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IMPACT OF EXTERNAL AND HUMAN FACTORS ON LABOR PRODUCTIVITY OF CONSTRUCTION PROJECTS IN IRAQ

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ABSTRACT

Labor productivity is one of the important issues to the contractors and subcontractors because it affects the profits of their construction projects.

Construction industry and projects suffer from different areas of problems and complex factors, such as quality, duration, cost and safety. Construction sector is one of the diverse areas as it contains contractors, subcontractors, engineers, consultants, designers, clients, suppliers and others. The study deals with the issues related to external and human factors in construction projects. The study includes identifying, analysis, discussion, and recommendation regarding impact of "external and human factors on labor productivity in construction projects in Iraq generally and specially in Maysan province in south of Iraq.

For every construction project or general projects, productivity, cost, quality, and time represent the main concerns for all parties, contractors, owners and engineers. To achieve a better labor productivity in any construction project it is required to deal with the impact of various factors and to minimize their negative impact on the construction projects.

Keywords: Labor Productivity, Human Factors, External Factors, Impact, Construction.

INTRODUCTION

Construction industry represents one of the important sectors in each country because it supports directly marketing, economics, operation hence a number of workers are direct beneficiaries from construction projects and sectors.There are a number of studies that have shown various factors of labor productivity and the extent of the impact of these factors on labor productivity in construction projects.

After 2003 Iraqi governments invested huge amounts of money in construction sector in all Iraqi cities and one of the significant issues troubling the local contractors and subcontractors was labor productivity.Construction labor productivity has become a big problem in construction industry in most countries especially in Iraq. This study deals with the impact of “external and human” factors on labor productivity in construction projects in Iraq. This study identifies two main groups and categorizes these main groups into twenty one factors. An attempt is made to show the impact ranges of “external and human” factors on labor productivity in construction projects in Iraq, through this study.

MAIN FACTORS IMPACT ON LABOR RODUCTIVITY IN CONSTRUCTION PROJECTS

In construction projects there are many factors that affect the labor Productivity. Labor productivity constitutes a significant part of production input for construction projects. In the construction industry, many external and internal factors are never constant and are difficult to anticipate during the periods of construction projects. This factor leads to a continuous variation in labor productivity. It is necessary for the contractors and sub contractors to make sure that a reduction in productivity does not affect the plan and schedule of the work and does not cause delays. The consequences of these delays could result in serious money losses when any of those external, human, internal and managerial factors become out of control in any construction project. This study deals with the necessity and importance of

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factors that affect labor productivity in Iraq according to the surveys which have been done on the Maysan city in south of Iraq. The classification of these factors is in two groups "External Factors" and "Human Factors".

WHAT ARE THE HUMAN FACTORS?

Any construction company or in general any organization considers its employees as worthy assets.

Productivity of any employee (construction workers) is affected by some factors:

i- Lack of experience
ii- Disloyalty
iii- Misunderstanding among laborers
iv- Lack of competition between the Laborers.
v- Age
vi- Personal problems.
vii- Alcoholism
viii- Absenteeism
ix- work overtime
x- work Accidents

WHAT ARE EXTERNAL FACTORS?

Productivity factors are classified into two categories (*Olomolaiye et al. 199*): external factors, the ones outside the control of the organization management and internal factors related to the productivity factors originating within the organization.

The study dealt with the following external factors as these factors were outside of the control of any construction company:

i. Implementation of government laws
ii. Rework
iii. Supervision delays
iv. Inspection delays from the authorities.
v. Variations in the drawings.
vi. Complex designs in the provided drawings
vii. Incomplete drawings
viii. Payment delays
ix. Training sessions
x. Design Changes
xi. Weather Conditions

OBJECTIVE TO THE STUDY

1- The main objectives of this study was to identify the level of impact of external and human factors on labor productivity of construction project in Iraq based on the views of consultants, contractors, project managers, and experienced engineers through data collection on the basis of questionnaire survey in Maysan city, Iraq.
2- These factors were ranked after analysis and calculation of the Relative Important Index (RII) and ordinal scales were done.

RESEARCH METHDOLOGY

The collection of data was done based on the process of using two basic methods in this research: personal interviews and questionnaires. A questionnaire was a suitable data collection technique and the most effective to use for this study.

The questionnaire was designed according to the opinions of consultants, experienced engineers, contractors, subcontractors, project managers and supervisors to meet with conditions of work in Maysan city, Iraq.

The purpose and approach used in this survey was completely explained to respondents. Confidentiality in the process of data collection was ensured.

ARRANGEMENT OF THE QUESTIONNAIRE

One of the important things of research study was about the number of respondents with complete information. Due to the high significance level for respondents in this research, the questionnaire was arranged in a simple format and pages for easy understanding of different levels of the target groups. The researcher explained all the parts of the questionnaires to respondents to ensure their full understanding without confusion about any section of the questionnaire.

DETAILS OF QUESTIONNAIRE

The first step was to design and prepare the questionnaire based on communication and discussion. The questionnaire papers were categorized into two groups "external" and "human" factors. These two groups consisted of 21 factors for both external and human factors.
The responses were to be based on the experiences, understanding and knowledge of the respondents and not related with any specific project. The method of questionnaire was simple and direct and this method was selected to establish a means of developing a list of factors impacting on labor productivity in construction projects.

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Table below identifies 21 external and human factors affecting labor productivity of construction project in Maysan, Iraq used in questionnaire process:

Sr.	Criteria	NO. of Factors in its group	Sub Criteria
1	Human Factors	1	Lack of experience
		2	Disloyalty
		3	Misunderstanding among laborers.
		4	Lack of competition between the Laborers
		5	Age
		6	Personal problems
		7	Alcoholism
		8	Absenteeism
		9	work overtime
		10	work Accidents
2	External Factors	1	Implementation of government laws.
		2	Rework
		3	Supervision delays
		4	Inspection delays from The authorities.
		5	Variations in the drawings.
		6	Complex designs in the provided drawings
		7	Incomplete drawings
		8	Payment delays
		9	(Lack of)Training sessions
		10	Design Changes
		11	weather Conditions

MEASUREMENT OF DATA COLLECTED

The detailed questionnaire was developed to calculate the factors (Human and External) affecting labor productivity in building construction.

In order to select the suitable technique of study, the level of measurement was studied. For each measurement type, there is (are) an appropriate method(s) that can be applied. In this research, ordinal scales were used. An ordinal scale, as shown in the Table is a ranking or a rating of data that normally uses integers in ascending or descending order. The numbers assigned (1, 2, 3, 4) neither indicate that the intervals between scales are equal, nor do they indicate absolute quantities. They are merely numerical labels. Based on a Likert scale, (*Cheung et al., 2004; Iyer and Jha, 2005; Ugwu and Haupt, 2007*).

Table shows Ordinal Scale used for Data Measurement for each one of 21 factors: in survey

Item	Not applicable	Does not affect it	Somewhat affects it	Directly affects it
Scale	1	2	3	4

DATA ANALYSIS APPROACH

To achieve the study analysis section, after the Literature Review and the focus interviews, a plan was formulated for collecting field information and creating an evaluation process and numerical values.
To analyze the results survey in the study use two different ways for this purpose:

i. Ranking of the various factors according to their significance, and calculating their Relative Importance Index (RII).

ii. Relative Importance Index (RII) method : Analyze the factors in the questionnaire as significant or non-significant.
The Relative Importance Index (RII) was used to decide various professionals' opinions of the RII in construction projects. RII is calculated as stated below (Cheung et al., 2004; Iyer and Jha, 2005; Ugwu and Haupt, 2007).

Formula:

Relative importance/difficulty index = $\frac{\sum w}{AN}$ *(1)*

Where,

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W is the weightage given to each factor by the respondents, ranging from 1 to 4.
A is highest weight = 4
N is the total number of samples.

ANALYSIS AND DISCUSSION OF RESULTS

To achieve main objective of the study in the best way and successfully, one of the important stages is collection correct data from target group.
Tables Show Statistical Data of Questionnaires in details:

Details of Companies/technical departments	Number of participated companies in survey
Governmental Technical Department	1
Local Companies (contractors + sub contractors)	9
Total	10

Details of Companies/technical departments	Number of distributed Questionnaires
Governmental Technical Department	22
Local Companies (contractors + sub contractors)	61
Total	83

Questionnaires Details	Number of distributed Questionnaires to staff of each company and technical departments
contractor	6
sub contractors	2
Consultants	2
Project managers in local companies	10
Experienced engineers in the local companies	63
Total of Questionnaires	83

STATISTICAL DATA BASE

The data base is represented in tabular form for easy understating

Factors Affecting Labor Productivity in Building Construction as classified into two groups in this Data Base these groups are:
First Group "Human Factors:

No. of Factor	Human Factors	Response based Measurement Data from Questionnaires			
		1 – Not applicable	2 – Does not affect it	3 – Somewhat affects it	4 – Directly affects it
1	*Lack of experience*	1	2	9	71
2	*Disloyalty*	11	27	38	7
3	*Misunderstanding among laborers.*	4	24	28	27
4	*Lack of competition between the Laborers*	6	24	49	4
5	*Age.*	6	27	26	24
6	*Personal problems*	4	23	30	26
7	*Alcoholism*	2	28	41	12
8	*Absenteeism*	1	19	22	41

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9	*work overtime*	1	5	29	48
10	*work Accidents*	6	28	31	18

Second Group " External Factors".

No. of Factor	External Factors	Response based Measurement Data from Questionnaires			
		1 – Not applicable	2 – Does not affect it	3 – Somewhat affects it	4 – Directly affects it
1	Implementation of government laws.	7	30	26	20
2	Rework	4	29	34	16
3	Supervision delays	4	33	20	26
4	Inspection delays from The authorities.	5	34	23	21
5	Variations in the drawings.	2	28	34	19
6	Complex designs in the provided drawings.	5	24	33	21
7	Incomplete drawings	11	16	28	28
8	Payment delays.	3	11	28	41
9	Training sessions.	3	7	38	35
10	Design Changes.	2	24	28	29
11	weather Conditions	3	5	43	32

The tables show Ranking of factors affecting labor productivity:

Results of first group as in table below:

Sr. of factor in questionnaire	First Group " Human Factors"	RII (%)	RANKs
1	Lack of experience	95.18%	1
9	work overtime	87.35%	2
8	Absenteeism	81.02%	3
6	Personal problems	73.49%	4
3	Misunderstanding among laborers.	73.49%	5
5	Age	70.48%	6
7	Alcoholism	68.98%	7
10	work Accidents	68.17%	8
4	Lack of competition between the Laborers	65.36%	9
2	Disloyalty	62.35%	10

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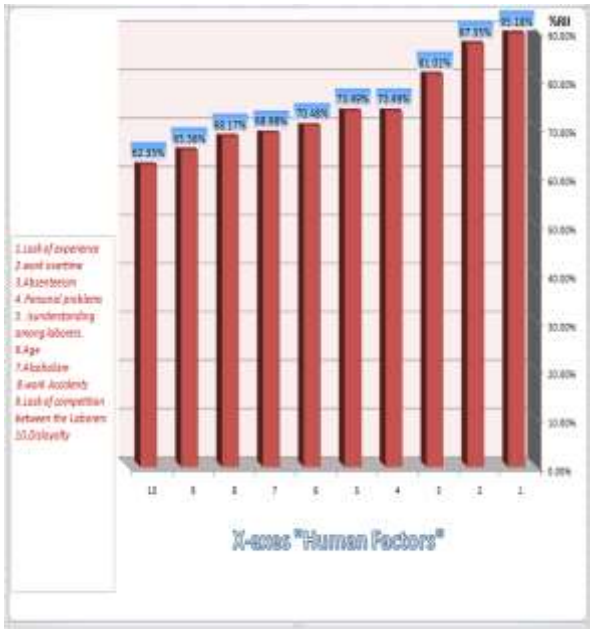
Results of second group as in table below:

Sr. of factor in questionnaire	Groups Two " External Factors"	RII (%)	RANK
8	Payment delays	82.23%	1
9	Training sessions	81.63%	2
11	weather Conditions	81.33%	3
10	Design Changes	75.30%	4
7	Incomplete drawings	71.99%	5
6	Complex designs in the provided drawings	71.08%	6
5	Variations in the drawings	71.08%	7
3	Supervision delays	70.48%	8
2	Rework	68.67%	9
4	Inspection delays from The authorities	68.07%	10
1	Implementation of government laws.	67.77%	11

PRESENTATION OF DATA

Presentation of data of 1st group as in the following figure:



Presentation of data of 2nd group as in the following figure:

Conclusion

In the present study, there are total 21 factors which cause the impact on labor productivity. This study identified these factors based on using Ranks and % RII. It was clear from the rank figures calculated for the first group (Human factors), that "Lack of experience" ranked first. This reflected how the "lack of experience" is one of the significant factors for contracting parties and engineers. One of the

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important tasks for contractors and construction companies is to ensure more training for their workers. It is necessary to enhance their knowledge periodically to make sure these workers are to up to date in their knowledge for using a new technology and increasing their experience level for any field job.

In the second group (External Factors), payment delays and lack of training sessions were very close and ranked as top two factors based on % RII. These figures refer to the responses obtained from contractors, sub contractors, project managers and experienced engineers who observed that their workers need more support in payment and they should to be paid in time (daily/ weekly/ monthly) as these payments will make the construction workers more focused on their jobs.

In order to increase the profits in a construction industry, it is necessary for the contractors and their construction partners to motivate and train the workers to obtain best outcomes of the construction productivity, so that there are no delay and losses.

Through this study we recommend to build valuable relationships between the construction companies and vocational training centers to help the workers to develop their skills and minimize the gap between the experience of a worker and requirement of the industry and that will lead to increase in construction labor productivity.

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