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Productivity from Within

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1. INTRODUCTION

Productivity is one of the main objects of attention of industrial and organizational psychology and business studies. It is affected by both human and non-human factors. In this article we examine the influence of variables representing aspects of human individuality and working environments.

Though there have been numerous direct studies of factors influencing productivity (Weyant, 1986), most (see e.g. Locke, 1965) have considered the effect of just a single independent variable, and none of the relationships found — except for certain highly theoretical mathematical models of group productivity (Steiner, 1972; Shiflett, 1979) — pretend to be explicative. Most research into productivity has in fact approached its goal indirectly by investigating job satisfaction, which is itself notoriously difficult to define and quantify (some authors have attempted to measure job insatisfaction objectively in terms of absenteeism or the turnover of workers in a particular job, while others have tried to relate workers' perceptions of their roles in their job to idealized models of such roles). In this article we approach productivity directly by examining the influence of numerous psychosocial variables on objective productivity values calculated for its employees by a large company for internal purposes. Knowledge of which variables affect productivity in a particular kind of job, and how much, would suggest objective criteria for control of variables affecting the working climate within a particular company; allow objective evaluation of the suitability of candidates applying for jobs of this kind; and possibly also allow a more rational approach to the study of job satisfaction.

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2. METHOD

2.1. *Subjects and procedure*

The subjects were 267 repairmen working in one of Spain's largest shipbuilders, Astano S. A. Scales were applied to groups of thirty or so in rooms forming part of the company's training facilities. Each group was addressed by both a member of the management and a workers' representative, both of whom assured the subjects as to the scientific aim of the exercise so as to remove any motivation for handing in false data. The subjects then wrote down their age, trade and category (but not their name); filled in the MAE and WES scales (see below); and finally noted whether anxiolytic drugs were taken by they themselves (one question) or any relative living with them (another question), and if so to what extent (on a scale of 1 to 7). The values of both questions

were added. Values of the dependent variable, productivity, were supplied by the company.

2.2. *Scales*

The Work Environment Scale (WES) devised by Moos et al. (1984) at the University of Stanford comprises 90 true/false items designed to measure three dimensions: relationships, self-fulfilment and stability/change. The relationship dimension is itself composed of three sub-dimensions: involvement (the degree to which employees are concerned about and committed to their work), cohesion (the degree to which employees help and encourage each other), and support (the degree to which management helps and encourages employees so as to achieve a healthy working climate). The self-fulfilment dimension is composed of the subscales autonomy (the degree to which employees are encouraged to be self-sufficient and rely on their own initiative); organization (the degree to which good planning, efficiency and task fulfilment are emphasized); and pressure (the degree to which the working climate is dominated by urgency or a feeling of pressure). The components of the stability/change dimension are clarity (the degree to which working rules and plans are explained so that workers are aware of the daily tasks to be fulfilled and their context), control (the degree to which management uses regulations and constraints on employees to control them), innovation (the degree to which variety, change and new approaches are encourged) and comfort (the degree to which the physical environment contributes to a pleasant working climate).

Pelechano's (1975) Motivation and Anxiety in Execution (MAE) scale consists of 72 yes/no items measuring two main factors: motivation (comprising the subscales overwork, estrangement, self-demandingness and ambition) and anxiety (comprising inhibiting anxiety and stimulating anxiety). The 11-item overwork scale contains questions concerning both objective aspects of the working environment and the worker's personal attitude to these aspects; high scores are generally associated with high productivity. The estrangement scale measures the subject's indifference towards his or her work and the degree to which life at work is divorced from home life; high scorers with low IQ's have little interest for their work but nevertheless tend to take it personally, and though nothing in the way of initiative can be expected of them, they perform undemanding jobs well; high scorers with high IQ's may have creative talent. The seld-demandingness scale measures whether the subject has a positive attitude to his working environment and strives to do his work better. The ambition scale is harder to define than the overwork or estrangement scale, but as with the latter, high scores are generally associated with high productivity. The inhibiting anxiety scale evaluates situational factors tending to cause negative reactions to stress. The stimulating anxiety scale, which is to some extent correlated with certain general intelligence tests, identifies personal traits that are known to facilitate positive response to stress; high scores generally indicate good performance in abnormally dynamic situations, and are generally obtained by restless, diligent persons.

2.3. *Analysis*

The multiple regression of normalized productivity on all the subscales and personal variables was calculated, and stepwise multiple regression analysis was then performed. Finally, Wilks' discriminant analysis method was applied to all the independent variables jointly to determine a function discriminating between workers with below-average and above-average productivity.

3. RESULTS

Almost 55% of the variance in productivity was jointly explained by the independent variables considered (Table 1). The three variables identified by the stepwise regression analysis as relevant at the .0000 level (use of anxiolytics, and the WES variables control and clarity) accounted for successive cumulative proportions of productivity variance of 11%, 20% and 31% (Table 2); the large absolute value of the coefficient of the use-of-anxiolytics term, .50634, is particularly striking. At the .05 level, the effect of age is also significant, with a coefficient of -.01777.

TABLE 2

Stepwise Multiple Regresion
Dependent Variable: Productivity

Variables	B Coefficient	R^2	E
Use-of-anxiolytics*	-.50634	11 (11%)	.16
Control*	-.07764	.1999 (19.99%)	.15
Clarity*	.08017	.3109 (31.09%)	.13
Age**	-.01777	.3712 (37.12%)	.14

*P = .0000
**P = .05

As well as use of anxiolytics, control, clarity and age, discriminant analysis found the WES variable innovation and the MAE variable ambition to be relevant at the .0000 level (Table 3). The discriminant function obtained successfuly classified 79% of the subjects as of below-average or above-average productivity, with the two groups having centroids at -1.623 and +1.986 respectively. Use-of-anxiolytics, age, control and ambition all contributed negatively to the value of the function, and clarity and innovation positively.

TABLE 1

Multiple Regresion

	R^2
All independent variables considered	5496 (54.96%)

TABLE 3

Wilks' Discriminant Analysis

Variables	Function
Use-of-anxiolytics	-.72215
Clarity	.58127
Innovation	.50886
Age	-.32913
Control	-.30767
Ambition	-.29775

Cases correctly clasified = 79.10%
DF = 6
$\chi^2 = 29.704$
$\lambda = .63$
P = .0000

4. DISCUSSION

Since most of the workers involved in the study were aged over 30 years, the negative effect of age on productivity was to be expected for work (shipyard repairs) involving physical effort (see e.g. Hazzard, 1986). It would be interesting to determine to what extent, if any, age-induced deterioration in productivity is counteracted by experience and familiarity with the job (most of the workers in this study had belonged to the shipyard for many years).

Likewise to be expected was the negative effect of the use of anxiolytics. This was the single variable most affecting productivity.

The at first sight surprising finding that the ambition dimension correlated negatively with productivity seems likely to be due to the items in this scale (e.g. «I think I'm fairly ambitious», «I've always been thought of as ambitious», «Even at school I was determined to go far») being aimed at ambition «in the large» rather

than at goal-directedness in specific situation. Workers who are ambitious in the sense of the scale may well experience frustration, leading to reduced productivity, in undemanding jobs with little social prestige. Though Pelechano (1975) found positive correlation between his ambition scale and productivity, he himself warned that the relationship between the two must be far from straightforward.

The sense of frustration hinted at by the ambition results may also mediate the negative correlation between control and productivity. The large proportion of supervisers in Astano, and the close monitoring of individual productivity, may actually reduce productivity by intimidating employees; less direct control would appear to be advisable.

A priori, the productivity of an individual depends upon both his own qualities and the environment in which they are applied; of the variables considered in the present study and found to affect productivity, the personal variables are use of anxiolytics, age and ambition, and the environmental variables clarity, innovation and control. The extent and direction of the influence of both kinds of factor may also be assumed to depend on the particular kind of job being considered, since increasing age, for example, though reducing productivity in physical work, may be expected to improve productivity in jobs in which experience is an advantage, such as managerial or scientific work; while the level of control required in nursing, say, may be contraproductive in door-to-door vending. Furthermore, if productivity depends upon some factor F non-linearly (age and control, for example, seem likely to be variables of this kind), then the correlation obtained in a study carried out in a single company or workplace will depend on the average position FO of that company or group of workers on the corresponding scale, since what the correlation estimates is the tangent to the productivity-F curve at FO. Thus in a company in which control is too lax, the productivity of individual workers may increase with the degree of control experienced, whereas in a company in which control is too tight (Astano appears to be a case in point) the correlation will be negative; and similarly, the correlation of productivity with age for physical work will be different for a workforce aged 16-25 years than for a group aged 36-45 years. Both considerations — the non-linear dependence of productivity on its controlling variables and the different parametrizations needed for different kinds of job — mean that a reliable theory of productivity must be based on a large number of studies of different jobs in different companies.

The failure to take into account differences between different jobs and companies, together with the failure to recognize the importance of personal variables, appear to be the basic weaknesses in job satisfaction theories (Herzberg, 1968; Vroom, 1964; Adams, 1965; Porter & Lawler, 1968; Davis, et al., 1968; Locke, 1969; Genesca, 1977). This was hinted at by Ford (1969), and explains the poor results obtained in studies attempting to correlate job satisfaction with productivity (Brayfield & Crocket, 1955; Locke, 1976; Alcaide de Castro, 1982; Pereda & Barrachina, 1987; Carrasco, 1986).

Finally it may be pointed out that studies performed in a single company will in fact find no correlation between productivity and a non-linear influent F whose value FO is optimal in that company; this kind of study will nevertheless reveal the direction in which the environment or the characteristics of the workforce might be altered so as to improve productivity.

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ABSTRACT

The influence of personal and environmental psychosocial variables on workers' individual productivity was investigated in a large company using the company's own index of individual productivity. Productivity depended on age, use of anxiolitics, the WES variables control, clarity and innovation (Moos et al., 1984) and the MAE variable ambition (Pelechano, 1975).

RESUMO

Neste artigo foi analisada a influência das variáveis pessoais e da envolvente psicossocial na produtividade individual de trabalhadores de uma grande empresa, usando-se para tal o índice de produtividade individual da própria organização. Os resultados obtidos permitem concluir que a produtividade depende da idade, do uso de ansiolíticos, das variáveis de controlo WES, claridade e inovação (Moos et al., 1984) e da variável de ambição MAE (Pelechano, 1975).