 2001; Roberto and Leslie, 2014). This improvement of health of workers is granted whenever people follow the knowledge of interacting innovation processes through new idea of generation.

Key lessons learned, including people and the cultural norms which influence their behaviours, are the most critical resources for successful knowledge creation, dissemination, and application; cognitive, social, and organizational learning processes are essential to the success of a KM strategy; measurement, benchmarking, and incentives are essential to accelerate the learning process and to drive cultural change (Morey *et al.*, 2002; Farhad *et al.*, 2011). This helps diffuse and disseminate the knowledge through different approaches to the society ensuring safe work place.

In organizational theory, knowledge diffusion is the practical problem in transferring knowledge from one part of the organization to another (Szulanski, 1996; Jayawarna and Holt, 2009). Like KM, knowledge transfer seeks to organize, create, capture or distribute knowledge, and ensure its availability for future users. Knowledge transfer is more complex because (1) knowledge resides in organizational members, tools, tasks, and their sub-networks (Argote and Ingram, 2000); (2) much knowledge in organizations is tacit or hard to articulate (Nonaka, 1995). Therefore, knowledge transfer is defined as "the process through which one unit (e.g., group, department, or division) is affected by the experience of another (Argote and Ingram, 2000). Diffusion of knowledge in occupational safety and health into national agenda becomes an important consideration for not only developed countries, but also for the developing countries as well (Katsoulakos and Katsoulacos, 2007).

Recent research findings have showed that regulations to ban and control dangerous products are needed to avoid the transfer of hazardous production to the developing country (Roberto *et al.*, 2014). This research shows that knowledge transfer of OSH is still overlooked. It tells us that strong knowledge diffusion to the society is very important for strongly industrializing developing countries. Acceptance of health risks in the name of industrialization has catastrophic implications for both the developing countries and on global scale. Occupational health and safety should have higher priority on the international agenda, but improvement of OSH infrastructures and systematic preventive approaches are extremely slow in industrializing countries (Roberto *et al.*, 2014).

In general, as it has been learned from literature reviews, OSH hazards are fatal to the economy of developing countries. In order to minimize the fatality of this workplace hazards, it is very important to work on knowledge diffusion in the industries (internally) and in the surrounding industries (external environment). Among many variables in solving workplace, safety is knowledge diffusion model development that helps management. Considering these issues, the emanating hazards will decrease and productivity increases; thereby, the socio-economy status is being developed.

4. Research Methodology

The authors adopted desk study using systematic review methodology for data collection and analysis. It is efficacious in appraising, summarizing, and bringing

together existing literature reviews on OHS knowledge diffusion. The review depends mainly on secondary data and prepositional analysis of the authors. These data basically were collected from recognized international journals available on the website (e.g., EMERALD, Elsevier, science direct, PUBMED, Omics Group open accesses international journal materials, etc.). These are few international databases of peer-reviewed and scientific journals related to occupational health and safety. Keywords were used in searching for these relevant literature datasets sources. The authors used words such as “occupational safety and health in developed and developing countries, Africa and Ethiopia”, knowledge diffusion, and knowledge management in manufacturing industries.” Literature reviews are being retrieved and downloaded several times related to OSH and knowledge (technology) diffusion to workplace, but almost none was obtained on Ethiopia. Forty (40) related reviewed papers were found. Out of these literature reviews, 11% of the reviewed research studies were found on OSH issues in Ethiopia and approximately 40% of revised papers on knowledge diffusion. The other approximately 49% were on general literature reviewed papers related to OSH and knowledge diffusion issues in Africa and other developed countries with global consideration. The data collected were analysed using content analysis and the findings are presented in this entire study.

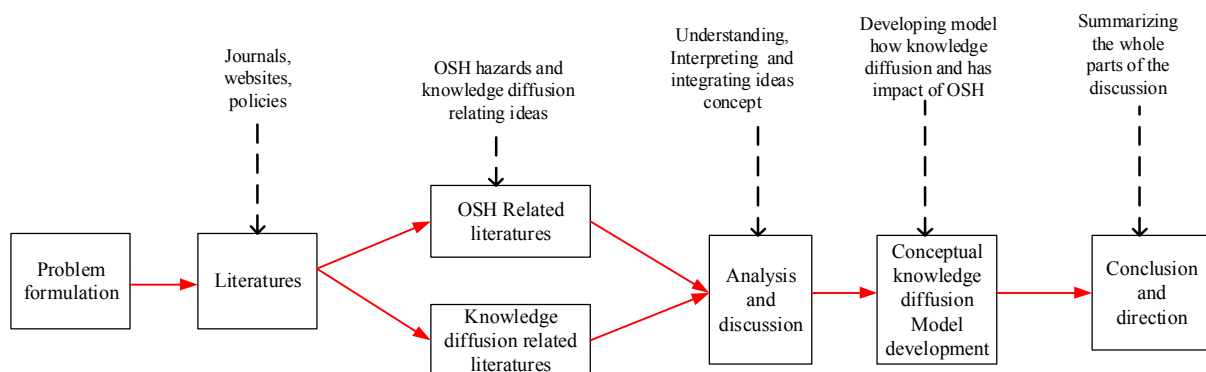


Fig. 1. Schematic approach of the research methodology design

5. Why OSH Knowledge Diffusion Model?

Because the existing knowledge diffusion models do not address the issue of OSH knowledge diffusion, a new model is proposed. This model includes workplace safety policies, knowledge, encouragement/enforcement, dissemination, implementation, evaluation, and improved

workplace safety output phases that fill the gaps observed in existing knowledge diffusion models.

Literature reviews elucidated that workplace safety and health is facing greater challenges presently than previously in all dimensions (Roberto and Leslie, 2014, LaDou, 2003). These multi-dimensional workplace safety challenges were emanated due to the nature of various endless demands of human being and high industrial development trend. As discussed in the literature, for

example, one of them is profit-maximization mind setup of human being. Whatever the degree of workplace hazards is, it is a critical issue to minimize risks occurring at workplaces for employees and properties.

In brief, one of the best techniques to minimize workplace risk is knowledge diffusion to workplace environment. Organizational learning is linked to resources at the organizational level and requires learning at the individual level, which depends on the abilities and attitudes of individuals in terms of their learning, use, and sharing of their knowledge (Hueske et al., 2015) which have not been considered in OSH areas. Knowledge, as discussed in the literature, is a tool that builds up the mind setup of the employees and management of any organization. Therefore, knowledge diffusion is found to be important for the workplace safety improvement. In order to diffuse knowledge to workplace, sources, communication channels, dissemination, evaluations, and end-users are key elements (Rogers, 2003). Knowledge diffusion becomes successful if practical training and implementation policies are encouraged or enforced than left for organizations. The first kind of knowledge diffusion process usually takes place in a formal way through the use of documents, databases or through interaction in face-to-face meetings or by using technological means as e-mail or videoconference. So, in minimizing workplace hazards and risks, knowledge diffusion will play an essential role.

As studies explained workplace safety and health is an overlooked area of research studies where knowledge diffusion is disadvantaged. In order to disseminate (innovate) knowledge that promotes healthy workplace, it desires to get more studies outputs in this area. However, no more studies were conducted as findings of literature reviews were publicized regarding workplace safety and health in general. Therefore, to introduce this idea to workplaces safety improvement means, it is found to develop a model that gives a clue to how knowledge diffusion streams into the society.

As discussed in this research, in developing countries, there are few research pieces regarding workplace safety and health (). As a result, it might be difficult to diffuse knowledge to industries and services without any challenge, because one foundation of knowledge diffusion is availability of research results. Therefore, knowledge diffusion is a key feature to enhance workplace safety and health through means of research outputs.

The core point of this study is an attempt to develop a conceptual frame work model that has not been presented for the purpose of workplace safety and health knowledge diffusion. Many research studies were conducted around knowledge and technology diffusion. One of the researchers that comes to the frontline is Roger (2003) in development initiation of knowledge and technology diffusion model. In his model, the adopters have two opportunities either to accept technology or reject technology forever. However, in the case of OSH knowledge diffusion, there is only one option i.e., to

accept eternally. Because it is a life issue that does not require prerequisite like technology diffusion. Even though Workplace safety knowledge diffusion stepping stone is Ropgers' model, it is different from his model in its phases and implementation option (Fig 2). In diffusing this knowledge to the society, communication channels and social networks play a central role in the widespread adoption of innovations (Cantono, 2009). The shortcoming of the traditional models is to ignore the complexity and competition underlying the process of diffusion (Kreng and Wang, 2013). Hence, this model considers this problem and conceptualizes new one. The companies are encouraged or enforced to implement knowledge diffusion model stated in this study.

As a result of this model, the workplace safety and health problem will reduce. Employees' health gets safe, and property damage is minimized. This results in reduction of companies workplace costs, productivity improvement, and increased profit.

6. Occupational Safety and Health Knowledge Diffusion Model

A proposed model is composed of three broad and eight sub phases. The three basic phases are preparation, operational, and output phases (Fig 2). The preparation phase comprises of policy, knowledge, and encouragement or enforcement bases. The operational phase has basic elements of dissemination, implementation, and evaluation. The last phase (influential) contains OSH awareness created and increased profit. The phases of conceptual models are shown in Fig 2. The operationalization of conceptual model processes have been discussed below.

6.1. Policy Development phase

Policy is the starting point for workplace hazards improvement. This policy development starts at the higher country management stage as most developing countries lack it. A health and safety policy is a written statement by an employer, stating that the company's commitment for the protection of the health and safety of employees and to the public. In most of the developing countries, literature publicized that workplace safety and health policies in the context of their organization were disregarded. Therefore, to diffuse knowledge through different media and interpersonal linkage, first stepping stone is workplace safety policy initiation which supports knowledge to diffuse to the society. Policy availability helps organization to mobilize resource and disseminate research output. The policy development has to take effect by higher officials of the countries. For instance, in Ethiopia, workplace safety and health prevention policies are not available. Hence, the knowledge diffusion models are operationalized only when there is a policy at a national level. They can develop the safety and health

management system/policy in the following steps: (a) creating a health and safety governance structure; (b) setting up a mechanism to consult workers; (c) developing health and safety policies and procedures. The Process of Policy development, the Link between Strategy & Policy, governance arrangements for policy ‘sign off’ and launching the policy and policy implementation are the four basic phases to be considered during policy development (Chelsey, 2007).

6.2. Knowledge Phase

with policy, the diffusion process starts at the knowledge phase. Knowledge is the foundation for all processes execution. In this step, an individual or institution unit learns about occupational safety and health solving techniques and seeks information raising critical questions like “what, how, and why” (Rogers, 2003). It is possible to derive questions from the knowledge of how to create awareness-knowledge, how-to-knowledge, and principles-knowledge. Awareness-knowledge can motivate individuals to learn more about workplace safety and health hazards management and adapt it to company level. The other is how-to-knowledge which contains information of how to utilize workplace safety and health management rules, policies, and regulations. One may have knowledge, but it is difficult to use it unless he/she has awareness of how to use it. To increase workplace safety and health hazards improvements, the diffusion chance of knowledge for an individual should have a sufficient level of how-to-knowledge prior to the trial of these techniques. The third type of knowledge is Principles-knowledge that includes the functioning principles describing how and why a workplace technique works (Rogers, 2003).

Knowledge tells us how to use the workplace safety and health tools, whereas diffusion is the natural spread of ideas, dissemination is the conscious effort to spread new

knowledge, policies, and practices to target audiences or the public at large (Green et al., 2014). Green idea of diffusion implies that it is new knowledge that is to be diffused to the society through practice. Therefore, it provides full information for the workplace regarding how this knowledge can be disseminated. Twentieth century theories of diffusion evolved into more robust theories of knowledge utilization in waves, beginning with research observing and tracking the process of diffusion in agrarian systems, moving to an emphasis on organization and individual adoption of innovations and accountability, and ending with a focus on how knowledge utilization could improve human services in health, education, and social support (Becker, 1970 cited in Green et al., 2014). Becker stated that knowledge created cannot be utilized without individual’s adoption of the knowledge as innovation through knowledge diffusion.

In order to diffuse the innovated knowledge to workplace safety and health improvement, knowledge drivers are the basic channels. Here, the knowledge drivers are of higher education and research institution/universities, technical and vocational education, and training institutes/colleges (Villarreal and Calvo, 2015; Díez-Vial & Montoro-Sánchez, 2015; Díez-Vial & Fernández-Olmos, 2014). These institutions are responsible for preparing researches, training manuals, preparing technical reports, and other knowledge dissemination-related documents account for workplace hazardous management. Hence, in this model, any responsible body is required to disseminate knowledge, and it needs the channels which are called knowledge drivers. The implementation process opt to consider these drivers to transfer know-how to workplace employees and stakeholders. These phases plan and give insight to teaching, training, and motivating employees and top managements to exercise how to prevent workplace accidents before, at and after occurrences.

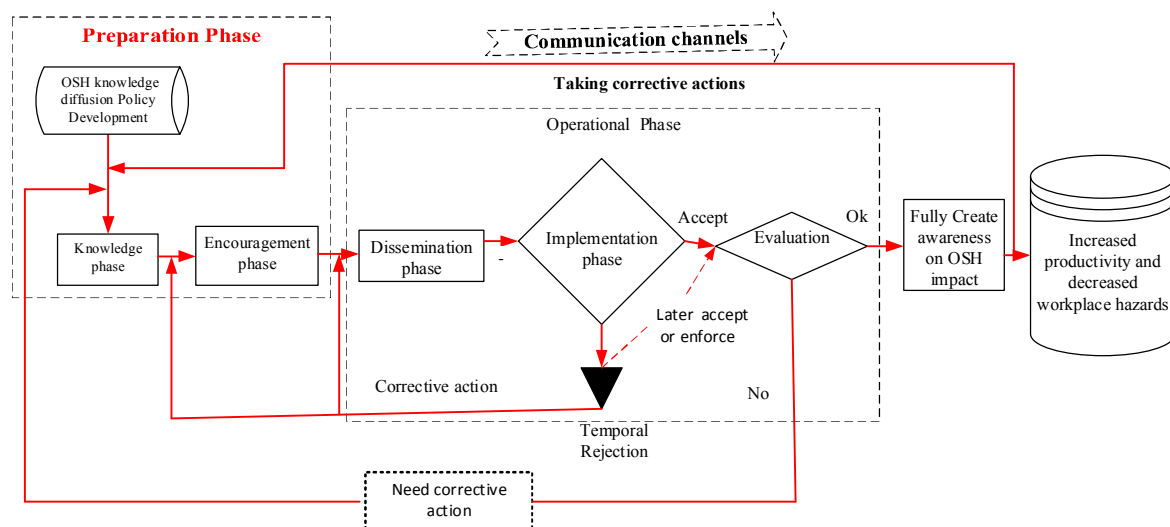


Fig. 2. Diffusion of OSH Knowledge conceptual Model

The university-Industry-Government linkage minimizes barriers of technology diffusion (Villarreal and Calvo, 2015). When university and industry work together, or university works with government or industries with governments, all the three collaborate to bring radical changes; innovative knowledge diffusion speed increases. The society can be easily addressed with issue of workplace safety and health improvement techniques. The quality of knowledge is measured by its acceptance in the society, and that knowledge emerged and over time it became technical as more people became increasingly familiar with its nature as serviceable equipment in the search for yet more epistemic knowledge (Jayawarna & Holt, 2009). Knowledge must be clear and understandable for every reader, so that its diffusion speeds up.

6.3. Encouragement/Enforcement Phase

The third phase is a stage where higher officials inspire researchers and organizations, so that knowledge diffusing traffics are reduced and workplace concern blooms. Researchers and organizations have not been motivated to exercise knowledge diffusion to workplace, for instance, in Ethiopia. Enforcement (negative or positive) at workplace change in business structure, human resources management, relationships with clients and suppliers, or in the work environment itself emanates when there is encouraging or enforcing power. It improves motivation and working conditions for employees, which leads to increased labour productivity, innovation capability, market resilience, and overall business competitiveness. All enterprises, no matter their size, can benefit from workplace encouragement and innovation. It improves performance and working lives and encourages creativity of employees through positive organizational changes; it combines leadership with hands-on, practical knowledge of frontline employees and engages all stakeholders in the process of change. Barrier of communication channels is an obstacle to the workplace knowledge diffusion and awareness creation. Research findings dissemination have positive effect on knowledge sources and industries when they are encouraged or enforced to implement and utilize the knowledge properly. This stage is a responsibility of top management to encourage or enforce knowledge diffusion to workplace safety improvement. It can be driven by harmonizing with legislations, regulations, rules, standards, society cultures, and geographical topologies setup of a workplace. Any system by which some members of society act in an organized manner to enforce the law by discovering, deterring, rehabilitating, or punishing people who violate the rules and norms governing that society is enforcement. This enforcement is diplomatic with stick and sandwich principle, so that the society gets bitter while they are enforced. Therefore, it helps in critical acceptance of the workplace knowledge diffusion, especially by developing economy that is not

being exercised for a long time. According to some studies, government did not enforce policies, legislations, regulations, laws, and standards to operational efficiency of an organization (Alkilani *et al.*, 2013). This indicates that knowledge by itself is not a solution to reduce workplace hazards, unless government takes action on research results of dissemination either by encouragement or enforcement. It is a common practice that knowledge is produced at higher educational institutes, but they are used only for the consumption of degree awards. Therefore, government bodies should encourage researchers to provide their knowledge to the society beyond consumption for obtaining degree. When the educational institutions provide their research output for the industries which are suffering from workplace safety and health problem, the industries will benefit from the institution in obtaining knowledge of how to implement and evaluate the knowledge process. How the government encourages knowledge diffusion is the question. The transition from academic research to opportunity passes through a critical juncture of being able to recognize that opportunity (Pattnaik & Pandey, 2015). Any research results that should be addressed to the society need government, stakeholders, or actors who support researchers. For instance, in case of research output, government can give patent, incentive, and recognition in some scientific presentations. Hence, encouraging phase is the one that speeds up knowledge diffusion and attracts attention of more researchers to involve in research activities.

6.4. Dissemination phase

It is a phase where outputs of the studies and trainings are circulated to the society through communication channels. Interpersonal communication channel is the most recommended dissemination channels. Some organizations may defend this model until they are convinced or enforced. The dissemination of output may be accepted perhaps or rejected temporarily until government officials enforce the new ideas of those defending organizations. For example, data obtained from various stakeholders' interviews and personal experience reveal that in Ethiopian construction industries, contractors prefer to pay compensation cost to the employees than to pay attention to pre-prevention. They expect that filling the pre-work preventive system costs more. They prefer that the insurance company can pay for the injured once. They are not aware of the individual, his/her family, organization, economy, society, and country wide negative impacts and effects. As a result of this, encouragement and enforcement from top management is necessary to establish a long run and sustainable awareness of workplace safety. Pathways of knowledge dissemination allow others to obtain the benefits of R&D without having to pay its full cost. When the technology is particularly enabling in the sense of providing radically new ways of doing things,

improving the technical bases for entire industry sectors, or being useful in many diverse areas of application, the spillover benefits to others are likely to be particularly large. By publishing, presenting, and patenting the knowledge, knowledge dissemination can encourage researcher to do more researches.

In reaching decisions on when, where, and how to publish and disseminate their work, researchers are motivated by a number of interrelated factors, beyond the simple desire to pass on their findings to those who may be interested in them (RIN & JISC, 2009).

Employers of society/union help to ensure workplace safety working in collaboration with employer's participation in the knowledge dissemination through interpersonal communication channels. Employees of union also have a role in the dissemination of knowledge to the workplace safety improvement. The dissemination of knowledge cannot be obtained unless knowledge is produced and encouraged by the government bodies. Here, again, the big-role players of the knowledge disseminators are the higher institution professionals who have professional permissions.

6.5. Implementation Phase

It is the operational level of the phase. Here, research studies' outputs are being implemented on the organizational level. In the implementation phase, all parties are responsible and involved in executing the model. It is required to establish data management system to record accidents occurred and report to the responsible bodies. In these stage trainings, how to manage data, pre-prevention methods, at-work prevention, and post-protection of workplace safety disease knowledge will be delivered and exercised. These implementation activities are the responsibilities of employers/employers union, employees/employees union, middle government bodies, social insurances institution, and higher institutions. Organizational knowledge gaps are the result of the discrepancy between the knowledge an organization has and the knowledge it needs for the solution of specific problems, including innovation and product development (Debackere, 2004 cited in Adamides and Karacapilid, 2006). In filling these gaps, the role of information technology is not only to organize data into useful information, but also to support the transformation of information into organizational knowledge (Adamides and Karacapilid, 2006). Therefore, organizations in diffusing knowledge to workplace safety improvement can use information technology supports. These tools and other uses of tools are very important when the implementation procedures are developed. The implementation procedures are the mandate of the individual enterprise, companies or middle level of the government bodies of a country. The conceptual model starting from policy development to the workplace safety and health implementation result evaluation needs other organizational policies for implementation.

Evaluation Phase: This is the last milestone step of this model. It checks if the target of the organization properly meets the planned objectives of workplace safety improvement or not. If it does not meet the objective of the model, then corrective action will take place. Once the implementation is fully applied, workplace hazards and challenges will be expected to be eliminated or else reduced. Thereby, productivity and profit of the company will be increased. Evaluation process will be made by the official government representatives who would have the skill in line with this workplace safety and health programs. The implementation process of the concept is the responsibility of the individual industries in line with this model so that step by step actions need to be taken.

In general, operationalization of the conceptual model, even though defined by the model, can be summarized as follows. Rogers (2003) asserted that diffusion is the process by which an innovation is communicated through certain channels over time among the participants in a social system. This conceptual model can be operationalized in line with the involvement of the government, employees, stakeholders, and management. The operational process is discussed in this section at each phase. There appears to be a growing trend in innovation research away from adoption and diffusion towards implementation and institutionalization. As the adoption and diffusion process moves along, the actual use or implementation of an innovation in a specific setting becomes more and more important. Of course, implementation should be an integral part of a comprehensive and systematic change plan from the beginning of this model. Understanding the model at all levels is an important place. To do so, training has to be given to the practitioner of the model before the conceptual model is set to enforcement. The model by itself leads to question of how to implement the concept (see Fig 2 & its description). The conceptual model can also be modified through other research studies in line with some factors such as topology/location of company, type of the industry, employee awareness, government commitment, top management commitment, and type of industry products.

7. Conclusion

In general, to summarize, this study identified common problems at workplace such as workplace safety hazards, high costs, loss of productivity, organizational competitiveness advantage and top management awareness absence. The cause of these all challenges is the absence of awareness of how to prevent or minimize workplace safety risks through the support of knowledge diffusion. The big unruly is the absence of collaboration among universities, industries, and top management commitment to conduct workplace safety and health research studies, so that they can disseminate the result.

Hence, this research gave an overview of how to develop such types of cultures.

Through the years, employees have been injured or killed due to man-made or natural accidents, or even their health conditions have been compromised by exposure to all kinds of agents. The magnitude and frequency of such unfortunate accidents were in part due to management negligence which has been driven by financial and economic pressures to cut down on costs. This trend has continued until governments (in industrialized countries) stepped into regulate safety conditions across all industries. These hazard situations still continued in developing countries as it has been obtained from literature reviews discussed in this research.

As a result of these problems, this research focused on the assessment of workplace safety and health condition knowledge diffusion practice on international and national levels. Many studies disclosed that workplace safety problems remain unsolved in developing economies. These are due to few research studies done on absences of awareness of workplace safety and knowledge diffusion hampering factors. There are absence of workplace safety supportive policy, negligence of higher educational centres, researchers' interest and high budget requirement to run the improvement techniques. Therefore, to curb this alarming unsafe workplace, research study is one of the key techniques to disseminate knowledge through the developed conceptual model.

In order to fight the hazardous workplace problem, this research attempted to develop a conceptual model. The knowledge diffusion conceptual model has been developed for any end users. It requires strong decision-making processes and coordination with the support of the stakeholders and government. The knowledge diffusion to workplace considered in this framework is categorized into different phases. The organizations are recommended to use this model and government is responsible to encourage the implementation as clearly as shown in the conceptual model. This model is the beginning for the workplace safety and health knowledge diffusion improvement. Without workplace issues, knowledge transfer is very difficult to bring about radical change to the economy of the citizens, in general. Upon implementing and utilizing this model, it will have promising benefits of minimizing risks, building up the mind setup of the employees and management in an organization, developing safe property damage and protecting the life of the employees, creating high awareness, and being easy to implement via following the steps given in the conceptual model development processes.

It is recommended to conduct further research studies concerning how geographical setup of the industry and how the implementation of this conceptual model will be affected by cultures, how government policy affects concept, how technological development influences diffusion and cultural norm of the society affects knowledge diffusion to the workplace safety. It is also

important to see directions of the future research regarding how inter-sectorial collaboration and hub sectors of industry will influence knowledge transfer and diffusion.

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