

FACTORS THAT AFFECT LABOR PRODUCTIVITY IN CONSTRUCTION PROJECTS

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Construction productivity is one of the most critical parts for many construction projects. Low labor productivity leads to delays and cost overruns. The aim of this study is to determine the factors effecting construction productivity. Fifteen labor productivity factors were shown from previous studies. Those factors are briefly discussed in terms of the effects on the Thai construction industry according to project managers' experiences. This study is intended as an initial investigation for further study of labor productivity and on factors to gain effective results in productivity.

Keywords: Factors, Labor productivity, Construction project, Thailand.

1 INTRODUCTION

The decreasing of labor productivity has been a serious problem in many countries in the past decade. Low labor productivity has a severe negative impact on the completion time and cost of the construction project. Therefore, to identify and eliminate the factors that cause low labor productivity is essential in order to improve construction projects to be more efficient.

2 PROBLEMS OF LABOR PRODUCTIVITY

There are fifteen labor productivity factors from previous studies that are briefly discussed below. In addition, each of these factors is analyzed for its impact on the Thai construction industry, as seen through the eyes of project managers based upon their experiences:

2.1 Financial Shortages

Financial problems are the most common factor causing low productivity, as it was ranked 13th of all problems that could affect construction productivity by a Singapore contractor (Lim and Alum 1995), and ranked 2nd of the most important project delay factors that affect the construction labor productivity of Malaysian residential projects (Abdul Kadir *et al.* 2005). In the Lao construction industry, financial shortage is the number one problem causing low productivity (Philavong 2005). Without financial liquidity, suppliers cannot keep material stocked efficiently on site (Lim and Alum 1995, Abdul Kadir *et al.* 2005, Philavong 2005).

Effects on Thailand's construction industry: After interviewing several project managers in Thailand, cash flow from the contractors was voted the most common

problem causing low productivity on construction sites. Sufficient funds are the most important resource to complete the project. Financial shortages leads to several problems in obtaining materials as well as maintaining equipment.

2.2 Worker Absence

Worker absence and turnover is also a significant problem. Health problems are a reason for Nigerian workers' absence (Olomolaiye *et al.* 1987). However, some of the workers have become absent because they have abruptly moved to other projects with more benefits (Kaming *et al.* 1997). Singapore has shown a high turnover rate for workers (Lim and Alum 1995). Moreover, Indonesian workers also consider quitting their jobs due to the distance between construction site and home, poor working environment, and the need for more challenging jobs (Kaming *et al.* 1997).

Effects on Thailand's construction industry: Worker absence is one of the most severe problems in Thai construction projects. Especially during the agricultural season, workers leave their construction jobs for farming jobs instead.

2.3 Lack of Incentive Programs

Incentive programs are used to help motivate the workers to significantly increase the productivity of construction projects. Therefore the lack of certain incentive programs such as low wages, late payment, no training sessions and/or labor recognition greatly reduces workforce productivity. Several countries in the developed or underdeveloped world, such as the Gaza Strip, USA, and Egypt, have been experiencing these problems (Enshassi *et al.* 2007, Mojahed and Aghazadeh 2008, Mahmoud El-Gohary and Fayek Aziz 2013).

Effects on Thailand's construction industry: A monetary policy has been implemented as a motivation tool to improve labor productivity in construction projects. However, it is not sufficient for long-term contract workers, resulting in a high turnover rate of the workers.

2.4 Insufficient Labor Skills and Inexperienced Workers

The productivity rate depends on the skills and experience of workers. Highly-skilled workers are needed onsite to increase the quality of work itself and to help improve and develop particular skills for other workers. This will help further along the more complex jobs onsite efficiently. A lack of skills and experiences can cause miscommunication and unclear instructions that could be detrimental to the project (Kaming *et al.* 1997).

Effects on Thailand's construction industry: Sufficient working skills and knowledge are essential to construction workers. The low productivity rate in Thailand is often caused by foreign workers who lack construction skills and knowledge. This could be easily improved by having some training sessions and/or appointing a skilled worker to be the head of the project.

2.5 Lack of Materials

The lack of materials for construction is the most common problem that affects productivity in many countries, such as Nigeria (survey dated 1987), Indonesia (1997), Malaysia (2005) and Chile (2011). Workers cannot proceed with any projects if materials are not available at the construction site, resulting in the lost of productive time and cost.

Effects on Thailand's construction industry: It is the most critical productivity factor because materials are needed in construction processes. It can be caused by many reasons. For example, contractors' financial problem would affect the material procurement and or delay the delivery. In addition, an unexpected shortage of the materials in the market could happen. Moreover, the lack of skills and improper planning from the workers could result in misuse of the materials.

2.6 Incomplete Drawings

Incomplete drawings have caused a high impact on labor productivity. The clear detail of construction drawing, specification, and work instruction will lessen managing time for the construction process. Therefore an incomplete drawing of the project plan would tremendously decrease labor productivity because it delays the starting time, affecting overall activities in the project.

Effects on Thailand's construction industry: An incomplete drawing is usually caused by the limitation of time and budget provided by project owner. Consequently, the drawings would not meet qualifications and thus further disrupt the bidding and constructing process (Makulsawatudom and Emsley 2001).

2.7 Instruction and Inspection Delay

Every step in the construction process needs to go through scrutinizing inspection prior to further additions to the project. Therefore, delaying inspection would cause construction downtime and a halt in productivity. However, inspections are mandatory procedures to ensure the stability of the structure. The determining factor of this step is the skills and experiences of the inspector/supervisor and the complexity of the project (Olomolaiye *et al.* 1987).

Effects on Thailand's construction industry: Instruction and inspection delays have serious effects on project durations. The common causes are an inadequate number of foremen in the project, incompetent project managers, and irresponsible inspectors and supervisors (Makulsawatudom and Emsley 2001).

2.8 Rework

It is highly common for certain structures to be rebuilt. This is due to several factors. For example, changes in design during construction can add additional work and time to the project. Moreover, some repairs are also required after inspections. The problems can be from misreading of drawings and specifications, and inadequate instructions from incompetent supervisors (Olomolaiye *et al.* 1987, Kaming *et al.* 1997, Kaming *et al.* 1998).

Effects on Thailand's construction industry: The problem of rebuilding in Thailand usually comes from the incompetency of the supervisors that misread drawings and

constantly change the order. This would consume both cost and time of the construction project (Makulsawatudom and Emsley 2001).

2.9 Changing Orders

As mentioned earlier in the reworking issue, changing orders leads to confusion and rearrangement in the process of construction. This matter could be done by the owner or consultants of the project. It can severely affect the cost and time if the changes are done during the construction stage, and could suspend current and subsequent work while discouraging the workers (Abdul Kadir *et al.* 2005).

Effects on Thailand's construction industry: Changing orders is an unavoidable issue since the project owner or designer usually requires it. It inevitably increases time and costs for the project.

2.10 Incompetent Construction Management Team

The management team is important for the success of construction projects, responsible for planning and controlling the project schedule, material procurement, and instructions to complete the work. Any inefficiency and ineffectiveness in the construction management team leads to disruptions of productivity (Abdul Kadir *et al.* 2005).

Effects on Thailand's construction industry: This problem directly correlates with the management of human resources. Unqualified construction managers/supervisors will cause ineffective teamwork. Also, insufficient numbers of managers/supervisors in the team should be avoided (Makulsawatudom and Emsley 2001)

2.11 Lack of Tools and Equipment

Workers cannot operate at their full capacity if tools and equipment are not well maintained in good working condition. The availability of machines is also important. Thus the number of machines should correlate with the number of workers. The most used machines that are required on site are steel-bending and steel-cutting machines, as well as concrete vibrators (Olomolaiye *et al.* 1987).

Effects on Thailand's construction industry: This problem is often found in Thailand, with an insufficient amount of machines relative to workers. Moreover, the lack of maintenance programs, and improper and unorganized storage of equipment, also contributes to this problem.

2.12 Poor Communication

Unclear instructions can lead to misunderstanding in the construction process, and be detrimental to the project (Kaming *et al.* 1997).

Effects on Thailand's construction industry: Significant numbers of workers in Thailand are from neighboring countries such as Burma, Laos, and Cambodia, which speak different languages. Language barriers sometimes cause serious problems during construction.

2.13 Poor Site Conditions

Environmental and physical conditions of each construction site vary. Certain man-made obstructions and pollutants can delay the production. Other environmental factors, such as seasons, affect climate conditions, which can cause overtime and cost overruns.

Effects on Thailand's construction industry: The investigation of site conditions prior to planning the project tends to be lacking in Thai construction companies. Certain preparatory steps are required, such as ground leveling, lighting installment, and fire protection system (Makulsawatudom and Emsley 2001).

2.14 Interference

Interference between work crew members has had unproductive effects on operations and work sequences. In order to avoid interference, there must be a balance between the working area and the size of crew in order to work productively (Olomolaiye et al. 1987, Kaming *et al.* 1997).

Effects on Thailand's construction industry: There is a lot of interference between worker gangs when the schedule is delayed. The project owner requires a completion of work within a limited time. Therefore, all workers have to work within the same time frame creating a disarranged process of work, resulting in a drop in productivity.

2.15 Technology

Engineering technology has advanced rapidly along with other technologies in the world. In the construction industry, high-tech tools can help ease the difficulty in more complex jobs, furthering projects along so workers can work more effectively and efficiently. These tools include mortar mixers, scaffolding systems, forklift trucks, epoxy mortars, and mortar additives (Mahmoud El-Gohary and Fayek Azi 2013).

Effects on Thailand's construction industry: Advanced technology tools and equipment tend to be available only in high-profile projects with a higher budget.

3 CONCLUSION

These fifteen factors were shown to be the main reasons for decreased labor productivity in construction projects. Therefore, this paper can be used as a basic guideline to reduce losses in labor productivity and gain improvement at construction sites. In future studies, we will be focusing more on the relationship between each factor and improvement methods in construction.

References

- Abdul Kadir, M. R., Lee, W. P., Jaafar, M. S., Sapuan, S. M., and Alli, A. A. A., Factors affecting construction labour productivity for Malaysian residential projects, *Structure Survey*, Emerald, 23(1), 42-45, 2005.
- Enshassi, A., Mohamed, S., Mustafa, Z. A., and Mayer, P. E., Factors affecting labour productivity in building projects in the Gaza Strip, *Journal of Civil Engineering and Management*, 13(4), 245-254, 2007.
- Kaming, P. F., Holt, G. D., Kometa, S. T., and Olomolaiye, P. O., Severity diagnosis of productivity problems—A reliability analysis, *International Journal of Project Management*, 16(2), 107-113, 1998.
- Kaming, P. F., Olomolaiye, P. O., Holt, G. D., and Harris, F. C., Factor Influencing Craftsmen's Productivity in Indonesia, *International Journal of Project Management*, 15(1), 21-30, 1997.
- Lim, E. C., and Alum, J., Construction productivity: Issues encountered by contractors in Singapore, *International Journal of Project Management*, 13(1), 51-58, 1995.
- Mahmoud El-Gohary, K., and Fayek Aziz, F., Factors influencing construction labor productivity in Egypt, *Journal of Management in Engineering*, ASCE, January 4, 2013.
- Makulsawatudom, A., and Emsley, M., Factor affecting the productivity of the construction industry in Thailand: The project managers' perception, *Proceedings, 17th Annual ARCOM Conference*, Vol. 1, 281-90, University of Salford, Association of Research in Construction Management, 5-7 September 2001.
- Mojahed, S., and Aghazadeh, F., Major factors influencing productivity of water and wastewater treatment plant construction: Evidence from the Deep South, USA, *International Journal of Project Management*, Elsevier, 26, 195-202, May, 2008.
- Olomolaiye, P. O., Wahab, K. A., and Price, A. D. F., Problems influencing craftsmen's productivity in Nigeria, *Building and Environment*, 22(4), 317-323, 1987.
- Philavong, L., Assessment of Productivity Perceptions and Factor for Lao Construction Personnel, A special research submitted in partial fulfillment of the requirements for the degree of the Masters of Engineering, Faculty of Engineering, King Mongkut's University Technology Thonburi, 2005.