Differential teamwork performance

The impact of general and specific human capital levels

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Introduction

In modern economics, it has been quite obvious that, as a prerequisite for success, firms have to design incentive methods to encourage workers to put more effort into their work. Incentive schemes, e.g. bonuses or pay-by-results, are widespread. Human resource managers, however, are preoccupied with trying to identify the "best" plan.

Many different factors are involved in determining and affecting the productivity of a firm. Certainly, labour is central to this question and many studies have been made of the impact of employee motivation on productivity.

Reports on the introduction of incentive schemes indicate positive economic returns to both firms and workers, ranging from 0 to as much as 43 per cent (Fein, 1973).

Edwards and Heery (1985) report that when a group incentive scheme was introduced in the UK National Coal industry, worker productivity increased and industrial disputes were reduced.

Even if we could find the "optimal" incentive plan, however, the question remains as to whether it would have the same impact on all the teamwork groups. Very little research has been done to identify the reasons for different results among teamwork groups operating under the same incentive plan.

Keller (1986) found that, among 32 project groups in R&D firms, group cohesiveness had a positive relationship with group performance, and that it was the strongest predictor of performance.

The focus of the present study is twofold: first, to determine if, from an organizational perspective, an incentive scheme increases the utility to the firm; and, second, based on Becker's (1975) classification of general human capital (GHC) and firm-specific human capital (SHC), if workers embodying higher human capital levels represent higher productivity, compared with those of lower human capital levels.

Literature review
Motivational theories
There are several theoretical approaches underlying a firm's strategy to raise the motivation of its employees (Cascio, 1989). One is that a worker will exert more effort if a personal physical or psychological need is being satisfied. Such theories include Maslow's (1954) hierarchy of needs, Herzberg's (1966) two-factor theory suggesting that satisfaction of needs causes either job satisfaction or lack of job dissatisfaction, and McClelland's (1961) classification of needs according to intended effects.

A second approach stems from "reinforcement" theories such as the Law of Effect (Skinner, 1957), which states that behaviour that is rewarded is behaviour that is repeated. Reinforcement theories emphasize the objective relationship between performance and reward.

Finally, there are "expectancy" theories (Vroom, 1964), which stress the perceived relationship. Expectancy theory is composed of three elements: the valance, or value, attached to rewards; the instrumentality, or the belief that the worker will receive the reward; and, the expectancy, or the belief, that the worker can, through greater effort, improve performance and thus earn a greater reward. Utilizing one or several of these theories, organizational incentive schemes are designed to increase worker motivation and productivity.

Pay incentive schemes are an application of the three approaches, suggesting higher rewards for higher performance.

Review of incentive schemes
The relative advantages and disadvantages of the different types of incentive schemes have been the focus of a great deal of research.

Walker (1992) suggested types of rewards that may be distinguished by their relationship to performance. He cross-tabulated financial and non-financial with contingent and non-contingent rewards. Incentives are referred to as financial and contingent rewards.

Various types of incentive plans are available to a firm. One rewards individual workers on the basis of agreements arranged especially with specific employees. The firm may also choose to set up a system whereby whole teams of workers are offered rewards on the basis of combined output. These teams are thought of as including a fairly small number of workers who generally represent a fraction of the total workforce hired by the company. Alternatively, some companies have schemes that provide incentives realized on a company-wide level; i.e. the individual worker gains bonuses on the basis of the overall performance of the entire company.

One type of incentive plan, which targets the individual worker, is based on the "piece-rate" system, whereby workers get paid for what they actually produce. Edwards (1979) showed that this kind of scheme was ineffective, because management did not know what rates to set (i.e., workers have private information about the difficulty of their jobs that is often unknown to management), and Clawson (1980) added that management cannot use workers'

past performances to determine piece rates because the workers would then have an interest in keeping their production lower than their actual capability. Gibbons (1987) formalized those two claims, concluding that, "piece-rate compensation schemes will not translate labour power into labour because workers will restrict output". Individual rewards such as piece-rates and sales commissions have proved to be effective, however, when they fit the type of work at hand (Cascio, 1989); but they do not fit, for example, assembly lines that require high performance levels from a group of workers in tandem.

Group incentive schemes can take several different forms. Studies by Marriott (1949) and Schwab (1973) found that employees operating under individual incentives were more productive than those under group schemes; but London and Oldham (1977) assert that these results were obtained because the studies only included group schemes that rewarded workers on the basis of the performance of the average worker in the group.

Steiner (1972) presented two alternative suggestions: pay accruing to all group members on the basis of the highest performer in the group; and pay accruing on the basis of the lowest performer. His study showed that, in a two-person work group, overall performance was highest when the lower performer was paid on the basis of the higher performer, rather than vice versa. Steiner (1972) also compared his two alternatives with an average performer basis, an individual incentive basis, and a fixed-rate payment system. He noted in his findings that, when the worker was most disadvantaged (i.e., he performed at a higher level, but was paid on basis of the lower performer), goals and performance were not affected.

Group schemes have the advantage that they encourage co-operation among group members, as opposed to competition between individuals; in both cases, employees are supposed to be working towards a common product. Such schemes also make it possible to reward "indirect labour" which does not necessarily get noticed under individual schemes. For example, maintenance workers keep production machinery in working order to allow other workers to produce the actual goods, but they themselves do not actually produce anything new; thus, their contribution could be overlooked unless the whole team were rewarded in common. In contrast, group schemes have the disadvantage that they may generate unnecessary competition between rival groups within the company. Also, workers may fear that overproduction as a group could lead to cuts in their incentives, and they may choose to temper their productivity. Another problem is that workers may fail to see their own contribution to the final product if they are rewarded only as a group, and may thus lose the motivation to try harder. Considering these advantages and disadvantages, group incentives are most appropriate when jobs are highly related.

Incentives can also affect all the workers hired by a company in a company-wide fashion. One example of this is the Scanlon plan, which is designed for union-management co-operation. The first element of this plan, the ratio, is computed by dividing the total payroll by the sales values of production. This is used as a measure of performance and is usually around 40 per cent, but this

can vary between companies. The next element, the bonus, depends on reduction in costs below the present ratio; for example, 75 per cent of the bonus might be split among employees and the remaining 25 per cent given to management. Each employee's salary is determined as a percentage of total labour costs. Another element is the production committee system, whereby each department appoints two to five workers plus a supervisor to a body whose responsibilities include efforts to raise efficiency of the department and passing on suggestions to higher levels of the hierarchy. The final element, the screening committee, has eight to 12 members representing the workers and top management, and reviews suggestions from production committees. This system can be efficient, but does not work well in piece-work operations and can make managers feel uneasy about the fact that they are giving up their prerogatives and letting unions into business planning (Cascio, 1989). White (1979), who looked at dozens of companies where this plan was executed with differing measures of effectiveness, cites the factors affecting the success of the plan as being:

- employee perception of their own participation;
- managerial attitudes;
- age of the programme in a company;
- expectations of the plan; and
- whether an executive takes a leading role.

Are incentive schemes efficient?
Several studies attempted to identify organizational factors influencing the success of the incentive scheme and comparing the effectiveness of different types of incentive plans (Lawler, 1971). However, empirical evidence is mixed. Bass (1960) demonstrated that group bonus systems are an improvement over individual ones. Similarly, Babchuk and Goode (1951) reported on a sales group that converted its incentive scheme from an individual to a group basis and was more productive after the change. Conversely, Marriott (1949) claimed that production tends to decrease as the size of the work group increases, and that workers paid on an individual incentive basis are more productive than even the smallest groups.

Farr (1976) constructed a combined individual-group incentive plan on the assumption that the positive elements of each would yield an even higher level of productivity than any single plan. Indeed, he found that the productivity level was higher under the combined plan; the results showed, however, that workers considered it the least fair. Shirom and Mar (1991) concluded in their study that different types of wage incentive plans, on individual and group, as well as on organizational scales, were complementary to one another and not, as they had expected, competitive. Results from Mannheim and Angel (1986) showed that a variable called work-role centrality (WRC) is highest under individual incentive schemes and lowest for group schemes, with fixed wage systems falling in

between. Some of the elements that determine the value of WRC coincide with those one might expect to result in higher productivity (e.g. importance workers attach to the success of their work), but others may not be relevant (e.g. respondents' ego identification with work roles).

Factors related to incentive schemes
A number of experimental studies have hypothesized the relationship between incentive schemes and certain factors such as job satisfaction and performance. Parnell (1991) stated that laboratory and organizational research shows that pay based on performance increases job satisfaction, increases productivity, reduces absenteeism, decreases voluntary turnover, and improves the quality of the employee mix. Frisch and Dickinson (1990) showed work productivity as related to monetary incentives by comparing the performance of workers functioning under no incentive scheme with that of workers whose firms had schemes providing for 10, 30, 60 or 100 per cent additions to base pay on the basis of performance. The results showed a significant difference between workers who had an incentive scheme and those who did not; but, interestingly, the size of the bonus did not seem to make a difference.

Locke *et al.* (1981) looked at goal setting as a measure of performance, concluding that the relationship is very robust. They suggested that the effectiveness of goal-setting arises from at least four mechanisms:

(1) directing attention and action;

(2) mobilizing energy expenditure or effort;

(3) prolonging effort over time; and

(4) motivating the individual to develop strategies for goal attainment.

Other factors affecting worker performance include job satisfaction, goal difficulty (Locke, 1968), goal specificity, etc. The claims of Locke *et al.* (1981) regarding properly constructed incentive plans also seem reasonable.

Incentive schemes and worker's human capital
One of the relationships left unclear by the studies is the one between the worker's human capital level and the utility derived from the introduction of an incentive scheme. Do human capital proxies, such as education and job tenure, play a role in determining performance, and thus the success, under an incentive scheme? An indirect relationship may be deduced from the survey by Locke *et al.* (1981) of field experiments on relationships between human capital and goal setting. While that work did not, for the most part, involve incentives *per se*, it is still arguable that an incentive itself is a goal towards which a worker strives; thus, findings relating human capital to the goal-setting process suggest a similar relationship between human capital and the effectiveness of incentive plans. Of those studies mentioned by Locke *et al.* (1981), many showed that higher education levels do make a difference, resulting in higher performance levels, greater relevance of goal challenge in determining

performance levels, and higher levels of goal setting (i.e. better educated workers set harder goals for themselves). An interesting twist to the idea of relating the success of incentive schemes to education levels of employees is provided by the work of Rinella and Kopecky (1989), examining a plan whereby a fast-food chain offers their employees incentives to remain in school. They found that employee turnover rate dropped from 179 per cent to 38.7 per cent and productivity increased.

On the question of job tenure, Dachler and Mobley (1973) found a significant relationship between stated goals and productivity only for employees with at least a year of experience at that job and not for shorter-tenured employees. However, Locke *et al.* (1981) noted that other studies found no moderating effect from job tenure in the goal-setting process.

Allen *et al.* (1988) did not find evidence for the previously reported curvilinear relationship between performance and tenure. However, they found that long-term teams performed better than short-term teams.

Theoretical hypotheses

Based on the above review, an attempt was made to study two facets: first, the organization's benefit from the introduction of an incentive scheme; and second, to identify correlates that might explain differential utility for the firm.

The first facet was approached by a "cost/benefit" analysis, while the second was approached by measuring the relationship between different human capital levels and the different utility derived from the introduction of an incentive scheme.

It was hypothesized that the utility of introducing an incentive scheme into an organization increases with the level of the human capital of the employees. This hypothesis, which was based on differential goal setting, perceived future organizational promotion prospects and the relative rewards system to be superior for workers of higher human capital.

Accordingly, two empirical hypotheses were suggested for the present study, based on the "expectancy" concept. The two hypotheses are related to firm-specific and general human capital. The underlying rationale is that workers' perception that they will receive monetary or non-monetary rewards for increased production can result in increased effort. This study attempts to identify those who are likely to increase their production.

> *H1*: Teamwork groups embodying higher levels of education will show greater performance to the firm.

In this case, the level of education represented general human capital level and was measured by years of schooling, whereas the organization's utility was measured by cost/benefit results of the incentive scheme.

> *H2*: Teamwork groups with longer years of service to the same employer (tenure) will show higher performance.

In this case, longer tenure represented more firm-specific human capital, whereas greater utility was measured by higher cost/benefit results of the incentive scheme. The rationale behind this hypothesis was that workers with longer tenure have invested their human capital in the firm and represent, on the one hand, more efficiency acquired during the years of work experience with the same employer, and, on the other hand, more attachment to the firm, which would produce more motivation. Moreover, those with longer periods of employment with the same employer would be less inclined to leave, since the cost of leaving increases with tenure.

Method
Service organizations in the public sector face substantial difficulties in determining the required production from their workers. Since, in this case, it is difficult to measure production directly, one of the alternative measurements focuses on the necessary "input", in terms of number of hours required to perform the job. If the worker or teamwork group manage to accomplish the job in less time, it is possible to calculate the excess efforts made by the worker, and accordingly to construct a reward system linked to the savings made in terms of less invested hours. This is the case in the present study.

A company of industrial engineer consultants was hired to design and introduce the incentive scheme plan. The high reputation of this group made it easier for the workers to accept their plan. Details of the techniques used by these experts are out of the scope of this study; nevertheless, the most relevant part is presented in Tables I and II.

Sample
Data were collected in 1990 on 65 workers employed in one of the largest municipalities in Israel. These non-secretarial workers were employed in five departments. Within each department there were several teams, ranging from two to six workers in each of the 20 teamwork groups. The type of their duties under the incentive scheme was quantifiable in terms of required working hours to accomplish the job.

Department	Numbers of workers	Hours worked	Premium hours	Total hours paid	Production value	Performance ratio
A	7	14.893	2.434	17.327	17.564	1.01
B	8	13.095	1.038	14.133	18.676	1.32
C	34	77.532	19.150	96.682	106.400	1.10
D	5	11.220	1.457	12.677	14.236	1.12
E	11	24.684	6.171	30.855	38.261	1.24
Total	65	141.424	30.250	171.674	195.137	1.14

Note: Performance was measured by a cost/benefit ratio, which means the pay-off for the firm

Table I.
Performance
ratio by
departments

Department	Teamwork groups	Number of workers	Performance ratio	Level of education	Seniority
A	Overall	7	1.01	7.3	3.3
	1	2	0.99	6	2.5
	2	3	1.03	8	4.5
	3	2	1.00	8	3.0
B	Overall	8	1.32	13.3	13.6
	1	4	1.324	14	14.0
	2	2	1.383	14	15.0
	3	4	1.264	12	12.0
C	Overall	34	1.10	9.5	6.0
	1	4	1.168	10	8.5
	2	4	1.04	10	5.0
	3	6	1.06	8	6.0
	4	6	1.12	9	6.0
	5	5	1.16	12	7.5
	6	3	1.06	8	5.5
	7	3	1.12	10	7.0
	8	3	1.02	9	2.5
D	Overall	5	1.12	10.5	6.5
	1	3	1.13	11	6.5
	2	2	1.10	10	6.5
E	Overall	11	1.24	12.5	10.1
	1	3	1.25	13	11.5
	2	2	1.20	11	9.5
	3	2	1.14	12	7.0
	4	4	1.29	14	12.5
Total	20	65	1.14	10.6	7.9

Table II.
Performance and "human
capital" by teamwork
groups

The mean education level was 10.5 years of schooling and ranged from a minimum of six to a maximum of 14 years. The mean years of tenure (work experience) with the current employer was 7.6 years.

Study design/procedures
The study employed a two-stage strategy. First, from an organizational perspective, a cost/benefit analysis was performed to assess the utility of the introduction of an incentive scheme. The "cost" was calculated as the team's number of hours worked plus the premium hours payed to the workers; the "benefit" was defined as the "production value" in terms of number of hours; and the ratio will be referred to as "performance". The results were compared on a departmental level.

Second, for each team, performance was calculated and related to the workers' education and tenure. Higher performance indicated greater "utility" to the organization.

Variables and measures definition

- *Dependent variable* – the focus of this analysis was on the differential utility of the incentive scheme, as predicted by proxies representing different human capital levels. As such, the "utility" was defined as the percentage of performance higher than the determined "work norm", and calculated for each one of the departments, as well as for each of the 20 groups (see Table I).

Independent variables

- *Education level* – the level of education was measured according to the average number of years of schooling of the team members, indicating the level of GHC.

- *Tenure* – tenure was measured according to the average worker's experience as represented by work tenure and indicated the SHC.

- An *interaction effect* was calculated by multiplying the average number of years of schooling by the workers' tenure.

Results

The first question under examination was whether the organization benefited from the introduction of the incentive scheme.

Table I presents the performance results on the organizational and departmental levels.

The performance at the organizational level subsequent to the introduction of the incentive scheme increased by 14 per cent.

On the departmental level, the performance ratio varied from 1 up to 32 per cent. Moreover, when the 65 workers within the five departments were sub-divided into 20 teamwork groups, different performance results were obtained for each of the teams (see Table II).

Descriptive statistics and Pearson correlation

At this stage it was clear that the teamwork groups performed differently. Thus, the statistical analysis concentrated on the relationship between the performance and both the level of education and tenure. Table III presents means and standard deviations of the utility of the cost/benefit analysis for the 20 teamwork groups and the human capital proxies for the statistical analysis.

Bivariate Pearson correlations showed positive and significant correlations between performance and both the level of education and job tenure.

Multivariate regression analysis

To test the concurrent impact of the worker's educational level, tenure, and the interaction effect on performance, a multiple regression analysis was performed for the 20 teamwork groups.

The regression equation was of the following type:

$$Y = \beta_0 + \beta_1 x_i + \beta_2 z_i + \beta_3 w_i$$

where:

Y = performance

β_0 = constant

β_1 = coefficient of the level of education

x_i = GHC by average years of schooling

β_2 = coefficient of tenure

z_i = firm SHC represented by tenure

β_3 = coefficient of the interaction effect

w_i = interaction effect of education and tenure

No.	Variables	Means	SD	1	2	3
1	Performance ratio	1.14	0.11			
2	General human-capital	10.45	2.30	0.916 (0.0001)		
3	Firm-specific human-capital	7.62	3.70	0.986 (0.0001)	0.889 (0.0001)	
4	Interaction effect	0.86	0.58	0.985 (0.0001)	0.922 (0.0001)	0.986 (0.0001)

Table III.
Summary of statistics, means, SD, Pearson correlation coefficients

The results presented in Table IV show that the estimated coefficient of tenure was positive and significant ($\beta = 0.024$; $t = 11.09$), and the estimated coefficient of the number of years of schooling was positive and significant ($\beta = 0.009$; $t = 2.52$). The interaction effect was not significant ($\beta = 0.239$; $t = 0.91$). The model was significant ($F = 283.81$; $p = 0.0001$) and the explained variance was 97.8 per cent.

Discussion

Organizations constantly attempt to develop strategies to increase their workers' performance in order to increase productivity and thereby increase their firm's success. Psychologists who concentrate on non-monetary rewards

Variables	Coefficient	Tenure	Significance
Intercept	0.862	35.97	0.000
Years of schooling	0.009	2.52	0.022
Tenure	0.024	11.09	0.000
Interaction effect	0.239	0.91	0.373
Note: Explained variance (R^2) = 97.8			

Table IV.
Results of regression analysis for performance

suggest that work satisfaction, commitment and loyalty to the firm are the principal motivators, while economists consider monetary rewards as the most important. From a review of the available literature, however, it may be seen that an explanation is lacking for the differential levels of performance among teams in a firm who have similar duties.

The results of the present study reconfirmed the payoff of introducing incentive schemes – productivity increased by 14 per cent, and showed different performance levels among the 20 teamwork groups.

The results of the bivariate and the multivariate analyses confirmed significant relationships between performance and both level of education and tenure. The interaction effect of the level of education and tenure was not significant, probably because of colinearity problems.

The positive relationship between tenure and performance may be related to several possible explanations. First, labour economists argue for the worker's gradual increase in efficiency acquired during his years of job experience with his employer. Moreover, job separation is less likely to occur as the worker acquires his firm-specific non-monetary and monetary rewards; consequently, his organizational commitment and survival within the organization should increase, and may result in higher productivity. In contrast, those with shorter tenure may decide that job separation for them would be less costly, with the result that they may produce less effort in their jobs.

Social psychologists advocate the positive relationship between tenure and performance by focusing on group cohesiveness (Keller, 1986). Their argument may be that the likelihood of teamwork members working together for many years may develop group solidarity and mutual responsibility, which may result in higher group productivity.

The positive impact of the level of education on the level of performance may be explained by the anticipated higher returns for higher levels of education (see Weisberg, 1995).

Although not tested in this study, it was observed that, in this specific organization, labour turnover among those of lower education was greater and the organization faced problems of labour retention. This observation receives some support from the high positive correlation between level of education and tenure.

Finally, we would like to recommend that this study be extended into other organizations and include additional "human capital" and personal characteristics. The major conclusion of such studies may be towards the relative utility of designing incentive scheme plans in organizations.

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