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EFFECT OF BASIC MOTIVATIONAL FACTORS ON CONSTRUCTION WORKFORCE PRODUCTIVITY IN TURKEY

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Abstract. Human resource today has a strategic role for productivity increase of any organization, and this makes it superior in the industrial competition. With the effective and optimum usage of it, all the advantages supplied by the productivity growth can be obtained. This usage is just possible by establishing clear and understandable criteria for the factors affecting labour. Therefore, it is aimed in this study that the factors influencing construction labour productivity in Turkey are determined, defined, and examined in detail. A survey was applied to 82 firms to obtain required data. According to results, the most effective factors group is organizational factors.

Keywords: motivation, construction labour, productivity, Turkey.

1. Introduction

The construction sector has a strategic role in all developed and developing countries. Employing more than 7 % of Europe's workforce, this sector is the largest industrial employer on the continent (Proverbs *et al.* 1999). In the US, construction industry accounts for about 14 % of the gross national product and some 8 % of total employment (Thieblot 2002). Similar to them, the sector in Turkey has a share of 4.6 % in the gross national product and 5.3 % in total employment. In addition, the employment share of construction among industrial sectors (which is a real indicator of a country's development level) is about 27 % (SIS 2005). As can be comprehended from these macro level data, the industry possesses a strong and particular structure all over the world as compared with manufacturing industry. Variations in the construction labour productivity can naturally make a great impact on national economy and productivity, since the sector also augments production capacity of its dependent sub-sectors that are more than 200. If the subsectors procuring inputs for the industry are considered together in Turkey, the share of construction in the gross national product rises to approximately 33 %, while it includes some 15 % in total employment (SIS 2005). However, construction workforce especially in developing countries is not seen as an important input, although project labour generally make up the most variable and the largest percentage of total project costs. Due to this high cost of labour, labour cost control is a very important function for profitability in the industry. Despite the fact that these costs change with the type of projects in a broad range, site workers typically account for up to 40 % of the direct capital cost in large construction projects. The labour cost component of electrical and mechanical works also represents 40–60 % of their final cost. Therefore, labour-intensive industries such as construction are considered under high-risk by contractors due to the relatively high labour component, and, thus, any reduction in this wastage presents enormous potential for the increased efficiency. In conclusion, the present situation of the industry makes productivity improvement imperative to the sector.

Industry is better characterized by traditional or manual methods and hard labour conditions, besides a low productivity. Labour-intensive technology, on the other hand, requires much more diligence and insight than equipment-intensive construction process, and, thus, labour resource becomes a more important input in the production phase. Moreover, production-related inactivity is not nearly as intuitively obvious in a labour-intensive project and the solutions of the inactivity are not easily found. It means that it is easy for a contractor to be lulled into a false sense of accomplishment, when the crews are all working. Residential and commercial construction is labour-intensive as compared to industrial and heavy constructions tendinh to be capital-intensive. In the same way, renovation or retrofitting work, by its own nature, requires a higher labour/capital ratio than the new construction.

As in most developing countries, a great portion of the construction labour also comes from farming in Turkey, and they work both seasonal and contingent on the need for specific skills in a project. The productivity of this type of workers whose abilities and socio-cultural backgrounds vary in a wide spectrum is naturally affected by many factors. Poor productivity of craftsmen was quoted as one of the most daunting human resource prob-

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lems in developing countries by Olomolaiye *et al.* (1987) and Kaming *et al.* (1997). Frequently construction labour efficiency was cited as poor in the US as well (Adrian 1987). According to Thieblot (2002), the reason for this situation is that the industry has rarely been able to have what would be considered normal labour relations and policies. Furthermore, managers may not always consider the factors that can affect the productivity of manpower. The productivity risk factor has also a strong impact on the project duration. Namely, poor labour productivity probably causes time overruns in construction projects (Kazaz, Ulubeyli 2004).

2. Motivation as a tool for improving labour productivity

The relationship between motivation and productivity can be summarized as that productivity is directly linked to motivation, and motivation is, in turn, dependent on productivity. Suitable motivation of labour can be hypothesized as a key contributor to maximizing workers' productivity. The motivation concept is generally defined as a composition of powers and mechanisms which help to direct human behaviour in a desired manner, or with a more specific context it is described as the all convincing and encouraging actions which help workers fulfill their tasks willingly and to come closer to project objectives. Motivation of the labour force is of paramount importance because the quality of human performance at the workplace depends largely upon motivation. That is, higher motivation brings higher productivity. Even the smallest action that is positive or negative can have an effect on workers' attitude and motivation. The motivation, especially monetary rather than moral, has proven its influence on the productivity of workers, and the methods of motivating personnel to promote productivity have been demonstrated by Khan (1993) through applications of different human relations theories of motivation. Research on the relationship between motivation and productivity in the construction industry has been conducted over the last 40 years. There are three most commonly used theories in this research area.

2.1. Maslow's need theory

Maslow (1970) argued that human beings strive to satisfy the following needs basically classified in ascending order: physiological needs, safety needs, social or belonging needs, self-esteem needs, and the need for self-actualization. These needs are arranged hierarchically. For example, if a worker has satisfied own physiological needs, he/she will next pursue safety needs. As soon as these are placated, social needs will be pursued, and so on. On the other hand, McKenzie and Harris (1984) claimed that money was the only motivator for construction workers. Olomolaiye and Ogunlana (1988) similarly asserted that earnings related factors were predominant for motivating construction operatives in a developing country, Nigeria. The findings of Zakeri *et al.* (1997) support these previous surveys, indicating money related issues for Iranian construction operatives. Kaming *et al.* (1998) introduced an international comparative study, and the findings were of concern to the first steps of the needs pyramid for Indonesian construction craftsmen. They also indicated that workers in developed countries expectedly have higher motivation needs than those from developing countries. However, it was also shown that workers in developed and developing countries could not meet values for belonging, esteem, and self actualization which are the last three needs. Proverbs *et al.* (1998) concluded that German workers were likely to be more highly motivated and hence more productive in reinforcement fixing than French and English workers because they are more highly paid and regarded as on a par with people doing intellectual and scientific work. In other words, physiological and esteem needs are satisfied together.

2.2. Herzberg's motivation-hygiene theory

Herzberg (1968) labelled his two factor theory as satisfaction or motivation and dissatisfaction or hygiene factors. He further insisted that these two factors independently exist, one running from satisfied to neutral and the other from dissatisfied to neutral. However, they do not exist on a continuum running from satisfaction through neutral to dissatisfaction. Herzberg's hygiene factors are approximately equivalent to Maslow's lower-level needs, and the motivators to Maslow's higher-level needs. It means that the hygiene factors provide necessary conditions for a satisfied workforce, but do not still necessarily motivate. Some of the related studies on this theory are of Borcherding and Oglesby (1975), who have examined the relationship between work satisfaction and construction productivity, and Olomolaiye (1988), who has investigated bricklayers' motivation and productivity.

2.3. Expectancy theory of motivation

This theory argues that the motivational force to perform or expend effort is a multiplicative function of the expectancies that individuals have concerning future outcomes and the value they place on those outcomes (Vroom 1964; Nadler, Lawler 1977; Maloney 1981; Laufer, Jenkins 1982). The conceptual application of expectancy theory is seen as more methodological and relevant to construction operatives than the former two theories. Maloney and McFillen (1986) have investigated the value of production quantity and satisfaction level of unionized craftsmen under this theory.

3. Methodology

The overall aim of productivity researches is to ensure that human and natural resources are used by means of the most productive methods consistent with country-specific conditions on the way to development. With productivity measurements, governments and private firms can decide how they utilize the capacity of their resources and hence what kind of preventive measures they will take for the future. It is the leading target for all of the business areas to investigate production inputs thoroughly, especially from the viewpoint of the labour component which is part of, but distinct from, other re-

sources because of its specific characteristics. In developed countries, productivity is being improved together with the profit enhancement by attaching importance to the concepts examined in this study such as training and motivation. However, the great importance of productivity could not be clearly comprehended in developing countries such as Turkey owing to that it is not paid attention to these concepts as much as those in developed countries, particularly in the construction sector. Furthermore, there is a different level of importance among productivity problems in developed and developing countries, and, thus, strategies to solutions are likely to be different. Therefore, recognition and subsequent arrangement of the factors affecting workforce motivation are today essential in any organization. In this study, the factors influencing construction labour productivity will be totally diagnosed and evaluated in detail; thus, it will be possible to create plainer and more intelligible criteria for these factors. From another point of view, the term "productivity" brings to mind images of workers who are working either diligently or otherwise, but in reality, productivity is too complex an issue to be measured only in terms of labour effort. In addition, different individuals have different experiences and therefore different opinions about similar occurrences or situations. It means that there is lack of common reference point in establishing these factors, and this study is a suggestion in this respect. Out of Turkey studies (Olomolaiye *et al.* 1987; Kaming *et al.* 1997; Zakeri *et al.* 1997; Kaming *et al.* 1998a; Kaming *et al.* 1998b; Sonmez, Rowings 1998; Ng *et al.* 2004) investigated the factors influencing labour productivity without any classification. In the survey of Rojas and Aramvareekul (2003) which is the unique exception in this regard; although classified, very limited factors were examined. The present study also removes the drawback, and reflects the dimensions of the motivational problems in most developing countries. Consequently, current level and position of the construction labour productivity in Turkey will be revealed from a different perspective of developing countries. Hence, the study will not only be a step for further works that will be performed by the potential researchers who may find interesting similarities between their countries and Turkey concerning this problem, but also assist readers and industry practitioners who may meet with motivation-based productivity problems on their sites.

To obtain the data required for the study, a questionnaire comprising 54 detailed questions under 18 subject headings, such as demographic features of firms, experience levels of respondents, or factor groups, was first prepared ((Ulubeyli 2004). Then, Turkish Employers' Association of Construction Industries (TEACI) and Turkish Contractors Association (TCA), which exactly represent the Turkish construction sector, were contacted. The member firms of these associations execute approximately 70 % of the total investments made in Turkey, and have also undertaken 90 % of the work done abroad in the field of construction. The number of members of TEACI is 126, while it is 139 in TCA. Although there are 265 large-scale construction companies in total, 187 firms to be interviewed are available since 78 firms have double memberships. In the application stage of the questionnaire, face-to-face (one-to-one) interview technique was utilized in order to assure the validity and reliability of the survey, but only 10 firms that could be not contacted were interviewed by e-mail. The telephone interviews, explaining the content of this study, were conducted with the general directors of 187 firms, and as a result, 82 of them (43.85 %) responded positively. The remaining ones refused the request with various reasons. Nevertheless, this relatively high approval rate can conveniently represent the sampling whole of the survey.

The category of the construction firms in terms of economic scaling was determined by means of their average annual incomes. These categories have been quoted from the classification of the Turkish Department of Commerce. About half of them (46.34 %) are large scale companies (> 20 million $), the others comprise medium (> 10 and ≤ 20 million $) and small (≤ 10 million $) scale firms. In addition, a great portion of the companies (76.83 %) has an experience of over 20 years in the sector, which is an indicator of possessing adequate experience. In terms of type of the contractors, just 34.15 % of the firms specialize in one field of construction such as building (educational, commercial, etc.), engineering (highway, bridge, dam, etc.), or industrial (power plants, refineries, etc.), while 65.85 % of them have undertaken several projects at least in two fields. It was also understood that the projects successfully completed by the contractors, since their foundations are geographically located not only in Turkey but also in foreign countries. Although 52 of 82 contractors (63.42 %) have undertaken at least one project abroad in the past, the number of whose former projects were limited to Turkey is 30 (36.58 %). On the other hand, 2 contractors (2.44 %) have not executed any project in Turkey, but just in foreign countries. Qualitative dispersion of the professionals, who have completed the questionnaire on behalf of the firms, similarly shows the survey reliability. The respondents were composed of site engineers (51.22 %), project managers (42.68 %), and chairmen of directors board (6.10 %). Furthermore, 73.17 % of the participants have a job experience of at least 11 years in construction. In conclusion, all the demographic characteristics prove that this survey completely reflects the real status of labour productivity in Turkey.

To analyze the data provided by the questionnaire, two statistical methods were used. The first was to acquire percentage values by frequencies of the answers received. The other was to calculate a relative importance index (RII). For this purpose, a rating scale of 1 to 5 was adopted with 1 representing the lowest level of effect and 5 representing the highest level. The RII was evaluated by the following expression (1):

$$RII = \frac{\sum_{i=1}^{5} W_i X_i}{\sum_{i=1}^{5} X_i}, \quad (1 \le RII \le 5), \tag{1}$$

W_i, is the rating given to each factor by the respondents ranging from 1 to 5, with 1 representing 'not significant' and 5 representing 'extremely significant'; X_i – the percentage of respondents scoring; and i – the order number of respondents. The numerical values calculated by the above formula were then differently classified as can be seen in Fig., because a single point or number changing from 1 to 5 in questions no longer symbolizes each verbal scaling expression in the evaluation phase. Namely, since the results are obtained as decimal numbers instead of integer numbers, a specific scale should be established. Thus, 5 expressions are defined by the intervals of 0.8. In addition to calculating the relative index scale, the percentages of respondents scoring 2 or fewer, 3, and 4 or more, on the significance scale were also evaluated for each factor. These were used to rank the factors in which relative importance indices were the same.

4. Factors out of classification

In the construction industry, many factors have potential to affect labour productivity. However, two factors that can get an effect on construction productivity have not been included in the groups, while 37 factors have been formed by searching related books and articles, which process has subjected to filter of personal judgment for their convenience to the study in terms of offering a developing country perspective, e.g. 'internet service given in site', as an excluded factor. Four factor groups have been decided by inspection of the factors. After these factors have been determined at inception, they were divided into groups.

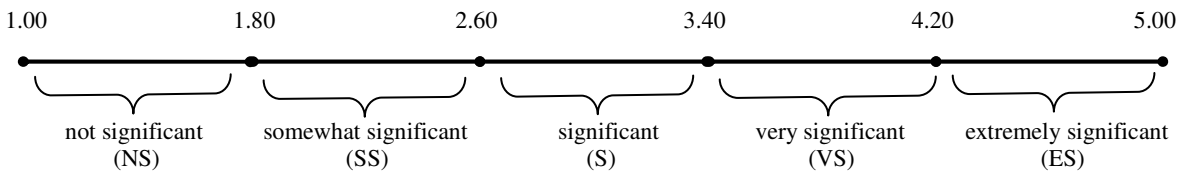
The first of excluded factors is technological advancements that has been the main driver behind improved productivity and reduced work forces. The main problem investigated in this paper is not how construction activities can be performed more productively or finished more rapidly, but only how the productivity of manpower can be increased without any machine assistance. Automation of construction tasks, which could potentially increase productivity, has yet to become reality on the job site, and for the near term this seems unlikely with the exception of some off-site prefabrication because the opportunity of standardization in production is very limited in construction due to that products vary in a large spectrum from one project to another with clients' demands. The other factor that was not given any place in the groups is ergonomics. It is an applied science that organizes tasks according to the principles of work sampling and coordinates the design of devices, systems, and physical working conditions with the biological and psychological capacities and requirements of workers in harmony for the purpose of enhancing output of the human-machine partnership. On the other hand, this original tool is utilized only at some specific activities in construction such as bricklaying, and not appropriate for generalization as a standard factor interacting with the productivity concept.

5. Findings

Among the 4 factor groups affecting construction labour productivity, organizational factors were found as the most important group with a mean index of 4.06 (very significant/VS), as can be seen in Table 1. Ten factors were investigated in this group, and quality of site management (extremely significant/ES-4.53), material management (ES-4.50), and systematic flow of work (ES-4.40) were ranked by the participants as the 3 most effective factors. On the other hand, relaxation allowances were determined as the least predominant factor with the index of 3.15 (significant/S). The other 6 factors have 'very significant' impact upon efficiency. When 37 factors are considered, there exist 6 organizational factors among the top 10 factors which are denoted with the approval (√) sign in the last columns of Table 1 and the subsequent tables. These 'results' columns indicate the most promising 10 factors that can initially give opportunities with a particular care for improving labour productivity.

The second most important group is economic factors (VS-3.81). 6 factors were totally searched (Table 2), and on-time payment (ES-4.41) was ranked by the sector professionals as the most effective motivator influencing Turkish construction labour. However, union membership was found out as the least important factor with the index 2.76 (S). The other 4 factors have 'very significant' impacts upon efficiency. Moreover, it is seen that there are 2 economic factors among the top 10 factors.

After the economic factors, physical factors (VS-3.46) including 9 elements are the most considerable group, as shown in Table 3. Working at similar activities (VS-4.04), design complexity (VS-3.68), and error tolerance (VS-3.64) were ranked by the respondents as the three most influential motivators, and at the same time, site congestion was determined as the least predominant factor with the index of 2.83 (S). Six of 9 factors have 'very significant' effects on productivity, while it is 'significant' for the rest of them. If 37 factors are totally considered, only 1 physical factor is available among the top 10 factors.



The evaluation scale

Table 1. Statistical results of organizational factors

Rank in group	Organizational factors	RII	Effect level	Percentage of respondents scoring			Rank in total	Result
				≥ 4	3	≤ 2		
1	Quality of site management	4.53	ES	96.20	3.80	0.00	1	√
2	Material management	4.50	ES	96.16	3.85	0.00	2	√
3	Systematic flow of work	4.40	ES	89.61	9.09	1.30	4	√
4	Supervision	4.20	VS	88.15	10.53	1.32	5	√
5	Site layout	4.18	VS	83.12	12.99	3.90	6	√
6	Occupational education and training	4.06	VS	79.22	19.48	1.30	9	√
7	Crew size and efficiency	3.92	VS	72.73	23.38	3.90	12	
8	Firm reputation	3.87	VS	71.79	17.95	10.26	13	
9	Camping conditions	3.74	VS	62.82	29.49	7.69	16	
10	Relaxation allowances	3.15	S	34.67	44.00	21.34	32	
	Average	4.06	VS					

Table 2. Statistical results of economic factors

Rank in group	Economic factors	RII	Effect level	Percentage of respondents scoring			Rank in total	Result
				≥ 4	3	≤ 2		
1	On-time payment	4.41	ES	96.20	3.80	0.00	3	√
2	Amount of pay	4.13	VS	81.25	17.50	1.25	8	√
3	Working in social insurance	4.03	VS	75.33	20.78	3.90	11	
4	Incentive payments and financial rewards	3.86	VS	71.43	19.48	9.09	14	
5	Discontinuity of work	3.69	VS	61.53	26.92	11.54	17	
6	Union membership	2.76	S	25.68	31.08	43.24	35	
	Average	3.81	VS					

Table 3. Statistical results of physical factors

Rank in group	Physical factors	RII	Effect level	Percentage of respondents scoring			Rank in total	Result
				≥ 4	3	≤ 2		
1	Working at similar activities	4.04	VS	87.18	8.97	3.85	10	√
2	Design complexity	3.68	VS	60.53	28.95	10.53	18	
3	Error tolerance	3.64	VS	65.33	24.00	10.67	20	
4	Weather conditions	3.53	VS	54.66	34.67	10.67	21	
5	Disruptions	3.50	VS	48.68	36.84	14.47	23	
6	Schedule compression	3.43	VS	44.00	48.00	8.00	24	
7	Overtime	3.26	S	44.73	35.53	19.74	27	
8	Shift	3.25	S	36.36	45.45	18.18	28	
9	Site congestion	2.83	S	21.06	48.68	30.26	34	
	Average	3.46	VS					

Finally, the least important group of which RII results are summarized in Table 4 was determined as socio-psychological factors with an average index of 3.28 (S). Work discipline (VS-4.17), health and safety conditions (VS-3.74), work satisfaction (VS-3.66), and creating competition (VS-3.53) were found as the 4 most influential motivators among 12 socio-psychological factors. However, distance from population centres and distance from home were determined as the 2 least predominant factors with the indices of 2.45 (somewhat significant/SS) and 2.56 (SS), respectively. The other 6 factors have 'significant' impacts. In addition, there is just one socio-psychological factor among the top 10 factors.

The top 10 factors are given as a whole in Table 5. The results of comparisons between these factors are presented in the last column of it. The first 3 factors (1–3) are evaluated as 'very important', the subsequent 3 factors (4–6) as 'important', and the remaining 4 factors (7–10) as 'somewhat important'. In this way, an importance scale of 3 has been created for the 10 factors.

According to the results, one economic factor and 2 organizational factors were found out 'very important', while neither physical nor socio-psychological factors have been listed as 'very important'.

The following major 10 factors which primarily impact construction labour productivity and therefore of which poor gratification on a construction site likely leads to great demotivation and continued low productivity, were fixed in descending order: quality of site management, material management, on-time payment, systematic flow of work, supervision, site layout, work discipline, amount of pay, occupational education and training, and working at similar activities. These are briefly explained below.

5.1. Quality of site management

Improving productivity could be best carried out by means of development in management quality. Namely, the principal difference in construction productivity is the management influence. Stages of estimating construction time and cost reliably, where the knowledge of labour productivity takes a considerable part, are the main items of successful management understanding. In the study of Sanvido (1988), ineffective management was cited as the primary cause of poor productivity rather than unmotivated or unskilled manpower. One of the primary means of rising worker productivity through management is to procure and control adequate working conditions since

Table 4. Statistical results of socio-psychological factors

Rank in group	Socio-psychological factors	RII	Effect level	Percentage of respondents scoring			Rank in total	Result
				≥ 4	3	≤ 2		
1	Work discipline	4.17	VS	88.31	11.69	0.00	7	√
2	Health and safety conditions	3.74	VS	62.82	30.77	6.41	15	
3	Work satisfaction	3.66	VS	68.35	17.72	13.92	19	
4	Creating competition	3.53	VS	51.31	42.10	6.58	22	
5	Relations with workmates	3.38	S	48.06	37.66	14.28	25	
6	Giving responsibility	3.34	S	44.15	44.16	11.69	26	
7	Sharing problems and their results	3.21	S	38.46	42.31	19.23	29	
8	Social activity opportunities	3.19	S	40.26	38.96	20.78	30	
9	Cultural differences	3.18	S	36.37	42.86	20.78	31	
10	Worker participation in decision making	2.96	S	25.00	47.37	27.63	33	
11	Distance from home	2.56	SS	21.34	26.67	52.00	36	
12	Distance from population centres	2.45	SS	14.48	28.95	56.57	37	
	Average	3.28	S					

Table 5. Summary of factor results

Factor groups	Rank in total	Result
Organizational factors		
Quality of site management	1	Very important
Material management	2	Very important
Systematic flow of work	4	Important
Supervision	5	Important
Site layout	6	Important
Occupational education and training	9	Somewhat important
Economic factors		
On-time payment	3	Very important
Amount of pay	8	Somewhat important
Physical factors		
Working in similar activities	10	Somewhat important
Socio-psychological factors		
Work discipline	7	Somewhat important

productivity in construction is greatly affected by work conditions that change from project to project. A good estimate of productivity requires a careful analysis of work conditions and their impact on productivity. On the conditions that change from project to project. A good estimate of productivity requires a careful analysis of work conditions and their impact on productivity. On the other hand, it is difficult or nearly impossible to quantify the impact of work conditions on productivity. Under inadequate working facilities, no employer can expect that labour satisfactorily work. Managers, therefore, should be aware that even highly motivated and skilled operators, working under poor conditions, will not continue to produce quality work. Investment in working facilities will not only enhance operatives' performance, such as high technology equipment and replacing immediately broken, lost, or stolen tools and machinery with the new ones, but also can be used as a potential contributor in placating other concerns such as safety on site. A project manager in the present study has expressed that even working clothes are effective motivators for construction labour.

Another way of increasing productivity is the supply of information and feedback. Production means in stationary and standard industrial plants are confined within narrow limits in construction. Besides, projects and thus employers typically change, and work is geographically dispersed, because both construction projects are rarely similar and identical undertakings are virtually nonexistent. Accordingly, workforce is mobilized too quickly, and a strong relationship between labour and contractor can not be set up due to temporary employment. To be able to obtain a high project performance, however, it has a great importance to get a worker-employer or worker-manager relation based on mutual trust in attaining coordination and improving productivity. In other words, the workforce and management team share a strong and positive relationship in terms of construction performance, and, thus, an evaluation of labour resources requires joint consideration of operatives and management. For this purpose, a flexible management style and a simple organizational structure should be established in construction. Central management, lack of confidence in employees, and formalities are the obstacles to this type of management. In this point, communication is a vital aspect of organizational life. There should always be a positive dialogue between professional site staff and labour, and these staff should also keep the worker motivation high. On the other hand, conflict is predictably preponderant in industries such as construction with its proliferation of human relationships, and it is impossible to make it high continually, since morale is a concept that has different perspectives. In such cases, foremen, who constitute communication between construction workers and managers should be seriously interested in every kind of labour problems. There is no doubt, that it should not be used some sorts of communication, in which hesitation and pressure exist, but be founded a relationship comprising mutual respect to reach high levels of productivity. Especially in developing countries, such as Turkey, if the low levels of education of construction operatives, who come from patriarchal regions of society are considered, they will be very pleased with the verbal and behavioral appreciation and recognition of their contributions and efforts on the project. To this aim, the management staff on site should have neither rigid nor ignoring attitudes, but act appropriate to the social and cultural structures of workers. Meanwhile, it does not mean that the mutual respect and hierarchy will not be preserved. Many of the participants have importantly stressed that Turkish construction workers are very emotional and their productivity could be mostly improved by inciting speeches, but it is also inevitable to consider that they may misuse the sincere interest.

The last choice that can be applied to get a productivity boom by management is the selection of the right people to control certain functions. Workers are given proper guidance and motivation, increasing productivity. The qualification level of managers and supervisors is one of the vital elements determining the level of labour productivity. Experienced staff leads to proper coordination of resources of the project. Particularly in the international construction tenders, an attention is paid to the qualification of technical personnel rather than labour employed in project since the personnel is the most important factor that assures good performance of workers. Managerial errors of site engineers and managers who lack proper experience, knowledge, and management skills can negatively affect worker efficiency. Some senior engineers in this study have claimed that workers do not take such individuals into consideration, who also make labour demotivated. In addition, the upper management should clearly determine the responsibility areas or task boundaries of lower management on site. Otherwise, these staff will be demotivated, and more importantly, do not want to take any responsibility in a work environment, where dictated instructions are dominant, authorities are maximally limited, and any motivation tool is not used for them.

5.2. Material management

Problems with adverse material management conditions that consist of supplying and shipping have been cited in the literature among major causes of productivity loss. Effective material management systems are counted as taking measures against fluctuations in material prices, informing vendors or fabricators precisely concerning the desired material features, and suitable material planning and organization, i.e. logistics management. The problems that can be appeared in material management applications are the following:

- running out of materials,
- extensive multiple-handling of materials,
- Improperly sorted or marked materials, which makes to define them difficult,
- wrong or damaged materials that exceed acceptable specification tolerances, or production errors pointing to a poor quality,
- unsystematic flow of materials,

- production rates of materials in plant incongruous with those on site.

In addition to these factors, distributing materials to the desired places, when they are needed, becomes too hard, if the project, e.g. a high-rise building, is located in a densely populated urban area or in a confined area. This type of sites possesses more traffic and congestion owing to the inventory problem, which means that materials are not ready to use just in time, even if supplied. Short planning and design change durations leaving management with little time to order the necessary materials are the other common problems, encountered in the procurement process. If the duration mentioned is small, loss of efficiency tends to be much higher than when it is adequate.

Lack of material is a universal problem and has a significant degrading effect on site productivity for both developed and developing countries. Improper material planning and on-site transportation difficulties are amongst the sources of lack of material. The case appeared as a result of materials shortage and it is likely the most considerable part of material management practices related with labour performance. When an adequate supply of materials is not possible, workers try to not exhaust their current stockpile of supplies, so they may slow down their pace or output in anticipation of a delivery, resulting in idle times and cost overruns.

5.3. Amount of pay and on-time payment

Remuneration is seen as the most important reason of why an individual has to work in a job. Because it both meets the physiological needs that are the most basic requirement of people, and gives esteem in a society. The amount of pay and on-time payment is the most vital factors required to meet the first hierarchy need of Maslow. A worker, for example, will probably quit the job if a higher wage is offered by another firm. Despite Herzberg's argument that money is not a satisfier and thus not a motivator, the present survey coupled with previous works such as McKenzie and Harris (1984), Price (1992), Ogunlana and Chang (1998), and Yisa *et al.* (2000) seems to indicate the contrary. In these studies, it is supported the contention that money is one of the most powerful motivators of construction workers, while low pay levels are a major source of discontent to many construction operatives. Hence, with inadequate wages one cannot expect operatives to perform a challenging task competently. Similarly, a project manager in this survey has stated that to agree on the periods and the amounts of wage increases especially before long-run projects is a very critical subject keeping the worker's ease. Another manager interviewed, on the contrary, has mentioned that the amount of pay is not an effective factor in productivity, since nobody in Turkey is satisfied with own wages in general. However, it does not mean that determining a fair level of pay always causes high worker productivity. By another view, in the construction industry like many other sectors, pay level is usually not a motivation tool determined by taking individual productivity into consideration. This is actually not practically applicable. The production levels of all workers are accepted as similar, and thus, equal wage levels are paid. Timely payment is also one of the primary principles of any working agreement. Whilst adequate working facilities can reduce to some extent the demotivating effects of low levels of pay, delay in payment simply cannot.

5.4. Systematic flow of work (planning)

It is almost axiomatic in construction management that a project may be regarded as successful if the building is completed on time, within budget, to the specified quality standards and overall client satisfaction. Judicious planning of labour resources are the foremost agent in fulfilling these constraints. Poor planning, however, can adversely affect labour productivity through the need for rework and can result in lost time for workers, since operatives are often paid on work done satisfactorily alone. Most workers take considerable pride in the work they have accomplished that can be seen from the very start of construction through completion. For workers to go back again and take apart what has been completed can be extremely frustrating and can cause them to put forth less effort for the remainder of the work. Resource levelling is of paramount importance in planning as well. Changes in the number of labour during project should follow a gradual move since rapid changes can cause organizational mistakes and make adaptation process difficult among both workforce and management staff. Accordingly, the curves which show how number of workers changes with project duration, should be carefully studied by managers in the inception of project against the trend problem of change.

Construction labour efficiency is affected by deviations from the normal flow of work. That is, worker productivity can be estimated by analyzing, how the work flow deviates from which has been planned. Governments possess a share of about 50 % of the construction investments made in Turkey (Thieblot 2002), and thus most of the construction companies are dependent on these investments. However, the sector has been in a stagnant period since last 5 or 6 years, and cash flows or payment claims are neither regular nor on time, since governments have not appropriated sufficient funds for construction investments. In such a business and economic environment, it is not quite possible that projects are professionally planned, and that the firms take labour productivity into consideration and evaluate it in a robust manner, as emphasized by many of the participants. For instance, a member of board of directors in a firm, which specializes in hydraulic structures, has notified that 94 dam constructions in Turkey did not continue owing to lack of appropriation. Consequently, the less the difference between the real and estimated time-cost data of projects, the higher the project performance. A senior project manager in this survey has quantified that this difference in the public projects they undertook usually stayed at the levels of approximately 1 % in developed countries such as Belgium, while it went up to about 20 % in Turkey. Political concerns created in the preplanning stages of projects rather than labour productivity issues have also been denoted as the other reason of over-

runs, which exposed many half-finished constructions. On the other hand, it attracts attention that the construction firms have not been negatively cited concerning this subject in the evaluation of the participants, because they can indeed become successful when good conditions are provided, as also expressed at the above example. Nevertheless, it can be asserted that most of the companies do not still become standardized and specialized in a particular field of construction, and therefore managerial drawbacks have a strong influence on the workforce productivity. In conclusion, in today's competitive world, the construction firms, which try to perform just in Turkey, have not any chance to expand, and so lots of them have generally extended their undertakings abroad, as mentioned in the 'Methodology' section.

5.5. Supervision

To follow-up and supervise labour while working is a vital aspect of any organization because both it can result in extensions of project time and cost, and the quality on site is controlled through inspection of the work completed by the gang. In this context, labour-only subcontracting makes some aspects of site management more difficult. The supervision level of labor-only gangs tends to be lower than that of employed workers, and the general contractor has little control, at best, over subcontractors' workforce. In other words, the lump poses the problem of which lump workers cannot be controlled, while firms possessing employed workforce have their own effect on labour relations. Moreover, subcontractors have no control over other subcontractors' labourers.

The number of site engineers, whose primary function is to supervise, changes in proportion to site area and project characteristics. Therefore the quantity of workers inspected and the responsibility area of each supervisor should be at the optimum level. Meanwhile, it is also very advantageous and effective on labour that top managers audit the works ion site at intervals. Proverbs and Holt (Proverbs, Holt 2000), however, claimed that shorter completion times were a feature of longer periods of relaxation and require reduced supervisory numbers. Supervisor's incompetence is another phenomenon. Labour is highly critical to the inspection personnel and questions of their competency. Questions of workers about tasks should be accurately replied by inspectors as quick as possible; waiting for the answer is so bad for the project in terms of authorities and images of these staff, reducing the work quality. Supervisors' communication with labour has a supreme importance as well. It is a fact that workers feel embarrassed and pressed with the existence of tight audits. Multiple tiers of field supervision reduce overall crew efficiency. To control workers periodically by making them aware of the existence of inspectors rather than to wait close to them without leaving is the most favourable method of supervision, as was specified by 30.49 % of the respondents. The technique mentioned should not be interpreted as poor supervision, but be perceived as a fundamental principle of labour management. In this point, piece-work or task basis supervision will be ideal. On the other hand, a smaller span of control has been shown to foster worker's interference (Thomas *et al.* 1990) and to impair construction productivity (Horner, Talhouni 1990). In the present survey, it was similarly revealed that 59.76 % of the participants control their labour uninterruptedly. 9.76 % of the companies, however, ignore the control mechanism and supervise the workforce at random.

5.6. Site layout

Layout can influence productivity and enhance space management capability. It defines the location of the tools and supporting utilities for optimum product flow, and thus has a direct impact on the facilities' time and cost of construction. In this context, the location of the management office has a strategic importance as well as worker dormitories on site, especially there are many shifts that may cause loud noise and thus a possibility to sleep.

5.7. Work discipline

One of the primary conditions for improving systematic working habits is to have a complete work discipline on site. Discipline can be defined as a concept that determines the human being behaviour by means of reward or punishment. This concept becomes more important in Turkey, since workers in the construction sector are still composed of individuals coming from the rigid regions of patriarchal society. The basic rule of keeping discipline among the workers is that the work discipline of management staff is at the top level. It has a vital aspect that these staff members start working before the workers and finish it after them. Site managers should also pay attention to using their authority on workers according to a personal plan, which has to conform to their characters. However, work discipline will not be able to be kept in any case, if workers have not any job responsibility or working ethics. In this situation, a project will likely be unsuccessful, if site manager does not take any precaution.

5.8. Occupational education and training

Vocational education, particularly in developing countries, is the total of activities, which enable the reasonable employment of unskilled labour by educating and directing them to vacant fields of labour market, to regulate and control those who come from farming and do not have any continuous working habit. Poor productivity and high costs in every branch of industry are due partly to low levels of training. Lack of occupational education in construction is now a reality in many countries around the world. For instance, there is currently a lack of formal training in construction in the US – the lowest of any major sector of the economy (The construction...1997). According to Allmon *et al.* (2000), this lack of job training is due to the increased percentage of non-union work. Increasing levels of non-union journeymen naturally cease any educational process. In the same way, an educational problem created by migrant labour, coming from abroad, does exist in Germany, although to be trained as a

qualified worker in Germany, one must first complete at least a 3 year training course and then take a professional association examination (Syben 1998). On the other hand, construction workers in Turkey are composed of unqualified and uneducated individuals, in general. In a business environment, where little educated people are employed as a craftsman, workers are mostly educated only by the apprentice-craftsman relationship on site, but this type of relation, which is in fact essential under normal conditions,becomes meaningless, since craftsmen are also uneducated. Inexperienced workers bring about large amounts of resource waste such as material, equipment, and tool until they are trained, and thus the triple constraint of project, i.e. cost, time, and quality, is directly influenced. Shortage of high-quality foremen, who are intermediate employees as both top-level workers and first-level managers, is the other problem concerning occupational education in Turkey, as stated by the respondents. Several ways of finding a permanent solution to these problems are available, but the most sensible one may be occasional short training programs or day-release courses and seminars in educational establishments in support of firm managers, employers' associations, trade unions, societies of engineers and architects, universities, and governments. This solution, however, has a serious disadvantage. Whether or not construction companies undertake the financial loan of their current labor is a big question mark because the workforce in construction is generally highly mobile. For this reason, contractors are often reticent to invest capital to train those who may soon be someone else's employees, which may result in a decrease in the construction workforce's average capability level. The answer in this phase is that governments should accept all the educational expenses incurred by the firms in proportion to their scales and financial structures as an input in improving productivity, and in this way, as a tax deduction on money spent for training, because the return on investment from craft training occurs well within the first year (Thieblot 2002). On the other hand, some participants have explained that they try to educate labour internally in the form of the training of 3 days for unskilled workers, a week for helpers, and half a month for skilled workers, even if the mentioned application is so simple.

5.9. Working at similar activities

To work constantly in the same or similar activities in the construction sector, where tasks vary in a very wide spectrum, or, in other words, to have a complete experience in one trade is one of the key elements guaranteeing the work to be performed by a worker in a definite standard. Experience is the warranty of success and productivity in any job. Working with experienced crews in the sector has many advantages. If experienced labour is known to be available, supervisors do not have to explain details of how to perform the tasks to experienced workers. Moreover, an estimator can foresee that the learning curve will not be significant, and productivity and quality of work will be better than those of a new or inexperienced worker. As the skill levels and experience of fellow workers increase, job-site safety and health concerns are likely to decline. This, in turn, may reduce workers' compensation costs and insurance costs in this industry. As a result, sustainability of the productivity level of construction workers now depends completely on specializing in a craft whatever are their positions as skilled or semi-skilled workers. On the other hand, experience and seniority concepts do not necessarily go hand in hand because the number of years that someone has been working in an industry may not be as relevant as the specific activities performed, and, thus, the quality and diversity of the work performed is far more important than the number of years in a particular position.

6. Conclusions

In this study, 37 factors influencing construction worker productivity in Turkey were examined by bringing them together in 4 main groups constituted from organizational, economic, physical, and socio-psychological factors. The most effective group among them was statistically determined as the organizational factors with a 'very significant' effect (4.06), followed by economic (VS-3.81), physical (VS-3.46), and socio-psychological factors (S-3.28). From the obtained results it is clear that organizational factors unexpectedly have a stronger effect than economic and socio-psychological ones which are actually the first two groups remembered, when workforce productivity is the point in question. Even if this is directly connected with the application of questionnaire to professionals and thus with denoting the managerial viewpoint, it is clear that the importance of organizational management is now perceived at the top level in developing countries. Economic factors are still of supreme merit, as was in the past, and they will likely preserve their position in the future research related to the labour productivity. The fact that socio-psychological tools have the lowest importance index among the groups seems quite normal in terms of displaying the work atmosphere in a developing country, if Maslow's need hierarchy is considered. In this context, construction managers require to change their sights. Consequently, despite the fact that a classification technique was applied to attain more concrete data in the present study, it is naturally impossible to distinguish one group from another or to assert that they each are entirely independent groups. The most evident proof of this judgment is that the relative importance indices of these 4 groups change within just an interval of 0.78 which almost represents one scaling expression. The notion that serves to guide in the problem solution is to consider these 4 groups totally. It does mean that motivating workforce can be best achieved by improving motivating factors and eliminating demotivating ones simultaneously, and the increase in motivation factors should always be accompanied by decrease in demotivation. At this point it is essential to distinguish that, if significant demotivators remain, it will be simply a vain attempt to try to nurture motivating factors. Applying the questionnaire to only management staff resulted in evaluating the productivity issue by one-sided perspective. However, it is generally acknowledged that foremen and craftsmen

are more knowledgeable about labour productivity problems than their supervisors, although managers consider construction labour productivity to be under their control rather than at the mercy of the construction industry environment. In this point, to improve the topic by one more step, the succeeding survey is planned to apply to the other side, i.e. workers.

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PAGRINDINIŲ MOTYVACIJOS VEIKSNIŲ ĮTAKA STATYBOS PRODUKTYVUMUI TURKIJOJE

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Santrauka

Šiuo metu vienas iš svarbiausių veiksnių, lemiančių bet kokios įmonės produktyvumo augimą ir konkurencingumą rinkoje, yra žmonių ištekliai. Produktyvumo augimas gali būti pasiektas tik efektyviai ir optimaliai naudojant šiuos išteklius. Efektyviai naudoti žmonių išteklius įmanoma nusistatant aiškius ir suprantamus kriterijus veiksniams, darantiems įtaką darbui. Šio tyrimo tikslas yra nusistatyti, apibūdinti ir išsamiai išanalizuoti veiksnius, veikiančius statybos darbo produktyvumą. Norint surinkti reikiamą informaciją, buvo ištirtos 82 įmonės. Remiantis gautais rezultatais, buvo prieita prie išvados, kad efektyviausia veiksnių grupė yra organizaciniai veiksniai.

Reikšminiai žodžiai: motyvacija, statybų darbai, produktyvumas, Turkija.

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