FACTORS AFFECTING LABOR PRODUCTIVITY IN BUILDING PROJECTS OF PAKISTAN

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Abstract- Productivity is dominating aspect in the construction industry, it encourage cost savings and effective utilization of resources. It is the most important concern in both developed and under developing countries. Pakistan a developing country is currently experience growth in its construction industry as well as facing problem like cost, time, quality and productivity in construction project. Objective of this research study is to identify and rank 'factors affecting labor productivity' in building projects of Pakistan. A questionnaire survey was conducted to record the importance of different factor that affect the labor productivity in context of Pakistan construction industry. The questionnaire comprised (38) factors classified were analyzed and ranked according to their relative importance index (RII). The analysis reveals five critical factors that negatively affect labor productivity are: Lack of Laborer experience, Low amount of pay, working seven days per week without taking a holiday, Drawings and specifications alteration during execution of project and poor relations between labor and supervisors. At the end of this study, some recommendations were made in order to effetely manage and minimize the major factors affecting the labor productivity in building projects of Pakistan.

I. INTRODUCTION:

Productivity is main concern of any organization, effective and efficient conversion of resources into end products determine the profitability of projects (Wilcox et al., 2000). Construction industry is a labor-intensive in nature, experience and previous literature exposed that 30%-50% of the total project's cost would account for labor costs (Guhathakurta and Yates, 1993). A huge portion of labor force works in the building construction. Therefore, labor productivity has critical importance for the profitability of most building construction projects.
The construction sector in Pakistan experience a considerable growth after the severe earth quake 2005 and flood 2010; its share of GDP increased from 1.69 % in (2003-2004)to 2.38% in (2012-2013), (Pakistan Buru of Statistics PBS 2013).

The reinforcement in construction is primarily driven by the reconstruction in affected areas and increasing demand of housing by individuals.Building construction is the pioneer sector in the construction industry that achieve high growth rate during the last decades, and plays an important role in socio economic development.

Due to increase demand of building construction; numerous jobs for skilled and unskilled labor produced in to Pakistan labor force (PBS 2013).

The labor performance is affected by many factors like time schedule, assigned budget, and required quality. Identification and evaluation of factors affecting labor productivity are serious issues which are faced by the project managers during the execution of project (Motwani et al. 1995). However identification and evaluation of factors affecting labor productivity at construction have been done in the last decade across world, yet in Pakistan there is no proper documentation of labor productivity so, a lot more effort is required to be put in, in order to ascertain the true factors which are more specific to our own construction environment. Only by identifying these factors, ranking them and further study of high ranking factors in detail will make this effort justified.

II. RESEARCH OBJECTIVE

There are following objectives of this research:

- To identify factors affecting labor productivity at building construction projects in Pakistan.
- To analyze the key factors which were identified by using relative importance Index (RII).
- To make recommendations to improve labor productivity at building construction industry of Pakistan.

III. LITRATUREREVIEW

The increase in productivity was the main concern in mid of 1906's at construction industry, due to increasing inflation rate and decrease in productivity. (Stall, 1983). In 1968 construction forum of developed countries was gathered due to anxiety of increasing price of construction activities resultant from increasing inflation and decreasing labor productivity (Thomas and Kramer, 1988)..

Labor productivity was observed more sever in construction industry as compared to other manufacture industry, as result it was recommended to rise the productivity in construction sector as for as possible. Though it was necessary to utilize the

information and knowledge of manufacture industry to the construction industry (Alarcon and Borcherding 1991). Policies to increase the labor productivity are not always similar in each state (Polat and Arditi 2005). Literature reveals that, 15% of productivity loss will occur due to resource management and 25 % loss occur due to working environment. Labor productivity is a main anxiety of any successful construction organization, as active management of resources and converting into desire market products for determine business profit (Wilcox et al, 2000).

Herbsman et al., (1990) classified factor that causing low productivity under two groups as, (Technological Factors and Administrative Factors). The technological factor group includes, the project factors, factor related to material specification and location. The administration related factors includes the management techniques, such as construction methods and, resource management, project administration factors and social factors.

Lim et al. (1995) conducted research for Singapore construction industry to determine the real factors which negatively affects productivity. Their research indicate the most severe problems as, employment of supervisors, manpower recruitment problems and labor turnover.

Olomolaiye et al., (1996) conducted a research to measure factors that affect labor productivity in building construction of Indonesia and observed that, craft worker's consumed only 75 % of their time during their duties. Most specific productivity problems associated with Indonesian construction industry were: materials shortage, rework, labor absenteeism, shortage of equipment and tools.

Enshassi et al., 2007 conducted research and highlight the problems associated with building projects in Palestinian which are material supply, scheduling techniques. Moreover number training g conducted to improve the scheduling techniques of contractors but these effort did not focus on projects scheduling software like Microsoft Project and Primavera.

Jarkas and Radosavljevic, (2012) studied productivity problem in construction industry of Kuwait. The objective of their study was to recognize factors disturbing productivity and arrange them according to their relative importance index (RII). In the result, most significant factors that affect labor productivity were, late payment, rework, financial motivation, and change in instructions, unskilled supervisors, interruptions in (RFI), over-crowding, scheduling faults, materials shortage, and unavailability of drawings.

Summary of the literature review for factors affecting labor productivity is given in following Table 1 (Enshassi et al., 2007&Herbsmanet al.1990).

Table 1: Summary of Factors Affecting Labor Productivity

S. No.	Factors Affecting Labor Productivity
1	Lack of Laborer experience
2	High workforce absenteeism
3	Labor dissatisfaction
4	Increase of labor age
5	Poor health of the workers
6	Poor relations among workers
7	Labor disloyalty
8	Lack of empowerment (training and resourcing)
9	Leadership and competency of construction management
10	Poor relations between labor and supervisors
11	Lack of labor observation
12	Lack of periodic meeting with labor
13	Unavailability of safety engineer on site
14	Ignore safety precaution
15	Inadequate lighting
16	Accident
17	Pollution/ Noise
18	Dangerous working conditions
19	Inadequate safety plan
20	Payment delay

S. No.	Factors Affecting Labor Productivity
21	Low amount of pay
22	Lack of financial motivation system
23	Poor condition of camping
24	Lack of training sessions
25	Lack of place for eating and relaxation
26	Working 7 days per week without taking a holiday
27	Work overtime
28	Misuse of time schedule
29	Increasing number of labor in order to accelerate work
30	Rest time(s) during the work day
31	Material shortages
32	Unsuitable material storage location
33	Tool and equipment shortages
34	Drawings and specifications alteration during execution
35	Changing order
36	Incomplete/revise drawing
37	Inspection delay
38	Rework
39	Low quality of raw materials
40	Inefficiency of equipment
41	High quality of required works
42	Working within a confined space
43	Interference
44	Construction method
45	Bad weather condition
46	Augmentation of Government regulations

IV. METHODODLOGY:

Measures:
Several factors (46) having direct and indirect effect on the Labor productivity in construction of building projects of Pakistan were identified from literature research. Those factors were then filtered to 38 most relevant factors through interviews held with the experienced professionals having construction project management experience of over 20 years.

Development of questionnaire and data collection:
The identified factors were transformed into research questionnaire to gather the data from Client, Consultant and Contractor. DifferentBuilding projects were visited for the purpose of onsite feed-back and to get the required data from the professional engineers working at different projects.

Questionnaires were sent to different professional engineers working with construction firms by post, through email and through engineers working on different Hydropower Projects. The respondents were asked to encircle the appropriate item according to their projects. Quantitative data analysis of 100 responses of the professionals engaged in construction projects for 38 different factors were analyzed on Likert's scale. "1" described as strongly disagrees, whereas "5" strongly agree.

Data Analysis Technique:
Following tests were carried out for data analysis:

- Cronbach's alpha
- Relative Importance Index

V. RESULTS AND DISCUSSIONS:

Cronbach's alpha:
For internal reliability, Cronbach's alpha was calculated for each scale. Cronbach's alpha for 100 samples was collected as 0.86. Thus the results indicate internal construct consistency and reliability of the data. Cronbach's alpha value range from 0 to 1 with 0.75 being considered the most sensible value (Nunnally).

RII Ranking Results:
The data included 38 factors that were to be analyzed. Strength of index familiarity, frequencies and agreements were computed through the technique of Relative Importance index (RII). Ranking carried out

through the Likert's Scale and top ten factors were identified.

$$RII = \frac{\sum PiUi}{N(n)} \quad (1)$$

Where N is the total number of respondents for a particular factor. Pi is a constant showing the weight of the ith response, Ui is the frequency of ith response, i is response category index where n = highest score of material managing factors order. The importance of the indices and overall ranking the factors calculated are shown in table 2.

Table 2: RII Index of Factors Affecting Labor Productivity

Factors affecting Labor Productivity	RII Index	Rank
Lack of laborer experience	0.89	1
Low amount of pay	0.87	2
Working 7 days per week without taking	0.85	3
Drawings and specifications alteration during execution	0.84	4
Poor relations between labor and supervisors	0.84	5
Payment delay	0.83	6
Rework	0.81	7
Increase of labor age	0.81	8
Bad weather condition	0.8	9
Ignore safety precaution	0.78	10
Accident	0.77	11
Lack of place for eating and relaxation	0.76	12
Poor relations among workers	0.76	13
Inadequate safety plan	0.76	14
Lack of financial motivation system	0.74	15
Work overtime	0.74	16
Changing order	0.73	17
Labor disloyalty	0.74	18
Material shortages	0.72	19
Poor health of the workers	0.72	20
Dangerous working conditions	0.71	21
Inefficiency of equipment	0.71	22
Lack of periodic meeting with labor	0.71	23
Leadership and competency of construction management	0.7	24
Working within a confined space	0.7	25
High workforce absenteeism	0.69	26
Incomplete/revise drawing	0.69	27
Low quality of raw materials	0.69	28
Rest time(s) during the work day	0.65	29
Augmentation of Government regulations	0.65	30
Unavailability of safety engineer on site	0.64	31
Construction method	0.64	32
Lack of empowerment (training and resourcing)	0.63	33
Inadequate lighting	0.63	34
Poor condition of camping	0.63	35
Tool and equipment shortages	0.63	36
Labor dissatisfaction	0.61	37
High quality of required works	0.61	38

Inspection delay	0.6	39
Unsuitable material storage location	0.6	40
Increasing No of labor in order to accelerate work	0.59	41

VI. SUMMARY OF FINDINGS

In today's world, the construction industry is contributing an important role in socio economic development of any state. Productivity is considered serious issue and has particular importance within the construction industry. Earlier awareness of factors affecting labor productivity during construction can save money and time. The object of this research is to identify and evaluate factors affecting labor productivity at building projects in Pakistan, and to rank these according to their relative importance. The first objective of the study is accomplished with help of literature review and 38 factors negatively affecting productivity were identified. The second objective is meet by ranking these factors according to their relative important by following Relative Importance Index (RII). The result indicate the 10 main factors negatively affecting labor productivity which are: (1) Lack of Laborer experience, (2) Low amount of pay, (3) Working 7 days per week without taking rest, (4) Drawings and specifications alteration during execution, (5) Poor relations between labor and supervisors, (6) Payment delay, (7) Rework, (8) Increase of labor age, (9) Bad weather condition, (10) Ignore safety precaution. Third objective is achieved by making recommendations and suggestion to improve and enhance the labor productivity in building construction of Pakistan.

The target individuals in this study were all the stake holder that involve in construction. Total of 215 questionnaires were scattered, and 115 questionnaires (57.5 % response rate) were give back. Because project managers, construction managers, site engineer and site supervisors have enormous experience in construction, their suitable experiences were a proper recommendation to study about the various factors affecting labor productivity.

VII. RECOMMENDATIONS

- Present study reveals that contracting companies should assign or recruit the experienced people to accomplish their important jobs. Government policies for technical education and apprentice program should be encouraged by construction companies
- Contractors should give assistance and initiate continual training programs for their craftsmen. Motivational or financial encouragement programs in the practice of top employee of the year should be introduced to create competition among labor, thus achieving better productivity.
- It is also suggested that regular shifts for day and night works be maintained for Labor so that there is no burden for workers to work continuously on site without rest. Alterations in design drawings and specifications should be reduced by engaging proper design consultants who have completed similar nature of work
- Each construction company to ensure sufficient pay packages to boost workers morale. Payments / funds are very important aspect, it is recommended that before the mobilization of all the site activities, Employer must confirm the availability of funds.
- Rework can be avoided if proper constructability analysis is carried out of similar nature of work. It is recommended that, all the young people having working experience of similar nature of works and age between 20-50 years be preferred in construction of building projects.
- Safety measures be adopted as per guidelines of OSHA Standards, Personal Protective Equipment (PPE) should be provided to all skilled / unskilled Labor to achieve better productivity and to enhance safety precautions on site.

VIII. FUTURE RECOMMENDATIONS

- Besides contributions, this study also has some limitations; it was limited to only building construction projects in the Pakistan constructed by contractor registered under C-4 category as classified under Pakistan Engineering Council (PEC).

- Future study could be done in a specific geographical area and could emphasize specific types of construction project, including (Dams, Railways, Roads, Sewage System, and Public Health Projects).

- Moreover, a study for motivational system to motivate the workforce for better labor productivity can also be carried out.

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