Analyzing the Factors Affecting the Productivity of Construction Project by Using Relative Importance Index Method

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Abstract: *Construction productivity is the concept which gives us the all over growth of the construction firm. There are so many factors on which productivity depends, such as, equipment which is used at site, skills of workers, no. of hours and days they are working and the main aspect is labor force. In this research, a study was conducted to recognize the significant factors for the low productivity in Indian construction industry. The focus was on the relationship among different factors through qualitative and quantitative analysis, so as to identify the most direct factors and their root causes. How to improve it and which things are to be considered, also some analysis methods will be implied to calculate construction productivity by using Craftsman questionnaire. It also gives the idea about labor problems and how does it affect on work as the labor force is the main and soul aspect of construction productivity. Although many factors were identified through these studies, further research on the relationship between different factors was seldom carried out.*

Keywords: construction productivity, labor productivity, growth, analysis methods.

INTRODUCTION

Productivity issues are categorized into macro- and micro-level. Macro level consists contracting methods, labor legislation, and labor organization; while micro-level consists management and operation of a project on the job site.

To improve productivity, we should measure it. And we must be able to measure the effect of changes adopted on methods, effort, and systems. The measured values of productivity then must be compared either to those used to assemble the estimate and maintaining the production standards. Performance factor, production rate, unit person-hour (p-h) rate etc are the terms used for construction productivity. Traditionally, productivity is the ratio of input/output, i.e., the ratio of the input of that resource to real output. To restate this definition for use in the construction industry: labour productivity is the physical progress achieved.

Productivity = outputs / inputs

BACKGROUND

The construction industry has been traditionally regarded as a labor-intensive industry. The production in this area has the features of large scale, open job sites, and extensive fragmentation in the process. Therefore the construction industry has long been regarded as an "incredibly inefficient" sector (Dacy, 1965). The industry's relatively low productivity growth compared with other sectors such as the manufacturing industry has caused its performance to be a great concern to clients and decision-makers.

In India, low productivity in construction was identified as one of the major problem of the construction industry. Because of its labor-intensive nature, the construction industry in Singapore employs a disproportionately large share of the nation's total workforce pool in relation to its contribution to the economy. As an economic sector, construction contributed 6% of the country's Gross Domestic Product (GDP), but took up 7.5% of the total workforce.

Over the 10-year period from 1982 to1991, the construction productivity in Singapore had increased at an average rate of 3.1%, which is below the 4.2% rate for the whole Singapore economy, which demonstrated that the construction industry is lagging behind the national development. The reasons for this situation include the separation of design and construction phases; a transient pool of largely low-cost, unskilled foreign labor; and the still economical, traditional labor-intensive construction systems.

If the effort to enhance productivity performance can be devoted in the right direction, then measures for improvement will be taken efficiently. Although several studies have been done on factors affecting productivity, and most of the factors are identified, further research on the relationship between different factors is seldom carried out. In this research, a study is conducted to recognize the significant factors for the low productivity in Singapore construction industry. The focus is on the relationship among different factors through quality and quantity analysis, so as to identify the most direct factors and their root causes.

CONCEPT & MEASUREMENT OF PRODUCTIVITY IN CONSTRUCTION:

Concept of Productivity:

There is no universal definition for productivity; the term has different meanings for different people (Adrian, 1987). Generally, productivity is the relationship between the output produced and one or more of the associated inputs devoted to the production process (National Research

Council, 1979). Productivity may be defined as the ratio of output to input, via the arithmetical ratio between the amounts produced (output) and the amount of any resources used during the process of production (input) (Chan & Kumaraswamy, 1995). In essence, it is a measure of how well we make use of the available resources effectively to produce the goods. A high productivity level represents good use of resources and high returns.

There is divergence in opinion on how to measure output and input. A vast number of output-to-input ratios can be created; no single productivity measure works for all purposes. The selection of an appropriate concept of productivity depends on the objective of measurement, availability of data, and the researcher's preference.

Measurement of Construction Productivity:

Productivity measurement can be categorized into partial productivity measures (PPM) and total productivity measures (TPM) (Riggs and Felix, 1983). Productivity is a parameter to evaluate the effectiveness of converting the resources into the products. These resources (input) include manpower, management, material, capital, technology, and equipment. Productivity expressed in relation to all of these factors is termed total-factor productivity (TFP):

Total-factor productivity = Total input/ Total output …… (1)

Dacy (1965) and Koch and Maovenzadeh (1979) studied total factor productivity at the industry level.

Other measures consider the relationships between output and a particular input or an incomplete combination of inputs. These are referred to as partial-factor productivity (PFP): Partial-factor productivity = Partial input Total output …… (2)

The most popular partial-factor productivity are labor productivity and capital productivity.

AIM SCOPE AND OBJECTIVES

The aim is to identify major factors that affect the productivity/workability of craftsmen and estimate the p-hrs (person-hour) lost per craftsman per week due to specific causes.

For the execution of this project, following objectives are defined respectively:

1) To analyze the Construction productivity within the housing industry
2) To distribute and fill-up a simple questionnaire form/list by craftsmen on a job site
3) To qualitatively and quantitatively identify the critical factors leading to the loss of productivity.
4) To develop cause-effect relationship between these critical factors, and allowing the project organizational-level factors to be determined.
5) To propose tips and solutions to rectify the issues for increasing construction productivity.

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HISTORY OF CONSTRUCTION INDUSTRY OF INDIA:

Construction sector plays a pivotal role in the economic growth of a nation, especially in an emerging one like India. The market size of Indian construction industry is around Rs 248,000 crore ($37.6 billion) and it currently employs a workforce of nearly 32 million, the second largest sector after agriculture.

The construction sector generates substantial employment and provides growth impetus to several sub-sectors to manufacturing like cement, bitumen, iron and steel, chemicals, bricks, paints, tiles, etc. whose combined value isRs192,000 crores ($29 billion) annually. The construction equipment market is valued at Rs105,000 crores ($16 billion). It is roughly estimated that 40–45 per cent of steel; 85 per cent of paint; 65–70 per cent of glass and significant portions of the output from automotive, mining and excavation equipment industries are used in the construction industry.

Growth of construction industry and its share total output: The construction sector in India is the second largest contributor to the GDP. The contribution of this sector to GDP was average and around 7.5 per cent between 2009-10 and 2013-14, but with the shift of National Income.

- Accounting to gross value added (GVA) based measures, its share increased to an average of 8.6 per cent during the last four fiscals ended 2014-15. During 2015, construction industry grew by 2-3 percent and hit volumes of 48,000 units. By 2018, the industry is expected to hit volumes of 74,000 units.
- The construction Industry is an important sector with its contribution of 10 per cent to India's GDP.
- In India, the sector accounts for second highest inflow of FDI after the services sector and employ more than 35 million people.
- Around 100 Smart Cities and 500 AMRUT Cities will invite investment of Rs 2 trillion in the next five years.
- Apart from the Smart Cities project, the Government's 'Housing for All by 2022' is also a major game changer for the industry.
- The construction sector is climbing up the growth ladder, with 100 per cent FDI and an expected investment of $650 billion in the coming 20 years.
- The major export destination for India's construction sector includes US, UAE, Saudi Arabia and UK.

LITERATURE REVIEW

Factors that affect the productivity of construction projects in small and medium companies: Analysis of its impact on planning- Nelia Valverde- Gascueña, Elena Navarro-Astor, Joaquin Fuentes-del-Burgo and Juan Pedro Ruiz-Fernandez (2011) [1] **-** In this paper the authors have presented the results of a research about the factors that impact the performance of construction works and, therefore, the planning and the building costs. Some of the considered factors such as technical faults in project documents, inspection delays or the workers' training and skills are included in a survey directed to building engineers working for small and medium building companies. The knowledge and appropriate management of these factors can improve the planning of the work during the project development phase and the execution phase. This will have positive effects regarding time shortening for the execution of activities and, as a result, cost reductions. The qualitative research approach carried out in this research shows how Project Management Teams and Site Managers working for the constructing company have different points of view when planning and acting upon a productivity factor. For example, Project Management Teams do not seem to consider inspection delays, project changes and lack of project information, while, at the same time, they happen to be very important and out of control for Site Managers. This contradiction implies that there is potential for site productivity improvement through coordination among these construction professionals.

Factors affecting construction productivity: a 30 year systematic review - Abid Hasan, (2017) [2] **-** The purpose of this paper was to undertake a comprehensive systematic review of mainstream studies on factors affecting construction productivity published within the last 30 years (1986–2016). Gaps in research and practices were discussed and directions for future research have been proposed. The outcomes of this study would help researchers and practitioners by providing the findings of previous studies in a concise manner. It is also expected that presenting a deeper and wider perspective of the research work performed until now will direct a more focused approach on productivity improvement efforts in the construction industry. This review paper undertakes a comprehensive systematic review of studies on identification of things affecting construction productivity published during the last three decades. To fulfill the objective a total of 46 articles from different sources such as journals, conference proceedings, and dissertation and PhD theses were identified and thoroughly reviewed. The review does not include studies that report productivity at the organizational or industry level as well as total factor productivity. The scope of the review is restricted to figure on identification of things affecting productivity at the activity level in construction projects.

Factors affecting the productivity of the construction industry in Thailand: the project managers' perception Arun Makulsawatudom and Margaret Emsley (2001) [3] **-** The objectives of this paper are to identify factors affecting construction productivity in Thailand, and their potential for improvement. To do so, 34 project managers working within the housing industry in Thailand were asked to finish a structured questionnaire survey. The factors were ranked, employing a relative importance index (RII), consistent with the project mangers' perception of their levels of influence and their potential for improvement. Findings indicate that the highest eight factors affecting construction productivity are: lack of fabric , incomplete drawings, inspection delay, incompetent supervisors, instruction time, lack of tools and equipment, poor communication and poor site conditions. However, the ranking of things in respect of their potential for improvement didn't correlate with their influence on productivity. To supplement the questionnaire data, in depth interviews were conducted with some project managers. This study forms the initial investigation of a more in-depth study of the Thailand housing industry , which aims to steer to overall productivity improvement.

A survey of the factors affecting the productivity of construction projects in Iran ¯ Mohammad Reza Hossieni and Parviz Ghoddousi (2012) [4] - The intense competition between the Iranian construction companies has led them to take all appropriate measures to decrease the costs as much as possible. Hence, thanks to the pivotal role of human resources in construction projects cost, a serious a part of Iranian construction companies seek their profitability and survival in maximizing the productivity of their operatives. Because of the widespread belief among contractors about the low productivity of daily workers and operatives with basic salary, they commit a serious a part of their projects activities to sub-contractors. Deployment of sub-contractors by construction firms has become

largely conventional in country's construction projects. The aims of this paper is defined as determining the factors and grounds affecting sub-contractor's productivity and evaluate their overall negative side effects on project productivity via a structured questionnaire. A total of 31 factors selected and were divided into 7 broad categories. The perceptions of companies managers were asked about the extent of effect caused by the mentioned factors and groups upon productivity on a time based criterion. The analysis indicated that the foremost important grounds affecting sub-contractors productivity in descending order include: Materials/Tools, Construction technology and method, Planning, Supervision system, Reworks, Weather, and Jobsite condition. Project managers should specialise in the identified major grounds and relevant factors so as to enhance productivity as long as they commit construction activities to sub-contractors.

Research of factors influencing construction productivity- Zohar Herbsman &Ralph Ellis (2006) [5] - This paper describes the event of a statistical model that illustrates the quantitative relationships between influence factors and the productivity rates. The application of such a model will enable the user to estimate productivity rates with a better degree of accuracy in future projects. Productivity rates are among the foremost essential data needed within the housing industry. The accuracy of productivity rates is crucial for the determination of direct relationships between these rates and subjects like estimating, cost control, scheduling, and resource management, among others. Past experience within the housing industry has shown that great variation in production rate values for an equivalent construction item is attributed to the consequences of project conditions which are commonly called influence factors.

Trends in productivity improvement in the US construction industry-David Arditi &Krishna Mochtar (2010) [6] – Surveys of the top 400 US contractors were conducted in 1979, 1983 and 1993 to identify the areas with potential for productivity improvement within the housing industry . The trends in the findings of these surveys are observed and interpreted. The results indicate that cost control, scheduling, design practices, labour training, and internal control are the functions that consistently over the years are perceived as having considerable room for productivity improvement, whereas materials packaging and foreign developments in construction technologies are perceived consistently as functions that don't have much effect on improving construction productivity. The functions that were identified as needing more improvement in 1993 compared with the previous surveys were prefabrication, new materials, value engineering, specifications, labour availability, labour training, and quality control, whereas people who were identified as needing less improvement than within the previous surveys were field inspection and labour contract agreements. Also, respondents indicated consistently over the years that they're willing to participate in activities associated with improving construction productivity but aren't curious about funding any such activities.

Factors affecting performance of construction projects in unstable political and economic situations- Ghanim A. Bekr (2017) [7]**-** The aim of this study is to identify and evaluate the main factors affecting the performance of construction projects in this country which suffers unstable political and economic circumstances that occurred after the year 2003 and still affecting the performance. Literature review about performance was administered to spot the factors affecting the performance of construction projects. In addition, other local factors are added as recommended by experts and consistent with the researcher's own experience in implementing construction projects. A literature review was administered and 64 factors were identified, categorized into 7 groups. A survey was conducted to guage and rank these factors from clients, consultants, and contractor's perspectives. A total of 116 questionnaire sets were collected representing 36 clients, 38 consultants and 42 contractors in several parts of Iraq. It was concluded that projects were delayed and therefore the actual cost of projects was far more than their values due to Iraq's political and security conditions. Overall project safety factors had been moderately implemented in construction organizations. It is recommended that construction organizations should have a transparent mission and vision to formulate, implement and evaluate their performance. A structured methodology and technique should be identified to beat the effect of local political and economic situations on the performance of construction projects.

Factors Affecting the Success of a Construction Project - Albert P. C. Chan; David Scott; and Ada P. L. Chan (2001) [8] - Different researchers have tried to determine the factors for a successful project for a long time. Lists of variables are abounded within the literature; however, no general agreement are often made. The aim of this paper is to develop a conceptual framework on critical success factors (CSFs). Seven major journals within the construction field are chosen to review the previous works on project success. Five major groups of independent variables, namely project-related factors, project procedures, project management actions, human-related factors, and external environment are identified as crucial to project success. Further study on the key performance indicators (KPIs) is required to spot the causal relationships between CSFs and KPIs. The causal relationships, once identified, are going to be a useful piece of data to implement a project successfully.

Factors Affecting the Performance of Construction Projects: A Survey of Construction Projects in the Coastal Region of Kenya - Peter Orero Nyangwara , Evelyn Datche (2015) [9]- This research evaluated firstly the factors affecting the performance of construction projects in order to assist owners, consultants and contractors to overcome performance problem and to improve performance of their construction projects secondly to determine the influence to which the external

environment affects performance of construction projects thirdly to identify the most significant project procedures that affect performance of projects and lastly to evaluate project management actions project performance. Respondents comprising of project manager's clients, contractors and consultants in construction firms throughout the coastal region of Kenya were selected because the sample population. Questionnaires were then distributed and collected from the sampled population respondents. Gathered data was analyzed to spot those factors that affect the performance of construction projects within the Coastal region of Kenya.

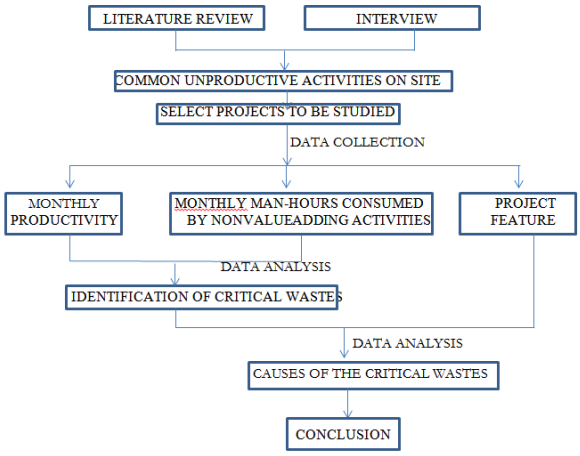
Study and Analysis of Factors Affecting the Performance of the Construction Projects Melba Alias, Dhanya R, Ganapathy Ramasamy (2015) [10]- The aim of this study is to identify the factors affecting the local construction projects and analyze them. A questionnaire is prepared from literature review. The questionnaire contains two parts; part A dealing with the general information of the company and the respondent and Part B is subdivided again into different factors like cost, time, health and safety, client satisfaction, community satisfaction factors, productivity factors and environmental factors. The questionnaire was distributed in Chennai, Kerala and Bangalore industries. Each respondent was asked to rank the factors in a range of one to five. The analysis of the response was done using the SPSS software. The top 5 factors affecting the performance of projects were identified as increase in material cost, inadequate supply of labor, incorrect planning, wrong method of estimation, and poor financial control on site.

The aim and objective of the study is to find the factors which affects the performance of the construction projects in and around the regions of Chennai, Kerala and Bangalore:

1. To find the factors affecting the performance of construction projects.
2. Analysis of the factors and ranking the factors according to the Mean
3. To give suggestions and recommendations to improve the performance of the industry.

RESEARCH METHODOLOGY

"The search of knowledge", generally refers the research carried out (Kothari 2004) (Naoum 2007). The research methodology is defined as a way to question the research objective, accompanied with discussion on the critical review which will finally guide to the correct conclusion. In order to achieve this target the research objectives should be properly questioned to achieve guaranteed results. This research methodology can be split into two categories that are qualitative research and quantitative research. The main factors governing the research strategy are the type and availability of required information and the purpose of study (Naoum, 2007). Selection of right strategy plays a significant role in obtaining best results.



Procedure of the study

PROBLEM STATEMENT

Productivity is the complex and multifaceted phenomenon, so it is hard to calculate is theoretically by considering few factors which are affecting construction productivity. So that it is important to analyze the productivity by using statistical methods. Statistical methods help us measure the productivity in numbered form and overcome it easily. However, it is important to calculate construction productivity for increase overall growth of the organization or company.

RESEARCH GAP

From the available literature review, it is noted that significant research has been done to analyze the factors that affect the productivity in the construction industry but there is a lack of work for analysis in Pune region. Pune is a developing city where there are multimillion projects going on simultaneously and contribute to the major share of employment for human resource. With this consideration, work is undertaken to analyze the factors affecting construction productivity in the Pune area by Craftsmen method and propose recommendations to improve the performance of the activities on the construction sites

FACTORS AFFECTING PRODUCTIVITY:

Productivity is one among the foremost important factors affecting the general performance of any organisation, large or small (Kazaz and Ulubeyli, 2007). The construction industry represents a substantial portion of the Indian economy; thus, research and development in this area may have an important impact on the national economy. Productivity in construction sites is vital because it influences time and price objectives (Moselhi and Khan, 2010). In fact, the share of projects exceeding cost or time forecasts is high (González et al., 2010; Johansen and Wilson, 2006).

Factors considered and definitions provided were as follows:

1. **Overtime:**

Scheduling of extended work days or weeks exceeding a typical eight-hour work day or 40hour work week lowers work output and efficiency through physical fatigue and poor attitude .

2. Morale and Attitude:

Spirit of workers supported willingness, confidence, discipline, and cheerfulness to perform work or tasks are often lowered because of a selection of issues, including increased conflicts, disputes, excessive hazards, overtime, over-inspection, multiple contract changes, disruption of labor rhythm, poor site conditions, absenteeism, unkempt workspace, and so on.

3. Fatigue:

Fatigue are often caused by prolonged or unusual workout

4. Stacking of Trades:

This occurs when operations happen within physically limited space with other contractors, resulting in congestion of personnel, inability to use or locate tools conveniently, increased loss of tools, additional safety hazards, increase visitors, and prevention of crew size optimum.

5. Joint Occupancy:

This occurs when work is scheduled utilizing an equivalent facility or work area that has got to be shared or occupied by quite one craft, and not anticipated within the original bid or plan.

6. Beneficial Occupancy:

This is a results of working over, around, or in close proximity to other crafts, owner's personnel, or production equipment, which may cause noise limitations, dust, or other hazardous risk. This may also prevent or cause access restrictions.

7. Concurrent Operations:

This is the effect of adding operations to any sequence of operations that has already been planned, without a gradual and controlled implementation of additional operations.

8. Absenteeism and Turnover:

There is an excellent deal of your time and money lost related to high turnover and absenteeism on projects. Construction projects in certain areas with low manpower and high demand for labor will usually be more impacted than others. Extreme weather (such as extreme heat or cold) also will increase absenteeism and turnover. Replacement workers are usually not conversant in the work or area, and need experienced workers to prevent work and show them what to try to to . The impact are often up to four days of lost work for every worker.

9. Mobilize/Demobilize:

This relates to moving resources on and moving off to projects as a result from changes or delays, causing work disruptions. Productivity may drop during these periods as time is lost when crews move from one area or work assignment to a different .

10. Errors and Omissions:

Increases in errors and omissions impact on labor productivity because changes are then usually performed on a crash basis, out of sequence, cause dilution of supervision, or the opposite negative impacts.
performed on a crash basis, out of sequence, cause dilution of supervision, or the other negative impacts.

11. Start/Stop:

This results from a piece stoppage or suspension of labor , which can cause an opportunity within the schedule, usually triggering a start/stop of labor activity. Stop-starts can have an impression on productivity and price of a project. Work scheduled or reassigned during holidays like Thanksgiving, Christmas, New Year's, then on are often impacted with stop-starts. Workers tend to debate the day off and lose previous momentum with a drop by productivity before they revisit in routine.

12. Reassignment of Manpower:

When workers are reassigned, they experience unexpected or excessive changes, losses caused by move-on or move-off, reorientation, and other issues that end during a loss of productivity.

13. Late Crew Build-up:

This is caused when the planned project manpower loading is altered and causes manpower loading to make up slower than planned because of availability, shortage of resources, or competition from resources. Impacts can be in excess of 10 percent.

14. Crew Size Inefficiency:

This is when the optimal crew size is altered by adding or deleting crew members. When workers are added or deleted from a crew, it breaks up the first team effort and rhythm of the crew and leads to loss of productivity.

15. Site Access:

This is a results of interferences to the convenient or planned access to figure areas. This can be due to blocked stairways, roads, walkways, insufficient man-lifts, or congested work sites.

16. Logistics:

Insufficient or poor material handling, owner-furnished material, procurement practices, or a scarcity of controls can cause procurement or delivery problems, also as other issues. This then prevents, delays, or disrupts the traditional material workflow to a piece area, warehouse, or laydown yard. This can even be a result from the extra replacement or substitution of fabric thanks to contract changes, defects, or delays at the work site.

17. Security Check:

This could be caused by workers entering or leaving the world , or from "brassing" in and out, toolbox checks, transport of labor to secure area, and so on.

18. Learning Curve:

When crew turnover causes new workers to be added to a crew or additional manpower is required within a crew, a period of orientation occurs so as to become familiar with changed conditions. They must then learn work scope, tool locations, work procedures, and so on.

19. Ripple Effect:

This is caused when changes in other trades' work then affects other work, just like the alteration of schedule.

20. Confined Space:

When work is during a confined space with limitations on egress and ventilation, this will end in nonproductive labor to supply hole watch, along side other issues. Time is additionally lost when going to and from the work area.

21. Hazardous Work Area:

This is caused when working in an area that is classified as hazardous, requiring special safety equipment and clothing.

Restrictions may limit time and exposure of workers to the world , leading to less time on tools within the area.

22. Dilution of Supervision:

This occurs when supervision is diverted from productive, planned, and scheduled work to research and plan contract changes, expedite delayed material, manage added crews, or other changes not within the original work scope and schedule. Dilution is additionally caused by a rise in manpower, work areas, or project size without a rise in supervision.

23. Holidays:

If workers work on holidays, there's not only a price factor for holiday pay, but there's usually a loss of productivity also . It may be addressed as a morale factor since workers are faraway from families and dealing rather than enjoying the vacations , or it also can be factored separately. Either way, there's usually a productivity loss to think about .

24. Shorter Daylight:

Hours Delays can cause work to be deferred from one-time period to subsequent , which can involve seasonal changes. Different regions and locations round the world even have different amounts of daylight , counting on the season.

25. Weather and Season Changes:

Performing add a change of season, temperature zone, or global climate change leading to work performed in either extremely popular or very weather , rain or snow, or other changes in temperature or climate can impact workers beyond normal conditions.

26. Rain:

Most crafts don't add the rain, but many do, especially those that sleep in wet regions of the country and must work or risk losing an excessive amount of in wages. Work can, and does occur within the rain, but not without inefficiencies thanks to rain gear, visibility, safety, morale, discomfort, hazards, and other issues.

27. Shift Work:

This is when work is performed at any time aside from the primary shift or the morning shift of a piece day. Work on second and third shifts are less efficient and should even be supported a shorter work period. The reduced daylight and problems trying to select up where the last shift left off leads to less productivity.

28. Working in Operating Area:

Inefficiencies may result when work is in close proximity to operating units like heat from boilers, smoke from emissions, explosion zones, and so on. This can cause work stoppages, need for protective clothing, work permits, or other requirements.

29. Over-manning:

This is caused when work planners hire too many workers for the estimated work scope and duration. Sometimes, when labor in certain areas or regions is scarce or hard to urge , work planners may overcompensate for potential absenteeism and turnover, which creates overstaffing. Another cause is the false assumption that increased manning will always result in increased work productivity.

30. Tool and Equipment Shortage:

This is caused when there is insufficient quantity or quality of tools and equipment to meet the needs of the project.

31. Area Practices:

This can be the results of added or extended coffee breaks, unique observance or custom, or other practices unique to the craft, owner, country, project location, or other customary practices in the area.

32. Proximity of Work:

This is caused by working during a remote area, proximity of tools, break areas, material laydown yard, or other resources causing a loss of your time for access.

33. Alternating, Staggered, or Rotating Work Schedules:

This usually leads to unusual or unique scheduled work periods designed to optimize craft hours worked, attract labor to remote sites, compete for resource , and minimize fatigue. Examples include allowing half the manpower to require every other Friday off, or staggered crews of 4-12s (working on four days then four days off), or rotating crews to work a week and then take a week off.

CONCLUSION

Through the discussion on the different types of strategies, qualitative strategy was found to be best suited for this research. The qualitative approach seeks subjective data and relies on the views and opinions unlike the quantitative approach which is suited by the researches who seek amount or quantity.

From the different methods of data collection, the questionnaire survey method was used in this research; this questionnaire is been established and sent to the website (https://docs.google.com). Finally a list of professionals is selected from LinkedIn and this link is send to them for the survey.

REFERENCES

1 Factors that affect the productivity of construction projects in small and medium companies: Analysis of its impact on planning- Nelia Valverde- Gascueña, Elena Navarro-Astor, Joaquin Fuentes-del-Burgo and Juan Pedro Ruiz-Fernandez (2011) -Valverde-Gascueña, Navarro-Astor, Fuentes-del-Burgo and Ruiz-Fernande

2 Factors affecting construction productivity: a 30 year systematic review - Abid Hasan, (2017) - Engineering Construction & Architectural Management

3 Factors affecting the productivity of the construction industry in Thailand: the project managers' perception Arun Makulsawatudom and Margaret Emsley (2001) Productivity in Thailand

4 A survey of the factors affecting the productivity of construction projects in Iran ¯ Mohammad Reza Hossieni and Parviz Ghoddousi (2012) - Echnological and economic development OF ECONOMY 2012 Volume 18(1): 99–116

5 Research of factors influencing construction productivity- Zohar Herbsman &Ralph Ellis (2006) - Construction Management and Economics Vol. 08 , 1990, Issue 1

6 Trends in productivity improvement in the US construction industry-David Arditi &Krishna Mochtar

(2010) - Construction Management and Economics Vol. 18 , 2000, Issue 1

7 Factors affecting performance of construction projects in unstable political and economic situations- Ghanim A. Bekr (2017) - Journal of Engineering and Applied Sciences VOL. 12, NO. 19, OCTOBER 2017

8 Factors Affecting the Success of a Construction Project - Albert P. C. Chan; David Scott; and Ada P. L. Chan (2001) ˙ Journal of Construction Engineering and Management 130(1) · February 2004

9 Factors Affecting the Performance of Construction Projects: A Survey of Construction Projects in the Coastal Region of Kenya - Peter Orero Nyangwara , Evelyn Datche (2015) - International Journal of Scientific and Research Publications, Volume 5, Issue 10, October 2015

10 Study and Analysis of Factors Affecting the Performance of the Construction Projects Melba Alias, Dhanya R, Ganapathy Ramasamy (2015) International Journal of Science, Engineering and Technology Research (IJSETR) Volume 4, Issue 4, April 2015