



## **FACTORS AFFECTING CONSTRUCTION LABOUR PRODUCTIVITY IN IRAQ USING BASRA CITY AS A CASE STUDY**

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### **ABSTRACT**

The construction industry has a multifaceted relationship with most sectors of the economy in all nations, as well as playing a vital role in social and economic development. One of the main factors that affect the development of the construction industry is labour productivity. The aim of this paper is to identify and rank the importance of the factors perceived in the literature to influence labour productivity in the Iraqi construction industry using Basra city as a case study. From the literature a total of 59 main factors were identified that may affect labour productivity on construction sites. These factors were classified into ten primary groups: (1) Managerial; (2) Environmental; (3) Manpower; (4) materials and equipment; (5) Schedule; (6) Safety; (7) Quality; (8) Motivation; (9) Technical; (10) External. The statistical analysis of these factors was prepared by using the Relative Importance Index (RII) and SPSS 23 programme. The grades obtained made it possible to assess the comparative importance of the factors as perceived by respondents.

The study provides comprehensive and explicit data for the construction contractors working in Iraq before providing the proposal for the bids taking in account the risks and the challenges mentioned in the study. Also it observed that the Iraqi government authority enforcement is essential to ensure that the construction labour productivity is fulfilled without losing in time and money. A structured questionnaire survey was sent to construction project managers, as a target group and the results showed in order to improve labour productivity in Basra city in particular and in Iraq in general. The results are show that the ten essential factors affect on construction labour productivity with different level of importance. In addition, all types of corruption must be considered to be serious problems affecting labour productivity. Enforcement, conduct education and training for manpower by using new techniques are decreasing the difference between estimated and actual labour productivity.

**KEYWORDS:** Construction Industry, Factors, Improvement, Labour productivity, Iraq, Basra

## العوامل التي تؤثر على انتاجية العامل في العراق: مدينة البصرة كنموذج

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### الخلاصة

ترتبط الصناعة الانشائية بعلاقات متعددة ومعقدة مع معظم جوانب الاقتصاد في جميع البلدان, وكذلك تلعب دورا مهما في التطور الاقتصادي والاجتماعي. ان احد العوامل التي تلعب دورا مهما في تطوير الصناعة الانشائية هو انتاجية العمال. هذا البحث يهدف الى تحديد العوامل التي تؤثر على انتاجية العامل وماهو تسلسلها من حيث الاهمية في مدينة البصرة كنموذج. من خلال دراسة البحوث السابقة تم تحديد 59 عامل مقسمة الى عشرة اقسام رئيسية وهي: (1) الاداري. (2) البيئي. (3) العمالة. (4) المواد والمعدات. (5) المخطط الزمني. (6) السلامة. (7) الجودة. (8) الحافز. (9) التقني. (10) عوامل خارجية. التحليل الاحصائي للعوامل المؤثرة على الانتاجية تم انجازه من خلال استخدام مؤشر الاهمية النسبي (RII) وبرنامج SPSS 23.

تقدم هذه الدراسة بيانات شاملة ودقيقة لمقاولي البناء الذين يعملون في العراق يمكن الاستفادة منها قبل تقديم اقتراح للمناقصات من خلال الاخذ في الاعتبار المخاطر والتحديات المذكورة في الدراسة. كما لوحظ أن دور سلطة الحكومة العراقية أمر ضروري لضمان ديمومه إنتاجية عمال البناء دون أن نفقد الوقت والمال. مجموعة من الاسئلة ارسلت الى مدراء المشاريع الانشائية وهم الذين يمثلون المجموعة المستهدفة من البحث. كل النتائج تم عرضها لكي يتم الاستفادة منها في تطوير الصناعة الانشائية في مدينة البصرة بالخصوص وفي العراق بشكل عام. لقد تبين من خلال الدراسة ان هناك 10 عوامل رئيسية تؤثر على انتاجية عمال البناء ولكن بدرجات مختلفة من الاهمية . اضافة لذلك تم ايجاد ان الفساد بجميع انواعه يمثل احد اخطر المشاكل التي تعيق انتاجية العمال من التطوير وبالتالي تؤثر وبشكل كبير على الصناعة الانشائية. فرض سلطة البناء وزيادة التوعية والدورات التدريبية لما يخص انتاجية العامل واستخدام التقنيات الحديثة في حسابها مما يقلل الفروقات بين الانتاجية المخمنة والانتاجية الفعلية.

## 1. INTRODUCTION

Due to the high percentage of failure in Iraqi construction projects especially which is mainly related with time and cost. The labour productivity represents one of the main challenges which prevent project planers to figure out the actual productivity in the field. This research aims to add more clarifications regarding all factors that possibly affect labour productivity which will help project planers to include all these factors in their consideration to reduce the gap between theoretical and practical productivity estimation.

A report published in Business Monitor International (2013) stated that the Iraqi construction sector could grow by 8.1% annually between 2013 and 2017, considerably less than the annual average real growth rate of 22.4% that occurred during the period 2008-2012. The report's authors expected the construction sector to grow respectively by 10.39% and 8.5% in 2015 and 2016, compared with a growth rate of 20.3% in 2014. The slower growth rate has been attributed to the absence of the positive statistical base and to a worsening business environment. The report's authors also noted that project delays, false starts, political separations and weakening security conditions continue to impede progress in the construction sector. They added that project delays can be considered a result of several factors, including a lack of institutional capacity, labour productivity problems, the lack of collaboration between federal and local authorities, and widespread corruption.

Labour productivity is defined as the amount of production per employee (or group of workers) per unit time (Olomolaiye et al., 1998). Labour productivity represents one of the main challenges facing the construction industry (Robles et al., 2014). In most countries, labour costs account for 30 - 50% of the overall cost of a project (El-Gohary and Aziz, 2013; Yi and Chan, 2013).

Construction labour productivity is not easy to quantify and is affected by several factors that influence its ability to be measured (Thomas and Napolitan, 1995). Data on productivity capacity allow the analysis of a range of factors that provide project owners, contractors, and project planning professionals with the means to control construction progress, to estimate the cost of future construction projects, and to measure their competitiveness in the global market (Al-Zwainy et al., 2013). It is therefore clear that the project planner needs to understand all the factors affecting labour productivity in any attempts to minimise their impact on the estimated labour productivity. The aim of this paper is to identify and rank all the potential factors that affect labour productivity in Iraq in order to provide clarification on how controlling these

factors could reduce project delays. In addition, this research contributes to the knowledge of Iraqi manpower by evaluate and solve current problems and improve the productivity.

## 2. LITERATURE REVIEW

It is essential to see labour productivity as a single element in the overall usefulness of an operating system in employing labour, equipment and capital to turn hard work into valuable output, rather than being a measure of the ability of labour (Shashank et al., 2014).

In order to identify all the factors that could affect labour productivity in the Iraqi construction industry, firstly the study conducted an extensive literature review. The relevant works are listed in Table 1 where the main categories represent the classification of factors in common areas.

**Table 1. Summary of literature review.**

No	Authors	No of main categories	Total no of factors
1	Jang, Kim, Kim, and Kim (2011)	4	25
2	Durdyev and Mbachu (2011)	8	56
3	Enshassi, Mohamed, Mustafa, and Mayer (2007)	10	.....
4	Soekiman, Pribadi, Soemardi, and Wirahadikusumah (2011)	15	113
5	Gidado and Ailabouni (2012)	4	32
6	Hafez et al (2014)	4	27
7	Shashank et al. (2014)	8	34
8	Makulsawatudom, Emsley, and Sinthawanarong (2004)	.....	23
9	Hicksona and Ellis (2013)	4	42
10	Abdul Kadir, Lee, Jaafar, Sapuan, and Ali (2005)	.....	50
11	Robles et al. (2014)	5	35
12	Mahamid (2013)	5	40

A total of 59 main factors were identified from a detailed literature review as those that could affect labour productivity on a construction site. Factors were classified into ten groups, namely (1) Managerial; (2) Environmental; (3) Manpower; (4) Material and equipment; (5) Schedule; (6) Safety; (7) Quality; (8) Motivation; (9) Technical; (10) External.

**Table 2. Proposed factors affecting labour productivity in Iraq.**

<b>Code</b>	<b>Group</b>	<b>Factors</b>
<b>M</b>	<b>MANAGERIAL</b>	
M1		Poor site management
M2		Poor communication
M3		Misunderstanding between labour and supervisor
M4		Lack of periodic meetings with labourers
M5		Lack of labour supervision
M6		Construction managers' lack of leadership
M7		Construction methods used
M8		Coordination problems between stakeholders
M9		Contract type
M10		Slow approval by local authorities
M11		Centralised decision making by headquarters
M12		Clients' lack of experience
<b>E</b>	<b>ENVIRONMENTAL</b>	
E1		Weather conditions
E2		Project location
E3		Working in confined spaces
E4		Large project size
E5		Site layout
E6		Restricted site access
<b>MP</b>	<b>MANPOWER</b>	
MP1		Lack of labour skills
MP2		Use of older labourers
MP3		Labour absenteeism
MP4		Lack of training
MP5		Personal problems of labourers
MP6		Number of breaks and duration
<b>ME</b>	<b>MATERIAL/EQUIPMENT</b>	
ME1		Materials shortage
ME2		Unsuitable material storage location
ME3		Old and inefficient equipment
ME4		Tools and equipment shortages

<b>S</b>	<b>SCHEDULE</b>
S1	Working 7 days per week without holiday
S2	Poor work planning
S3	Overcrowding
S4	Misuse of scheduled hours
<b>SF</b>	<b>SAFETY</b>
SF1	Ignoring safety precautions
SF2	Accidents
SF3	Lack of safety engineer on site
SF4	Insufficient lighting
SF5	Working at height
<b>Q</b>	<b>QUALITY</b>
Q1	Low quality of raw materials
Q2	High quality of required works
Q3	Rework
Q4	Quality inspection delay
<b>MO</b>	<b>MOTIVATION</b>
MO1	Payment delay
MO2	Non-provision of transport
MO3	Lack of financial motivation system
MO4	Lack of places for eating and relaxation
MO5	Lack of provision of labour with transportation
<b>T</b>	<b>TECHNICAL</b>
T1	Clarity of technical specification
T2	Coordination level among design disciplines
T3	Design complexity level
T4	Extent of variation/change orders during construction
T5	Poor buildability of design
<b>EX</b>	<b>External</b>
EX1	Traffic problems
EX2	Cultural problems
EX3	National and religious holidays
EX4	Corruption

### 3. RESEARCH METHODOLOGY

This research was based on a survey designed to assemble all essential data proactively. The survey yielded 59 productivity factors from related research on construction productivity. The ‘Survey Monkey’ tool was used to design and administer the survey, using project managers, as a target group. Participants were asked to rate each factor using a scale of 1 (no influence) to 5 (very strong influence). Respondents were also asked a few general questions related to their work and experience.

### 4. DATA ANALYSIS APPROACH

In order to analyse the data obtained, the Relative Importance Index (RII) was used according to the following formula:

$$RII (\%) = \frac{5*n5+4*n4+3*n3+2*n2+1*n1}{5(n5+n4+n3+n2+n1)} * 100 \quad (1)$$

Where: n1, n2, n3, n4 and n5 represent respectively the number of participants who stated that a given factor had (1) No influence (2) Weak influence (3) Medium influence (4) Strong influence, (5) Very strong influence.

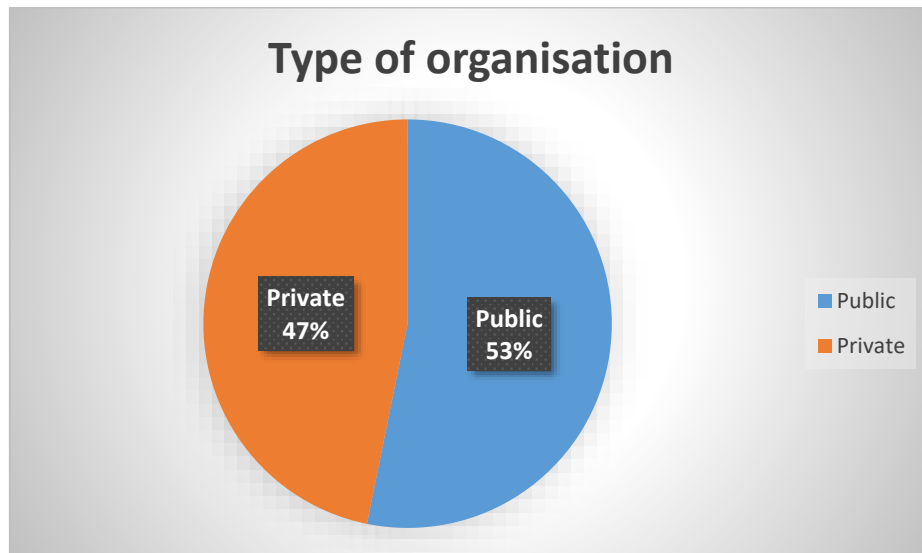
The RII was used to rank the various factors affecting labour productivity. The grades obtained made it possible to assess the comparative importance of the factors as perceived by respondents. In addition, SPSS 23 programme has been used to carry out all analysis techniques.

### 5. DATA ANALYSIS AND RESULTS

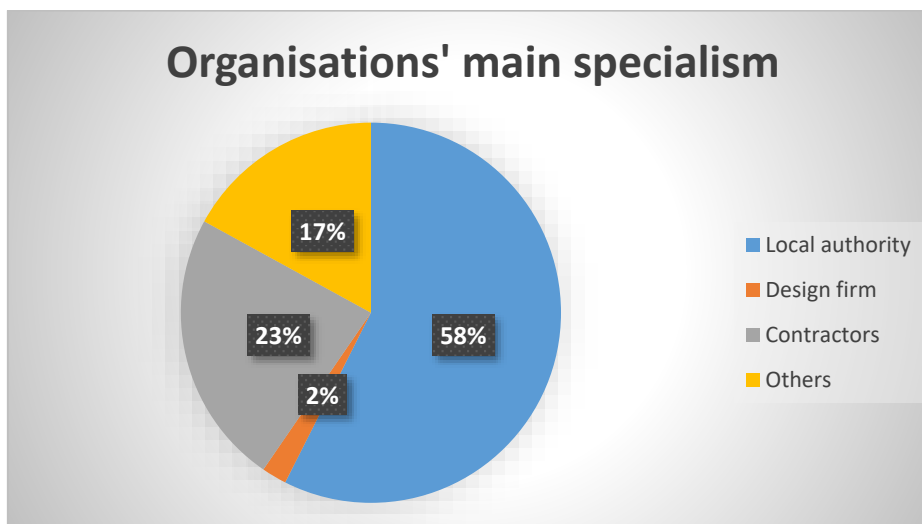
The influence of each of the 59 factors proposed to affect construction labour productivity in Iraq was determined. All factors were categorised into the ten major groups listed in [Table 2](#). The comparative importance table within each corresponding group, together with the overall ranking of the factors investigated were obtained, assessed, and compared with the conclusions of previous similar research. Before present and discuss the results, the descriptive analysis which contains the backgrounds of the participants in [Figs. 1 to 3](#), will be present first as shown below. From the figures it can be concluded that the participants relatively equally employed in private and public organisation which increase the generality of this research. In addition, most of the participants work for local authorities which can be understood due to the nature of the public organisation in Basrah city where all the public organisations are local authorities. Regarding the participants’ experiences, it can be concluded that 46% of participants have less than ten years’ experience which can be considered as a weak point because it can be argued that these participants do not have enough experiences to predict the importance of the affecting

factors. However the rest of the participants have more than 10 years' experiences which mean that this research has good combination from different level of experiences.

After discussing the descriptive analysis, each category will be discussed separately to figure out its effects on labour productivity. In addition, an overall discussion will be presented at the end of analysis section.

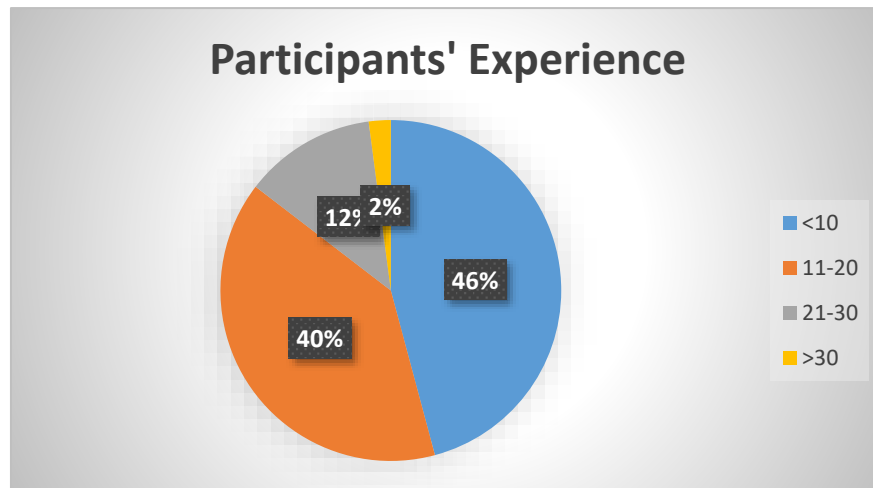


**Fig. 1. Participants' organisation types.**



**Fig. 2. Main specialisms of Participants' organisations.**





**Fig. 3. Participants' length of experience in years.**

## 6. MANAGERIAL

The relative importance of the twelve factors categorised in the managerial group is shown in Table 3.

**Table 3. Importance ranking of managerial factors.**

Rank	Factor	No of respondents	Mean	RII%
1	Construction managers' lack of leadership	48.00	3.92	78.33
2	Lack of labour supervision	48.00	3.90	77.92
3	Centralised decision making by headquarters	48.00	3.81	76.25
4	Contractor lack of experience	48.00	3.75	75.00
5	Poor site management	48.00	3.73	74.58
6	Slow local authority approval	48.00	3.71	74.17
7	Misunderstanding between labour and supervisor	48.00	3.69	73.75
8	Construction method	48.00	3.65	72.92
9	Client lack of experience	48.00	3.54	70.83
10	Contract type	48.00	3.52	70.42
11	Coordination problems between stakeholders	48.00	3.35	67.08
12	Poor communication	48.00	3.19	63.75

Table 3 shows that the 48 participants ranked “Construction managers’ lack of leadership” as the most important factor affecting labour productivity in the managerial group with mean equal to 3.92. This highlighted that leadership is vital in construction industry and can affect project productivity significantly. In order to improve the leadership among construction manager, this research suggests developing some training sessions regarding the leadership which can be considered as a fundamental to be a construction manager. In addition, it can be seen from the table that the participants illustrated that supervisions, decision making, and experiences can affect labour productivity considerably.

## 7. ENVIRONMENTAL

The comparative importance of the six factors classified in the environmental category is shown in Table 4.

**Table 4. Importance ranking of environmental factors.**

Rank	Factor	No of respondents	Mean	RII%
1	Site layout	45	3.82	76.44
2	Restricted site access	45	2.98	59.56
3	Working in confined spaces	45	2.96	59.11
4	Weather conditions	45	2.93	58.67
5	Project location	45	2.82	56.44
6	Large project size	45	2.71	54.22

Table 4 shows that the 45 participants ranked “Site layout” as the most significant factor affecting labour productivity in environmental group with mean equal to 3.82. This presented that prepare site layout will help to reduce delays caused by accidents, congestions, and unprepared areas. This research suggests to include the preparation of site layout should be done before start any actual construction work. In addition, it can be concluded from the above table that the other environment factors have less importance compared to site layout. However, these factors still important and need to be improved to gather long term benefits regarding labour productivity.

## 8. MANPOWER

The qualified importance of the eight factors in the manpower category is shown in [Table 5](#).

**Table 5. Importance ranking of manpower factors.**

Rank	Factor	No of respondents	Mean	RII%
1	Fraud, dishonesty and time-wasting	44	4.23	84.55
2	Lack of labour skills	44	4.02	80.45
3	Lack of training	44	3.98	79.55
4	Labour absenteeism	44	3.86	77.27
5	Lower average labourer age	44	3.09	61.82
5	Labourer personal problems	44	3.09	61.82
5	Number of breaks and duration	44	3.09	61.82
6	Higher average labourer age	44	2.82	56.36

[Table 5](#) shows that the 44 participants' ranked "Fraud and dishonesty and wasting time" as the most important factor affecting labour productivity in the manpower group with mean equal to 4.23. This illustrated that labour personality has significant effects on the productivity. However, this factor is relatively difficult to improve due to the complexity and variability of personality among labours even if they came from same areas or they worked together for long time. This research suggests that provide clear explanation regarding job description for each labour and introduce a promotion system may improve labour loyalty to their projects. In addition, it can be seen that skills, training, and absenteeism have considerable effects on the productivity comparing with the remaining factors.

## 9. MATERIAL/EQUIPMENT

The comparative importance of the four factors categorised in the material/equipment group is shown in [Table 6](#).

**Table 6. Importance ranking of material/equipment factors.**

Rank	Factor	No of respondents	Mean	RII%
1	Tools and equipment shortages	43	4.00	80.00
2	Old and inefficient equipment	43	3.72	74.42
3	Materials shortage	43	3.63	72.56
4	Unsuitable material storage location	43	3.19	63.72

Table 6 shows that the 43 participants ranked “Tools and equipment shortages” as the most important factor affecting labour productivity in the material/equipment group with mean equal to 4. This result brought to light that lack of suitable and modern tools and equipment can prevent labours from improving their productivity and lost time and efforts by working with exhausted tools and equipment. Additionally, the lack of materials and their storage area can affect the productivity negatively. Therefore, planning properly and try to provide suitable tools and equipment will definitely improve the labour productivity.

## 10. SCHEDULE

The relative importance of the four factors classified in the schedule group is shown in Table 7.

**Table 7. Importance ranking of schedule factors.**

Rank	Factor	No of respondents	Mean	RII%
1	Misuse of time schedule	43	3.58	71.63
2	Poor work planning	43	3.51	70.23
3	Working 7 days per week without taking any holiday	43	3.21	64.19
4	Overcrowding	43	3.12	62.33

Table 7 shows that the 43 participants ranked “Misuse of time schedule and Poor work planning” as the most significant factors affecting labour productivity in the schedule group with means equal to 3.58 and 3.51 respectively. These results indicated that misuse good time scheduling has the same impact as providing poor work planning on productivity. Therefore, it is important not just provide high quality time scheduling but it is crucial to make sure that there

is a team able to understand this planning and implement it successfully. In addition, increasing work load and the number of labour will not necessarily improve productivity but on the contrary it will produce damaging impact on the overall labour productivity. Finally, it can be concluded that this category's factors have considerable relationship with improving team skills and provide suitable training session regarding the project planning which will definitely improve the overall awareness among project team.

## 11. SAFETY

The relation importance of the five factors in the safety group is shown in [Table 8](#).

**Table 8. Importance ranking of safety factors.**

Rank	Factor	No of respondents	Mean	RII%
1	Ignoring safety precautions	41	3.78	75.61
2	No safety engineer on site	41	3.49	69.76
3	Working at height	41	3.44	68.78
4	Accidents	41	3.34	66.83
5	Insufficient lighting	41	3.22	64.39

[Table 8](#) shows that the 41 participants ranked “Ignoring safety precautions” as the most important factor affecting labour productivity in the safety group with mean equal to 3.78. It can be concluded from the results that ignoring safety has significantly effects on labour productivity in negative way. This result can be understood because ignoring safety regulations will increase the accidents occurring chance in the site which will affect productivity critically. However, ignoring these regulation does not mean there is a lack in these regulations but the problem is in the awareness of the safety terms among project team. This research suggests that providing a high quality safety plan for any project before it starts and discuss it with project team will help to increase the safety importance understating among construction labour in general.

## 12. QUALITY

The qualified importance of the four factors in the quality group is shown in [Table 9](#).

**Table 9. Importance ranking of quality factors.**

Rank	Factor	No of respondents	Mean	RII%
1	Quality inspection delay	41	3.88	77.56
2	Low quality raw materials	41	3.80	76.10
3	High quality of required work	41	3.63	72.68
4	Rework	41	3.24	64.88

Table 9 shows that the 41 participants ranked “Quality inspection delay” as the most important factor affecting labour productivity in the quality group with mean equal to 3.88. This result revealed that quality has considerable relationship with quality. This fact is not new but this research found that inspection routine and lack of good quality material prevent productivity to reach its target level. This delay tends to push labour continue working without quality checks which will increase the chance of rework. This research suggests to involve quality assurance and quality control team in early design stages and share project planning with them to improve the project time scheduling and avoid any unnecessary delays. The current project quality checking system in Basrah in particular can gather huge benefits via using some well-known quality system as ISO and PMI.

### 13. MOTIVATION

The relative importance of the five factors in the motivation category is shown in Table 10.

**Table 10. Importance ranking of motivation factors.**

Rank	Factor	No of respondents	Mean	RII%
1	Payment delay	40	4.18	83.50
2	Lack of financial motivation system	40	3.98	79.50
3	Lack of places for eating and relaxation	40	3.78	75.50
4	Lack of provision of labour with transportation	40	3.68	73.50
5	Non-provision of transport	40	3.38	67.50

Table 10 shows that 40 participants ranked “Payment delay” as the most significant factor affecting labour productivity in the motivation group with mean equal to 4.18. The poor financial system in Basrah in particular and in Iraq in general cause lots of payment delays in almost all construction projects due to different and fragmented authorities that need to approve any payments. These all obstacles can produce frustrated feelings among labours which they need their payment to feed their families. The local authorities have considerable experience regarding these problems. However, they are still facing the same problem which mainly comes from lack of required knowledge among these authorities. Therefore, this research suggests to employed foreign consultant with qualified experiences to avoid these problems.

#### 14. TECHNICAL

The comparative importance of the five factors in the technical group is shown in Table 11.

**Table 11. Importance ranking of technical factors.**

Rank	Factor	No of respondents	Mean	RII%
1	Clarity of technical specification	40	3.78	75.50
2	The extent of variation/change orders during construction	40	3.75	75.00
3	Level of coordination among design disciplines	40	3.40	68.00
4	Level of design complexity	40	3.38	67.50
4	Poor buildability of design	40	3.38	67.50

Table 11 shows that 40 participants ranked “Clarity of technical specification and change orders” as the most important factors affecting labour productivity in the technical group with means equal to 3.78 and 3.75 respectively. This results highlighted that technical factors have significant impact on productivity. However, proving clear specification which can be read and understood by all project team will help to improve the labour productivity without wasting time to try to understand these specifications or implementing them incorrectly.

#### 15. EXTERNAL

The relative importance of the four factors in the external category is shown in Table 12.

**Table 12. Importance ranking of external factors.**

<b>Rank</b>	<b>Factor</b>	<b>No of respondents</b>	<b>Mean</b>	<b>RII%</b>
1	Corruption	39	4.51	90.26
2	National and religious holidays	39	3.69	73.85
3	Cultural problems	39	3.64	72.82
4	Traffic problems	39	3.00	60.00

Table 12 shows that the 39 participants ranked “Corruption” as the most important factor affecting labour productivity in the external category with mean equal to 4.51. It can be seen that corruption has been identified as the most factor that affected the labour productivity enormously. Corruption can produce damage behaviour among construction labours due to feeling that they are not treated fairly and their rights have been seized. This research suggests that providing clear regulation that aim to secure labours rights and increase the awareness among them that they need to fight any sort of corruption because it is part of their duty to their project and to their country. In addition, different types of holidays will interrupt work continuity and can reduce overall productivity. Finally, also cultural problems such as using labours from outside the country can cause some sort of competitiveness which will lead to improve productivity.

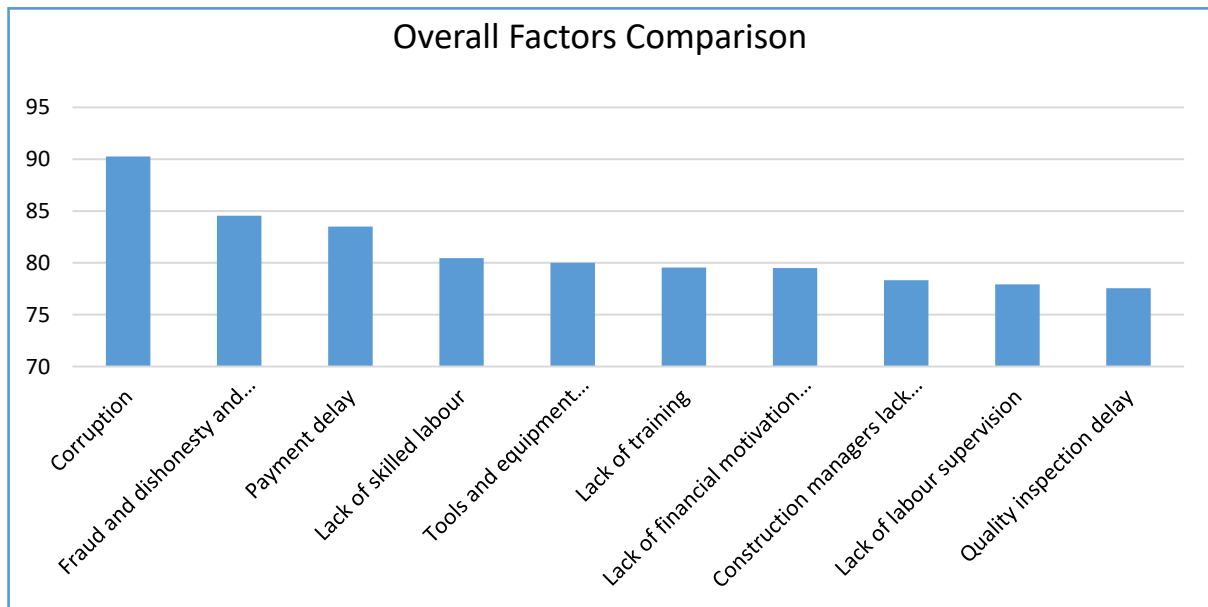
## **16. COMPARISON BETWEEN CATEGORIES**

Table 13 shows the 10 most important factors with their main category as they affect construction labour productivity in Iraq. Fig. 4 shows the differences between these factors.



**Table 13. The top 10 most important factors.**

Rank	Main Category	Factor	RII%
1	External	Corruption	90.26
2	Manpower	Fraud and dishonesty and wasting time	84.55
3	Motivation	Payment delay	83.50
4	Manpower	Lack of skilled labour	80.45
5	Material/equipment	Tools and equipment shortages	80.00
6	Manpower	Lack of training	79.55
7	Motivation	Lack of financial motivation system	79.50
8	Managerial	Construction managers lack of leadership	78.33
9	Managerial	Lack of labour supervision	77.92
10	Quality	Quality inspection delay	77.56

**Fig. 4. Overall factor comparison.**

Corruption is perceived to be by far the most important factor affecting construction labour productivity in Iraq, showing clear differences with other factors. In addition, it can be seen that

factors related to the fraud and dishonesty of labourers and then payment delay have a considerable effect on labour productivity. One of the more surprising results is that participants did not ascribe much importance to weather conditions, even though Basra city is considered one of the hottest populated areas on earth. This research found that increase the productivity awareness among the construction industry participants will improve their understanding which will lead to increase productivity as a final result. Moreover, using the new productivity calculation techniques such as Return Of Investment ROI will help to consider different type of factors that may affect labour productivity and lead to improve the prediction in the early design stages.

A comparison has been made between the results of this study with those obtained from studies carried out over the last 3 years in Nigeria, New Zealand, Kuwait, USA, Turkmenistan, Turkey, India and Egypt; the top 5 factors influencing labour productivity for each country are shown in [Table 14](#). It can be concluded for the table that the factors affecting labour productivity is almost the same. However, their priorities are different depends on the construction development in each county. In addition, it can be seen that the corruption and labour personality dishonesty represents the most important factor regarding labour productivity which slightly different from other countries even developing countries such Kuwait and Egypt. The main reason beyond that the political problems that facing Iraq government recently and the national and local authorities are unable to apply the law which directly cause the spread of corruption. As suggested previously increase the awareness will help people to realise the problem and encourage them to face it in different ways.

**Table 14. Overall ranking of the top 5 factors affecting construction labour productivity in previous studies in the last 3 years.**

Rank	Indonesia Soekiman et al. (2011)	New Zealand Tran and Tookey (2011)	Kuwait Jarkas and Bitar (2012)	USA Mahesh (2012)	India Mistry and Bhatt (2013)	Egypt El-Gohary and Aziz (2014)	Research Results
1	Lag of Materials	Reworks	Clarity of technical specifications	Lack of required construction Materials	Payment Delay	Labourers' experience and skill	Corruption
2	Labour strikes	Level of skill and experience of the workforce	The extent of variation/change orders during construction	Shortage of power and/or water Supply	Skill of Labour	Incentive programs	Fraud, dishonesty and time-wasting
3	Delay in arrival of materials	Adequacy of method of construction	Coordination level among design disciplines	Accidents during construction	Clarity of Technical Specifications	Availability of materials and their ease of handling	Payment delay
4	Financial difficulties of owner	Buildability issues	Lack of labour supervision	Lack of required construction tools/equipment	Material Shortage	Leadership and competency of construction Management	Lack of skilled labour
5	Unclear instructions to labourers	Inadequate supervision and coordination	Proportion of work subcontracted	Poor site condition	Motivation	Competency of labour supervision	Tools and equipment shortages

## 17. CONCLUSION

Based on the findings and data analysis, corruption, fraud dishonesty and wasting time and payment delay are the most significant factors that affect construction labour productivity. Extremely hot weather and sometimes high humidity did not consider strong factor correlation with labour productivity in Basrah, so that this result gives as opportunity to look in details in the effects of weather condition in Basrah city.

The results presented the top 10 of 59 factors affecting construction labour productivity can serve as tools to evaluate the current status of labour productivity in Basrah city in particular and Iraq. In general the paper reveals the effectiveness of improve labour productivity, reduction in time and money loss, and overall construction industry management. Enforcement, conduct education and training for manpower are essential in the enhancing labour productivity of construction projects in Iraq.

## 18. REFERENCES

- Abdul Kadir, M., Lee, W., Jaafar, M., Sapuan, S., & Ali, A. (2005). Factors affecting construction labour productivity for Malaysian residential projects. *Structural survey*, 23(1), 42-54.
- Al-Zwainy, F. M. S., Abdulmajeed, M. H., & Aljumaily, H. S. M. (2013). Using Multivariable Linear Regression Technique for Modeling Productivity Construction in Iraq.
- Durdyev, S., & Mbachu, J. (2011). On-site labour productivity of New Zealand construction industry: Key constraints and improvement measures. *Construction Economics and Building*, 11(3), 18-33.
- El-Gohary, K. M., & Aziz, R. F. (2013). Factors influencing construction labor productivity in Egypt. *Journal of Management in Engineering*.
- Enshassi, A., Mohamed, S., Mustafa, Z. A., & Mayer, P. E. (2007). Factors affecting labour productivity in building projects in the Gaza Strip. *Journal of Civil Engineering and Management*, 13(4), 245-254.
- Gidado, K., & Ailabouni, N. (2012). Evaluation of factors affecting productivity in the UAE construction industry.
- Hicksona, B. G., & Ellis, L. A. (2013). Factors affecting Construction Labour Productivity in Trinidad and Tobago. *The Journal of the Association of Professional Engineers, Trinidad and Tobago*, 42(1), 4-11.

- Jang, H., Kim, K., Kim, J., & Kim, J. (2011). Labour productivity model for reinforced concrete construction projects. *Construction Innovation*, 11(1), 92-113.
- Mahamid, I. (2013). Journal Info.
- Makulsawatudom, A., Emsley, M., & Sinthawanarong, K. (2004). Critical factors influencing construction productivity in Thailand. *The journal of KMITNB*, 14(3), 1-6.
- Olomolaiye, P., Jayawardane, A., & Harris, F. (1998). *Construction productivity management*: Longman.
- Robles, G., Stifi, A., Ponz-Tienda, J. L., & Gentes, S. (2014). Labor Productivity in the Construction Industry-Factors Influencing the Spanish Construction Labor Productivity.
- Shashank, K., Hazra, S., & Pal, K. N. (2014). Analysis of Key Factors Affecting the Variation of Labour Productivity in Construction Projects.
- Soekiman, A., Pribadi, K., Soemardi, B., & Wirahadikusumah, R. (2011). Factors relating to labor productivity affecting the project schedule performance in Indonesia. *Procedia Engineering*, 14, 865-873.
- Thomas, H. R., & Napolitan, C. L. (1995). Quantitative effects of construction changes on labor productivity. *Journal of construction engineering and management*, 121(3), 290-296.
- Yi, W., & Chan, A. P. (2013). Critical review of labor productivity research in construction journals. *Journal of Management in Engineering*, 30 (2), 214-225.