

## 1 Technology and the Study of Organisations

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This monograph has been written as a contribution to the current debate among industrial sociologists about the place of technology as an explanatory variable in the study of attitudes and behaviour within organisations. To understand the shape which the report takes it should be seen in a general setting. The authors share the besetting sin of so many academics of taking too long to prepare their material for publication. Our survey data was collected at the end of 1965. The first reports were written in 1966. Subsequent field work was carried out in 1967 and 1968. Now, four years later, we have benefited from reading the results of new studies in this field, of which there have been a number, as well as from the ongoing discussions we have had with our colleagues at Imperial College.<sup>1</sup> Our original interpretation of the data has not changed fundamentally. But its re-examination in the light of new research findings stimulated us to ask new questions. Sometimes our resources were inadequate and the questions have had to remain unanswered. But sometimes we were fortunate enough to be able to reanalyse our material and to collect additional information. The account presented here, therefore, is in one sense the story of the unfolding and development of a research project.

It began with a survey embarked upon for purposes which appear rather far removed from questions about the influence of technology upon structure and behaviour in organisations. It was part of an investigation into the nature and extent of differences in the terms and conditions of employment of manual and non-manual workers and of attitudes towards those differences.<sup>2</sup>

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- 1 For a summary of the Imperial College work see ed. J. Woodward, *Industrial Organisation: Behaviour and Control*, Oxford University Press, 1970. For a contribution adopting a very different approach see J. H. Goldthorpe, D. Lockwood, F. Bechhofer, J. Platt, *The Affluent Worker: Industrial Attitudes and Behaviour* Cambridge University Press, 1968., and *The Affluent Worker in the Class Structure*, Cambridge University Press, 1969.
- 2 See D. Wedderburn "The Conditions of Employment of Manual and Non-Manual Workers" in *Social Stratification and Industrial Relations*, ed. John Goldthorpe and Michael Mann, S.S.R.C., Cambridge, 1969, mimeographed; and D. Wedderburn and J. C. Craig, "Relative Deprivation in Work" paper read to Section N of the British Association for the Advancement of Science, Exeter, September, 1969.

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In so far as conditions of employment—that is such things as fringe benefits—of manual workers were becoming more like those of non-manual workers, it might be hypothesised that this would occur first in the most advanced technological conditions where the most highly skilled manual workers would be employed. Thus the influence of technology was seen as of some, but certainly not of prime, importance, in the research design of that particular study. Among other things, however, we carried out a large-scale attitude survey of a sample of manual workers in the employment of one major company, on a site where a number of different technologies were in use. Some marked differences of attitude were revealed between groups employed in different works where the production systems were also very different.

This finding was not altogether unexpected for a considerable body of literature was already available to suggest an association between technology and workers' attitudes and behaviour. For example, in the fifties, the workers at the Tavistock Institute developed the concept of an open socio-technical system". This was derived from the:

“consideration that any production system requires both a technological organisation—equipment and process layout—and a work organisation relating to each other those who carry out the necessary tasks. The technological demands place limits on the type of work organisation possible, but a work organisation has social and psychological properties of its own that are independent of technology. . .”<sup>1</sup>

At the same time the analysis pointed

“in particular to the various ways in which enterprises are enabled by their structural and functional characteristics ('system constants') to cope with the 'lacks' and gluts in their available environment.”<sup>2</sup>

There was an emphasis upon the constraints imposed by the hardware of the production system upon the social system. In other words, the kind of social relationships which would develop in the work situation would be shaped and limited by things like the kind of machinery in use, its layout and the sequencing of production tasks. However, it was argued that there was no

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1 A. K. Rice, *Productivity and Social Organisation*, Tavistock Publications, London, 1958, p.4.

2 F. E. Emery and E. L. Trist, “Socio-Technical Systems” in ed. C. W. Churchman and M. Verhulst, *Management Science, Models and Techniques*, Vol. 2., Pergamon Press, Oxford, 1960, p.94.

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one-to-one relation between the requirements of the technological and the social systems:

“but what is logically referred to as a correlative relation.”<sup>1</sup>

This made possible an emphasis upon the uniqueness of the constellation of social and psychological aspects of each individual work organisation.

Concurrently Joan Woodward had been examining the assumptions of classical management theory which implied that there were certain general principles of organisation which had a universal validity and that the adoption of ‘correct’ organizational principles would lead to ‘success’. As a result of her South East Essex studies she had concluded that this was not the case. She did, however, find that firms using

“similar technical methods had similar organisation structures.”<sup>2</sup>

Differences of technology seemed to be associated with different management structures. A further conclusion was that technology also affected human relations in the plant:

“there appear to be considerable differences between production systems in the extent to which the ‘situational demands’ create conditions conducive to human happiness.”<sup>3</sup>

or, as it was more fully argued:

“Some factors—the relaxation of pressure, the smaller working groups, the increasing ratio of supervisors to operators, and the reduced need for labour economy—were conducive to industrial peace in process production. Thus, although some managements handled their labour problems more skilfully than others, these problems were much more difficult for firms using the middle ranges (i.e. batch production) than those in unit or process production.”<sup>4</sup>

Joan Woodward was concerned to develop a ‘middle-range’ theory of organisation. She believed that her studies supported the view that structure

1 Ibid., page 87.

2 Joan Woodward, *Management and Technology*, H.M.S.O., London, 1958, p.16.

3 Ibid., p.30.

4 Ibid., p.18.

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was dependent upon the type of technology in use. If technology, as the independent variable could be conceptualised in a way which would enable it to be measured then it would be possible to test this hypothesis. She therefore made one of the first systematic attempts to classify technology for purposes of sociological analysis. She combined the engineering characteristics of the production process (unit, batch, mass and continuous) with the nature of the product (integral or dimensional) to produce eleven categories of technology.<sup>1</sup>

Meanwhile, in the United States, Blauner had drawn attention to what he has termed the preoccupation of industrial sociologists with the situation of the assembly-line worker.<sup>2</sup> These researches were concerned with a specific type of technology, which was the assembly line method of mass production. Blauner's own study of alienation became available just as the first stage of the present inquiry was being planned. Here was yet another sociologist laying stress upon the importance of technology in shaping workers' attitudes. Blauner examined four kinds of technology, chemical process, textile, printing and, once again, the automobile assembly line. He argued that what he called 'structural differentiation' within modern industry has led to a situation where:

"the industrial system distributes alienation unevenly among its blue-collar labour force, just as our economic system distributes income unevenly".<sup>3</sup>

The most important differentiating factor which gave an industry its distinctive character was technology:

"Technology refers to the complex of physical objects and technical operations (both manual and machine) regularly employed in turning out the goods and services produced by an industry."<sup>4</sup>

Therefore, it was the differences in technology which largely accounted for differences in the degree of alienation among the work force. As an example of Blauner's argument we may quote what he has to say about continuous-process industries:

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1 Joan Woodward, *Industrial Organisation: Theory and Practice*, London, Oxford University Press, 1965, p.39.

2 R. Blauner, *Alienation and Freedom*, The University of Chicago Press, Chicago, 1964, p.5.

3 *Ibid.*, p.5

4 *Ibid.*, p.6.

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“The case of the continuous-process industries, particularly the chemical industry, shows that automation increases the worker’s control over his work process and checks the further division of labour and the growth of large factories. The result is meaningful work in a more cohesive, integrated industrial climate. The alienation curve begins to decline from its previous height as employees in automated industries gain a new dignity from responsibility and a sense of individual function.”<sup>1</sup>

Earlier Sayles<sup>2</sup> and Kuhn<sup>3</sup> had postulated a connection between technological factors and one particular aspect of industrial behaviour, namely grievance activity. These authors saw the impact of technology as mediated through its influence upon the formation of work groups in bargaining situations.

“The ability of work groups to conduct fractional bargaining depends upon the power relationship between the work group, the union, and management, a relationship significantly influenced by the technological conditions under which a plant or industry operates.”<sup>4</sup>

Yet despite this growing volume of literature concerned with the influence of technology, it was difficult to construct propositions about the way in which it was thought to influence attitudes and behaviour, except at a most general level. In some measure this was due to the diversity of meanings attached to the concepts ‘technology’, ‘attitudes’ and ‘behaviour’ by different writers. One problem for instance, was that ‘technology’ or ‘production system’ was sometimes described or classified in engineering terms and on other occasions in terms which were themselves social, that is, according to the degree of social interaction which was possible in the work situation, or according to the size of the work group. Another difficulty sprang from the fact that the various authors concerned themselves with quite different aspects of behaviour and attitudes.

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1 Ibid., p.182.

2 L. R. Sayles, *The Behaviour of Industrial Work Groups; Prediction and Control*, John Wiley and Sons, New York, 1958.

3 J. W. Kuhn, *Bargaining in Grievance Settlement*, Columbia University Press, New York, 1961.

4 Ibid., p.144.

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This is important because divergent attitudes can be expressed by the same group of workers towards different aspects of the employing organization.<sup>1</sup> Some studies have shown attitudes to the company and to immediate supervision which coincide, others have shown attitudes more favourable to one than to the other. Which attitudes, then, are those most influenced by technology, and what, if any, is the relationship between such attitudes and various aspects of behaviour?<sup>2</sup>

Just as the use of the concepts varied, so did the suggested causality. Some sociologists had laid emphasis upon the effect of technology upon the nature of the work task. Blauner, for instance, spoke of 'alienation' which dealt with the consequences of the task for the worker in terms of 'meaninglessness', feelings of 'powerlessness', isolation, 'self-estrangement'.<sup>3</sup>

Others, like Joan Woodward, placed more emphasis upon the nature of the control system associated with a particular technology and its consequences for workers in "the amount of discretion they have in the organization of their own activities".<sup>4</sup>

Furthermore, in almost all the studies referred to, comparisons of technology, however defined, were across firms and industries.<sup>5</sup> The broad similarity of the findings of a number of studies did suggest that other variables such as the market position of various firms, geographical location, management philosophy, degree of trade union organization, etc., were likely to be of lesser importance. Nonetheless, there was clearly interest in testing whether some of these very general associations between technology, attitudes and behaviour which had been postulated, would be repeated in a situation where some of the other variables could be held constant.

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1 For a discussion of the different dimensions of 'involvement' in an organisation and the research task which remains if an index representing involvement in all objects of an organisation is to be constructed, see A. Etzioni, *A Comparative Analysis of Complex Organisations*, The Free Press of Glencoe, New York, p.303 et seq.

2 For a survey of the difficulties arising from the lack of precision in the terminology and for a useful typology of behaviour see T. Kynaston Reeves "Constrained and Facilitated Behaviour—A Typology of Behaviour in Economic Organisations", *British Journal of Industrial Relations*, Vol. V., No.2., 1967.

3 Blauner, 1964, op.cit., Chapter II.

4 Woodward, 1965, op.cit., p.190.

5 For an earlier study of the attitudes of two groups in different technological settings within the same firm see W. W. Daniel "A Comparative Consideration of Two Industrial Work Groups", *Sociological Review*, Vol. 14., No.1., March, 1966.

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This was the opportunity offered by the study on the Seagrass site with which the present report begins. The site contained a number of separate and distinct works using technologies which belonged to different categories in the Woodward classification.<sup>1</sup> But they were operating in the same geographical location against the background of a common company policy. It had been a simple matter to design the sample for the attitude survey in a way which would enable us to test for an association between workers' attitudes and technology such as would be predicted from Woodward or Blauner. When the results were first analysed they showed that certain constellations of attitudes—for example towards the interest of the job itself and towards supervision—were consistently more favourable in the continuous-flow process works and less favourable in the batch production-machine minding works. There were also important differences of attitude between tradesmen and general workers across the whole site. These findings were sufficiently striking to lead us to examine whether there were also any differences of overt behaviour between the works for instance in relation to absenteeism or willingness to engage in industrial disputes. Such differences did, indeed, exist between the works. But by this stage in the research the general debate about the influence of technology had been taken an important stage further by contributions from other sociologists.

It was, perhaps, inevitable that the emphasis upon technology in influencing behaviour, indeed in some cases attributing to it the role of the sole explanatory variable, should be challenged as being narrowly deterministic. One expression of this view put the matter in the following way:

“Thus, a currently fashionable view among industrial sociologists and some industrial relations specialists links the state or organisation of labour relations in particular industries or enterprises with their specific technologies—the argument being that a given technique of production imposes particular social relationships on its human participants and confines them within determinate ‘socio-technical systems’ which will produce qualities and phenomena which are not fully under their control.”<sup>2</sup>

Turner and his colleagues had shown in this study that the state of labour relations differed considerably between different firms in the automobile industry in Britain. In particular, the level of strike activity showed great

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1 See Chapter 2 for further description.

2 H. Turner, G. Clack and G. Roberts, *Labour Relations in the Motor Industry*, George Allen and Unwin, London, 1967, p.327.

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variation. Yet the technology was, they argued, the same, it was mass production assembly line. Hence they questioned whether technology had any influence upon strike behaviour.

Goldthorpe emerged as another critic. In an analysis of what he called “a deviant case”—again, it is interesting to note, from the motor car industry—he argued:

“Most previous writers, we would suggest, have tended to over-simplify the problems of workers’ response to the stresses and constraints of assembly-line technology (and have tended to assume greater uniformity in this respect than tends to be the case) because they have left out of account one important *variable*: that is, the orientations which men *bring* to their employment and which *mediate between* the objective features of the work situation and workers’ actual experience of, and reaction to, this situation.”<sup>1</sup>

He argued that the starting point for explanation did not lie with the technology, which was to be seen as a limiting factor, the importance of which would vary according to the workers’ perception of the situation:

“but rather with the ordering of wants and expectations relative to work, and with the meaning thus given to work which result in men taking up and retaining assembly-line jobs.”<sup>2</sup>

Thus prior orientations to work were to be seen as important influences upon workers’ responses to any particular work situation. Wants and expectations, that is orientations, might also be important in influencing the way in which workers selected or decided to remain in particular jobs. When there was genuine choice of employment workers might enter jobs in a non-random fashion because they would deliberately seek work which would satisfy their particular set of needs. This process of self-selection could, in turn, result in the appearance of different constellations of attitudes and behaviour in different work settings.

Fortunately, the first stage of the Seagrass study had investigated the general attitudes to work of the sample. It had also provided information

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1 John H. Goldthorpe, “Attitudes and Behaviour of Car Assembly Workers: A Deviant Case and a Theoretical Critique”, *The British Journal of Sociology*, Vol. XVII, No.3., 1966, p.240. These arguments have subsequently been expanded in Goldthorpe et. al., 1968, op.cit.

2 Ibid., p.240.



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about some of the social characteristics which Goldthorpe and his colleagues argued shaped orientations to work. These included factors such as how far workers had been geographically mobile and what stage they were at in their life-cycle.<sup>1</sup> A further analysis of the Seagrass material was clearly called for to examine whether differences in the characteristics of our sample in these respects were associated in any way with the attitudinal and behavioural differences which had been revealed.

This further analysis showed that some differences of orientation and background did exist between the general workers in the different works. As we shall argue, however, they appeared to be too small to account for the major differences of attitude to their employment situation which the survey revealed and we returned to factors in the work situation itself. But there was one group of workers at Seagrass whose expectations did stand out as being markedly different. These were the tradesmen. Compared to the general workers they were far more concerned with the nature of the work they had to do and with their status. They emphasised the importance of having control over their work and took it for granted that it should be interesting. The tradesmen displayed what could be summarised as a work 'ethos' of a general kind which seemed to be more closely linked to their identification with their craft or occupation than to the particular work situation in which they found themselves at Seagrass. The general workers, on the other hand, did not expect to find their work interesting. As we shall see, in those situations where they did find it interesting they valued their good fortune. But their first preoccupation was with pay, security and general working conditions.

If we were to make any progress with explaining the differences of attitudes and behaviour among the general workers it was clearly important to investigate in more detail. Was it possible to categorise those features of the production technology which could be described as 'constraints' for the worker? In the ongoing work in the Imperial College group a clearer distinction was being drawn between, on the one hand, the specific technology of the organisation which:

“is then, the collection of plant, machines, tools and recipes available at a given time for the execution of the production task and the rationale underlying their utilisation.”<sup>2</sup>

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1 Goldthorpe 1966, op. cit., p.241.

2 ed. J. Woodward, 1970, op. cit., p.4.

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and, on the other hand, the system for directing and controlling the production task. The latter formed part of the social system of the organisation but it was linked with, although not wholly determined by, the technology as defined above.

“At any given time, the administrators and supervisors of a firm have, as one of their functions, to make the series of arrangements necessary for the achievement of the production task. It is evident that the nature of the arrangements which they make will be influenced by their current definition of the firm's production task; but in making these arrangements they will also have to take into account, among other things, the nature of the work force available at that time, and the state of the existing technology of the firm, which can be seen as a concrete cumulative residue of previous decisions about the task of the firm. The resultant arrangements for programming and control of work will form the basis for the administrative constraints which will be placed upon the individual employees.”<sup>1</sup>

The original association found at Seagrass between attitudes and technology had been on the basis of classifying the specific technology in the most superficial way according to the hardware and recipes in use. Nothing at that time was known about similarities or differences between the works in the system for planning and controlling the production task. More field work was undertaken, therefore, to build up a picture of some aspects of this control system to see how they impinged upon the social roles of operator and first line supervisor. This involved observation in the works and further interviews with supervision and management.

At this stage the opportunity was also taken to check on some of the factors in the general environment of the different works which might have influenced such things as management worker relations, for instance, the degree of pressure being experienced in the works as a result of different degrees of market competition. We had argued that the comparison of production systems within the same company was likely to hold constant a number of factors which could easily vary considerably between companies. But we did not know how far this argument could be carried. One apparently simple point had also to be considered. Dissatisfaction both in overt behaviour and as expressed in the interviews was greatest on the works where the technology was machine minding large batch production. But this was

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<sup>1</sup> Ibid., p.14.