

**A DETAILED ANALYSIS OF LABOUR PRODUCTIVITY AND
IMPROVEMENT IN CONSTRUCTION**¹S SARAVANAN, ²T SATHEESH KUMAR, ³S.S JANAGAN

ASSISTANT PROFESSORS, GNANAMANI COLLEGE OF ENGINEERING, NAMAKKAL.

ABSTRACT:- A Poor productivity of construction workers is one of the causes of cost and time overruns in construction projects. As construction is a labor-intensive industry, this paper focuses on labour productivity in the construction industry. It covers the construction labour productivity definitions, aspects, factors affecting it. The main outcome from the literature is that there is no standard definition of productivity. This study provides a guidelines for necessary steps required to improve construction labour productivity.

The productivity of labour is particularly important especially in developing countries, where most of the building construction work is still on manual basis. This paper reports on a survey made on project managers and experienced engineers of building projects. Where an increase in productivity is being sought. Respondents were required to rate using their experience how all factors affect productivity with respect to time, cost and quality. The survey was carried out by a questionnaire and responses. The ten most significant factors affecting labour productivity for small, medium and large companies are identified. From the analysis of data collected it is observed that measurement of labour productivity is helpful in saving the time of the project as well as cost of project without hampering the quality of work.

Keywords: labour productivity, questionnaire survey, Time saving, Cost saving.

1. INTRODUCTION**1.1 GENERAL**

Productivity has been generally defined as the ratio of outputs to inputs. Construction projects are mostly labour based with basic hand tools and equipment, as labour costs comprise 30 % to 50 % of overall projects cost. Therefore, while numerous construction labour productivity research studies have been undertaken, only a few have addressed the productivity issue in developing countries factors affecting productivity in the construction. Productivity in economics refers to measures of output from production processes, per unit of input. Productivity may be conceived of as a measure of the technical or engineering efficiency of production (Saari, 2006). There are many factors that influence the productivity in construction industry. Labour productivity is one of the most important factors that affect the physical progress of any construction project. Construction labourers are responsible to operate a variety of equipment. To perform their jobs effectively, construction labourers must be familiar with the duties of other craft workers and with the materials, tools, and machinery they use.

In India, one of the greatest challenging faced by the construction industry is to attract and to attain skilled labour. Low productivity among the labour will give impacts to the construction industry such as cost overruns and schedule delays. Besides that the foreigner labour which is estimated to constitute 70% of the construction workforce were reported to be involved in such social problem, lack of skill and communication problem.

WHAT IS LABOUR PRODUCTIVITY?

Productivity can be defined in many ways. In construction, productivity is usually taken to mean labour productivity, that is, units of work placed or produced per man-hour. The inverse of labour productivity, man- hours per unit (unit rate), is also commonly used. Productivity is the ratio of output to all or some of the resources used to produce that output. Output can be homogenous or heterogeneous. Resources comprise: labour, capital, energy, raw materials, etc.

Productivity = Output / Labour cost

1.2 OBJECTIVE

The aim of this research is to develop ways of improving productivity through varied motivational strategies. This is because of the declining trend of productivity and difficulties in its measurement in the construction industry. In view of this, the research is to look into the problems relating to motivation in construction companies in india. The main objective of the study is to identify and evaluate the most significant factors affecting on productivity in building construction industry. This study focuses on views from the construction industry about various factors affecting labour productivity, analysis factor affecting the labor productivity, impact, inefficiency, motivation and improve labour productivity.

2. LABOUR PRODUCTIVITY IN CONSTRUCTION

2.1 General

Construction labour productivity is a measure of work process efficiency. It can be defined as the ratio of the value labour produces to the value invested in labour. Productivity increases as needed labour resources are minimized and wasted efforts eliminated from the work process. This definition and the practice covered here treats productivity as a direct, absolute measure to be optimized (Picard, 2004).

2.1 Factors Influencing the Labour Productivity in Construction Industry

Management controls most of the constraints on all three categories. The “want to” factors are goals, which include job content, interpersonal atmosphere, compensation, working conditions, physical capability, and society. The “know how to” factors are education and training. The “allow to” factors are organization, raw materials, tools, information, and time to act (Mei, 2006). Labour Productivity Factors In order to improve productivity, a study of the factors affecting it, whether positively or negatively, is necessary. Making use of those factors that positively affect productivity and eliminating (or controlling) factors that have a negative effect, will ultimately improve productivity. If all factors influencing productivity are known, it will also be possible to forecast productivity

2.2 Impacts of Labour Productivity in Construction Work.

The construction process results in relatively high costs and labour becomes a more important input in the production phase. Moreover, the labour cost is somewhere between 20% and 50% of the total project cost and reduction of these costs can be best carried out by the productivity improvement. At the same time, the success of a construction company in today's competitive market largely depends on accurate estimation of productivity, and a reasonably correct assessment of the labour cost is fundamental to the accuracy of any estimate might be obtained. In addition, the effect of the factors on productivity may vary from task to task. Although some factors could have similar influences on the productivity of a number of tasks, their rate of impact on productivity may be different

There are some ways to overcome the bad impacts of labour productivity in construction industry:

(1) Increasing skills and experience of workforce; (2) good management in construction work; (3) improve motivation among the labour; (4) reduce the lack of material availability; (5) decrease the number of foreign labour.

3.3 sample calculation for column work

Data required to carry out the research was collected by Questionnaire Survey. On basis of previous studies on labour productivity & suggestions from Local Industry Professionals which are having influence on construction labour productivity in Mumbai Region. The target population included Civil Engineers from construction firms categorized as contractors. The Questionnaire prepared was distributed amongst respondents. Respondents were required to rate using their experience how all factors affects labour productivity. Time study is a work measurement technique for recording the times of performing a certain specific job or its elements carried out under specific conditions.

Table 1. Normal workability of column

Description	No. of Labours	Time taken (min)
Getting steel bars and stirrups at place	2	25
Erecting bars and completing lapping	2	30
Selecting stirrups and placing	2	30
Binding stirrups with binding wire at position	2	100

3.3.1 Site Details

For research purpose we considered reinforcement binding of column of building with nos. of floors: G + 19 and from varying sizes of column we took size of Column as 600mm x 600mm x 3000mm their diameter and size so that time required to finding the bar required can be minimized.

Result:

Average time taken for erection and binding of reinforcement of column without changes = 200 min/column

Average time taken for erection and binding of reinforcement of column with changes in site layout = 190 min/column

Time saving = 10 min/column

3.3.2 Effect of Changes in Site Layout Along with Changing Semi Skilled Labour with Skilled Labour

It was seen that labour used for preparation of column were semiskilled. This was resulting in compromising with quality of work and time consuming. With use of two skilled labours instead of two semiskilled labours the time could be reduced and there was no need to compromise with quality of work.

Result:

Average time taken for erection and binding of reinforcement of column without changes = 200 min/column

Average time taken for erection and binding of reinforcement of column with changing of labours = 155 min/column

Time saving = 45 min/column

Since effect of change is considerable after applying changes in site layout along with changing semi-skilled labour with skilled labour; considering result of those changes data is analyzed for saving in cost and time per floor and from that for whole building.

3.3.3 Productivity Calculation

To find out the productivity we are using activity oriented model as $\text{Labour Productivity} = \frac{\text{Output}}{\text{Work hour}}$ Before application of any changes on site number of columns completed per day are 2 which shows that 494.53 kg of steel reinforcement binding used to complete in 8 working hours. From this the productivity can be calculated as $\text{Productivity} = \frac{494.53}{8} = 61.81 \text{ kg/ work hour}$ After application of changes it was seen that columns completed per day are 3 which shows that 741.8 kg of steel reinforcement binding used to complete in 8 working hours. From this the productivity can be calculated as $\text{Productivity} = \frac{741.8}{8} = 92.72 \text{ kg/ work hour}$ This shows 50% increase in reinforcement binding labour productivity.

Increase in labour productivity also results in saving cost and time. It can be seen in following calculations

3.4.4 Saving in Time and Cost due to Changes Applied Per Floor

Data collection using time study method showed considerable reduction in time after applying changes with site layout and labours which means considerable saving in time for the activity and which in turn means saving in cost as well. Calculations regarding saving in time and cost are shown below.

Saving in Time:

Prior to Changes:

Number of columns of size 600 x 600 x 3000 per floor = 32

Number of columns completed prior to changes = 2 per day

Number of days to complete reinforcement of column = 16 days

Time for 32 columns without applying changes = $32 \times 200 = 6400 \text{ mins}$

After Application of Changes:

Time for 32 columns after changes in site layout and changing labour with skilled labour = $32 \times 155 = 4960 \text{ min}$

Time saving per floor = $(6400 - 4960) = 1440 \text{ mins}$

This time is equivalent to $(1440/155 = 9.29 \approx 9)$ 9 extra columns. With time of 155 min per column and 8 hours of working day per labour number of columns completed per day = 3 column

Time required to complete 32 columns = $10.6 \approx 11 \text{ days}$

Saving in time after changes applied = 5 days

Saving in Cost

Prior to Changes:

Wages paid to semi-skilled labour = Rs. 350/-

Number of labours = 2

Number of days required to complete 32 columns before applying any changes = 16 days

Cost of semiskilled labours per floor when changes were not applied on site= $16 \times 350 \times 2$ = Rs. 11200/-

After Application of Changes:

Wages paid to skilled labour = Rs. 400/-

Number of labours = 2

Number of days required to complete 32 columns before applying any changes = 11 days

Cost of skilled labours per floor when changes were not applied on site

= $11 \times 400 \times 2$ = Rs. 8800/-

Savings per Floor = $11200 - 8800$ = Rs. 2400/-

Saving in Cost for Building

Number of floors = $G + 19 = 20$

Savings per floor = Rs. 2400/-

Net savings for entire building (1 tower) = 2400×20 = 48000/-

4. FACTORS AFFECTING LABOUR PRODUCTIVITY

Factors influencing productivity of construction workers in many countries have been explored (Butcher, Gillard acknowledges that labor productivity figures are highly variable, Affected by such factors as the mode of employment, overall task duration, and length of the Workday. Identifying and evaluating the factors that influence productivity are critical issues faced by construction managers (Motswana et al Most of these factors have been arrived at by asking the workmen directly and the project managers. Butcher recognized that the best means of acquiring information about production problems is by asking the workmen themselves.

4.1 Top fifteen factors affecting LP

1. Labour Supervision
2. Scheduling of work
3. Training of labour
4. Payment
5. Communication between site management and labour
6. Climatic condition
7. Unscheduled extra work
8. Construction method
9. Miscommunication between site management
10. Safety conditions on site
11. Motivation to labour
12. Incentives schemes (Payment for extra work)
13. Temperature on site
14. Facilities provided to labour
15. Project manager's leadership

5. FACTORS AFFECTING CONSTRUCTION

5.1 IMPORTANT JOB FACTORS FOR CONSTRUCTION WORKERS

The construction industry is a unique and highly fragmented industry. Construction workers as a result are very heterogeneous ranging from plumbers and electricians to masons and laborers. As such the construction labor force has its unique characteristics, and construction workers differ in their consideration of important job factors from workers in other industries. A study done by William F. Maloney and James M. McFillen identified the importance that construction workers attach to specific job factors, and their satisfaction with each factor. Their results will be presented and discussed because they represent an excellent source of information on construction workers. The study was conducted by surveying 2800 construction workers. The workers were asked about the importance they attach to various job related factors and their satisfaction with each factor. The 28 individual factors were reduced to seven which were as follows:

Factor 1 - Intrinsic Rewards

- The opportunity for challenging work
- The chances you have to accomplish something worth-while
- The resources you have to do your work
- The chances you have to learn new things
- The chances you have to do something that makes you feel

Good about yourself as a person

- The opportunities to develop your skills and abilities
- doing your work in a craftsman like manner
- The chances you have to do the things you do best
- The respect you receive from the people you work with

Factor 2 - Opportunity

- Your chances for getting ahead
- Your chances for getting promotion
- The chances you have to take part in making decisions
- The amount of job security you have

Factor 3 -Interpersonal Rewards

- The friendliness of the people you work with
- The way you are treated by your co-workers
- The respect you receive from the people you work with

Factor 4- Feedback

- seeing the results of your work
- The opportunity to do an entire job

Factor 5- Supervision

- The foreman's understanding of the kind of work you do
- The foreman's ability to manage work
- The particular task assignment you receive

Factor 6 - Performance Level

- High productivity
- The quality of work you do
- doing your work in a craftsman like manner

Factor 7 - Extrinsic Rewards

- The amount of pay you get
- The fringe benefits you receive

Importance: After analyzing the responses and ranking the factors it was found that the most important factor was Intrinsic Rewards. This shows that construction workers place high value on such things as: performing Challenging work; developing one's skill; working like a Craftsman etc. These are functions of job design, i. e. the nature and combination of tasks in a job and the specific job assignment. The next important factor was that of Performance Level. High productivity and the quantity of work done were relatively important. This indicates that workers care about the level of output and the manner in which the output is obtained. Feedback and extrinsic Rewards were found to be the third most important factors. Feedback involves the desire of people to know how well they are doing. In construction work, the physical progress of the work provides a form of feedback. The two important items that had significant loadings on this factor were "seeing the results of your work" and "the opportunity to do an entire job". Seeing the brick rise or the steel go up is important to workers. As the brick rises, the masons receive the feedback that tells them they are doing a good job. The opportunity to do an entire job provides the workers with closure. They can see their work culminating in the completion of their own activity and the facility. Extrinsic Rewards include pay and fringe Benefits. In the union sector, wages and fringe benefit levels are established through collective bargaining agreements, giving the contractors no direction in the establishment of such rewards on their specific jobs. Therefore, extrinsic rewards do not vary with performance level on an assigned task. The inability to vary extrinsic rewards in accordance with individual performance is believed to significantly weaken their ability to influence performance.

5.2 LABOR UNIONS AND THEIR IMPACT ON PRODUCTIVITY

Many of the industrial relations problem areas are the result of the nature of the construction process and, in particular, the market and technical aspects of the Industry. Completed construction products (e.g. Buildings , roads , dams, etc.) are immobile and removal typically involves complete demolition of the structure; therefore, the complete product cannot be manufactured at onside and then transported to the side of utilization. This immobility has resulted in the development of construction as a local market industry. The local markets tend to be protected from outside competitive pressures and thus the potential for monopolistic arrangements involving contractors or union groups, or both , is created. In the local markets producers are able to resist new techniques and to pass higher costs on the buyers without fear of competitive underbidding from outside producers. Similarly, unions are able to gain control over the labor supply and introduce regulatory policies without fear of outside competition. Construction projects are extremely complex and the numerous highly skilled operations required on any construction project have let to craft specialization where

6.METHODS OF OBTANNG LABOUR PRODUCTVTY

Before productivity can be increased, there is need to measure and quantify the existing situation. Lord Kelvin's dictum 'to know properly you must measure it' is sound advice to anybody interested in measuring productivity. The measure of construction productivity is thus a very important issue. There are two different methods of generating data on productivity – accountancy based and engineering based methods. Accountancy based standards rely on the analysis of historical accounting data to establish work hour requirements for specific types of work. Engineering based standards involve breaking down complex work processes into small manageable parts and analyzing these parts for the length of time required to complete these processes. The accountancy based data are relatively easy to follow but they do not capture the varying working conditions. The engineering methods of measuring labor productivity include work measurement, work sampling, time and motion analysis, and modeling.

Work measurement is the determination of the time required for an average operative to carry out a particular task in accordance with a specified method and standard of performance (Calvert). Work sampling involves observing individual pieces of the work process and classifying the results as either productive or nonproductive. It is useful for recording productivity levels for comparative purposes. Harris and McCaughey describe its use. Thomas roundly condemned activity sampling as being unsuitable for measuring productivity in construction activities. Time and motion studies are said to be the most accurate methods for generating productivity standard Factor based modeling is arguably the most applicable engineering based technique to the construction industry Premium is placed on workers skilled in the full range of duties associated with the craft rather than narrow specialties.

7. METHODS OF MEASURNG INEFFCENCY

Measuring inefficiencies on construction projects has been done numerous ways over the years: Measured Mile Comparison to other projects Comparison to contractor's bid, estimate, or plan Use of expert testimony to establish inefficiency Published inefficiency factors or studies Bureau of Labor Statistics Business roundtable National Electrical Contractors Association Mechanical Contractors Association of America The U.S. Army Corps of Engineers Modification Impact Guide Practical exercises and case studies Many of these have been used for construction claims, such as the "Measured Mile". It gauges inefficiency loss by comparing a measurable period of time on a project impacted with inefficiencies against a period of the same length with no inefficiency impact. It is important to use known and accepted industry sources whenever possible to establish and build inefficiency tables. Reliable industry standards, practices, surveys, historical data, and case studies can all prove to be excellent sources for developing a table of factors for labor inefficiency for use in construction planning. Another consideration in developing a table of factors with reliable and known sources is the established credibility in helping to support or defend a construction claim and change orders as a result of impacts caused from inefficiencies.

7.1 BARRIERS TO IMPROVING LABOUR PRODUCTIVITY

The country's economy has become increasingly more dynamic and complex. As a result, economic measurement and analysis, particularly relating to productivity, have become more difficult and complicated. The main problem involves properly defining units of measurement, evaluating qualitative changes and obtaining reliable data for both inputs and outputs.

8. MOTIVATION

8.1. MOTIVATION IN CONSTRUCTION

There are four determinants of a worker's productivity: the duration of the worker's effort, the intensity of the worker's effort, the effectiveness with which the worker's effort is combined with technology and other resources, and the efficiency of the worker's effort. The duration of the worker's effort is the proportion of time the worker is engaged in productive work during a time period. The intensity of a worker's effort is a measure of how hard the worker is working. It may also be considered a measure of the degree to which a worker is utilizing his abilities. The effectiveness with which a worker's effort is combined with technology and other resources is a measure of the degree to which the productive potential of technology and other resources has been utilized. For example, a worker may dig a trench either with a pick and shovel or a trenching machine. In the latter case, the worker's effort has been combined much more effectively with the available technology. It is important to understand that the technology considered is not limited to that possessed by the firm. The final determinant of a worker's productivity, the efficiency of his effort, is a measure of the quantity of acceptable quality output produced by a worker with his effort.

8.2. CONSTRUCTION - RELATED MOTIVATION STUDIES

In recent years, several attempts have been made to examine the applicability of work motivation theories to construction workers. Most of the studies are not based upon empirical evidence, but, rather, they are analyses of the unique characteristics of construction work in light of motivational theories. The studies limit themselves primarily to Maslow's need theory and to Herzberg's two-factor theory. The Maslow and Herzberg models attempt to identify specific factors in the individual (in the case of Maslow) or in the job environment (in the case of Herzberg) that motivate employees. Maslow argues that man's needs are basically of five types: physiological needs, safety needs, social needs, self-esteem needs, and needs for self-actualization, and these needs are arranged hierarchically and become active in the aforementioned order.

8.3. INTRINSIC AND EXTRINSIC MOTIVATION

Intrinsic motivation is that which occurs while a person is performing an activity in which he gains satisfaction from engaging in that activity itself. This is called internal reward and it is directly part of the job content. Extrinsic motivators are the incentives or rewards that a person can enjoy after finishing work. This is related to the job environment or an external reward. Traditionally work has been viewed as necessary drudgery. Rewards came in the form of pay, which was enjoyed off the job; holidays and vacations, which were enjoyed off the job; cafeterias and lounges, which were enjoyed away from the job; and pensions, which were received after retirement from work. Modern behavioral research has tended to emphasize that work itself can be satisfying. Managers in enlightened corporations have been applying this concept by placing people on jobs for which they are trained and interested, by new concepts of job design and work flow, and by gearing recognition directly to the job. Although there are those enthusiasts for intrinsic motivation who would substantially downgrade all efforts toward extrinsic motivation, in reality both are necessary. If working conditions, wages, job security, and fringe benefits are inadequate, a company will find it difficult to recruit and retain good people. Turnover, absenteeism and grievances tend to be high where management ignores external forms of reward. Large bureaucracies, in both government and industry, tend to do quite well in meeting people's maintenance needs. What they so often lack is emphasis upon challenging assignments, an encouragement of innovation, and large rewards for achievement. By emphasizing job tenure, loyalty, and conformity, bureaucracies tend to repel those with an enterprising spirit and drive. A sound motivational climate must provide both extrinsic and intrinsic motivators.

8.4. CREATING AN EFFECTIVE MOTIVATING WORK CLIMATE

Because human needs are very much a personal matter, organizations can do little to change the fundamental on-the-job needs and goals of their employees. They can, however, influence how motivated employees are to perform their jobs effectively - that is, whether or not employees also direct their efforts toward the goals of the organization. Some organizational climates encourage goal-oriented behaviors while others do not. In the past, most executives were able to create adequately motivating climates by using well-established, standardized approaches to compensation, job design, promotion and selection. But times have changed, and the way people are today suggests that changes are necessary in the motivational approaches taken by most organizations. Though the situation is far from critical, significant changes are taking place and unless organizations take some decisive actions, they may find themselves without one of their most valuable assets - their ability to influence work climates. Behavioral scientists have done a large amount of research that defines a motivating climate as a work situation where important rewards are perceived to be tied to performance. Establishing the necessary clear connection between performance and rewards may appear to be an easily achieved goal, but the task of establishing this objective in an organization can be very complex. With societal conditions changing so rapidly, it is not always evident to managers how performance-reward principles can and should be used in making decisions about things such as the design of information systems and the adoption of new technology.

On the basis of this technological analysis, the organization may decide to reject the new technology, modify it, or accept it because other advantages outweigh its negative motivational impact. A few organizations now do technological analyses and one of the more interesting approaches to the technique is to have the employees who will utilize the technology do the analysis. Among the obvious advantages of this method are that it helps reduce resistance to whatever technology is finally adopted and assures that the needs of the employee's receive serious consideration. It certainly is not the only way to proceed, but it makes sense where employees have knowledge to contribute and where resistance is a potential problem. Individualized job design: To be motivating, a job must be designed to fit the values and needs of the people performing it, a point frequently overlooked in debates over the advantages and disadvantages of job enrichment and the more scientific management or industrial engineering - oriented approaches to job design. The simple fact is that no one approach to job design is always correct. In some cases the workforce of an organization may be sufficiently homogeneous so that it makes sense to use only one approach to job design; however, situations where this condition exists are probably in the minority. Because of the diversity that exists in workforces of most organizations, any approach to motivation that uses the same approach to job design for all individuals is likely to fail to motivate and satisfy many employees. An interesting example of how this can be done is as follows: In a certain company, miners were given the choice of (1) working in a traditional system where everyone did only one job with a foreman present or (2) joining an autonomous section where miners switched jobs and "managed" themselves.

9. USE AND IMPROVEMENT OF LABOUR PRODUCTIVITY

9.1 USE OF LABOUR PRODUCTIVITY

Productivity is one of the key measures of construction performance. Latham and Egan clearly addressed the importance of raising productivity in the construction industry in UK. The studies and the recommendations made for the UK construction industry are relevant worldwide. It was observed by Kaming and Olomolaiye that poor productivity of construction craftsmen is one of the most daunting human resource problems in developing countries. As pointed out by Kaming et al, the success of a construction company in today's competitive environment largely depends on accurate estimation of productivity. Labour productivity rates are used as indicators of the construction time performance. They are used in planning and scheduling of construction, controlling of the cost and worker performance, estimating and accounting. If a company wishes to reduce risk, increase profits, or gain market share, there is direct need within the firm to have accuracy data on and use of labor productivity (Gilleard). Although studies have been made in a number of countries, most of the data available is not directly relevant to all countries because of the differences in materials used, techniques employed and working environment. Construction workers too have differences in the work culture.

9.2 CURRENT THEORIES FOR IMPROVEMENT OF LP

The current thinking that will improve construction productivity hinges on the theories of innovation and knowledge transfer, benchmarking and industrialization. Motwani, Kumar and Novakoski however pointed out that theories of improving productivity vary from business to business and because of the variety of uncontrollable productivity influence factors it is hard to have one plan.

9.2.1 Innovation

The performance of the construction industry in terms of productivity, quality and product functionality has been low in comparison to other industries, and a low rate of innovation has been provided as the major explanation to this situation (Winch, Gann). As stated by Winch, construction is commonly characterized as a backward industry, one that fails to innovate in comparison to other sectors. While the other sectors modernized through the introduction of interchangeable parts, then assembly lines, and then automation, construction retained its craft method of operation and fell further and further behind the rest of the manufacturing industry in terms of productivity, quality and hence value for money. Innovation is a process of gaining and using new and existing knowledge to enhance either product or process (Dodgson and Besant). Freeman defines innovation as the actual use of a nontrivial change and improvement in a process, product or system that is novel to the institution developing the change. Innovation as defined by Barret and Sexton is the effective generation and implementation of a new idea which enhances overall organizational performance. The main factors for innovation include: reward for innovation; opportunity for innovators to communicate their knowledge directly by presentation of events; funding and support the industry Research and Development (R&D). The adaptation of new procurement methods and the new organizational structures are seen to improve the ability to provide more integrated and innovative solutions.

9.2.2 Benchmarking

Before productivity can be increased, there is need to measure and quantify the existing situation. The point made is that a construction company should have a measurement procedure in place such that it can determine how it is doing relative to the benchmark. As pointed out by Adrian, by measuring the company's performance relative to the benchmark and by

implementing improved processes and procedures, the construction industry can work towards improvement. Benchmarking is the search for the best practices that will lead to superior performance of an organization. Houston in a document titled Planning, Organizing and Managing Benchmarking: Users Guide, defines benchmarking as a systematic and continuous measurement Process of 1992; a process of continuously measuring and comparing an organization's business Process against business leaders anywhere in the world to gain information which will help the organization to take action to improve its performance.

9.2.3 Industrialization of construction

Increasing heavy demands for the products of the building industry were made in the years following the end of the Second World War during the reconstruction programs. Since the Second World War, the world population has more than doubled. Currently, the demand on housing is very high and the number of homeless people has been growing. There is also a big number of huge construction projects, which are being undertaken notably in Eastern Asia and China. While the increase in demand of construction products is happening, there is growing shortage of skilled manpower. Shortage of manpower is unlikely to improve to any significant extent (Foster). Industrialization of construction is needed to increase the productivity of the industry generally while at the same time reducing the amount of site labour involved.

CONCLUSION

The productivity growth in the construction industry may have considerable effects on the economic development and stability. Project management skills were acceptable as the most important factor that influenced the productivity among the labour a part of the other factors such as technology exploration, skill and training, labour organization, project uniqueness and wage trends. Project management skill is a major factors influence the labour productivity. So that, proper planning is really need to make sure that the project completed successfully. The project manager should train themselves to be more leadership, more innovative, and creative. As a good leader, they should being a good role model to their employees. Try to make good relationship between employee and employer. The impacts on labour productivity was identified where it is strongly agree that technology exploration will increase the productivity while low labour productivity will cause delaying of project. Explorations of new technology or transfer technology are very essential to develop better performance of project in line with globalization in construction industry. Changing the semi-skilled labour with skilled labour along with change in site layout helped increasing labour productivity for reinforcement binding by 50% and it also helped in reducing time by 5 days per floor and labour cost by Rs. 2400/- per floor which results in saving of Rs.48000/- for entire building. Work study and work measurement are the techniques useful for data collection of labour and improvement in labour productivity. Using this technique it helped to reduce cost by 20% of labour cost per floor.

REFERENCES

- [01] Adnan Ensha ssi, Peter Eduard Ma yer, Sherif Mohamed, Ziad Abu Mustafa (2007) "Factors affecting labour productivity in building
- [02] ASCE M , Willia m Ibbs(2005) " Impact of change" s timing on labour Productivity. "Journal of Construction Engineering and Management, 2005,131(11), 1219-1223
- [03] BAHARUDIN, K. S., Construction Management Skills for The Global Market, Buletin Jurutera, 2006, 34-35.
- [04] BURLESON, REBECCA C., An Analysis of Multiskilled Labor Strategies in Construction, Dissertation Department of Civil Engineering, The University of Texas at Austin, 2007.
- [05] CIDB, Malaysian Construction Industry Master Plan, CIDB Malaysia, 2008.
- [06] KAZAZ, A., ULUBEYLI, S., A Different Approach to Construction Labour In Turkey: Comparative Productivity Analysis, Building and Environment
- [07] 39, 2003, 93 –100
- [08] Khaled M. El-Gohary, Mostafa E. Shehata, (2011) " Towards improving construction labour productivity and projects performance." Alexandria Engineering Journal . 2011, 50; 321 -330.