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APPLYING MICROSOFT PROJECT PROFESIONAL SOFTWARE IN OPTIMIZING SAFETY& RISK MANAGEMENT SYSTEMS IN CONSTRUCTION PROJECTS

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ABSTRACT

The research project task is to Apply project management software as important tool in optimization of Safety and Risk management systems in construction projects, which is designed to assist a project manager in developing a plan, assigning resources to tasks, tracking progress, managing the budget, and analyzing workloads.

Every one of us is a manager of projects of our own life. From a house wife to an employee to financial analyst, from banker to doctor, from engineer to administrator, from a teacher to a student, we all work on different tasks with deadlines. Regardless of our occupation, norms, or location in an organization, we all work on tasks that are full of risks and involve people who do not usually work together. The project may have a simple goal that does not need many people or a great deal of money or it may be quite complex, calling for diverse skills and plethora of resources. But the bottom line is that every one of us manages projects. Construction in many countries, does in a Traditional way, this sometimes proves Uneconomical & Tedious too. Traditional way also proves to be Time Consuming, more risk and Confusing. The presented work will provide an Opportunity to clearly observe the difference between the Microsoft Project (MSP) and the Traditional Planning Techniques which speeds up Construction projects, risk management plan and also make the Project Cost Effective with Proper Planning with the help of the project management skills.

Rwanda has recently been named as one of the fastest growing country in Africa, this important research will support in infrastructure development of our country and succession of multiple construction projects and risk control. Therefore, in this connection of project management tool with safety and risk management systems in construction projects, hope many project managers, engineers and stakeholders will benefit in this research.

Keywords: Microsoft Project Software, Optimizing, Safety, Risk Management Systems &Construction Projects.

I. INTRODUCTION

The construction industry is perceived as a pillar industry in national economies. Construction projects encounter significant risks and uncertainties in term of safety, cost, time, and quality. These risks threaten the successful completion of these projects, slow the pace of development, and could impact the whole society.

For example, in preparation to host the 2022 FIFA World Cup in Qatar, more than $40 billion in infrastructure projects are planned. This includes a new airport, a metro system, a high-speed rail network, and 40,000 more hotel rooms. It is estimated that 500,000 construction workers are currently in the country. Additional thousands of workers are likely to arrive as mega infrastructure projects are launched. Such a huge construction boom raises concerns about worker's safety. Similar to other developing countries, Qatar is experiencing high percentage of construction-related injuries and fatalities. Since 2012, almost 900 worker deaths were reported in Qatari infrastructure construction projects. The International Trade Union Confederation, stated that if the

conditions did not get any better, at least 4,000 construction workers fatality are expected by the time the World Cup kicks off. This situation has recently raised many concerns about the construction industry health and safety problems.

II. STATEMENT OF PROBLEM

In the early years' construction project were done in the traditional way and this involved a lot of risk, high cost, loss of lives, poor quality and time consuming. It also required much labour in terms of human input and efforts. Over the years, these problems especially the risk and safety part have gradually been reduced due to the covering of Technology.

Engineers and other connected fields due to many problems have come out with software which tries to help project managers in the field of construction engineering and management and other business areas. This have not change the traditional way of carrying out construction work but mainly designed to help in project planning, resources allocation, control and monitoring the project progress in the line of risk reduction. This research is thus aimed at identifying the importance of applying project management software skills in optimizing safety and risk management systems in construction projects.

General objectives of the Research

The general objectives of this research is to apply project management software skills in optimizing safety and risk management systems in construction projects.

Specific Objective of the Research

Specific objective is to determine how the practitioners are managing risks in everyday situations.

In other words, the main idea is to see if the construction projects are working in safe manner and how risks are managed by applying project management software as important tool in construction management.

In order to achieve the main objectives, the following research questions have been developed to support the analysis:

- Determination of risk using Microsoft project software.
- Optimization of safety and risk in construction projects.
- Evaluation of risk and safety in construction project using Microsoft project software.

The purposes are to understand the concept of RM and to apply project management software to facilitate in optimization of safety precautions and risk management process in construction projects.

Hypotheses of the Research

This research project is comprised of the null hypothesis and the alternative hypothesis.
The null hypothesis is denoted as **H0** while **H1** represent the alternative hypothesis.
Ho = The application of project management software skills in optimizing safety and risk management is not necessary in construction projects.
H1= The application of project management software skills in optimizing safety and risk management is necessary in construction projects.

Limitations

The research focuses on the construction industry and is based on theories of, safety and risk management systems described in the literature. The research was contributed by a study of a construction project work at the site with some of the workers involved in it. Because of the limited research time of the thesis, the project was investigated during the planning and design phase only.

III. THE NATURE OF CONSTRUCTION WORK

This chapter provides the theories used for this research. A construction project involves a lot of activities and participants, and to understand the process and the interacting elements there is a need to understand the whole system. System thinking has been used in this study to show the setup of construction projects on construction sites and the flow of information having an impact on safety applications and risk assessment and communication. From the system thinking perspective, construction projects have been guided by regulations

and system which influences, safety applications, risk management and risk assessment and communication. In addition, some social aspects from social theories of risk and risk management will be discussed in this chapter to give more comprehensive context for understanding factors contributing to apply safety and risk management systems in construction projects, also the frame of how project is organized and descriptions of different members involved in construction projects.

IV. PROJECT LIFE CYCLE

Each activity or process, regardless of the area of business domain, has a beginning and an end. Likely concepts are used in the engineering projects over time. The terminology project life cycle is used as a management tool to improve any project's performance. The scope of life cycles changes among the industries and diverse terminology with a various number of stages is used depending on the nature. However, several terminologies are always used within one particular sector even though a number of phases can vary (Smith et al., 2006). Therefore, it is very difficult to systemize and provide one common scope and definition of a project life cycle. Smith et al. (2006) concluded that different forms of PLC frameworks described in the literature are outcomes of variety of projects. For instance, in Construction projects, the PLC model comprises eight succeeding phases including pre-feasibility, feasibility, design, contract/procurement, implementation, commissioning, handover and operation (Smith et al., 2006). In contrast, Pinto and Prescott (1988) present a four phase PLC developed by Adams and Brandt, and King and Cleland as the most widely applicable framework, where conceptualization, planning, execution and termination are the main phases. A likely model is used by Westland (2006) who identifies initiation, planning, execution and closure as principal project stages. While another model was developed by Ward and Chapman (1995) which sets up concept, planning, execution and termination to constitute PLC. The same authors in another publication make a further division of each of the 4 phases into another number of stages and steps. Such number of activities provides easier and more accurate potential risk identification and makes risk management processes more effective (Chapman and Ward, 2003). Due to the various project types, PLC requires adjustments and an individual approach. A number of different stages within each phase must be adjusted to a particular project depending on its scope and nature. Since each project is unique, a framework used in one project can`t be applicable in another. Therefore, the model, as the one proposed by Chapman and Ward (2003). The construction projects require a special approach due to the complexity of work undertaken and thus such modified PLC should bring benefits to project management and its performance (Bennett, 2003). It is also this approach which will be used in this paper.

V. PROJECT OPERATION PHASE

There are three main activities in the operation phase, in addition to the construction itself: monitor and control, resource management, and documentation and management. The exercises of monitor and control covers supervision of among others, time, cost and quality (Bennett, 2003). The project manager is usually the key point who undertakes this management process to keep track of ongoing activities. Follows the previously mentioned, time, cost and quality are key aspects of each project and hence managing them is a great work. Time management is used to log actual time spent for execution of certain activities. It also facilitates to allocate resources more perfectly and control schedule of performing works (Westland, 2006).

The actual schedule and work progress is compared to the schedule drawn up in previous steps. If any discrepancies are detected, a person responsible must take an appropriate action in order to bring the project back into conformance (Bennett, 2003). Keeping track of the time aspect makes it possible to manage other important issues, finances and quality. Cost control is used to record all actual expenses within the project and gives control over a budget and out-of-pocket expenditures. In this exercise of effective work and quality monitoring is performed in order to deliver what was promised to the client (Westland, 2006), it also controls whether the work performed is in compliance with technical desires stated in tender documentation (Bennett, 2003).

Document management is the last activity in the operation phase, but its great should not be ignored. It treats communication within the project and grandness of entire documents.

VI. PROJECT CLOSE-OUT AND TERMINATION PHASE

Most of PLC‟s ends up at the execution phase where the final product is handed over after being accepted by the client. Performing a project summary requires additional resources, time and money, which investors tend to prefer to spend on new investments instead (Westland, 2006). However, project close-out and termination is

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crucial, among others, from a legal perspective. Before installation activities can be considered as ended, there are still works which must take place. The last activity is clean up, inspections, handover to the owner and project closure (Bennett, 2003).

The last procedure in the PLC, as mentioned by Westland (2006), is to review the project completion. In this stage the overall project assessment is performed. It provides possibility to draw conclusions for next projects to improve their performance.

Definitions of the important Terms in this research

The field of safety applications and risk management systems faced with difficulties in defining and agreeing on principles. Safety and Risks are dealt with differently across different countries, industries and sectors and fields. Terms, definitions and interpretations are as varied as the number of sources providing them. There are no agreed unified definitions of safety, risk analysis, assessment and management. There are often misconceptions. Different terms, for example "risk analysis" and "risk assessment", are often used interchangeably (Lingard and Rowlinson, 2005)

Safety

Safety is related to external threats, and the perception of being sheltered from danger. According to the business Dictionary, safety is defined as a relative freedom from danger, risk, or threat of harm, injury, or loss of personnel and/or property, whether caused deliberately or by accident. Safety can also be defined as the control of recognized hazards to achieve an acceptable level of risk. In this study, safety means freedom from danger, harm, and injury to the person involved in construction activities.

Hazards

A hazard is always connected with a circumstance or activity that, if left uncontrolled, can result in danger. HSE (2004) define hazard as source of potential harm, damage or adverse health effects on something or someone at certain conditions at work place. Basically, a hazard can cause damage or adverse effects. In this study hazard mean something which has the potential to cause harm to people if no action taken in construction projects.

Health

Health is the general attitude of a human being in mind, body and spirit, always meaning to be free from illness, injury or pain. The World Health Organization (WHO) defined health in its broader sense in 1946 as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" (WHO, 2006). In this study health means being free from illness, injury or pain which can be caused by construction work.

Risk

Risk has been traditionally defined as a measure of the probability and severity of adverse effects (Haimes, 2009). Rowel (1982) provides that risk is related to hazard whereby risk becomes the hazard level (hazard severity) combined with the likelihood of the hazard leading to hazard consequence. The general concept of all definitions of risk provides that risk as a danger of not needed and unfortunate events. For the purpose of this study risk is a probability of occurrence (likelihood) of an event and the magnitude of its consequence (Kaplan and Garrick, 1981; Mondarres et al 1999)

Risk= (S, P, C): where S= Scenario leading to hazard
P= Probability of occurrence
C= Consequence (severity

Accident and Injury =33%

The word 'accident' and 'injury' are used in accordance with the meaning adopted at the first World Conference on Accident and Injury Prevention (WHO, 1989); that is, an accident is an unintentional event which results or could result in an injury, whereas injury is a collective term for health outcomes from traumatic events by (Andersson, 1999).

The use of the term 'accident' in this research is based on an event which cause physical harm or damage to the body resulting from an exchange, usually acute, of mechanical, chemical, thermals, or other environmental energy that exceeds the body's tolerance.

Project Risk Management

Project Risk Management is useful aspect of project management. Risk management is one of the ten knowledge areas defined in [PMBOK] Project risk can be defined as an unforeseen event or task that can impact the project s' progress, result in uncertainty matter.

Safety &Heath

The Construction Stage Health and Safety Plan is the primary management document for health and safety on site. It should be well prepared before construction activity starts in resources sheet. However, it is a live and dynamic document that will change and grow during the construction project.

Updates will occur to the risk assessments if changes are needed. When using the plan, make sure to re-save it when you make changes. This Construction Stage Health and Safety Plan.

The objective of this research is to provide practical guidance on technical framework for safety and health in construction with a view to:

(a) Ensuring appropriate design and implementation of construction projects;

(b) Providing means of analyzing from the point of view of safety, health and working conditions, construction processes, activities, technologies and operations, and of taking appropriate measures of planning, control and enforcement as reference to the [international labor office Geneva article].

Application

(a) Construction activities which covers:

- Construction of buildings, together with excavation and construction activities, structural alteration, renovation, retrofit, maintenance and demolition of all types of construction buildings.
- Civil works, covers excavation and the construction works, structural alteration, repair, maintenance and demolition, let's say, airports, docks, harbors, inland waterways, dams, river and avalanche and sea defense works, roads, highways, railways, bridges, tunnels, viaducts and works related to the provision of different services such as communications, drainage, sewerage, water and energy supplies;
- The erection and dismantling of prefabricated buildings or structures, as well as the manufacturing of prefabricated materials on the construction workplace;

(b) The fabrication and erection of oil rigs and offshore installations while under construction on shore. The provisions of this guide should be considered as the basic needs for protecting workers.

General duties of competent authorities

(c) The competent authorities should, on the basis of an assessment of the safety and health dangers involved and in consultation with the most representative organization of employers and workers, adopt and maintain in force national laws or regulations to ensure the safety and health of workers employed in construction projects and to protect persons at, or in the vicinity of, a construction site from all risks which may arise from such work.

General duties of employers

(d) Employers should provide adequate means and organization and should establish comprehensive programme on the safety and health of workers consistent with government laws and regulations and should comply with the prescribed safety and health measures at the workplace.

(e) In particular, construction works should be so planned, prepared and undertaken with much consciousness.

General duties of self-employed persons

(f) Self-employed persons should comply with the prescribed safety and health measures at the workplace according to national laws or regulations.

(g) Co-operation and co-ordination

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(h) Whenever two or more employers undertake activities at one construction site, they should co-operate with one another as well as with the client or client's representative and with other persons participating in the construction work being undertaken in the application of the prescribed safety and health measures.

General rights and duties of workers

(i) Team should have the right and the responsibility at any site to participate in ensuring safe working conditions to the extent of their control over the equipment and methods of work and to express views on working procedures adopted as they may affect safety and health.

(j) Workers should have the right to obtain proper information from the employer regarding safety and health risks and safety and health measures related to the work processes. This information should be presented in forms and languages which the workers easily understand.

(k) Workers must have the right to control themselves from danger when they have good reason to believe that there is an imminent and serious danger to their safety or health. They should have the duty so to inform their supervisor immediately.

General duties of designers, engineers, architects

(l) Those concerned with the design and planning of a construction project should have trainings in safety and health and should integrate the safety and health of the construction workers into the design and planning process in accordance with national laws, regulations and practice.

(m) Architects, engineers and other professional workers, should not include anything in the designs.

(n) Facilities should be included in the design for such work to be performed with the minimum risk.

General duties of clients

Clients should:

(a) Co-ordinate or nominate a competent worker to co-ordinate all construction activities relating to safety and health on their construction site;

(b) Inform all contractors on the project of special risks to health and safety of which the clients are or should be aware;

Safety of workplaces

General provisions

All appropriate precautions should be taken:

(a) To ensure that all workplaces are safe and without risk of injury to the safety and health of workers;

(b) To protect persons, present at or in the vicinity of a construction site from all risks which may arise from such site. All openings and other places likely to pose danger to workers should be clearly indicated.

Housekeeping

In any construction storage at the site or in industry, the following procedures should be followed:

(a) the effective storage of materials and equipment;

(b) the removal of scrap, waste and debris at proper intervals.

Workplaces and passageways that are slippery owing to ice, snow, oil or other causes must be well cleaned up or strewn with supporting sand, sawdust, ash or the like.

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Picture1: Construction storage at site

Firefighting and Fire prevention

Effective measures should be taken by employers to:

(a) avoid the risk of fire;
(b) control quickly and efficiently any outbreak of fire;
(c) bring about a quick and safe evacuation of persons.

Enough and proper storage should be provided for flammable liquids, solids and gases.

Picture2: Firefighting and Fire prevention

Picture3: Firefighting and Fire prevention

Lighting at working places

Where natural lighting power is not adequate, there should be proper lighting either by portable cables to ensure safe and secure place.

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Picture4: Lighting at working places

Scaffolds and ladders

General provisions

Where there is undergoing construction activities, there should be provided scaffolds and ladders to protect and support workers on the ground and upper stairs.

Every scaffold should be well designed, constructed, erected and maintained so as to avoid collapse or accidental displacement when effectively used.

Every scaffold and part thereof should be:

(a) Designed so as to avoid dangers for workers during erection and dismantling at working place;

The competent authority should establish and enforce laws, regulations or standards covering detailed technical provisions for the design, construction, erection, use, maintenance, dismantling and inspection of the different types of scaffolds and ladders used in construction works.

Design and construction

Scaffolds must be designed for their maximum load and with a safety factor of at least 4, or as prescribed by the competent authority.

Scaffolds should be properly braced.

All scaffolds and appliances used as supports for working platforms should be of sound construction site.

Application of scaffolds

The employer should provide proper supervision to ensure that all scaffolds are used effectively and only for the purpose for which they are designed or erected. In transferring heavy loads on or to a scaffold a sudden shock should not be transmitted to the scaffold.

- When necessary to avoid hazards, loads being hoisted on or to scaffolds should be controlled, e.g. by a hand rope (tag line), so that they cannot strike against the scaffold capability.
- The load on the scaffold should be evenly distributed, as far as practicable, and in any case should be so distributed as to prevent disturbance of the stability of the scaffold.
- During the use of a scaffold care should be taken that it is not overloaded or otherwise misused.
- Scaffolds should not be used for the storage of material except that required for immediate use at workplace.

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Picture5: Scaffoldings

Tower cranes

Where tower cranes are necessary have cabs at high level, workers should only be employed as crane operators who are capable and well trained to work at a certain height.

The characteristics of the different machines present should be considered against the operating needs and the surroundings in which the crane will operate before a particular type of crane is chosen.

Care should be there during the assessment of wind loads both at operations and out of service. The ground on which the tower crane stands should have proper bearing capacity.

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Picture6: Tower Cranes

Transport, materials-handling and earth-moving

General provisions

Earth-moving, materials-equipment and all vehicles should;

(a) Be of proper design and construction taking into account as far as possible ergonomic principles particularly with reference to the seat;

(b) Be operated in good working order;

(c) Be appropriately used with due regard to safety and health;

(d) Be operated by person who have well effective training in accordance with national laws and regulations.

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Picture7: Transport, materials-handling and earth-moving Machines

Mobile asphalt layers and finishers

Wooden floors in front of the sprayers should be well covered with corrugated sheet metal.

The mixer elevator should be within a wooden or sheet-metal enclosure which should have a window for observation, lubrication and maintenance.

Bitumen scoops should have proper covers.

The sprayer should be given with a fire-resisting shield with an observation window.

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Picture8: Mobile asphalt layers and finishers

Pavers

Pavers should be well equipped with guards that avoid workers from walking under the skip.

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Picture 9: Paver

Concrete work equipment

Concrete mixers should be well protected by side railings to avoid workers from passing under the skip while it is raised.

Hoppers into which worker could fall, and revolving blades of trough or batch-type mixers, should be effectively guarded by grating.

Concrete bucket towers or conveyor belts should:

*(a)*be erected by skilled persons;

*(b)*be inspected on daily basis.

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Picture10: Concrete work equipment

Excavations, shafts, earthworks, underground works and tunnels

General provisions

Proper precautions should be considered in any excavation, shaft, earthworks, underground works or tunnel:

(a) By proper shoring or otherwise.

(b) to prevent against danger to workers from a fall or dislodgement of earth, rock or other equipment.

(c) to enable the persons to reach safety in the event of fire, or an inrush of water or material.

Drilling

When drilling is done in rock, loose rock should be scaled down to prevent workers against falls of ground; where this is not applicable, a protective canopy or overhead screen should be provided to use.

Transport, storage and handling of explosives

The transport, storage and handling of explosives should be done with the requirements of national laws and regulations.

Explosives should not be conveyed in a shaft cage or bucket together with other materials.

Explosives and detonators should not be conveyed together in a shaft unless they are in a suitable powder car.

Blasting

The modes of blasting should be in accordance with national laws or regulations presented.

No other electrical circuit should be installed on the same side of the tunnel as the blasting circuit.
Only effective battery lamps should be used during loading shot holes.

Formworks

Formworks should be well designed not to cause any danger.
All procedures should be followed to cover all stages during construction activities.
Supervision should be there during construction work, to make sure all procedures are followed.
Coordinator should be the one to order any changes.
Scaffoldings and all materials should be well checked with designs before put into use.
Before any construction work, foundation should be checked clearly to ensure that, the excavated soil is the same soil as reported.
Shuttering, erected and dismantling should be operated well under supervision with specialist together with competent workers.

Picture15: Formworks

Demolition of buildings

During demolition of walls or any story building should be starting with roof and floor to floor, unsupported walls should be prevented from falling by means such as shoring and ties.

Use and removal of asbestos and materials

Use and removal of asbestos cement sheets or asbestos insulation present in particular health problems, this particular exercise should be operated in accordance and adequate specialist on dismantling or structure demolition.

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Picture16: Use and removal of asbestos protection equipment.

Heat stress, cold and wet conditions at work place

Where heat stress, cold and wet conditions at workplace becomes a problem to workers, the following measures should be considered;

- ✓ Adequate design of the workload and workstation, with special regard to man powers in cabins, and command or driving operations.
- ✓ Information, instructions and training to enable detection of early signs of disorders.
- ✓ Provision of protective equipment for workers.
- ✓ Daily inspection and routine medical surveillance.

Those working in hot conditions, preventive measures to prevent heat stress should include rest in cool areas and an adequate supply of drinking water at construction site.

Noise and vibration at workplace

Proper provision of protection for workers from the harmful effects of noise and vibration from machines and work processes, by measures including:

- ❖ Provision of active and latest machines at workplace.
- ❖ Ear protection from noise.

Picture17: Noise and vibration at workplace

Biological and Chemical agents at any construction site

During construction activities in any areas where there are biological agents the following measures should be taken;

- ❖ Information, instructions and trainings for the workers accordingly about biological agents and how to prevent it.
- ❖ Effective measures against vectors, such as rats and insects.
- ❖ Appropriate actions on chemical prophylaxis and immunization;

- Availability of suitable preventive and curative medicine, mainly in rural areas;
- Provision of protective clothing and other precautions against biological agents.

Personal or worker's protective equipment and clothing

At any undergoing construction activities workers should be provided protective equipment against the risk of accident or injury to health, including exposure to adverse conditions, cannot be ensured by other means, suitable personal protective equipment and protective clothing, having regard to the type of work and risks, should be provided and maintained by the employer, without cost to the workers, as may be prescribed by national laws or regulations.

Personal protective equipment and protective clothing should comply with standards set by the competent authority, taking into account as far as possible ergonomic principles, such as;

- Protective gloves or gauntlets.
- Footwear of an appropriate type.
- Respiratory protective equipment for the particular environment.
- Clear or colored goggles, a screen and face shield.
- Safety helmets or hard hats to protect the head from dangers.

Picture19: Worker's Protective equipment

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Picture20: Construction wearing safety and health picture.

All facilities such as food and drinks

Depending on the nature of the construction work at any cases, on the number of workers, the duration of the work and its location, adequate facilities for obtaining or preparing food and drink at or near a construction work site should be provided, if not otherwise available at workplace.

Workers living accommodation

Proper workers living accommodation should be available at construction sites which are remote from their homes, where appropriate transportation between the site and their homes or other suitable alternative. Men and women workers should be provided with separate sanitary place, washing and sleeping facilities availability.

Information, tools and training

The following are key points that workers should;

(a) Workers should be informed of potential safety and health hazards to which they may be exposed at their construction workplace;

(b) Workers well instructed and trained in the measures available for the avoidance and control, and protection against, those hazards at the workplace.

Workers should not be employed in any work at a construction site unless that person has received the necessary information, instruction and training about any hazards at workplace so as to be able to do the work competently and safely. The concerned and competent authority should, in collaboration with employers, promote training programs to enable all the workers to read and understand the information and instructions related to safety and health matters for being safe at worker.

Trainings, instructions and information, should be given in a language understood by the worker and written, oral, visual and participative approaches should be used to ensure that the workers have assimilated the material. Regulations or National laws should prescribe:

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(a) The length and nature of training or retraining required for different categories of workers employed in construction projects.

(b) The employer has the duty to set up appropriate training schemes or arrange to train or retrain various categories of workers about safety at workplace and how to prevent hazards.

Workers should well informed and receive instruction and training about the general safety and health measures common to the construction project site, which should include:

- ✓ The general rights and duties of workers at the construction workplace.
- ✓ Accessibility and egress both during normal working time and in an emergency;
- ✓ Adequate measures for proper housekeeping.
- ✓ The location and effective use of welfare amenities and first-aid facilities provided in pursuance of the relevant provisions of this code to workers.
- ✓ Effective use and care for worker's equipment such as, clothes, protection tools etc.
- ✓ Worker's health protection and general measures for personal hygiene

Reporting of accidents and diseases

National laws or regulations should be well known before reporting of occupational accidents and diseases to the competent authority.

All accidents to persons causing loss of life or serious injury should be reported forthwith to the concerned and competent authority and an investigation of these accidents should be made orderly.

Other hazards causing incapacity to workers for periods of time as may be well specified in national laws or regulations, and prescribed occupational diseases should be reported to the competent authority within short period of time as soon as possible.

Most dangerous occurrences;

(a) Serious fire and explosions

(b) The lifting appliances, the collapse of cranes, derricks or others etc.

The collapse of structures, buildings or scaffolds or parts thereof, should be well revised and reported forthwith to the competent authority in such form and manner as may be prescribed, whether any personal injury has been caused or not.

VII. Methodology

A research process consists of a number of sequential phases. It begins with finding the research area and developing research questions. Thereafter, the investigation method should be selected along with research design and data collection techniques. Finally, the gathered data is analyzed and interpreted accordingly, then conclusion.

Data collection

Collecting data in this research involve specific tools, different sources based on construction activities and self-completion questionnaires or structured interview were developed to assist during research data collection. For the purpose of this master of technology thesis, a qualitative research method has been chosen to provide a description of how people experience the application of safety and risk management systems in the complex project organization. Qualitative methods are based on the facts which are socially constructed rather than purposely and are based on peoples‟ experience and expertizes. Qualitative research data collection method is an inductive approach where theories are gathered out of collected data and analyzed. Thus this method is most appropriate for this thesis since it uses Senior managers' experience.

Methods of data analysis

The collected data was through a conducted interviews and questionnaires and analyzed using simple percentage method (%).

Microsoft project software as tool to help construction project Manager to optimize safety and risk management systems in construction projects

Microsoft project software it is a project management tool and platform designed to help project managers to allocate resources, planning, control and monitoring the project progress and reduce workloads.

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Construction industry is one of complicated business area which requires skills, knowledge and experiences to achieve the planned objective or goal, to meet the planned objective there should be an application of specialties and techniques, it is in this concept of applying Microsoft project software as project management tool in optimizing safety and risk management systems in construction projects.

Project Risk Management

Project risk management includes the process of conducting risk management planning, and controlling risk on a project. The objectives of project risk management are to increase the likelihood and impact of positive events, and decrease the likelihood of negative events in the project. Below is the risk management cycle.

Figure3: Risk management cycle

Identifying the risk

You cannot resolve the problem before u understand it. The better way is first to understand the matter.

Analyze the identified risks

After you have got the potential risks in your project, the first is to find the way that can be prevented or controlled before happen.

Prioritize the risks

All risks are not affecting at the same level, therefore it is very important to weigh it and come up with an idea of how to resolve the problem, if is to split the activities, add more resources or to carry parallel activates and will be helped by MSP.

Assign an Owner to the risk

It is very important to appoint someone to deal with the matter after identified to be resolved.

Respond to the risk

This is very important phase in risk management, you should know if the risk is positive or negative so that you plan how are u going to deal with the matter or to mitigate it.

Monitor the risk

Very important part in risk management process, you cannot identify or manage risks without tracking the progress of the work, therefore Microsoft project will help you to set a baseline and status date and control the movement of the activities.

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Application of Microsoft project in construction activities and its role to reduce risks

Microsoft project as a project management tool is applicable in the construction project, starting from project initiation, planning, execution, tracking/monitoring to the project closure.

During project planning, Microsoft project software helps the planners to mention activities, set the calendar to schedules the activities accordingly.

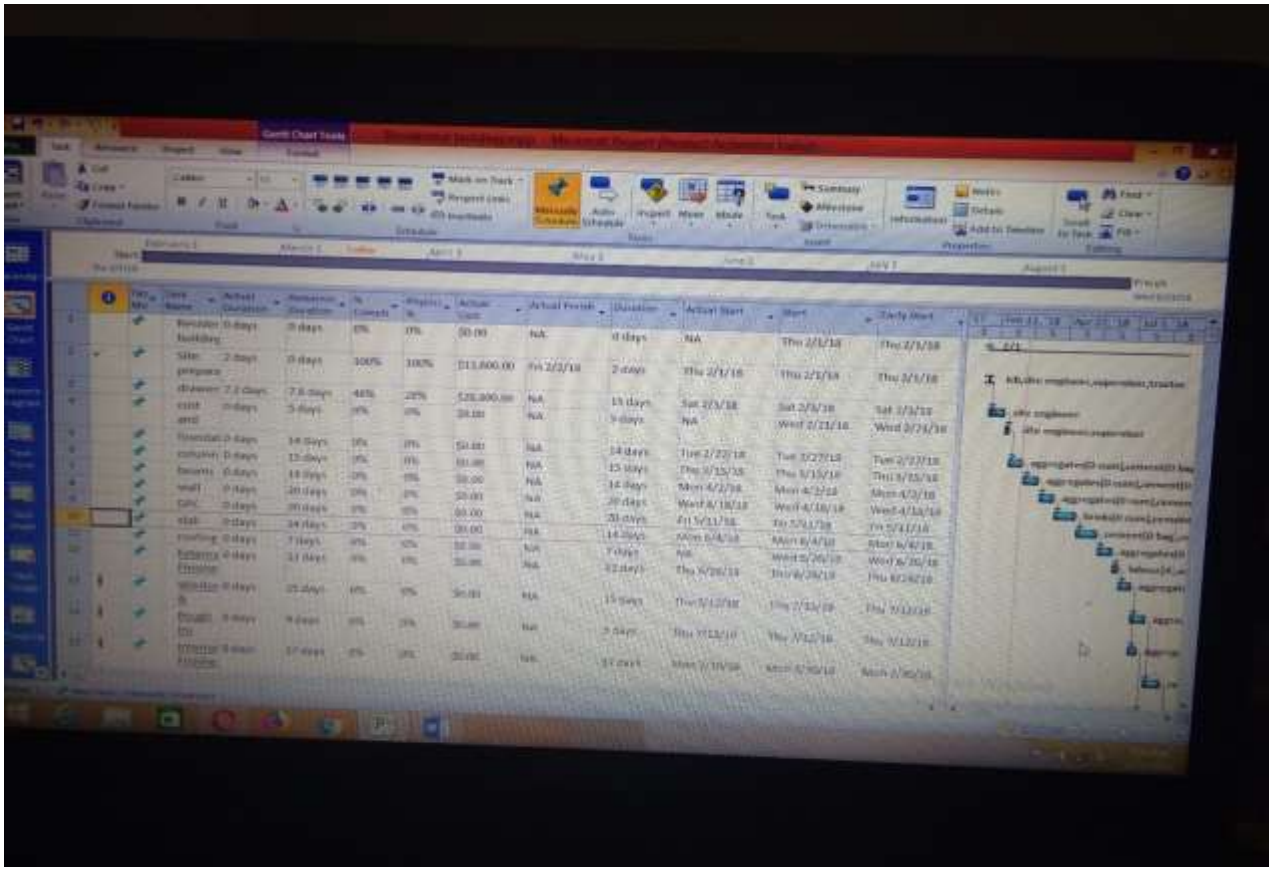

Figure4: Gantt chart tools

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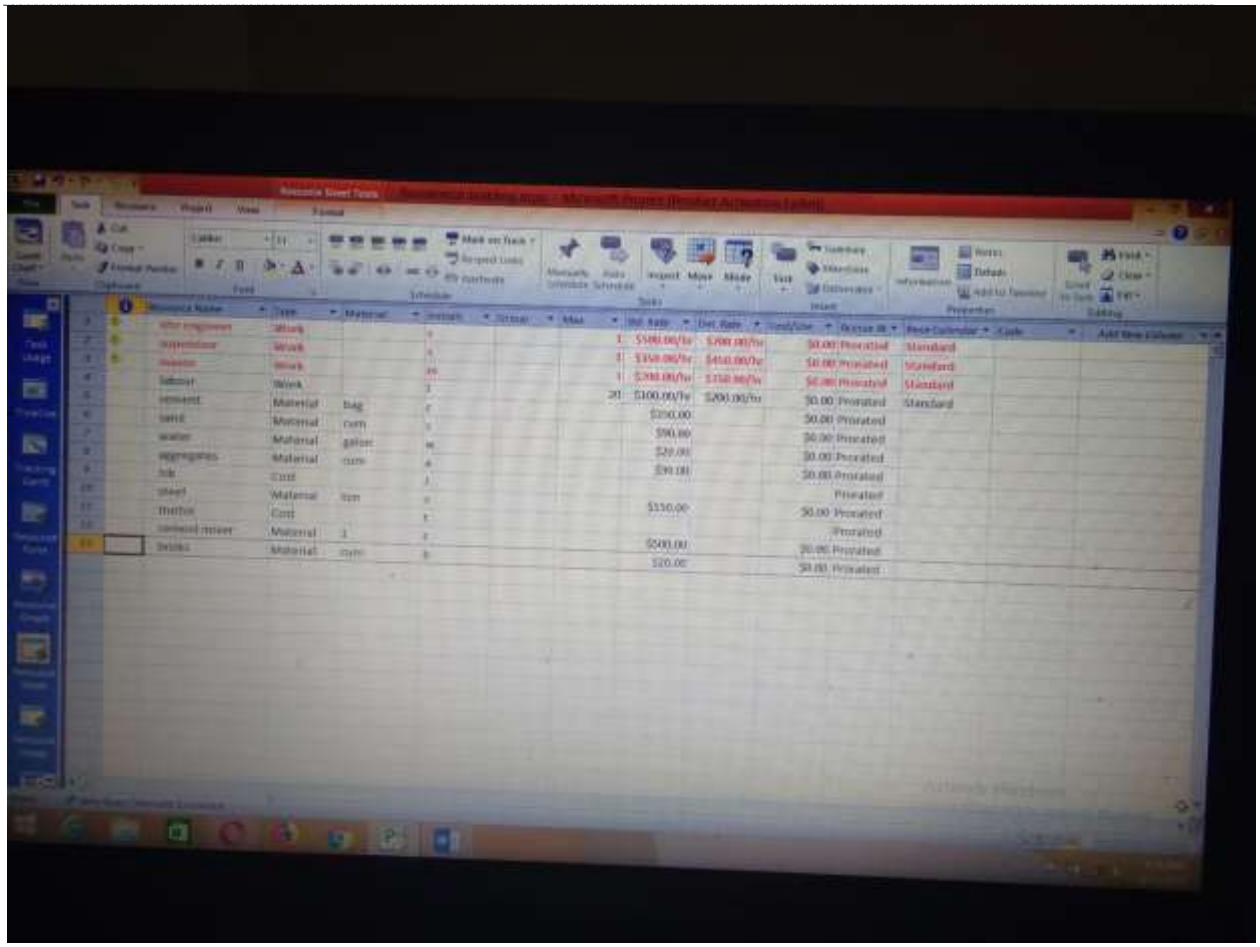

Figure 5: Resource sheet tools

Project Tracking

In construction projects, as one of the expensive and full of risks, project manager uses Microsoft project software as tool to track the progress of the project.

Tracking is the process of collecting, entering and analyzing of actual project performance values, such as work on tasks and actual durations. The tracking is the Second major phase of project management. The main thing to focus on project planning is developing and communicating the details of a project plan before actual work starts. When work begins, the next phase of project management is tracking progress. Tracking means recording project details such as work did by whom, when the work was done, and at what cost. These details are usually called as actual.

The first phase of managing your projects is planning. After the planning is completed, the implementation of the project starts. Construction projects are implemented according to the planned, but it is not possible in many situations. In general, the more complex is construction project plan and it takes the longer duration than its planned duration, there is possibility of variance. Variance is the difference between what you thought would happen (as recorded in project plan) and what really happened (as recorded by tracking).

Properly tracking actual work and comparing it against the original plan ensures you to identify variance and adjust the incomplete activity of the plan not to cause any risk or danger in construction project.

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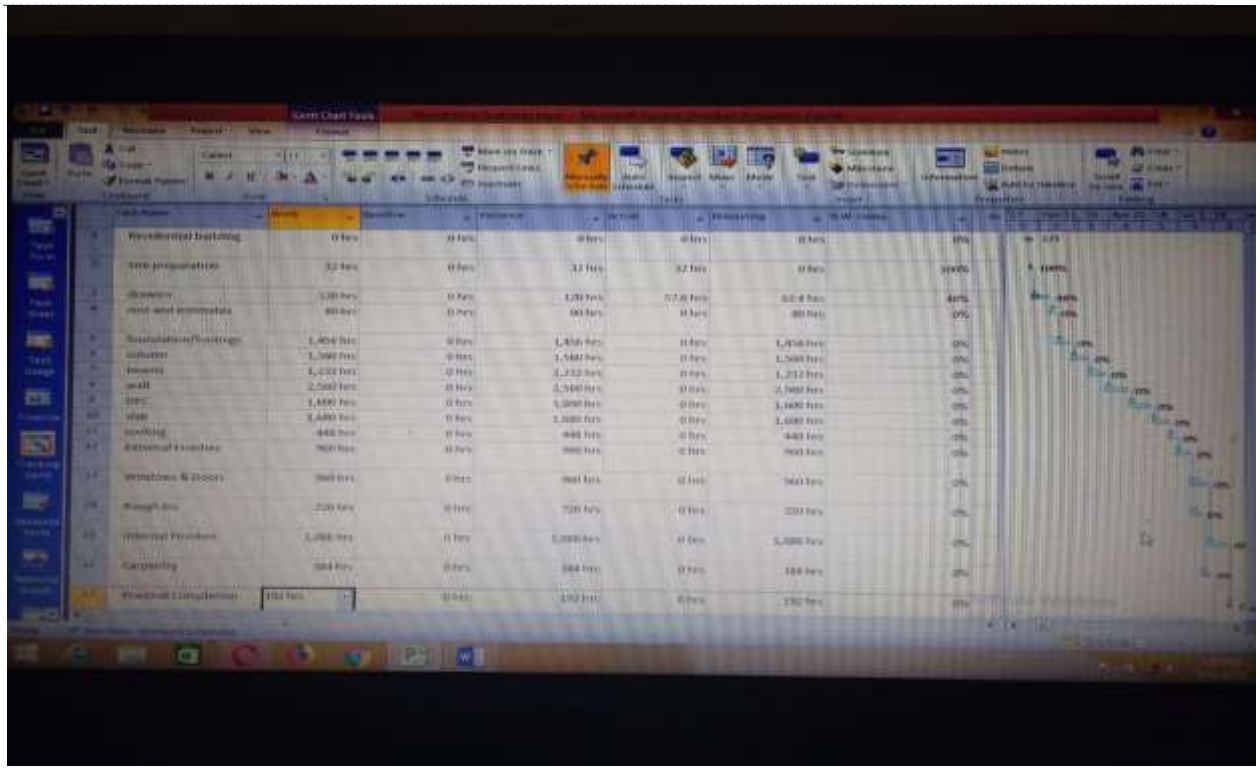

Figure6: Track Project Progress with physical % complete.

VIII. FINDINGS AND INTERPRETATION

Response

Depending on the nature of the work and responsibilities Senior managers in different construction projects were chosen to involve in this research because the software was designed for project managers, to assist in project planning, resources allocation, control and monitoring, tracking and reporting the project progress and reduce workloads.

Table1: Companies 'Experience

SN	Years	Frequency	Percentage
1	1-4	0	0%
2	5-7	13	23.2%
3	8-12	26	46.4%
4	More than 12 years	17	30.4%
Total		**56**	

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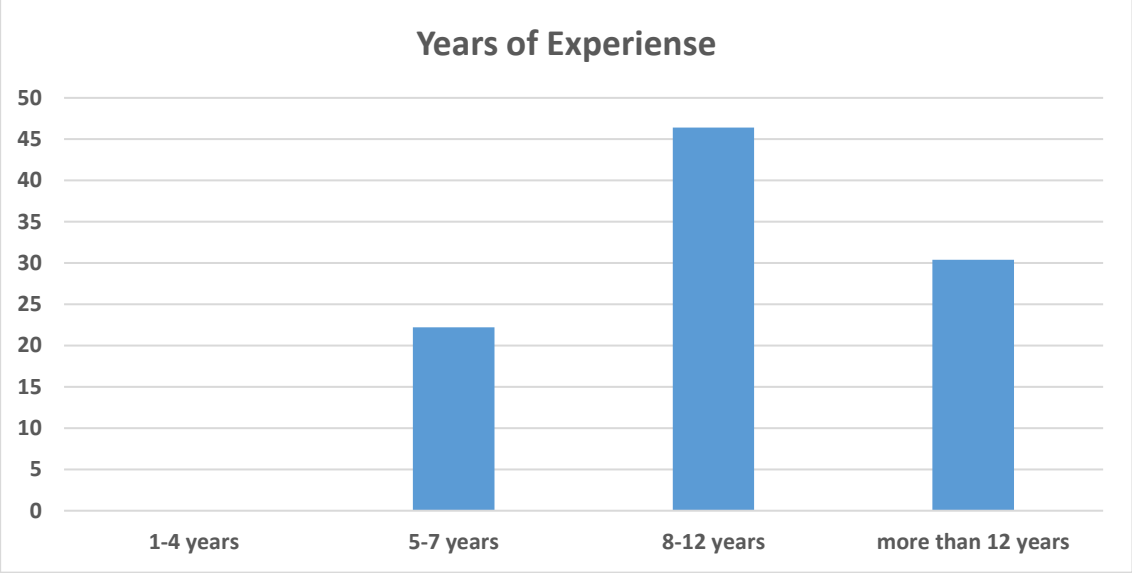

Figure1: Years of experience

The above table1 and bar chart1 represents the number of senior managers with their experiences in construction services and responses in percentages.

Table2: Companies 'Expertise

SN	Construction work in different areas	Frequency	Percentage
01	Transportation	8	14.3
02	Buildings	31	55.4
03	Industrial building	7	12.5
04	Hydraulic structure	10	17.8
Total		**56**	

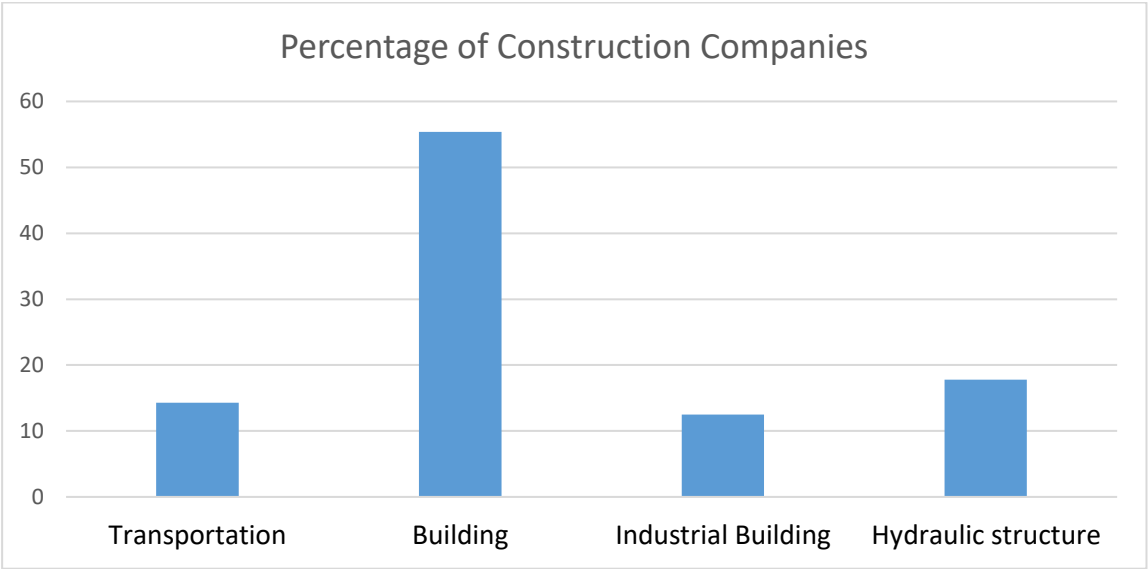

Figure2: Companies 'expertise

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The above table2 and figure2, represents the companies' expertise, senior managers from each construction company with their responses analyzed using simple percentage method.

Table3: Responses in percentage (%).

SN	Questions	Response	
		Yes	No
01	Are you aware of safety and risk during construction work?	89.3%	10.7%
02	Do you have any team in your company that is responsible for risk/safety during construction activities?	17.9%	82.1%
03	Do you conduct risk/safety training in your company?	14.3%	85.7%
04	Are using any software tool concerning risk management in your construction work?	28.6%	71.4%
05	Are using any Microsoft project tool in your construction company?	25%	75%
06	Do you consider risk before handling project to sub-contractor?	32.1%	67.9%
07	Do risk/threat affect your project timing during construction work?	82.2%	17.8%
08	Do risk have effect on cost during construction work?	85.7%	14.3%
09	Do any risk/threat affect the quality of the construction work?	89.2%	10.8%

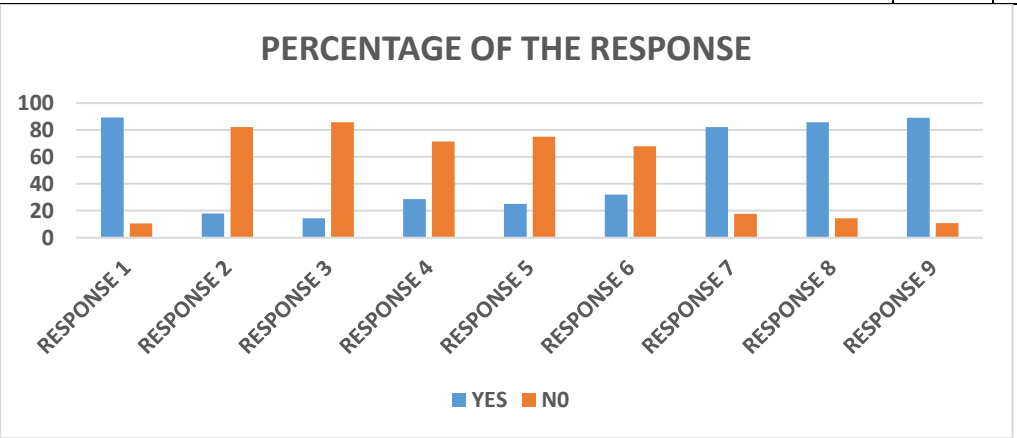

Figure3: Responses in percentage

The table3 and figure3 above, represents questionnaire and responses of different senior managers and responses were analyzed in simple percentage for those answered **Yes/No.**

IX. CONCLUSION

Construction Projects as one of the complexity activity, very expensive, full of risks compare to other projects which brings more disputes, loss of properties, lives and other many conflicts in the entire company or institution. Traditional way of planning doesn't sub divide the main task which future gets the hurdle of over allocation of resources, improper judgment of resources for particular activities etc. Therefore, Microsoft Project is the modern tool of Project Management that aid to overcome the challenges faced during planning and management that may come up with project failure due to lack of skills and using local means. It ensures the project manager for the optimum and effective organization of activities which helps to give the vision to complete the project in planned duration, cost and meet the scope.

Relevant to the findings collected and analyzed, depending on each question were asked individually proved that different people though they have a big role in construction projects but they don't have enough knowledge about safety and risk management only few of them have theory in them and depending on the percentages given above shows that many construction activities are conducted under risk due to lack of skills in respect with risk management process. Also during the time of data collection something were noted, due to lack of

communication also could be the barrier to express their feelings on the questions raised and many interviewers involved in data collection showed their interest and feelings about this research and willingly to pay their attributes. The above bar charts show that few senior project managers/companies developed in their companies strong measures to manage risks though no special skills or special team basically for it. Which proves that application of project management software is another reinforcement in construction industry in optimizing safety and risk management processes.

X. RECOMMENDATION

A country without infrastructure means there is no development at all, also due to day to day world' technologies and development especially in the area of construction projects, a lot of skills and specialties are demanded to overcome this serious issue of risk in construction projects.

Therefore, because of time limit would recommend other researchers in future to apply more software skills in the area of risk management and safety precautions in construction project, such as Primavera software, etc.

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APPENDIX A – INTERVIEW/QUESTIONAIRE

Section1

1. Number of years' company has been in the construction services
   1-4 years
   5-7 years
   8-12 years
   More than 12 years in service
2. What is your company expertise in the construction industry?
   Transportation
   Building
   Industrial building

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Hydraulic structure

Section2

1. Are you aware of safety and risk during construction work?
   Yes/No
2. Do you have any team in your company that is responsible for risk/safety during construction activities?
   Yes/No
3. Do you conduct risk/safety training in your company?
   Yes/No
4. Are using any software tool concerning risk/safety in your construction work?
   Yes/No
5. Are using Microsoft project tool in your construction company?
   Yes/No
6. Do you consider risk before handling project to sub-contractor?
   Yes/No
7. Does risk/threat affect your project timing during construction work?
   Yes/No
8. Does risk have effect on cost during construction work?
   Yes/No
9. Does any risk/threat affect the quality of the construction work?
   Yes/No

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