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A survey of constraints on Iranian construction operatives' productivity

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Construction productivity is rarely analysed in Iran. If productivity is to improve, current weaknesses must be identified. To this end data were collected through a structured questionnaire survey. By utilizing the relative index ranking technique, the identified problems were prioritized for detailed analysis and discussion. Results indicate that the five highest-ranking problems are: Materials shortage, weather and site conditions, equipment breakdown, drawing deficiencies/change orders, and lack of proper tools and equipment. Devastating war with neighbouring Iraq has led to a boom in construction activities leading to shortages of construction materials. The casual employment of the majority of construction operatives and poor managerial skills are the significant contributors to low productivity on Iranian construction sites.

Keywords: Productivity, site operations, Iran.

Introduction

Construction is more important in developing countries than it is in developed countries (Altaf, 1979). The construction sector in Iran constitutes 10.9% of the total workforce (Iran Central Census, 1990) and contributes more than 8% of the GNP (MRU, 1994). As in many other developing countries, the construction industry in Iran suffers from poor productivity and increasing construction costs. A surge in construction activities is a consequence of, among other things:

1. the 1979 Islamic revolution, with its populist policies, including mass housing, electricity and water supply projects;
2. eight years of devastating war with neighbouring Iraq (1980–88);
3. population growth, including mass migration from neighbouring Afghanistan.

These, combined with the refurbishment or reconstruction of old buildings[1] and major infrastructure projects for the oil, petrochemical and gas industries, have jointly led to a boom in construction demand and shortages of construction materials. The shortages have been further compounded by seemingly uncontrollable hyper-inflation in the Iranian economy. There is a paucity of investigations on construction productivity and management techniques in Iran, but going by the example of other countries it can be assumed that any effort directed to improving productivity will greatly enhance the country's chances of realizing her development goals. This paper reports an investigation aimed at identifying constraints on construction operatives' productivity in Iran. The rationale of the paper is that productivity cannot be improved without first identifying fundamental weaknesses in existing practices.

Data collection

Data for the study were collected via a structured questionnaire survey of 355 construction operatives

[1] 1.5% of residential buildings in rural areas and 2.2% in cities are demolished every year owing to ageing and poor maintenance (MRU, 1994a)

on 31 sites in Iran. The questionnaire consisted of six sections and a total of 49 questions, covering a number of productivity-related factors. Such factors were identified from previous studies (Borcherding, 1976; Mackenzie and Harris 1984; Sikkeland and Erkelens, 1984; Sanders and Thomas, 1991). Arrangements to contact operatives were made through officials in the Iran Ministry of Residence and Urbanization (MRU) for government housing projects in Tehran and neighbouring cities, and through directors of private construction companies. These officials requested aims and potential benefits of the investigations to the industry and companies before granting permission to contact the operatives through their supervisors. The supervisors subsequently granted direct contacts to the operatives, who were, in turn, asked to complete the questionnaires and return them directly to the first author. While bias cannot be totally eliminated, the operatives were assured that responses would have no effect on their employment. In the booming Iranian construction industry it can safely be said that no skilled worker need fear any employer as they can easily find work on a nearby site! One hundred and seventy two operatives out of 335, i.e. 51.3% of the total sample, returned the questionnaire, of which 141 (i.e. 42.1%) were duly completed and form the basis of the analysis reported in this paper.

Personal characteristics of respondents

As variation in personality is one of the main factors in human motivation and productivity (Olomolaiye, 1988), it was considered logical to evaluate the personality of the operatives. This was done with regards to age, experience, training, mode of employment, and overall attitude towards employers with respect to length of employment.

Age group

As Table 1 indicates, the majority of the construction workforce surveyed were young operatives, the modal age group being 20–30 years. This is probably due to the manual nature of construction work in Iran; specifically, the requirement for carrying heavy concrete or operating heavy machines. Among those trades requiring a greater degree of skill (e.g. joinery and masonry), the data suggest a tendency towards older workers. This may be related to the length of training period required for such skill acquisition.

Table 1 Operatives' age distribution

Age group	Number	Percentage
15–20	2	1.42
20–30	58	41.13
30–40	53	37.59
40 +	28	19.86
Total	141	100.00

Table 2 Operatives, construction working experience

Years of experience	No. of operatives	Percentage
0–2	6	4.25
2–5	18	12.77
5–10	41	29.08
10–20	55	39.01
20+	21	14.89
Total	141	100

Construction experience

Table 2 lists operatives' work experience. With almost 83% of operatives having more than five years of construction experience, it can be safely assumed that the operatives surveyed were generally conversant with the problems of their trades. For clarification of respondent working experience, relevant to the major construction activities undertaken in the country, they were requested to classify their working experience according to type of jobs executed (see Table 3). By

Table 3 Operatives' working experience

Construction works	Number	1st	2nd	3rd	4th	Total score	Relative index	Ranking order
Housing	137	91	22	18	6	472	0.86	1
Public building	139	22	85	29	3	404	0.73	2
Industrial and civil engineering	122	24	27	34	37	282	0.58	3
Commercial building	115	0	4	45	66	168	0.36	4

utilizing the relative index ranking technique (Holt, *et al.*, 1994), workers were found to have greatest experience on *housing projects*, as reflected by the relative importance index of 0.86 ascribed to housing. This is a function of eight years of war and a fast-growing population, leading the government to plan for the construction of 1 500 000 new houses in the 1993–98 period (MRU, 1994b). *Public building*, with a relative importance of 0.73, is ranked highly in second place. *Civil and industrial engineering* projects usually have their own special type of workforce, requiring a high level of skill and expertise. On these types of project, conditions of employment are often better; advanced tools and equipment are more in evidence; good management (supervision and control) and job security, are also more prominent. Facilities such as canteens, accommodation, transport and allowances are not usually available to operatives on *housing* or *public works*, but feature strongly on *civil engineering projects.*

Table 4 How operatives were trained

Training method	Number	Percentage
(a) Apprenticeship	119	84.39
(b) Technical school	2	1.42
Combination (a) and (b)	5	3.55
On-site training	15	10.64
Total respondents	141	100.00

Table 5 Operatives' mode of employment

Mode of employment	Number	Percentage
Full time	69	48.94
Part time	0	0.00
Casual	37	26.24
Individual subcontractor/ daily pay	35	24.82
Total	141	100.00

Education and training

The construction workforce in Iran generally has low levels of literacy. The 1986 Census indicates the following characteristics of construction workers:

1. 41% are literate;
2. 59.5% have elementary schooling;
3. 15.6% primary high school (3 years);
4. 10.9% secondary high school (3 years);
5. 2.7% higher education (degree and above);
6. 10.3% have no official degree (Iran Central Census, 1990).

The World Bank Staff Working Paper (World Bank, 1973) indicated that the Iranian government in many respects has failed in manpower planning and education to cater effectively for the requirements of the construction industry. The industry has usually had to train its own skilled labour, and has often suffered critical manpower shortages, particularly at the sub-professional level. This problem has frequently been aggravated by government delaying payments. Our survey indicates that more than 95% of the workers have been trained through apprenticeship and on-job training (Table 4). Technical schools add relatively little to the available pool of skilled labour. However, some companies working on specialized contracts (such as gas pipeline projects, petrochemicals, oil field projects and power stations) have special training programmes, which typically utilize guarantee bonds obliging the operatives to work for a minimum period of time for their sponsors. Institution-based training is not yet common practice in Iran, and hence there are no nationally recognized certificates for construction comparable to the UK's City and Guilds or NVQs. Often operatives commence work in the industry by being apprenticed to some skilled/experienced worker until the employer begins to entrust them with work independently. It may take two to four years before this recognition is attained by aspiring tradesmen.

Mode of employment

Operatives involved in construction are often from rural areas, and not permanently employed in construction. This does not necessarily imply that they are not in full-time work. Typically at harvest time workers leave their construction jobs only to return after planting. Table 5 shows operatives' mode of employment, and apart from full-time construction operatives, casual labour (mostly farmers) constitutes 26% of the work force. These operatives exhibit high rates of absenteeism and/or turnover, causing disruption to the progress of construction projects. However, Afghan refugee workers have alleviated the problem to some extent. Daily-paid operatives, who constitute 25% of the work force, are available from an operatives' pool, and typically earn higher wage rates, but have little job security or additional allowances.

Length of employment and attitudes

Table 6 indicates that most workers rarely spend more than 3 years with any particular employer. Conversely, Table 7 indicates that operatives' knowledge, attitudes, ability, and experience at work, and attitudes towards

Table 6 Length of service with present employer

Years	Number of operatives	Percentage
0–1	57	40.42
1–3	67	47.52
3–5	14	9.93
5–10	3	2.13
10+	0	0.00
Total	141	100

Table 7 Operatives' rating of working attitudes towards employer

Rating	Number of respondents	Percentage
Very good	38	26.95
Good	70	49.65
Satisfactory	33	23.40
No good	0	0.00
Total	141	100

an employer or manager, are generally satisfactory, suggesting a relationship between length of employment and conducive working environments. Perhaps the question is not one of loyalty but more a reflection of the duration of construction projects, which rarely exceed one year. It would seem that operatives are given chances on each new contract of employment (with new agreed terms and conditions) to realize job expectations. Site managers utilize the effort and energy of this new, enthusiastic and well-motivated workforce to achieve higher-quality work.

Operatives and main productivity problems

Various internal and external factors affect operative productivity. Some common factors were selected from a literature review of productivity studies, and operatives were asked to identify those constituting problems on their projects, and give estimates of time losses per week, per problem area. Subsequent utilization of the relative importance ranking technique helped to identify the ranking of the factors (see Table 8). For the purposes of this discussion we shall consider/analyse the ten most important ranked constraints.

Lack of materials

With a relative index of 0.44, *lack of materials* emerged as the most crucial on-site problem. As project activities are often interdependent, there could be unquantifiable levels of disruption in other activities, such as formwork or scaffolding, if materials are not available. Materials shortages can be traced mainly to

Table 8 Causes of poor productivity and hours loss per week per operative

Causes	Number	<3	3–6	6–9	9–12	12–15	15+	Total score	Relative index	HL[a] (%)	Ranking order
Lack of materials	139	15	51	48	19	5	1	368	0.44	6	1
Weather and site condition	126	34	60	27	5	0	0	255	0.34	4.6	2
Equipment breakdown	129	36	63	23	5	2	0	261	0.34	4.6	3
Drawing/spec./change order	74	24	42	7	0	1	0	134	0.30	4.1	4
Lack of proper tools and equipment	115	45	52	17	1	0	0	204	0.30	4	5
Inspection delay	110	49	47	10	2	1	1	192	0.29	3.9	6
Absenteeism	82	48	19	8	5	1	1	141	0.29	3.9	7
Safety (accidents)	93	40	43	8	2	0	0	158	0.28	3.8	8
Improper plan of work	106	53	39	10	3	1	0	178	0.28	3.8	9
Repeating work	89	48	32	7	1	1	0	142	0.27	3.6	10
Changing crew size/ turnover	81	54	23	4	0	0	0	112	0.23	3.1	11
Interference at work	78	56	22	0	0	0	0	100	0.21	2.9	12
Poor communication and MIS	63	51	11	1	0	0	0	76	0.20	2.7	13
									Total	51%	

[a]HL=hours loss per operative per week.

increased construction demand due to the reconstruction programme, including factories, bridges, power stations, oil refineries, petrochemical plants, houses and other infrastructure, since the end of hostilities. Complicating the shortage problem further is the apparent lack of any specific government policy on materials procurement and distribution in this very important sector of the economy. It is not disputed that a shortage of materials affects on-site productivity, but the problem is often compounded by outright unavailability. While management may have no alternative than to pay higher prices for those materials available on the market, little can be achieved when materials are simply not available. Operatives were therefore asked to indicate the common causes of non-availability on their sites, on the premiss that if the causes are known some solution may be proffered.

Causes of non-availability of materials

Ineffective material management leads to inefficient use of craft labour (Thomas, 1989). The main reasons that respondents cited for non-availability of materials are detailed in Table 9. The factor with the greatest impact was *negligence and sabotage.* Owing to a shortage of cement bags, cement is often taken to site loosely by truck. Most sites do not have silos or proper cement storage: therefore cement is often kept in a pit or temporarily between loose bricks covered with polythene sheets. Sometimes during transportation cement is not securely covered, resulting in high wastage. Though sheer negligence and probable sabotage were cited by some operatives, who are not satisfied with their pay level or management treatment, the problem is actually nothing but poor transport facilities. In two sites the author detected that operatives were transporting materials with punctured wheelbarrows. In most concrete and steel structural frames with joist and block floors, it is common that the joists and concrete or brick blocks are transported floor to floor manually or by very simple and unsafe rope and spool, and each time a percentage of the transferred materials is damaged or wasted entirely.

The second major cause relates to *on-site transport difficulties*, with a relative index of 0.68. *Congested working space* and/or *improperly deposited material* generally make movement and manoeuvrability very difficult. *Improper material handling* on site ranked third. While some large companies use highly advanced handling equipment, the majority of contractors have only very simple and ineffective handling methods. Inefficiency is not limited to wastage, but could also be related to poor safety measures.

Improper material usage or application to the specification ranked fourth, with a relative index of 0.64. Materials are misused for many reasons, including contractor dishonesty (using inferior materials to those specified), poor workmanship, poor instruction and poor supervision. *Lack of proper plan of work*, with a relative index of 0.47, ranked fifth. An improper plan of work or ineffective preplanning effort on the part of site managers or general foremen usually leads to confusion and delay, or utilization of materials in non-critical activities. This is particularly important in Iran, with increasing demand for construction materials and scarcity in the market. *Improper material deliveries*, with a relative index of 0.43, is ranked sixth, and occurs as a result of unavailability of material in the market or deliberate dishonesty in using cheaper materials. Rejection of delivered materials to site by project superintendents (due to non-conformance with specifications) results in much disruption to the working process, delay and loss. Such problems are not uncommon, especially on complex projects utilizing

Table 9 Main causes of non-availability of materials on site

Causes	Number	Very high	High	Medium	Low	Very low	Total score	Relative index	Ranking order
Waste due to negligence/ sabotage	138	24	50	44	17	3	489	0.71	1
On-site transport difficulties	134	24	43	37	26	4	459	0.68	2
Improper material handling on site	140	27	39	35	36	3	471	0.67	3
Improper material usage to specification	129	2	17	28	69	13	413	0.64	4
Lack of proper plan of work to be done	123	1	9	37	59	17	287	0.47	5
Improper materials delivery to site	122	5	8	20	58	31	264	0.43	6
Excessive paperwork for materials requisition	119	1	5	20	46	47	224	0.38	7

materials and equipment from abroad. *Excessive paperwork procedure for materials requisition* was the lowest-ranked cause, cited by some operatives working on large sites.

Weather and physical site conditions

Respondents ranked this problem second, with a relative index of 0.34. Every year, excessive rainfall and adverse weather conditions cause considerable financial loss to many Iranian construction projects and contractors in particular. This loss, however, directly affects those operatives who are not on a regular payroll. The average hour loss per operatives per week in this regard is 4.6%, which compared with Clapp's (1966) study of five English housing sites each of between 50 and 120 houses, between 1953 and 1956, is three times more. The National Electrical Contractors Association's (1974) general findings' that 100% productivity can only be achieved when temperature is between 5°C and 25°C and relative humidity is below 80% can be suitable guidance for scheduling operatives performance with regard to the site location. Harris and McCaffer (1975) developed a model that allowed the determination of the additional costs that arise due to bad weather. Applying this model in contract documents, particularly on large contracts, may also save Iranian contractors from undue loss of productivity as a consequence of adverse weather conditions.

Lack of proper tools and equipment

Productivity is dependent upon an efficient application of tools and equipment. However, a lack of proper tools and equipment can have a critical effect. With 4.6% hour loss per operative per week, this factor ranked as the fifth major problem on Iranian construction sites (see Table 8). Old and obsolete construction equipment, shortage of spare parts, improper service and maintenance, slack use of machinery or intentional sabotage by operators (who are not happy with company policy, its management or level of earnings) are some of the causes of this problem leading to delays (of weeks in some instances). This was further aggravated during hostilities, as some construction equipment served as ready spare parts for the war effort. With increasing change in project size and complexity, and the development of new technology, construction is constantly exposed to changing methods, tools and equipment. A general consensus of opinion from this survey showed that replacing old and outdated machinery would almost certainly enhance productivity.

Design, drawing and change orders

Commonly reported problems for productivity in Iran were:

1. errors in design and poor constructability of designs;
2. non-conformance (contradictions) in the architectural, structural, mechanical and electrical engineering drawings;
3. contract document specifications conflicting with drawing specifications;
4. too many revision and change orders.

This factor, with a relative importance index of 0.30 and 4.1% hour loss per operative per week, ranked as the fourth problem overall. These problems were high among two developers and a few contractors utilizing different specialists in the design process. Revisions and change orders lengthen construction time, and may allow profits to the workforce or contractors. However, it is often rather frustrating to operatives when no progress is apparently being made or when completed work has to be demolished. The contractors themselves complain because project rhythm is disrupted, and expensive 'overtime' payments often have to be made.

Inspection delays

This factor was ranked sixth: see Table 8. Responses indicate that most sites do not have a resident superintendent or an agent, and where they do he rarely has full authority, experience or knowledge of the job in hand to make effective decisions promptly. Sometimes many days are needed for even simple decisions to be taken. Also, a negative attitude on the part of site agents towards operatives and subcontractors disrupts work in progress, resulting in time and resource wastage. Similarly, lack of cooperation between contractors and client representatives (e.g. project architects) results in delays, especially on public projects. Complexity and sensitivity of projects, particularly in the oil-field area, may cause long and costly delays.

Absenteeism

With a relative index of 0.29 and 3.9% hour loss of site productivity per operative per week, absenteeism ranked seventh (Table 8). The Business Round Table (1982), in an assessment of the economic impact of absenteeism on labour cost, by assembling a team of experts established that each 1% increase in absenteeism causes an increase in labour cost of 1.5%. The absenteeism rate in Iran, though, is less than the minimum reported by the Business Round Table (5–15%). The present inflationary situation of the

country, with an increasing need for economic efficiency, could have a considerable destructive effect on operatives' productivity. Reasons for absenteeism range from unavoidable absence (due to ill health etc.) to deliberate absence (e.g. searching or working on more lucrative jobs elsewhere).

Safety (accidents)

Construction work is naturally accident prone. Improvements can be of great benefit to the physical well-being of operatives, to morale, and to the progress of the work generally (Davies, 1986): hence effective safety and health programmes are desirable. Surprisingly, this factor was ranked only eighth by operatives, with a relative index of 0.28. Hinze and Parker (1978) showed that good safety performance and high productivity occur together. Unsafe activities are the result of such things as worker negligence, carelessness, ignorance, and mostly lack of attention by contractors to providing the required safety equipment for operatives. Contractors in this survey recorded six deaths on four projects resulting from various breaches of safety regulations. This has not only caused contractors considerable financial loss in direct compensation (to the operatives' families and to the Ministry of Labour and Social Affairs for breach of safety), but has also resulted in project delay and cost overrun.

Improper plan of work

With a relative index of 0.28, this factor is ranked ninth (Table 8). Clearly, the major benefit of planning occurs not when things go as planned, but when the unexpected happens (Tucker, 1986). Poor knowledge and the inexperience of project managers in planning, scheduling, and the procurement process help to explain poor operative productivity. With such a huge socio-economic crisis in Iran, causing constantly increasing prices of all resources, non-availability of materials, and high irregularity in payments, planning can be very difficult. Even the best-planned projects in Iran soon require replanning, which is not always possible and often expensive. Of the operatives surveyed, 26% work on projects with no formal knowledge of work planning, 17% do not even know whether projects have a working plan or not!

Repeating work

This was the tenth operatives' ranked productivity problem. Discontent with rework as a result of poor instruction, supervision, change orders, revision in drawings, etc. impacts negatively on operatives' productivity as well as their working morale and attitudes (Kahn and Katz 1965; Borcherding, 1972; Borcherding and Oglesby, 1975). The most significant causes of reworks as reported by respondents are shown in Table 10. The greatest amount of rework is attributed to *poor workmanship*, which is a function of poor instruction, supervision and control. Recruiting low-wage, unskilled labour for projects requiring experience and expertise is the root cause, closely followed by *operatives, negligence and sabotage.* High rate of *revision and change orders* is the third-ranked cause (which may result from lack of specific construction material in the market, clients changing their mind, sloppy engineering design with incomplete drawings and/or errors, inconsistencies in the plans etc.), and this appears to create continuous dilemmas for craftsmen and supervisors on the site. Other causes of repetition, as seen in Table 10, may again be seen as managerial and supervisory obligations.

Table 10 Causes of repetition/rework on site

Causes	Number	Total score	Relative index	Ranking order
Poor workmanship	134	473	0.88	1
Negligence/ sabotage	137	463	0.84	2
Revisions/change order	136	440	0.81	3
Congestion	132	411	0.78	4
Complex drawings and specification	129	336	0.65	5
Poor instruction and supervision	127	279	0.55	6
Improper material application	122	255	0.52	7
Poor engineering drawings and design	123	231	0.47	8

Changing crew size and labour turnover

New recruits require learning time, including familiarization with personnel, administrative procedures, working conditions, etc. The time lost is a direct expense to the contractor. The factor with 3.1% hour loss per operative per week ranked tenth. In an effort to find out the rate of labour turnover, operatives were asked to state the number of operatives in their gang who had left the project since they were recruited (see Table 11).

They were also asked to suggest and rank the four most important reasons for labour turnover on their

Table 11 Rate of operatives' turnover

Number of operatives	Number of respondents	Turnover (%)
<3	25	17.73
3–5	40	28.37
5–10	38	26.95
10+	23	16.31
Don't know	15	10.64
Total	141	100

project (see Table 12). It would seem that Iranian construction operatives change jobs primarily to increase their income. The rapid devaluation of the country's currency, and inability of government to cope with economic crisis and a high inflation rate, brought severe disruption to the whole industrial process; the resultant low level of pay has led to a continuous demand for higher pay. Although the minimum wage rate has recently been increased by 20% by the Ministry of Labour (Khaje Nouri, 1995) to 5333 Rials (£1.92) per day, this is still far from the amount needed for a decent standard of living!

The second most important cause is the casual nature of employing most of the work force. The majority of Iranian construction workers are from rural areas with seasonal fluctuations in their availability (Iran Central Census, 1990). They are usually closely knit, working and living together, and so do not easily accept strangers within their groups. Though unpredictable, they demonstrate a good sense of responsibility, faithfulness and affiliation towards their employer and the job.

Remoteness of sites and family problems is the third source of dissatisfaction and cause of labour turnover. Most large and developmental projects are located in remote and less developed areas, with poor access and insufficient facilities. Problems may accrue on the remote sites because contractors are usually not prepared to provide suitable canteen, accommodation and other recreation and transport facilities for their personnel, and usually labour turnover in such a project is very high.

Delays in payment of salary and allowances ranked fourth. The cause of such delays can be traced mainly to late payment of contractors by clients. This indirectly affects operatives' attitudes and morale at work, and soon leads them to search for better paid jobs.

Impact of labour turnover on productivity

Correlation analysis of turnover factors (Table 12) to productivity on 25 sites under this survey indicates that *management behaviour/treatment and remote sites and family problems* are significantly correlated with productivity directly and *casual labour*, *job opportunity* indirectly (see Table 13). Stepwise regression analysis of these factors against the productivity of the sites indicates that *management behaviour* accounts for 25% and *remote sites and family problems* account for 14% explanation of variation in the sites' productivity.

Conclusions

The five most problematic constraints to construction workers' productivity in Iran have been found to be:

1. lack of materials;
2. weather and site condition;

Table 12 Ranking of labour turnover factors

Causes	Number	1st	2nd	3rd	4th	Total score	Relative index	Ranking order
Low level of pay	132	72	36	20	4	440	0.83	1
Casual labour force	42	18	14	4	6	128	0.76	2
Remote site and family problem	64	15	16	19	14	160	0.62	3
Delay in payment	61	10	17	17	17	142	0.58	4
Discontinuity of work	45	5	12	15	13	99	0.55	5
Job opportunity	60	8	15	10	28	125	0.52	6
Management behaviour/ treatment	46	5	10	14	17	95	0.51	7
Hard working condition	38	3	6	16	13	75	0.49	8
Lack of working facilities	50	2	12	18	18	98	0.49	9
Lack of material at site	14	1	3	4	6	27	0.48	10

Table 13 Correlation matrix of operatives' turnover factors to site productivity

	1	2	3	4	5	6	7	8	9	10	11
1. Productivity	1.00										
2. Low level of pay	0.12	1.00									
3. Delay in payment	0.01	0.01	1.00								
4. Casual labour	–0.26	0.09	–0.38	1.00							
5. Remote site	–0.45*	0.09	–0.21	–0.01	1.00						
6. Insufficient facilities	0.15	0.20	0.12	–0.18	–0.02	1.00					
7. Job discontinuity	–0.01	–0.9	–0.14	0.17	–0.34	–0.43*	1.00				
8. Management	0.55**	–0.33	–0.17	–0.48*	–0.30	–0.21	0.23	1.00			
9. Job opportunity	0.02	–0.02	0.21	–0.54**	–0.06	0.13	–0.25	0.18	1.00		
10. Hard work. cond.	0.10	–0.01	–0.58**	0.38	–0.29	–0.13	0.21	–0.02	–0.36	1.00	
11. Lack of material	0.13	–0.05	–0.24	0.04	–0.02	–0.18	0.05	0.17	–0.27	0.49*	1.00

* Significance level 0.05 ** Significance level 0.01

3. equipment breakdown;
4. design deficiency and/or change orders;
5. lack of proper tools and equipment.

While materials shortages can be traced to the increase in construction demand since the war with Iraq ended, the government's poor procurement and distribution policies have compounded the problem further. It would seem that construction workers' problems are externally generated by the socio-economic crisis in the country. If the economic situation could be stabilized, workers' problems would to some extent, be alleviated. However, effort would still need to be directed at training, and at improving the professionalism of the construction business as conducted by major participants in the industry. While Table 8 indicates an overall of 51% of hour loss per operatives per site per week, the activity sampling shows 24–46% unproductive time variation on these sites. Stepwise regression analysis of turnover factors against productivity on these sites indicates that *management behaviour/treatment* and *remote site with insufficient facilities* together account for 39% of variation in the operatives' productivity. In order to develop a strategy for removing the barriers to productivity in Iran, a comprehensive study of workers' motivation is being conducted and will be reported in a future paper.

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