

Construction Productivity in Turkmenistan: Survey of the Constraining Factors

Serdar Durdyev, Syuhaida Ismail, and Nooh Abu Bakar

Abstract—The aim of this study is to identify the key factors constraining labour productivity of Turkish contractors in Turkmenistan based on the views of project manager consultants, contractors and subcontractors. Qualitative data collected through literature review formed the basis for questionnaire surveys conducted among the target populations. In-depth literature review revealed 28 labour productivity constraining factors, however after the reliability test, corrected scale of the questionnaire merely consisted 24 of the factors. Before the factor analysis factors were ranked according to their mean ratings. Recommendations were provided for improving construction labour productivity of Turkish contractors in the construction industry of Turkmenistan for addressing the labour productivity constraints.

Index Terms—Construction, productivity, project management, Turkmenistan.

I. INTRODUCTION

Productivity is one of the important aspects for the companies in the construction industry, which helps for survival or growth. Improvement in the productivity of the construction industry is therefore of critical importance considering its significant contribution to the GDP.

Furthermore, improvement in the productivity of the construction industry has a positive impact on all other industries, as well as on the national economy [1]. For instance, according to [2], 10% escalation in construction productivity would annually save about £1 billion.

There are various critical problems facing the Turkish contractors in the construction industry of Turkmenistan, but one of the most significant according to the authors points of view, is low productivity [3]. Therefore, as part of the aim of this study, factors constraining construction productivity of Turkish contractors in Turkmenistan are going to be provided. This provision allows Turkish construction companies to focus in order to achieve a remarkable improvement in the construction productivity. On the other hand, resources could be optimally disbursed addressing the few causes responsible for the significant portion of the construction productivity issues. To this end, factors constraining construction productivity were first identified via a review of related literature, and recommendations for enhancing the construction productivity level of the Turkish contractors were provided based on the statistical analyses of the chosen factors.

The details of the research method adopted are as follows:

- Factors constraining the construction productivity were identified from the relevant literature.
- Questionnaires were prepared based on these factors, which were further administered to the target population.
- The reliability of the collected data was assessed by statistical analysis.
- The factors constraining labour productivity were ranked according to their mean ratings.
- Recommendations for improving labour productivity were provided based on the results of the statistical analyses.

II. LITERATURE REVIEW

A. Overview of Turkmenistan and Its Economy

Turkmenistan is largely (85 percent of the total area) a desert country boarded by Uzbekistan, Kazakhstan, Iran, Afghanistan and Caspian Sea, which intensively deal with agriculture and has also a large gas and oil resources. According to the International Monetary Fund's (IMF) 2011 World Economic Outlook Report, Turkmenistan has been considered in the list of emerging and developing countries [4]. Table I gives a brief overview of the economy of Turkmenistan in statistical terms.

TABLE I: SELECTED ECONOMIC INDICATORS FOR TURKMENISTAN (1999-2004):

Item	1999	2000	2001	2002	2003	2004
Nominal GDP (Billion)	20,05	25,64	35,11	45,24	55,70	64,34
Changes in Real GDP	60	80	90	00	90	40
Construction Share of GDP (%)	16.5	18.6	20.4	20.5	17.1	15.5
Inflation Rate (%)	12.2	6.8	5.7	9.0	9.0	9.0
Unemployment Rate	23.46	8.04	11.63	8.75	5.58	5.88
	62.9	63.3	63.9	64.6	65.4	60.0

Source: Economic Survey of Europe 2005, Issue.

The Gross Domestic Product (GDP) of Turkmenistan has been rising year by year and in 2004 it has reached to 64,34 billion Manats (12,4 billion USD according to the 2004 exchange rate). Unfortunately, because of lack of statistical information about the economy of Turkmenistan, economic indicators between 1999 and 2004 have been added. However, there are some up-to-date economic indicators such as GDP and inflation rates which could have been found through several report published on the economy of Turkmenistan. According to the Central Intelligence Agency (CIA) World Factbook (WF), by the end of 2010 GDP of Turkmenistan was \$36,64 billion, which has increased

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approximately 11 percent (3rd in comparison to the world) comparing to 2009 [5].

The main contributors to the GDP in the economy of Turkmenistan are agriculture (cotton and wheat), gas, and oil and petroleum products. After agriculture, gas and petroleum sector, construction industry is the 3rd with its contribution of 9 percent of GDP. By the end of 2010 this was approximately 10 percent of contribution of GDP [6].

Comparing with the other countries in Central Asia, Turkmenistan has the highest GDP growth until 2009. Fig. 1 demonstrates the real GDP growth by country between 2005 and 2011. By the end of 2009 there was a sharp decline in GDP growth. Main reasons of that decline are the Global Economic Crisis and disagreements on energy between Russia, therefore it caused of closing of the export routes through Russia [6].

Despite all these high rates in economy, Turkmenistan has been facing with a high level of unemployment problem. According to the WF report, in 2004 unemployment rate in Turkmenistan was estimated as 60 percent of the population, which makes it the 195th country comparing to the World [5]. The main reasons of high unemployment rate are limited privatization and high rates of unemployment in the rural areas of the country.

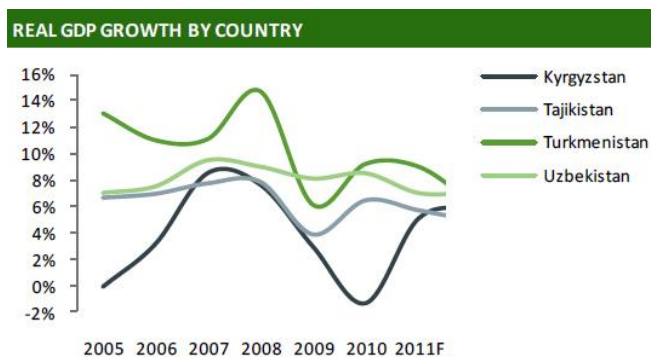


Fig. 1. Real GDP growth by country.

In summary, nevertheless Turkmenistan has a large resource of oil and gas; it is still remaining underdeveloped due to the problems caused from impoverished population, misuse of natural resources and unwillingness to adopt reforms in the economy [7].

B. Construction Industry in Turkmenistan

Construction industry plays very important role on economic development as a physical infrastructure supplier [8], besides that infrastructural development in Asia was an important part of economic development [9]. After break up of the Soviet Union, the several international construction companies in line with the first president's taste for giant-scale projects have been reconstructing Turkmenistan [10]. Therefore, construction sector has been playing a significant role in socio economic development, as well as in reducing unemployment, so that, in January – April period of 2010, the GDP growth rate rose in the construction sector 2.2 times [11].

Despite some bureaucratic problems and certain laws, Turkmenistan has started to attract foreign investments especially construction companies from Turkey and France. In recent years number of construction projects (industrial

enterprises, gas-turbine power plants, children's health improvement and recreation centers, healthcare, educational and pre-school institutions and apartment houses) have been implemented through international companies, which have contributed to the employment, as well as to the socio economic development of Turkmenistan. Furthermore, in 2008 Turkmen government introduced new favorable terms of housing loans as part of National Program on the Transformation of Social and Living Conditions of the Population by 2020. One of the commercial banks in Turkmenistan is offering loans with a reduced deposit of 10 percent, annual rate reduced to 1 percent with up to 30 years of loan. All these opportunities supplied by the government make Turkmenistan people to improve their life standards, even in rural areas.

In summary, it seems that Turkmenistan is going to invest a lot of money (\$7 billion in 2011) to reconstruct the country after Soviet Union and make an improvement in social and in living conditions in rural areas. However, government should also pay attention on the factors, which are constraining the construction industry of Turkmenistan and explore the innovative ways of improvement.

C. Turkish Contractors in the Construction Industry of Turkmenistan

Construction industry plays an important role on economic development as a physical infrastructure supplier [8], besides that according to the survey reported by United Nations [9], infrastructural development in Asia was an important part of economic development. After break up of the Soviet Union, the several Turkish construction companies in line with the first president's taste for giant-scale projects have been reconstructing Turkmenistan [10].

Despite some bureaucratic problems and certain laws, Turkmenistan has started to attract foreign investments especially construction companies from Turkey. In recent years, number of construction projects (industrial enterprises, gas-turbine power plants, recreation centers, healthcare, educational and pre-school institutions and apartment houses) have been implemented through Turkish companies, which have contributed significantly to the socio-economic development of Turkmenistan.

After the breakdown of the Soviet Union, attempts of the President of Turkey Turgut Ozal helped for Turkish construction companies to invest in Turkmenistan. According to the [11] Turkish construction companies have fulfilled projects in Turkmenistan over \$25 billion since 1991. However, Turkish construction companies were facing several problems, such as implementation of new technology, experienced workforce, and the most important problems are schedule pressure on the projects and payment crisis by the Government. These problems eventually led to the scenario where Turkish construction companies are experiencing lack of productivity in Turkmenistan. Therefore, this study aims to identify and examine the factors constraining labour productivity of the Turkish construction companies in Turkmenistan and ultimately to provide some recommendations for the improvement of labour productivity.

D. Construction Productivity

Productivity is an effective utilization of the resources to achieve set objectives. Increase in productivity correlates

well with increased profitability, competitiveness, achievement of key stakeholder propositions as well as long-term growth and sustainability of a company, an industry and a nation [12]. This study is not focused on defining productivity, but on the factors constraining labour productivity of Turkish contractors in the construction industry of Turkmenistan. However, to move ahead, the research thrusts need to be anchored on a contextual interpretation of productivity.

European Cooperation defines productivity as “the quotient obtained by dividing output by one of the factors of production”. Or, in another words, “the same as efficiency, which is defined as the ratio output energy divided by input energy”. On the other hand, definition of productivity was made by [13] as “the quantity of work produced per man-hour, equipment-hour, or crew-hour”.

In overall, productivity can be defined as “quantity of output of a process per unit of resource input”, which aligns with several approaches. This definition is also in accordance with others made by a number of authors [14,15,16].

Based on the above-mentioned review, productivity in the construction industry can be defined as a measure of outputs (i.e. units or dollar) obtained by the inputs (i.e. man-hour, machine-hour, materials or money).

At the level of the individual projects executed by an organisation such as a construction company or consulting firm, emphasis is placed on the achievement of the three key project objectives - time, cost and quality targets. The measure of productivity at this level ought to be how well the targets set for those three objectives are achieved by the deployment of company resources (manpower, machinery, money and materials), using the process or method adopted for the project, while complying with the requirements of the statutory/regulatory environment within which the project is carried out. However, to align this with productivity measures at other levels, the project level measurement may focus on the dollar value of the project per unit cost of the resource inputs.

E. Factors Constraining Construction Productivity

Construction labour productivity has been the subject of numerous research studies. For instance, type of the procurement system has a remarkable impact on the achievement of time, cost and quality targets for a project [17].

[18] have identified 56 on-site labour productivity constraints to the construction industry of New Zealand under eight broad categories which are project finance, workforce, technology/process, project characteristics, project management, statutory compliance, unforeseen events and other external factors.

In their studies, [19] have identified factors, which have significant impact on construction labour productivity in Kuwait. They have identified 45 factors having impact on construction labour productivity, which are grouped under: 1) management group; 2) technological group; 3) human/labour group and 4) external group.

Depending on circumstances, factors having impact on labour productivity may vary from country to country, from project to project, and possibly within the same project site [20]. Therefore, this paper aims to identify the factors constraining construction labour productivity of Turkish

contractors in Turkmenistan.

Table II displays the factors having impact on construction labour productivity, which have been identified in the previous studies.

TABLE II: REVIEW OF THE CONSTRAINTS TO PRODUCTIVITY

Factors Influencing Construction Productivity	[17]	[18]	[19]	[20]	[21]
On-time/Late payments;			✓		
Reworks;	✓	✓			✓
Motivation;				✓	
Level of skills and experience of the workforce	✓			✓	
Method of Construction;	✓				
Site Conditions;	✓	✓			
Project Management				✓	
Supervision or Supervision Delays;			✓		
Design Changes/Change Orders;	✓	✓			✓
Inclement Weather;	✓	✓	✓		✓
Workforce Absenteeism;	✓	✓			
Material Availability;	✓	✓		✓	✓
Health of the Workforce;	✓				
Accidents at Work Sites;	✓				✓
Working Overtime;	✓		✓		
Incomplete Drawing;	✓	✓			
Poor Communication;	✓	✓			
Poor Site Layout;		✓	✓		
Lack of Tools;	✓	✓			

III. RESEARCH METHODOLOGY

This paper examines constraints influencing labour productivity of Turkish contractors in Turkmenistan. Therefore, as an appropriate method [3] in collecting data, questionnaire surveys were conducted among the target population to further analyze the factors constraining labour productivity of Turkish contractors. This survey also ranks the factors constraining labour productivity.

Likert-type scale was applied [18] in this study to the questionnaire design, running from 1 (very low) to 5 (very high). To determine the questionnaire structure, a second evaluation was conducted to ensure its effectiveness and suitability to the construction context of Turkmenistan. The original questionnaire consists of 28 factors constraining labour productivity.

Before the distribution of the questionnaire, a pilot test was performed to confirm that the questionnaires were phased appropriately. Twelve construction professionals in Turkmenistan were provided with softcopies of the original questionnaire, respectively. Respondents in pilot testing process were asked to comment on the readability, accuracy and comprehensiveness of the questionnaires.

The Cronbach’s alpha coefficient (α) was used to determine the questionnaire reliability, because items which are used to form a scale (Likert scale), construction at the group level and reliability of each item at the individual level has to be evaluated. For the pilot test, Cronbach’s α of 0.896 was achieved, and the corrected scale consisted 23 structural

survey questions representing 23 factors constraining the construction productivity of Turkish contractors in Turkmenistan.

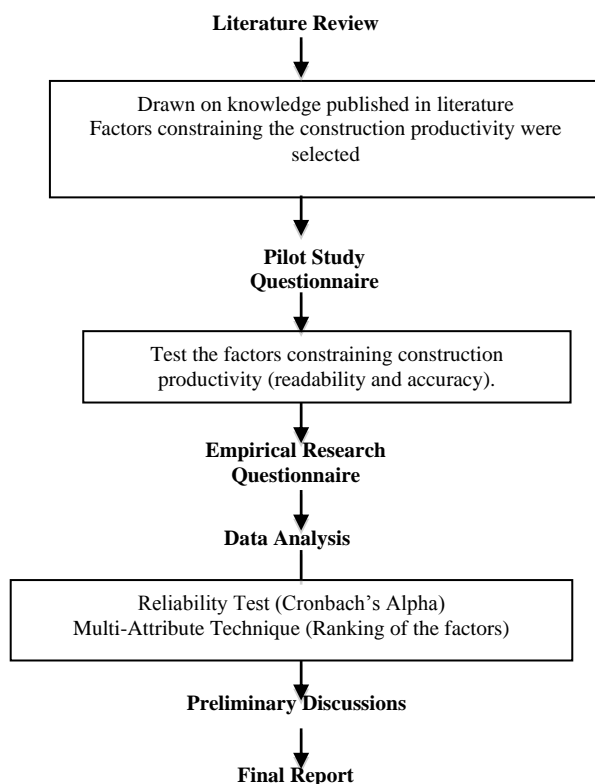


Fig. 2. Research framework for this research study; source: adapted from Walker (1997).

The survey sampled consultants, contractors and subcontractors in Turkmenistan. For the quantitative surveys, emails were sent to the target population in the database inviting them to participate in the online survey. The survey was hosted on a web-based survey platform. Several reminders were sent at monthly intervals to the potential respondents, to improve the response rate. Given the anonymous nature of this self-administered online survey, an apology was issued in the emails to those who might have already responded while encouraging those who had not to do so before the cut-off date.

Only 124 usable feedbacks were received by the cut-off date and this represented about 53% of total 235 email invitations that have been sent. The 54 useful responses were from contractors (44%), 48 from project management consultants (39%) and 22 from subcontractors (17%) in the construction industry of Turkmenistan. Figure 2 displays the overall research framework of this study.

IV. FINDINGS AND DISCUSSIONS

A. Ranking of the Constraints

The factors constraining labour productivity of the Turkish contractors were ranked according to their means, which are listed in Table 3. The seven factors out of 23 with means of 4 or more were recognized as the most significant to labour productivity. Table 3 ranks these constraints based on mean value.

‘Lack of local experienced labour’ was ranked first among the twenty-four identified, therefore considered as the most

significant factor constraining labour productivity of Turkish contractors. This result is justified, as experience improves labour in different ways such as intellectual and physical abilities.

After the Independence of Turkmenistan, a lot of construction companies from Turkey have made an investment to re-build the country. However, the main problem of the Turkish companies was to find experienced local labour, which are mostly migrated to another countries after the breakdown of the Soviet Union. Effect of this factor to the construction productivity is clear and was further recognized among the important factors affecting construction productivity in developing countries such as in the USA, Uganda, Malaysia and Indonesia [3], [20], [21].

TABLE III: RANKINGS OF THE CONSTRAINTS TO PRODUCTIVITY

Items	Constraint	Mean	Rank
F1	Working overtime	4.38	3
F2	Rework	4.17	5
F3	Work permit of the local labours	3.74	10
F4	High cost of needed resources: material, money & machinery	3.36	13
F5	Work delay caused by Inspection delays by Local Authority	2.66	15
F6	Cost of the wasted materials on site	2.12	23
F7	Inadequate Financial policies of the Government	4.16	6
F8	Payment Delay	4.11	8
F9	Lack of Experienced Local Project Managers	3.25	14
F10	Lack of labour motivation	3.40	12
F11	Frequent changes in government policies/ legislations impacting on construction	2.29	21
F12	Financial Weakness of the Contractor	4.28	4
F13	Working 7 days/week without taking holiday	4.10	7
F14	High cost of foreign labour	3.99	9
F15	Lack of communication between Government Authority and Contractor	2.46	16
F16	Over influence of the Government on the Construction Process	3.61	11
F17	Material shortage	2.44	17
F18	Schedule Pressure caused by Government	4.45	2
F19	Lack of local experienced labour	4.46	1
F20	Frequency of design changes/ change orders	2.28	22
F21	Poor Estimation	2.41	19
F22	Immigration department policies	2.42	18
F23	Unfamiliarity with current job and conditions	2.41	20

‘Schedule pressure caused by government’ was ranked second. This result is justified because accelerating a project can be rewarding, however the consequences can be troublesome [22], [23]. Schedule pressure negatively affects labour performance, which is finally affecting labour productivity in overall [24]. Construction projects in Turkmenistan are directly tendered and controlled by the Government or in the other words lack of privatization. In addition to this, there are three different days (Independence Day, neutrality day and flag festival) when all construction projects have to be finalised and it makes a schedule pressure on contractors, which is having an impact on the productivity of Turkish contractors.

‘Working overtime’ was ranked third. This factor is directly related with the one which is ranked second, because

schedule pressure causes working overtime. This result is justified; because of the nature of the construction industry in Turkmenistan is mostly involving working overtime is unavoidable since there is a pressure on the project schedule and labour shortage, especially in the rural areas of the country. Sometimes in some areas of the country it may cause from the hot weather, where the temperature can be 55°C, which therefore make labours to work after hours. In their studies, [2,15,20] support this result by classifying this factor as one of the most influencing factors having impact on construction productivity in the UK, Thailand, USA, Uganda, and Gaza Strip, respectively.

‘Financially weakness of the contractor’ was ranked fourth. Turkish construction companies, which are investing in Turkmenistan financially, are not so strong, because mostly they consider investing overseas as to survive in the industry or make some money and go back to Turkey. [19] argue that financial weakness of the contractor may cause material shortage or some problems in procurement system, which is very critical to achieve productivity for any country such as Turkmenistan, because mostly materials are exported. On the other hand, Government pays just 20% or 30% in advance, however any contractor has to invest much more money for the resources to be used during the construction phase, such as foreign labours, machine, material and money.

‘Rework’ was ranked fifth among 23 factors constraining labour productivity. This result agrees with the findings of other author [33], [34], who argue that the delays and costs associated with rework in construction have profound impact on productivity. In another study [35], it was found that the cost of rework ranged from 2 to 12 percent of the total contract value. Suggestions made by [14] will enhance labour productivity of Turkish contractors, where he states that the use of quality management systems and improvement in labour skills, particularly for on-site management and the management of multi-projects at the firm level.

‘Inadequate financial policies of the Government’ was ranked sixth. This constraint is very significant in terms of its influence on the labour productivity of Turkish contractors, because the Government tenders almost all construction projects in Turkmenistan. Consequently, the Government makes all payments. Even in some construction projects, it becomes very difficult to find financial support from the Ministries of the related project; therefore it affects productivity of the construction companies, such as Turkish. Implementation of the privatization may help to avoid such kind of financial problems, which is consequently will improve productivity of the construction industry of Turkmenistan.

‘Working 7 days/week without taking holiday’ was ranked seventh. This result is tally with the findings of the study done by [15] where it was rated as the first in the time group. [36] has also found that working additional days has a significant impact on the construction productivity. Therefore, this result is justified as working additional days has a negative effect on the labours’ motivation and physical strength. Furthermore, due to the schedule pressure caused by the Government in the construction projects of Turkmenistan, both labours and project managers are working mostly without taking any holiday more than six months. Thus, this can lead to the moral demotivation of the local and foreign labours.

V. CONCLUSION

As part of its aim, this study identifies and ranks the factors constraining labour productivity of Turkish contractors in Turkmenistan, which are measured based on the views of construction professionals. The findings of the research are generally aligned with the results of previous studies related with labour productivity. The results indicate that the most significant factors affecting labour productivity are, lack of local experienced labour, schedule pressure caused by the Government, working overtime, financial weakness of the contractor, rework, inadequate financial policies of the Government, working 7 days/week without holiday.

Based on the outcomes of this research paper, recommendations to improve labour productivity are as follows:

- Structured planning of pre-construction phase to avoid the reworks during project implementation.
- Improvement of skills of the workforce based on education and training.
- Relaxation of residence permit throughout Turkmenistan to attract local skilled workforce from other states.
- Relaxation of the immigration policies for the foreign workforce.
- Trade and professional associations to use CPDs for ongoing improvement of member skills.
- Effective changes in regulations to minimize compliance costs and processing time.
- The Government authority, which is responsible for the project should do proper cash flow forecast. This will help to avoid the payment delay.
- Project period should be properly scheduled, which will not make a pressure on the contractors.
- Encourage skilled native project managers and workers based overseas to come back home.

In conclusion, it is believed that the outcomes of this paper can assist in achieving high labour productivity by focusing and acting upon the most important factors. Furthermore, by focusing on the significance of the evaluated factors constraining labour productivity, Turkish construction companies could be well guided in their efforts to addressing the factors in a time, cost and quality-effective manner.

VI. RECOMMENDATIONS FOR FURTHER STUDIES

This study focused on factors affecting labour productivity in Turkmenistan; however, there are several aspects to labour productivity. Future studies should explore other influencing factors affecting construction productivity at all stages of the procurement process.

As demonstrated in the demographic analysis of the respondents, the responses were just from contractors. The results did not include inputs from subcontractors. It may be necessary to aim for representative feedback from subcontractors in future studies, as they are the key players on construction sites. Also there was absence of feedback from clients and designers. Further studies should also seek to capture opinions of these stakeholders as they significantly influence on-site procurement processes and performance outcomes.

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