Factors affecting construction labour productivity for Malaysian residential projects

M.R. Abdul Kadir, W.P. Lee, M.S. Jaafar, S.M. Sapuan and A.A.A. Ali

Universiti Putra Malaysia, Selangor, Malaysia

Abstract

Purpose – Construction labour productivity is of great interest to practitioners and researchers because it affects project cost and time overrun. This paper evaluates and ranks the importance, frequency and severity of project delay factors that affect the construction labour productivity for Malaysian residential projects.

Design/methodology/approach – A total of 100 respondents consisting of 70 contractors, 11 developers and 19 consultants participated in this study. The respondents were asked to indicate how important each item of a list of 50 project related factors was to construction labour productivity. The data were then subjected to the calculation of importat indices which enabled the factors to be ranked.

Findings – The five most important factors identified by them were: material shortage at site; non-payment to suppliers causing the stoppage of material delivery to site; change order by consultants; late issuance of construction drawing by consultants; and incapability of contractors' site management to organise site activities. On the other hand, the five most frequent factors were: material shortage at project site; non-payment to suppliers causing the stoppage of material delivery to site; late issuance of progress payment by the client to main contractor; lack of foreign and local workers in the market; and coordination problem between the main contractor and subcontractor.

Originality/value – The inferences drawn from this study could be used by the project managers to take account of these factors at an early stage, hence minimising the time and cost overrun.

Keywords Employee productivity, Construction operations, Malaysia

Paper type Research paper

Introduction

Malaysia registered a productivity growth of 2.7 percent from RM 24,013 m in 2002 to RM24,652 m in 2003 (current exchange rate 1USD = RM3.8). Productivity contributed 51.2 percent while employment contributed 47.8 percent to the GDP growth of 5.8 percent. For the period 1998-2003, Malaysia's economy posted a productivity growth of 2.3 percent (National Productivity Corporation, 2003). This growth surpassed that of several major countries of the Organisation for Economic Co-operation and Development (OECD) namely, the US (2.2 percent), the UK (1.3 percent), Japan (1.2 percent), Canada (1.1 percent), France (1.0 percent), Germany (0.9 percent), and Italy (0.1 percent) as shown in Figure 1. Among the selected Asian countries, Malaysia's productivity growth was better than Indonesia (0.1 percent), Singapore (1.1 percent), Thailand (1.1 percent), Hong Kong (1.8 percent), and Philippines

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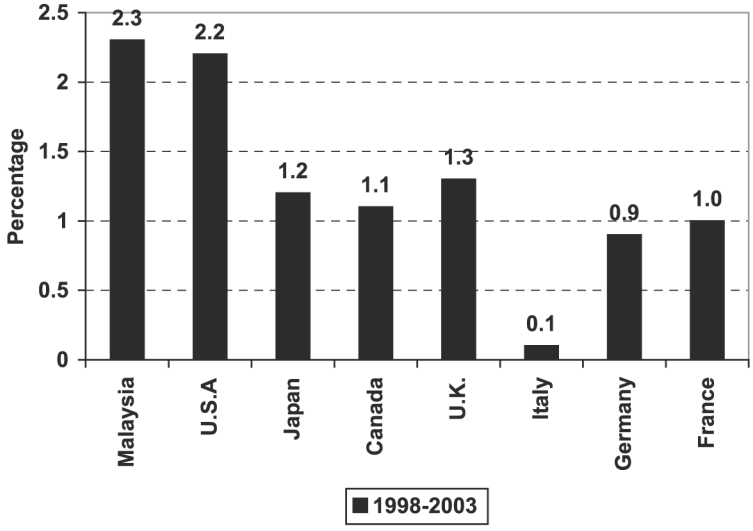

Source: National Productivity Corporation (2003)

Figure 1.
Comparison of productivity growth between Malaysia and selected OECD countries for year 1998-2003

(2 percent) but lower than that of Republic of Korea (3.5 percent) and Taiwan (2.8 percent) – refer Figure 2.

The construction sector registered a productivity growth of 2.6 percent and output growth of 1.9 percent. The principal factor contributing to this positive growth was the improvement in domestic demand due to lower interest rates. Furthermore, initiatives taken by the government to revive large scale infrastructure and to encourage house ownership also helped to improve the development of this sector.

Although the government's policy objective in the seventh Malaysia Plan was productivity driven growth, alas it was not the case. Low productivity combined with high capital and labour inputs seemed to affect economic growth during the years preceding the crisis. This was evidenced by low total factor productivity (TFP) growth and an increasing incremental capital output ratio (ICOR), both of which adversely affected the economy's long-run competitiveness (Zaini, 2000). Therefore, in order to face the challenges of the 21st century, particularly in the building construction industry, novel methods of construction for improving productivity and reducing the amount of site labour involved in the building operations have to be developed through continuous productivity improvement, more value added operations and enhanced product quality.

Malaysia's housing need

Having described the general productivity trends in Malaysia, it is now appropriate to discuss the general scenario about housing need in Malaysia and how the study about the project delay factors can assist the country to solve its construction productivity problems, particularly in the housing sector.

The provision of suitable housing is still one of the biggest problems faced by the world. It is known that increasing population, immigration, and natural disasters

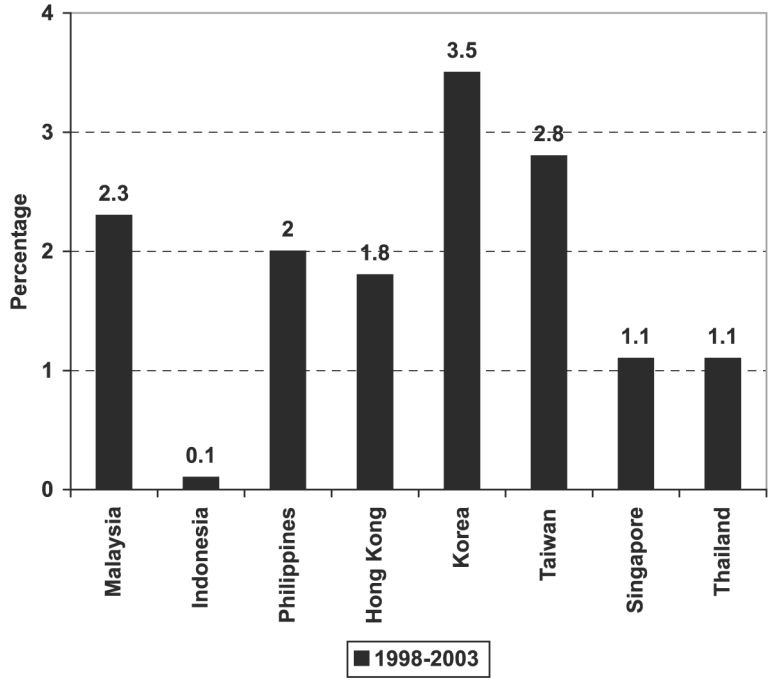

Figure 2.
Comparison of productivity growth between Malaysia and selected Asian countries for year 1998-2003

Source: National Productivity Corporation (2003)

are the main reasons for the great housing demand. The industrial revolution caused an increase in building demand, and because of this, new developments in building construction systems emerged. Furthermore, the conventional construction method, which is commonly being practiced in the building construction industry, is unable to respond to this huge demand in a short time with standard quality (Senturer, 2001).

Although developments in the building construction sector started at the beginning of the twentieth century, the real developments were realised after the Second World War during the restoration of the ruined cities (Warszawski, 1999). Today, the Western World has mad substantial progress in solving its housing problems. However, it is still a paramount problem for developing countries such as Malaysia, together with the issue of having better environmental quality. This is a multidimensional problem and there are many issues related to the reasons for, and the solutions to, the problem. If the problem is considered from the viewpoint of the building industry (the design, production, construction and economy of the building), industrialised building systems seem to be a solution. Buildings constructed by this method have a short construction time and standard quality (Senturer, 2001).

Although Malaysia did not face the devastating impact of World War II, the increasing population has prompted the country to put emphasis on housing particularly the low cost housing as evidenced in the periodic 5 year Malaysia Plan.

Historically, the provision of housing was addressed during the first Malaya Plan (1956-1960), where a small provision of about RM10 million was allocated for the

development of low cost housing followed by the provision of RM40 million in the second Malaya Plan (1961-1965). Further, in 1964, the government established the new Ministry of Local Government and Housing to oversee the housing development in the country. Since then, more vigorous programmes of public housing have been planned particularly targeted at the low income group. The need of this group was more evident when over 8,000 applications were received for only a 100 units of low cost house in Penang (Peng, 1986). This eventually prompted the government to allocate more funds in the first and second Malaysia Plan (1966-1976), where RM150 million was devoted to low cost housing. As a result, a total of 22,500 low cost housing units were completed during this period compared to 7,500 units during the previous plan.

During the third Malaysia Plan (1976-1980) and the fourth Malaysia Plan (1981-1985), a total of 500,000 units and 923,300 units of various categories of houses were planned, respectively. Subsequently, a total of 701,500 units of houses were envisaged during the fifth Malaysia Plan (1986-1990). Out of this 71 percent was allocated to the low cost houses (Peng, 1986). Further, during the sixth Malaysia Plan (1991-1995), 667,745 houses were required in which the public sector contributed 15.7 percent (104,524 units) while the private sector contributed 84.3 percent (563,221 units). The number of projects and totals of low cost housing completed during the Malaysia Plans from 1976-1995 are shown in Table I.

In the seventh Malaysia Plan, the country intended to construct about 800,000 units of houses for its population. These houses are categorised in Table II. By the end of the 1999, about 70 percent of the target had been achieved. Of the 110,644 units approved by the Ministry of Housing and Local Government to be built within the first 6 months of 2000, 25.4 percent of the approved units were for low cost unit housing, 38.7 percent medium cost houses and 35.5 percent higher end houses. A total of 57,925 units of residential properties were launched in housing schemes in the first half of 2000. Out of this, 39.4 percent are represented by condominium/apartment units and primarily concentrated in Selangor and Kuala Lumpur. Nevertheless, the huge supply of

Malaysia plan	Number of projects completed	Number of units completed
Third Malaysia plan (1976-1980)	21	5,153
Fourth Malaysia plan (1981-1985)	143	21,556
Fifth Malaysia plan (1986-1990)	72	13,992
Sixth Malaysia plan (1991-1995)	28	6,042

Source: Ministry of Housing and Local Government, Malaysia, 1997

Table I.
Number of low cost projects and houses completed during the Malaysia Plans (1976-1995)

Item	Category of house	Cost per unit	No. of units	No. of units (percentage)
1	Low cost house	Less than RM25,000	235,000	29.3
2	Low medium cost house	RM25,000-RM60,000	350,000	43.75
3	Medium cost house	RM60,000-RM100,000	85,000	16.25
4	High cost house	More than RM100,000	85,000	10.63

Source: Ministry of Housing and Local Government, Malaysia, 1997

Table II.
Categories of housing during seventh Malaysia Plan (1996-2000)

higher end condominiums causes its rental at depressed levels (Ministry of Finance, Malaysia, 2000).

With the announcement of the eighth Malaysia Plan (2001-2005), the country continues to embark on developing affordable and sustainable low and medium cost houses. However, the country is facing an uphill task to accomplish the target of 600,000-800,000 houses during this period. This is because the residential construction industry faces various project-related factors that hinder the timely completion of projects.

Research objective

Having described the Malaysia's housing need, it is imperative to identify the project delay factors that can impede Malaysian residential construction labour productivity at the project level. Specifically, the objective of this study is to rank the importance, frequency and severity of project delay factors on labour productivity. By acknowledging the factors, a preliminary blueprint could be devised by project managers to minimise the construction time and cost overrun.

Research design

Data for this study were collected through a survey questionnaire administered to 200 participants. A total of 100 questionnaires (or 100 residential projects) were completed by 70 contractors, 11 developers and 19 consultants, represented a response rate of 50 percent. Of these 100 projects, the majority was apartment (54 percent) followed by condominium (24 percent percent), link house (11 percent), bungalow (5 percent) semi-detached (6 percent) as shown in Figure 3. In terms of structural building system used to construct the house, 55 projects used the conventional building system (timber and plywood formwork) followed by cast *in-situ* table form system (16 projects), cast *in-situ* half tunnel form system (nine projects), full precast concrete system (precast concrete wall with precast half slab) (15 projects), composite system (precast concrete wall with cast *in-situ* slab) (three projects), block system (one project) and timber framing system (one project) as shown in Figure 4.

The respondents were asked to indicate how important each item of a list of 50 project related factors was to construction labour productivity (in terms of "strongly important", "important", "neutral", "not important" or "strongly not important"). The 50 factors were categorised into consultant factors, client factors, type of contract,

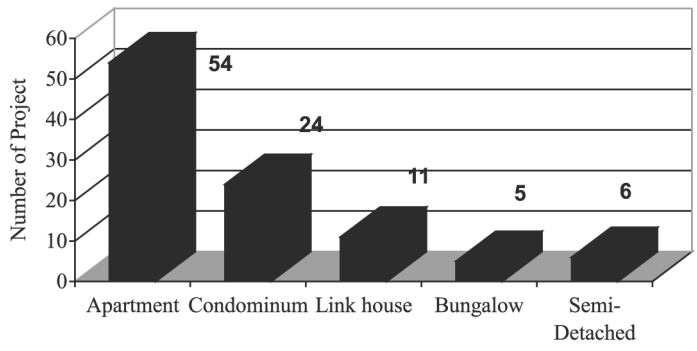

Figure 3.
Classification of projects according to type of building

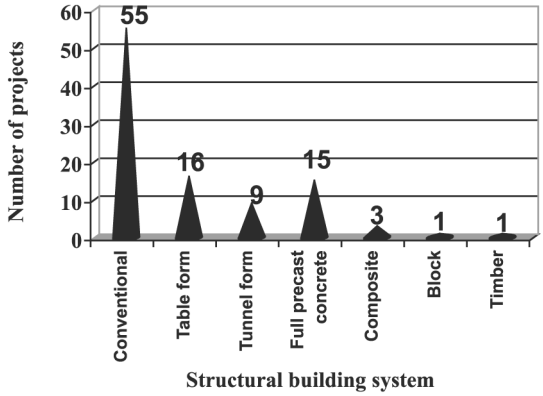

Figure 4.
Classification of projects according to type of structural building system

contractor factors and external factors to facilitate the ranking. The factors were taken from relevant literature, as well as from the authors' practical experience. The "importance index" was derived for each factor using the following formula (Lim and Alum, 1995):

$$\text{Importance index} = \frac{5n_1 + 4n_2 + 3n_3 + 2n_4 + n_5}{5(n_1 + n_2 + n_3 + n_4 + n_5)}$$

where n_1 is the number of respondents who answered "strongly important", n_2 the number of respondents who answered "important", n_3 the number of respondents who answered "neutral", n_4 the number of respondents who answered "not important", and n_5 the number of respondents who answered "strongly not important".

The respondents were then asked to rate the frequency of occurrence for each factor according to three ordinal scales: high (3), medium (2), or low (1). The "frequency index" for each factor was derived from the following formula:

$$\text{Frequency index} = \frac{3n_1 + 2n_2 + n_3}{3(n_1 + n_2 + n_3)}$$

where n_1 is the number of respondents who answered "high", n_2 the number of respondents who answered "medium", and n_3 the number of respondents who answered "low".

Finally, an overall index, the multiplication of "importance index" by the "frequency index" was named the "severity index". The severity index was used to rank the overall implication of each factor on labour productivity for residential projects.

$$\text{"Severity index"} = \text{"Importance index"} \times \text{"Frequency index"}.$$

Results on importance of project delay factor on labour productivity

Results indicated that out of 50 factors listed in the questionnaire, the ten most important factors causing project delay (low labour productivity) as shown in Table III are as follows:

Project related factors	Degree of importance quoted by 100 respondents[a] 1	2	3	4	5	Total respond	Importance index	Rank
Material shortage at project site	64	28	7	0	2	100	0.912	1
Non-payment (financial problem) to suppliers causing the stoppage of material delivery to site	51	35	9	5	0	100	0.870	2
Change order by consultants causing project delay	43	40	14	3	0	100	0.848	3
Late issuance of construction drawing by consultants	38	45	16	1	0	100	0.844	4
Incapability of contractor's site management to organise site activities	40	43	14	2	1	100	0.840	5
Late issuance of progress payment by client to contractor	46	33	15	2	4	100	0.834	6
Late supply of materials in the market	43	35	15	6	1	100	0.834	7
Lack of foreign and local workers in the market	44	33	16	6	1	100	0.832	8
Coordination problem with subcontractor	34	47	14	3	2	100	0.822	9
Equipment shortage	37	38	19	4	2	100	0.812	10
Lack of coordination among consultants	32	50	13	3	2	100	0.810	11
Coordination problem with supplier	27	49	15	7	2	100	0.784	12
Rework due to construction error	26	45	19	6	4	100	0.772	13
Change order causing additional work	23	46	24	5	2	100	0.770	14
Strict government policy on recruitment of foreign workers	26	43	20	9	2	100	0.766	15
Coordination problem with consultant	21	50	20	7	2	100	0.766	16
Stop work order because of site accident	31	37	19	10	3	100	0.764	17
Workers strike due to unpaid work	29	38	19	10	4	100	0.764	18
Unrealistic deadline for project completion set by client	30	33	26	8	3	100	0.756	19
Slow response of consultant's site staffs attending to inspection work	21	45	24	9	1	100	0.756	20
Work stoppage because of insolvency of subcontractor	25	39	22	9	5	100	0.748	21
Conventional contract	23	35	31	9	2	100	0.740	22
Inadequate site staffs	20	50	15	10	5	100	0.738	23
Site congestion	19	44	27	5	5	100	0.736	24
Lack of consultant's site staffs experience Causing unreasonable insistence on compliance to specification without due regard for practicality or site condition	16	48	27	5	4	100	0.736	25
Slow response of consultant to verify progress claim certificate	25	32	29	9	5	100	0.732	26
Slow local authorities approval	24	35	26	10	5	100	0.730	27
Poor weather condition	13	49	28	8	2	100	0.730	28
Poor buildability design	21	35	30	10	4	100	0.720	29
Construction management contract	21	37	26	11	5	100	0.718	30
Centralised decision making by headquarter	18	40	30	5	7	100	0.718	31

Table III.
Ranking of importance of project delay factors on labour productivity

(*continued*)

Project related factors	Degree of importance quoted by 100 respondents[a] 1	2	3	4	5	Total respond	Importance index	Rank
Disruption of power/water supplies	23	28	33	15	1	100	0.716	32
Stop work order because of infringement of government regulation	22	33	27	13	5	100	0.716	33
Design and build contract	18	43	23	10	6	100	0.714	34
Contractor staffs absenteeism	23	30	28	13	6	100	0.712	35
Poor economy condition	15	43	27	10	5	100	0.712	36
Tool shortage	17	44	21	14	4	100	0.708	37
Poor site condition	17	36	33	10	4	100	0.704	38
Lack of coordination between client and contractor	10	43	31	13	3	100	0.694	39
Higher inflation rate	15	35	31	12	7	100	0.684	40
Coordination problem with client	9	41	36	10	4	100	0.682	41
Impact of currency on imported material	15	38	26	13	8	100	0.678	42
Lack of tool and equipment in the market	11	38	33	11	7	100	0.674	43
Cost plus contract	14	28	37	13	8	100	0.658	44
Client lack of experience	11	31	31	17	10	100	0.632	45
Riot	10	35	27	15	13	100	0.632	46
Higher bank interest rate	10	31	36	11	12	100	0.632	47
Absenteeism of consultant's site staffs during normal working hour	8	29	38	18	7	100	0.628	48
Project site far from suppliers	3	36	35	19	7	100	0.626	49
Reluctance of consultant's site staff to work extra days on sunday and public holiday	10	20	38	24	8	100	0.598	50

Note: [a]1 – Strongly important; 2 – Important; 3 – Neutral; 4 – Not important; 5 – Strongly not important

Table III.

(1) material shortage at project site (importance index=0.912);

(2) non-payment (financial problem) to suppliers causing the stoppage of material delivery to site (importance index = 0.87);

(3) change order by consultants causing project delay (importance index = 0.848);

(4) late issuance of construction drawing by consultants (importance index = 0.844);

(5) incapability of contractor's site management to organise site activities (importance index = 0.840);

(6) late issuance of progress payment by client to contractor (importance index = 0.834);

(7) late supply of materials in the market (importance index = 0.834);

(8) lack of foreign and local workers in the market (importance index = 0.832);

(9) coordination problem with subcontractor (importance index = 0.822); and

(10) equipment shortage (importance index = 0.812).

Material shortage at project site (importance index = 0.912)
Lack of material was ranked as the most critical factor causing low labour productivity with 64 percent of respondents quoted that this factor was "strongly important". Lack of material refers to problems encountered due to inaccessibility of items or excessive time expended to acquire them. As a result of this, workers are often idle waiting for materials. As the construction activities are interdependent, the shortage of critical materials such as rebars, ready-mixed concrete and formwork impede the work sequence and progress.

The site management should plan ahead to ensure that the critical materials are available at site all the time. Sometimes, the non-availability of materials is caused by negligence and sabotage. For instances, during bad economic times, the project manager might purposely delay the work progress to prolong the contract period especially those employed on a contract basis. In this case, the top management should be mindful of the behaviour of the project manager.

Lack of materials was found to be the most critical construction delay factor in Indonesia (Kaming *et al.*, 1998), Iran (Zakeri *et al.*, 1996) and Nigeria (Olomolaiye *et al.*, 1987). It was also ranked eighth in Singapore construction productivity problems (Lim and Alum, 1995). In urban Singapore, timely delivery of materials is paramount because of inadequate storage spaces. When materials are delivered too early, double handling occurs, hence causing the loss of man-hours.

Non-payment (financial problem) to suppliers causing the stoppage of material delivery to site (importance index = 0.87)
The second most important factor resulting in low labour productivity is the stoppage of material delivery by the suppliers due to non-payment by the contractors with an importance index of 0.87 or equivalent to 51 percent of respondents who answered "strongly important". This makes the suppliers lose their confidence in the credibility of the contractors. Sometimes, the suppliers insist on cash terms or a bank guarantee before the delivery the materials. Delay in material delivery to site was ranked 12th in Singapore construction problems (Lim and Alum, 1995).

Change order by consultants causing project delay (importance index = 0.848)
Change order by consultants was ranked the third factor causing low labour productivity (importance index = 0.848). Change order might occur due to design error during planning stage. This factor is a particularly irritating and costly problem if the work has been done. For instance, hacking of hardened concrete is time consuming and affects the workers' motivation. Work sequences are also disrupted due to rework. This problem was ranked fourth most important productivity problem in Indonesia construction projects (Kaming *et al.*, 1998).

Late issuance of construction drawing (importance index = 0.844)
Late issuance of construction drawing by consultants was ranked fourth most critical delay factor with an importance index of 0.848. This may cause man-hours lost due to workers idling. For instance, late issuance of the pilecap construction drawing results in delay to progress of structural frame work because it cannot be done without first completing the pilecap work. Often the late issuance of construction drawing is interrelated to coordination problem among consultants

factor which was ranked 11th in term of importance of delay (importance index = 0.810).

Incapability of contractor's site management to organise site activities (importance index = 0.840)
An effective and efficient site management team is paramount to ensure that work sequence is accomplished according to work programme. Poor knowledge and the inexperience of the site management team in planning, scheduling and procurement impedes the work progress. The project manager should check for discrepancies between structural, architectural and electrical construction drawings to avoid rework. Subcontractors should be appointed even before site procession so that they can be familiar with the construction drawing, and planning of labour, which can be done at an early stage. The incapability of contractor's site management to organise site activities was ranked as fifth factor in term of importance of delay with an importance index of 0.84.

Late issuance of progress payment by client to contractor (importance index = 0.834)
Late issuance of progress payment by client to contractor can severely hinder the work progress. This delay factor was ranked sixth (importance index = 0.834) among the other factors. Delay in progress payment affects cash flow of contractors which in turn affects the payment to workers and suppliers. This causes detrimental effects on workers' motivation and suppliers' creditability.

Late supply of materials in the market (importance index = 0.834)
Currently, the construction industry in Malaysia experiences severe shortage of steel bar due to artificial shortage created by the suppliers. Steel bars are critical material in any construction project and are a controlled item in Malaysia with price ranged from RM1214 to RM1284 per tonne but are being sold on the black market between RM1800 – RM2,000 per tonne. Some contractors have to wait up to 2 months before getting a supply. This severely affects the project work progress. The delay caused by lack of material was ranked seventh with an importance index of 0.834.

Lack of foreign and local workers in the market (importance index = 0.832)
The Malaysian construction industry is facing an acute shortage of construction workers due to vacancies left by the local workers who prefer to join lucrative and conducive working environments in the manufacturing and service sectors. It was reported that 30.6 percent out of 425,041 legal foreign workers (July 1992-December 1995) were working on construction projects, while the percentage of illegal workers was 46.6 percent out of a total 133,397 illegal workers (February 1993-1996) as quoted in Abdul-Aziz and Abdul-Rashid (2001). Delay caused by inadequate construction workers was ranked eighth with an importance index of 0.824. In order to discount this delay factor, the government should take proactive measures to train and encourage local people to join the construction industry. This helps to reduce the reliance on foreign workers.

Coordination problem with subcontractor (importance Index = 0.822)
Coordination problems between main contractors and subcontractors pose a major hindrance to work progress. The common coordination problems such as late issuance of revised construction drawings to subcontractor can cause rework due to

construction errors. This problem was ranked ninth with an importance index of 0.822. To resolve this problem, site meetings should be held regularly between the main contractor and subcontractors to clarify any outstanding issues.

Equipment shortage (importance Index = 0.812)
Equipment shortage refers to frequent breakdown of major equipment, shortage of spare parts, improper service and maintenance, slack use of machinery or deliberate sabotage by operators. This problem causes major idle time since employed workers are unable to progress their work due to material transportation problems. The equipment shortage was ranked 10th with an importance index of 0.812. This factor ranked as the fifth major problem in Iranian construction projects or 4.6 hour lost per operative per week (Zakeri *et al.*, 1996).

Results of frequency of project delay factors on labour productivity
The first 10 most frequent project delay factors quoted by the respondents that cause low labour productivity are listed below:

(1) material shortage at project site (frequency index = 0.727);
(2) non-payment (financial problem) to suppliers causing the stoppage of material delivery to site (frequency index = 0.723);
(3) late issuance of progress payment by client to main contractor (frequency index = 0.720);
(4) lack of foreign and local workers in the market (frequency index = 0.677);
(5) coordination problem between main contractor and subcontractor (frequency index = 0.663);
(6) change order by client causing additional work (frequency index = 0.663);
(7) incapability of site management to organise site activities (frequency index = 0.600);
(8) unrealistic deadline for project completion date set by the client (frequency index = 0.650);
(9) change order due to error in construction drawing by consultant (frequency index = 0.643); and
(10) coordination problem between main contractor and suppliers (frequency index = 0.637).

Result on severity of project delay factors on labour productivity
The first ten most severe project delay factors mentioned by the respondents that cause low labour productivity are listed below:

(1) material shortage at project site (severity index = 0.663);
(2) non-payment (financial problem) to suppliers causing the stoppage of material delivery to site (frequency index = 0.629);
(3) late issuance of progress payment by client to main contractor (frequency index = 0.600);
(4) lack of foreign and local workers in the market (frequency index = 0.563);

(5) incapability of site management to organise site activities (frequency index = 0.554);
(6) change order due to error in construction drawing by consultant (frequency index = 0.546);
(7) coordination problem between the main contractor and subcontractor (frequency index = 0.545);
(8) late issuance of construction drawing by consultants (severity index = 0.520);
(9) lack of material in the market (severity index = 0.517);
(10) change order by client causing additional work (frequency index = 0.511).

Recommendation

The results of the survey indicated that the top two most important, frequent and severe factors that are adversely affecting construction labour productivity at a project level were material shortage at site and non-payment to suppliers causing the stoppage of material delivery. Lack of material means that the workers are idling doing nothing. This would affect the workers' motivation and productivity. To overcome this problem, the procurement department should always coordinate with site staff on the material shortage at site. Something, the materials shortage is linked to artificial shortage created by the suppliers who prefer to export them to other countries for extra profit. For instance, the artificial shortage of steel bar in the early part of 2004 causing the price increases by 60 percent in local markets and many projects experienced delay. In this matter, the government should take proactive action by restricting the export since the steel bar is subject to price control in Malaysia.

Conclusion

The Malaysian residential industry experiences time and cost overrun due to various project delay factors that affect construction labour productivity. This paper has identified and ranked those factors that affect construction labour productivity. Results indicated that the five most important factors, they are as follows:

(1) material shortage at project site;
(2) non-payment (financial problem) to suppliers causing the stoppage of material delivery to site;
(3) change order by consultants causing project delay;
(4) late issuance of construction drawing by consultants; and
(5) incapability of contractor's site management to organise site activities.

On the other hand, the five most frequent factors are listed below:

(1) material shortage at project site;
(2) financial problem (non-payment) to suppliers causing the stoppage of material delivery to site;
(3) late issuance of progress payment by the client to main contractor;
(4) lack of foreign and local workers in the market; and
(5) coordination problem between the main contractor and subcontractor.

Finally, the five most severe project delay factors are listed below:

(1) material shortage at project site;
(2) non-payment (financial problem) to suppliers causing the stoppage of material delivery to site;
(3) late issuance of progress payment by the client to main contractor;
(4) lack of foreign and local workers in the market; and
(5) incapability of site management to organise site activities.

It was concluded that the most important, frequent and severe factors were related to the availability of materials at site. This result was substantiated by studies carried out in Indonesia, Iran, Singapore and Nigeria. By acknowledging the project delay factors that cause low construction labour productivity, project managers can address the problems at an early stage, thus minimising time and cost overruns.

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