HOW CAN TECHNIQUE BE TRANSFERED AT ROAD CONSTRUCTION SITES ?

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abstract: Skills transfer at road construction sites in Southeast Asia are not yet clearly documented. A questionnaire survey was conducted on limited sites in the three Southeast Asian countries of Indonesia, the Philippines and Thailand. The results showed that the road construction workers have had limited education or training prior to their employment in the industry and once inside, skills transfer was facilitated mainly through two dominant modes - self-reliance and among friends. On the basis of findings, the study proposed the establishment of in-house retraining programs for road construction workers. Such educational program will involve on-site technical transfer of knowledge, with the skilled company workers as trainers and the unskilled ones as beneficiaries. The private sector, through existing road construction companies, can spearhead this undertaking with appropriate incentives from the government.

1. INTRODUCTION

The advent of high technology has come to Southeast Asia at a rate faster than ever before. One area where there is already a high degree of technological sophistication is in the road construction industry. Road construction methods in asphalting and road concreting have been revolutionalized to improve road quality. Moreover, the use of computers in road design is commonplace. The use of heavy equipment has also dominated this engineering field, thereby requiring a greater number of skilled labor to keep it going.

Meanwhile, most participants of the labor force in Asian countries have insufficient educational background and compulsory training for their jobs. A study made by the United Nations Educational, Scientific and Cultural Organization (UNESCO) showed that the proportion of students enrolled in technical and vocational education in most Asian countries is quite small (Singh, 1986). Even if the educational system improves, most workers who had stopped schooling would have very little opportunity to study anymore as education in Asia is largely expensive. There is in fact a general impression of under investment in Asian education as data revealed how;

> "...Most developing countries in the region have not generally allocated the sector a share of Gross Domestic Product that would have been warranted by the growth performance of their economies." (Singh,1986)

Given the poor educational preparation of construction workers, other learning avenues that can supplement this limitation should be looked into. One possibility is a retraining program which could play an important role in ensuring the steady supply of skilled labor.

The situation poses some significant questions: How do road construction workers make up for their lack of technical background? What are the formal and/or informal mechanisms in their learning environment? What improvements can be made to reinforce their technical learnings?

The above questions, in turn, require a look into the existing sources of formal road engineering training and education. In the Philippines, there are sub-agencies of the Department of Labor and Employment (DOLE) which specifically provides this type of education, such as the Construction Manpower Development Foundation (CMDF), and the Construction Manpower Development Center (CMDC) which provide short-term training on road equipment operations. Thailand has also similar agencies, however, graduates of the programs are few and has yet to make a significant impact as a sub-sector on the construction industry.

In this connection, it is also important to undertake studies that would identify the most appropriate and effective training programs for road construction workers. To achieve this much relevance, the training programs must reflect and operate within the context of contemporary Southeast Asian conditions.

This paper presents a skills profile of the road construction workers in three countries, namely, the Philippines, Thailand and Indonesia. The respondents are further subdivided into five sub-groups, namely: (1) management group; (2) heavy equipment group; (3) support group; (4) skilled labor group, and (5) unskilled labor group. It then looked into the manner by which the workers acquired their technical skills and how their learning techniques can be maximized and transformed into formal training programs.

2. RESEARCH METHODOLOGY

The survey method was used in data collection. There were 261 valid questionnaires on the basis of convenience sampling in Indonesia, 143 in the Philippines and 100 in Thailand, or a total of 504.

Direct visits of road construction sites with ongoing projects were undertaken in the following specific areas: (1) North Sulawesi province of Indonesia, specifically its capital city, Manado; (2) the Metro Manila area in the Philippines, and (3) Bangkok, Thailand.

In the Philippines, questionnaires were also provided to site engineers for distribution among operators and workers. In Indonesia, aside from road construction site cells, the asphalt mixing plants (AMP) of some companies were visited in order to interview the operators, workers and the other people involved in road construction projects.

From the above statements, it can be said that the sampling method used was convenience sampling. Hence, the findings of this study may not be reflective of the characteristics of the total population of workers in the said countries and may only give some idea to the characteristics of workers in the specific areas mentioned. However, the results can indicate vital skills characteristics, and how technical transfer on road construction sites take place in the Southeast Asian countries. Such findings can be very useful in terms of providing insights on how to further develop a comprehensive study on the subject of road construction skills transfer.

3. FINDINGS OF THE STUDY

The survey sought to present some general characteristics of road construction workers in the three countries under study. To achieve this, the questionnaire covered the following areas of inquiry: (1) Worker designation in the company; (2) educational background; (3) source of road construction skill/knowledge; (4) work experience, and (5) income level.

3.1 Comparison of Individual Characteristics of Workers in Indonesia, the Philippines and Thailand

Table 1 shows that the 18 to 40 age bracket comprised the bulk of road construction workers in Indonesia (84.6%), Thailand (77.0%) and the Philippines (67.8%). Worker aged 51 and above were few. This may be due to the labor-intensive nature of construction work which puts a premium on physical endurance, the quality of which is weakened by chronological factors such as increasing age.

The majority of those interviewed in Indonesia (57.7%) and a large percentage in Thailand (36%) were workers who were relatively less skilled. In the Philippines, the majority (79.1%) was made up of heavy equipment operators who can be considered as skilled due to the degree of sophistication that is normally required for a worker to man a heavy equipment.

Regarding the educational level attained by workers in three countries studied, around 71 percent of workers in the Philippines had a high school degree or better. These findings are consistent with a survey of the Institute of Labor Studies among construction workers in 1988 (Teodosio, 1990). Majority of the respondents in that study were high school graduates who are largely unskilled. While a lesser proportion among their counterparts in Indonesia (28.8%) and Thailand (23.0%) attained the same educational level. In the Philippines, 19 percent had been to college (undergraduate); about half of them eventually became college graduates. In Thailand, three percent earned a university degree, while in Indonesia, a low percentage had been to college (1.6%) and half of these graduated.

With regard to income level, it is quite interesting to note that road construction workers in Thailand and the Philippines were receiving higher wages than their Indonesian counterparts. By bracketing the income of the three countries proportionately, it can be seen that close to 98 percent of workers in the Philippines and 86 percent of workers in Thailand, belonged to the top bracket as compared to a very low percentage (5.7%) for the same level among workers in Indonesia. Majority of the workers in Indonesia (51.3 %) belonged to the lowest bracket (Rp 5,000 or less); none of the workers in Thailand and the Philippines was earning as low.

However, this dose not necessarily a better way of life among workers in Thailand and the Philippines than those from Indonesia. One probable explanation for this finding could be the fact that the survey was conducted mostly in urban centers -- in Metro Manila, the Philippines and Bangkok, Thailand -- where the standard of living is higher compared to the study area in Indonesia which was in Manado.

Table 1. Individual Characteristics of Workers in Indonesia, the Philippines and Thailand

Character-istics	Categories	Indonesia Samples=261	(%)	Philippines Samples=143	(%)	Thailand Samples=100	(%)
Age	Under 18	2	(0.8)	1	(0.7)	15	(15.0)
	18 - 30	164	(62.7)	48	(33.6)	49	(49.0)
	31 - 40	57	(21.8)	49	(34.2)	28	(28.0)
	41 - 50	27	(10.3)	34	(23.8)	8	(8.0)
	51 -60	9	(3.4)	11	(7.7)	0	(0.0)
	above 61	2	(0.8)	0	(0.0)	0	(0.0)
Designation	Owner/Manager	1	(0.4)	1	(0.7)	0	(0.0)
	Project Engineer	10	(3.8)	3	(2.1)	4	(4.0)
	Operator Grader	1	(0.4)	18	(12.6)	6	(6.0)
	Operator Roller/Compactor	11	(4.2)	11	(7.7)	3	(3.0)
	Operator Loader	7	(2.7)	26	(18.2)	2	(2.0)
	Operator Bulldozer	3	(1.1)	22	(15.4)	1	(1.0)
	Operator Backhoe	-	-	22	(15.4)	-	-
	Operator Dump truck	9	(3.4)	8	(5.6)	2	(2.0)
	Operator Finisher	1	(0.4)	0	(0.0)	5	(5.0)
	Operator AMP	4	(1.5)	0	(0.0)	2	(2.0)
	Operator Crane	-	-	6	(4.2)	0	(0.0)
	Mechanic	6	(2.3)	3	(2.1)	11	(11.0)
	Stener	-	-	0	(0.0)	-	-
	Electrician	0	(0.0)	2	(1.4)	5	(5.0)
	Carpenter/Mason	14	(5.4)	7	(4.9)	13	(13.0)
	Steelman/Welder	-	-	2	(1.4)	-	-
	Supervisor	22	(8.4)	0	(0.0)	4	(4.0)
	Foreman	13	(5.0)	3	(2.1)	6	(6.0)
	Worker/Laborer	149	(57.1)	3	(2.1)	36	(36.0)
	Others	10	(3.8)	6	(4.2)	0	(0.0)
Education	Never studied	3	(1.1)	1	(0.7)	1	(1.0)
	Never finished elementary school	15	(5.7)	5	(3.5)	32	(32.0)
	Finished elementary school	46	(17.6)	33	(23.1)	29	(29.0)
	Did not finish secondary school	0	(0.0)	-	-	7	(7.0)
	Finish secondary school	122	(46.7)	-	-	8	(8.0)
	Did not finish high school	6	(2.3)	6	(4.2)	1	(1.0)
	Finish high school	28	(10.7)	68	(47.6)	1	(1.0)
	Did not finish Tech. high school	2	(0.8)	0	(0.0)	2	(2.0)
	Finish Technical high school	27	(10.3)	3	(2.1)	13	(13.0)
	Did not finish Technical D-3	2	(0.8)	-	-	1	(1.0)
	Finish Technical Diploma (D-3)	6	(2.3)	-	-	2	(2.0)
	Did not finish univ.	2	(0.8)	12	(8.4)	0	(0.0)
	Finish univ.	2	(0.8)	15	(10.5)	3	(3.0)
Income Level (per day)	US $ 2.00 or less	134	(51.3)	0	(0.0)	0	(0.0)
	US $ 2.00 - US $ 3.00	91	(34.9)	0	(0.0)	0	(0.0)
	US $ 3.00 - US $ 4.00	21	(8.0)	3	(2.1)	14	(14.0)
	US $ 4.00 or more	15	(5.7)	140	(97.9)	86	(86.0)

note; US $1.00 = PHP 25 = Baht 25 = Rp.2250

3.2 Comparison of Skills Characteristics of Workers in Indonesia, the Philippines and Thailand

There was a similar pattern in skill characteristics of road construction workers in the three countries. On the basis of educational background, a larger percentage of workers in Indonesia (83.5%), Thailand (78.0%) and the Philippines (90.1%) had no prior education/ training in road construction (See Table 2, Table 3, and Table 4).

In terms of direct road engineering education, only two-and-a- half percent had a civil engineering background in the Philippines. The civil engineering course is academically closest to road engineering due to its mandatory three-unit course in highway engineering. In Thailand, a similar three percent had a background on road construction while in Indonesia, it was almost twice as much (5.8%). These road engineering education percentages of workers were quite minimal if ranged against the percentages of governments' budget for infrastructure projects in these countries, especially in terms of horizontal structures which are currently in the upswing.

As to the length of engineering education/training that the workers went through, the most common range in the Philippines was the period of three months or more. The duration was shorter in Indonesia, where pertinent education was no less than three months. In the three countries, the current jobs of those with backgrounds in engineering education/training were largely related to what they were educated or trained for (Philippines, 83.8 percent; Indonesia, 74.4 percent; and Thailand 95.5 percent).

As to those who had no formal background in engineering in the Philippines, learning by doing or self-training (39.7%) was their major source of skills transfer. On the other hand, friendship was the major factor in Indonesia (47.5%) and Thailand (41.0%). Moreover, some companies with in-house experts were providing informal training to aspiring workers in the Philippines. This explains why there was a significant percentage (21.5%) of workers who learned through this process. The case is, however, not the same for Indonesia as responses showed an insignificant proportion of workers who benefited from in-house expertise (2.3%). Training through the informal guidance of relatives also figured highly (32.0%) in Thailand.

Presenting it in another way, Figure 1 shows how the road construction industry is dominated by those without engineering background when they first joined the industry in the three countries and how these are remedied through informal means.

Regarding the working experience of workers, bigger percentages of workers in Indonesia (67.6%) and Thailand (90.0%) had less than five years of work experience. However, in the Philippines, those with experience of five years and above accounted for more than half (57.8%) of the sample.

Most workers in the three countries -- Indonesia (87.0%), the Philippines (72.7%), and Thailand (73.0%) -- indicated the need for further training in road construction techniques. On-site training was most favored in Indonesia (73.1%) and the Philippines (66.7%), while classroom training and field practice was highly preferred in Thailand (28.5%). Figure 2 presents the percentages of workers clamoring for training and the manner of training in graphical form.

Table 2. Skills Characteristics of Road Workers in Indonesia

Characteristics	Categories	Relative Frequency in %	Frequency
Has background education/training	[1] Yes	16.5	
	[2] No	83.5	
Has background in training	[1] Mechanical engineering	5.7	34.9
	[2] Electrical engineering	1.2	6.9
	[3] Road construction engineering	5.8	34.9
	[4] Building construction	3.1	18.6
	[5] Irrigation engineering	0.4	2.3
	[6] Others	0.4	2.3
Length of engineering education/training obtained	[1] Less than 1 month.	3.5	20.9
	[2] Between 1 - 2 months.	1.2	6.9
	[3] Between 2 - 3 months.	5.4	32.6
	[4] More than 3 months.	6.5	39.5
Relation between background edu/train and the present job	[1] Yes	12.3	74.4
	[2] No	4.3	25.6
Source of eng. skills in the absence of formal eng. background education/training	[1] Self Training	29.2	
	[2] Taught by friend	47.5	
	[3] Taught by relative	2.3	
	[4] Taught by an expert	2.3	
	[6] Others	2.2	
Experience working on road construction	[1] Less than 1 year	21.5	
	[2] 1 - 2 years	24.1	
	[3] 2 - 5 years	22.0	
	[4] 5 - 9 years	15.7	
	[5] 9 - 20 years	10.4	
	[6] Over 20 years	5.4	
Need more training on road construction technique	[1] Yes	87.0	
	[2] No	13.0	
Manner of training	[1] Have train direct on site	73.1	
	[2] Have a class training	0.7	
	[3] Class and field practice	13.0	
	[4] Others	0.2	

Table 3. Skills Characteristics of Road Construction Workers in the Philippines

Characteristics	Categories	Relative Frequency in %	Frequency
Has background education/training	[1] Yes	9.9	
	[2] No	90.1	
Has background in training	[1] Mechanical engineering	2.5	25.3
	[2] Electrical engineering	1.6	16.1
	[3] Civil engineering	2.5	25.3
	[4] Others	3.3	33.3
Length of engineering education/training obtained	[1] Less than 1 month.	0.8	8.1
	[2] Between 1 - 2 months.	1.7	17.2
	[3] Between 2 - 3 months.	4.1	41.4
	[4] More than 3 months.	3.3	33.3
Relation between background edu/train and the present job	[1] Yes	8.3	83.8
	[2] No	1.6	16.2
Source of eng. skills in the absence of formal eng. background education/training	[1] Self Training	39.7	
	[2] Taught by friend	14.9	
	[3] Taught by relative	14.0	
	[4] Taught by an expert	21.5	
Experience working on road construction	[1] Less than 1 year	7.5	
	[2] 1 - 2 years	16.5	
	[3] 2 - 5 years	18.2	
	[4] 5 - 9 years	19.8	
	[5] 9 - 20 years	24.8	
	[6] Over 20 years	13.2	
Need more training on road construction technique	[1] Yes	72.7	
	[2] No	27.3	
Manner of training	[1] Have train direct on site	66.7	
	[2] Have a class training	2.4	
	[3] Class and field practice	3.6	

Table 4. Skills Characteristics of Road Construction Workers in Thailand

Characteristics	Categories	Relative Frequency in %	Frequency
Has background education/training	[1] Yes	22.0	
	[2] No	78.0	
Has background in training	[1] Mechanical engineering	11.0	50.0
	[2] Electrical engineering	4.0	18.2
	[3] Road construction engineering	3.0	13.6
	[4] Building construction	3.0	13.6
	[6] Others	1.0	4.5
Relation between background edu/train and the present job	[1] Yes	21.0	95.5
	[2] No	1.0	4.5
Source of eng. skills in the absence of formal eng. background education/training	[1] Self Training	4.0	
	[2] Taught by friend	41.0	
	[3] Taught by relative	32.0	
	[4] Taught by an expert	1.0	
How long do they need training before operating work ?	[1] Less than 1 month.	11.0	14.1
	[2] Between 1 - 2 months.	18.0	23.1
	[3] Between 2 - 3 months.	24.0	30.8
	[4] More than 3 months.	25.0	32.1
Experience working on road construction	[1] Less than 1 year	16.0	
	[2] 1 - 2 years	40.0	
	[3] 2 - 5 years	34.0	
	[4] 5 - 9 years	3.0	
	[5] 9 - 20 years	5.0	
	[6] Over 20 years	2.0	
Need more training on road construction technique	[1] Yes	73.0	
	[2] No	27.0	
Manner of training	[1] Have train direct on site	24.8	
	[2] Have a class training	8.8	
	[3] Class and field practice	28.5	
	[4] Others	10.9	

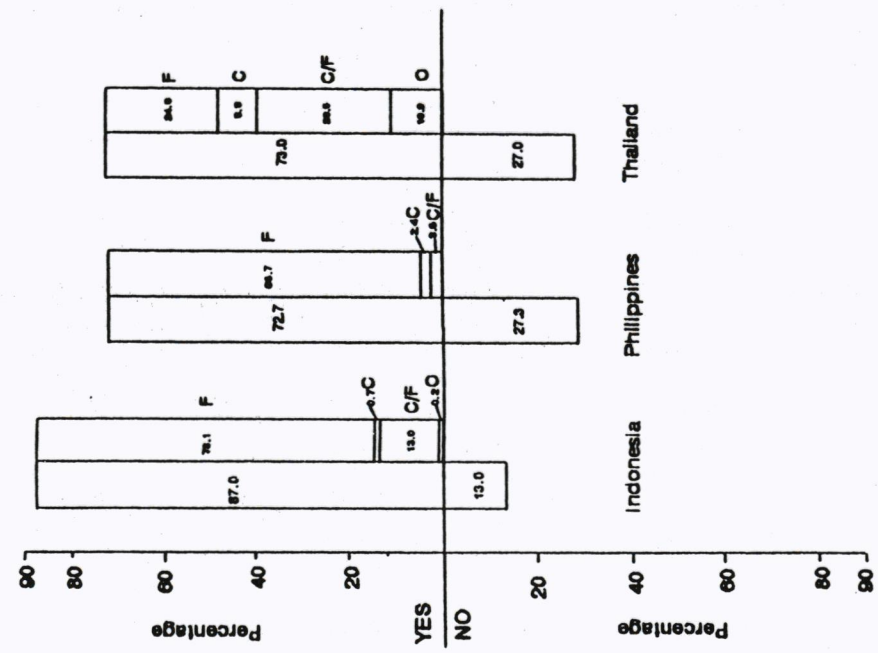

Figure 2 The Need For and Type of Training Desired by Road Construction Workers in Indonesia, the Philippines and Thailand

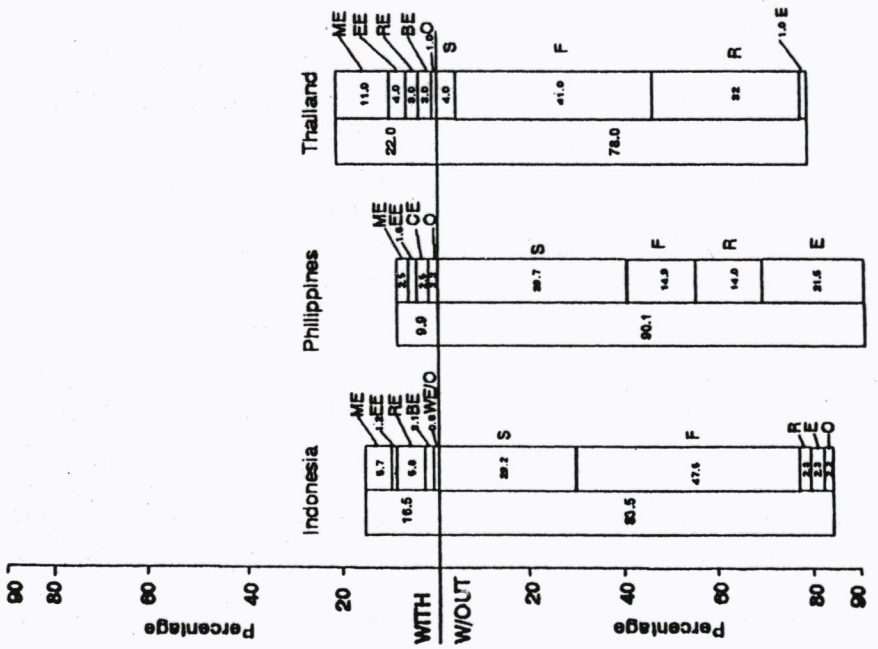

Figure 1 Absence / Presence of Engineering Background of Road Construction Workers in Indonesia, the Philippines and Thailand

3.3 Characteristics of Skills Transfer at Construction Sites

The road construction organization can be thought of as composed of five sub-groups with each sub-group having its own set of characteristics and functions. These five sub-group are (a) the management group, (b) the heavy equipment group, (c) the support group, (d) the skilled labor group, and (e) the unskilled labor group.

The management group were composed of the construction firm owner, project manager, engineers and supervisors; their jobs were mainly concerned with the management of projects and the company to ensure efficient, therefore profitable, operations. The heavy equipment group were made up mostly of heavy equipment operators, widely considered to be the prime movers in road construction and maintenance. The support group may either be white collar workers, such as clerks, secretaries and checkers; or blue collar workers, such as electricians and mechanics. This group is deemed vital to the company but their jobs are not directly involved in the construction of roads. The skilled labor group was defined separately from the heavy equipment group because the former were composed of foreman, carpenters, and masons who used only hand tools to perform their jobs. The unskilled labor group, in turn, was made up of laborers and workers who were mostly newcomers to the road construction industry and were those, literally speaking, who work under the sun.

Dividing the respondents into the mentioned five sub-groups and the aggregate of these sub-groups among the three countries gives us the results as shown in Table 5 and 6. Several important findings about skills transfer and retraining can be derived:

1. Skills transfer at constructions sites largely occurred between friends and among friends (mean total, 41.4%) in the three countries under study. The findings showed how interpersonal relationship, especially in the unskilled labor group (rank-and file workers), played a major role in the workplace. It was this same group which derived the least benefit from company expertise/training. In fact, not one respondent from the group had access to company-sponsored skills upgrading.

There is in effect a prevailing system of informal apprenticeship in the industry. Skills transfer under system may have occurred largely without formal logistical and financial support from management. This can be partly explained by the fact that most, if not all, workers of the road construction industry are employed on a contractual or per project basis; hence, the minimal investment of management in their skills upgrading.

Workers classified under the heavy equipment group, in turn, benefited the most from company expertise. This may be explained by the possibility that management would like to ensure that workers properly handle or operate the company's fixed assets in the form of equipment and vehicles.

Still, the heavy equipment group also demonstrated a relatively high percentage of both internal (self) and informal outside support (friends and relatives) in skills transfer.

The management group sourced the least skills transfer assistance through friends. It was next to the heavy equipment group in accessing skills upgrading as sanctioned by the company.

The support group got very minimal assistance from other source. This characteristics was

shared by the skilled labor group (foreman, carpenter, mason, steelman, and welder).

2. In terms of skills training preferences, the over-all result showed on-site instruction to be most popular among the industry groupings (with mean total of 66.5%). Only the management group explicitly opted for a combination of on-site and classroom training (51.3%); this was common among all the three countries surveyed. Nevertheless, pure on-site training as an option for managers was a significant choice at around 46 percent.

The rest of the groupings, as earlier mentioned, wanted on-site training. Except for the Thai respondents among the skilled (25%) and unskilled (7.1%) labor groups who expressed greater preference for a combination of classroom and field instruction, the workers-respondents in Indonesia and the Philippines gave similar responses, thereby making on-site training a predominant choice among the respondents in the three countries.

The clamor for more training from the majority of workers simply shows that skills upgrading is generally perceived to be wanting among the respondents themselves. Their responses also indicate that they preferred that such training be conducted on-site. This can either mean that workers, to interrupt their jobs; or that they believe that on-the-job training would work best in skills transfer.

4. GENERAL CHARACTERISTICS OF THE PROPOSED SKILLS TRANSFER TRAINING PROGRAM

While these results may be inconclusive as to how the skills transfer process at construction site can be developed into a workable plan, the presence of the demand is enough for those concerned to consider this further. Based from the above results, the skills transfer training program can incorporate the following characteristics:

1. On-site training should be used in imparting the technical skills to workers.

2. The target population of the skills training should be the unskilled labor group because as contractual workers, its members get the least benefit from the company.

3. Because friends and relatives were major sources of skills transfer, an in-house training program can be developed with skills transfer, an workers as trainers, and the unskilled and newly recruited labor (the latter are usually known or related to the skilled workers) as beneficiaries. This in-house training only covers training for the use of equipments already being used by the company. For newly developed equipments, this may not be possible.

4. The desire for skills upgrading among workers was very high, hence, self-training which showed prominently as one avenue of acquiring skills will always be plausible. However, this could result to workers inefficiency and equipment breakdowns which will not be good for the company. Hence, in order to eliminate this process of acquiring skills, a formal training program should be put up by the company.

5. The private sector, with the support of the government. especially road construction companies should spearhead the skills training because these could translate into workers' efficiency and proper equipment handling. Appropriate incentives for these companies can be drawn up by the government as a reward mechanism for non-formal technical education.

Table 5. Designation Versus Source of Engineering Skills

Designation	How Engineering Skills were Obtained (in Percent) Self-help/ Experience 1	Friend 2	Relative 3	Company/ Expert 4	Total
1. Management Group (Owner, Manager, Proj. Engineer)					
a. Indonesia	55.0	15.0	5.0	20.0	95.0
b. Philippines	0.0	0.0	0.0	0.0	0.0
c. Thailand	0.0	5.0	0.0	0.0	5.0
Sub-Total	55.0	20.0	5.0	20.0	100.0
2. Heavy Equipment Group (Operators)					
a. Indonesia	6.2	8.2	0.7	0.0	15.1
b. Philippines	25.3	16.4	8.9	20.5	71.2
c. Thailand	0.0	8.2	4.8	0.7	13.7
Sub-Total	31.5	32.8	14.4	21.2	100.0
3. Support Group (Mechanic, Electrician, Others)					
a. Indonesia	17.6	35.3	0.0	5.9	58.8
b. Philippines	23.5	0.0	5.9	0.0	29.4
c. Thailand	0.0	11.8	0.0	0.0	11.8
Sub-Total	41.1	47.1	5.9	5.9	100.0
4. Skilled Labor Group (Foreman, Carpenter, Mason, Steelman, Welder)					
a. Indonesia	14.5	29.1	0.0	1.8	45.5
b. Philippines	20.0	0.0	1.8	1.8	23.6
c. Thailand	1.8	21.8	7.3	0.0	30.9
Sub-Total	36.3	50.9	9.1	3.6	100.0
5. Unskilled Labor Group (Worker, Laborer)					
a. Indonesia	25.9	48.1	2.7	0.0	76.7
b. Philippines	3.2	0.5	0.0	0.0	3.8
c. Thailand	0.5	7.6	11.4	0.0	19.5
Sub-Total	29.7	56.2	14.1	0.0	100.0
Total(mean)	38.7	41.4	9.7	10.1	100.0

Table 6. Designation versus Type of Trainning Desired

Designation	Type of Training Desired (in Percent) On Site 1	Classroom 2	Both 3	Total
1. Management Group (Owner, Manager, Proj. Engineer)				
a. Indonesia	41.0	2.6	35.9	79.5
b. Philippines	0.0	0.0	2.6	2.6
c. Thailand	5.1	0.0	12.8	17.9
Sub-Total	46.1	2.6	51.3	100.0
2. Heavy Equipment Group (Operators)				
a. Indonesia	16.6	0.0	2.7	19.3
b. Philippines	66.2	0.0	2.1	68.3
c. Thailand	6.2	1.4	4.8	12.4
Sub-Total	89.0	1.4	9.6	100.0
3. Support Group (Mechanic, Electrician, Others)				
a. Indonesia	26.5	0.0	8.8	35.3
b. Philippines	14.7	0.0	2.9	17.6
c. Thailand	23.5	2.9	20.6	47.1
Sub-Total	64.7	2.9	32.3	100.0
4. Skilled Labor Group (Foreman, Carpenter, Mason, Steelman, Welder)				
a. Indonesia	34.1	0.0	9.1	43.2
b. Philippines	9.1	2.3	4.5	15.9
c. Thailand	11.4	4.5	25.0	40.9
Sub-Total	54.5	6.8	38.6	100.0
5. Unskilled Labor Group (Worker, Laborer)				
a. Indonesia	70.3	0.7	9.7	80.6
b. Philippines	1.3	0.0	0.0	1.3
c. Thailand	6.5	4.5	7.1	18.1
Sub-Total	78.1	5.2	16.8	100.0
Total(mean)	66.5	3.8	29.7	100.0

5. CONCLUSION

The findings show that road construction workers in the three Southeast Asian countries were employed in the industry notwithstanding their minimum formal and/or informal knowledge and skills. They can, however, be credited with substantial resourcefulness as they demonstrated their capacity to absorb technical skills transfer through co-workers who were earlier involved in the industry with the same minimal engineering background. This was the simplest way of learning the techniques on road construction as it happened in Indonesia and Thailand. With practically very little technical transfer from an expert, they continued to work and subsequently gained more knowledge on the job, with most Filipinos learning from their own individual experiences.

To compensate for an educational system in the said countries that does not give much emphasis on courses in road engineering, the learning environment in the road construction industry has to improve. With the current economic growth Southeast Asia is experiencing, more and more road infrastructure are expected to be built and maintained. Hence, more skilled workers are needed immediately in the work sites. As it is, implications of largely improvised learning practices are tremendous in terms of lesser productivity and a constant threat to workers' health and the public safety at large.

The group which will benefit the most from formal retraining is the unskilled labor group. The contractual employment status (while this was not asked in the survey questionnaire, this is a common practice in the three countries) of the workers in this category makes them disadvantaged because they had been getting the least priority, if at all, in terms of access to formal skills training. Hence, they had to rely on an informal networks made up of personal contacts, predominantly friends who were also engaged in the construction industry.

The respondents themselves were aware of their lack of technical preparation as they expressed the need for skills upgrading. Apparently, the coping mechanism in terms of job adaptation that occur among the workers in the industry is far from sufficient. An in-house retraining program that will involve the on-site technical transfer of knowledge with the skilled company workers as trainers and the unskilled ones as beneficiaries can be the most successful manner of technical skills transfer. The high demand for skills upgrading may be enough basis to develop a training framework or plan to be implemented in construction sites. A training program spearheaded by the private sector with incentives from the government would be the best approach.

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