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WORKER INFORMATION SYSTEMS:
TOWARDS AN ANALYSIS

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INTRODUCTION

Recognition of the importance of information in management decision-making has been growing for the past few decades (McRae, 1971). Management information systems (MIS) are a key concept in organisational design and change, and it is widely accepted that deliberate efforts must be made to ensure adequate management information for decision-making. Thus, for example, published accounts will often give inadequate information for many areas of decision-making, especially in more complex organisations.

Nearly all the development of theory and practice of information systems has been in the area of MIS. In MIS theory the organisation is seen as hierarchical and it is assumed that managers are in effective control, a bias reproduced in our Systems Management course (Open University 1974). This orientation of MIS theory is not value-free for it implicitly (or explicitly) embodies normative assumptions regarding the way in which organisations should be run.

Yet in parallel with this 'managerially biassed' development of MIS theory has been a growing awareness of the contradictions
of hierarchical organisations and the existing forms of division of labour (Wilson 1973, HMSO 1975). This awareness has been one of the significant factors in such developments as organisational innovations like autonomous work groups and the revival of co-operatives. There has also been increasing interest in the disclosure of information to employees, from both management and union viewpoints (see e.g. CBI 1976, Aikin 1975, TUC 1974, Barratt Brown 1978).

Apart from the debates on disclosure of information, remarkably little work has been done on the role of information for workers and others who are designed to provide rather than receive information for the MIS. This paper argues that much more attention should be given to this aspect of information and outlines a framework within such work could be directed.

INFORMATION, PARTICIPATION AND OPPOSITION

This paper assumes that workers have a legitimate interest in the activities of the organisations which employ them, and that these interests are at least partially in conflict with those of the organisation's management (and, where appropriate, its shareholders). Its normative orientation is therefore rather different from that dominant in MIS theory. A second assumption is that the pursuit of these interests may be either through participation in decision-making or through oppositional
means, or a combination of these approaches. This view encompasses a range of alternative strategies, including, say, worker directors, participation in a co-operative enterprise and trade union opposition to rationalisation.

Just as management must depend on adequate information for its decision-making, so must the workforce - both individually and collectively. This need for adequate information has been recognised by a variety of people - arguing from many different perspectives. Thus on the one hand, Bernstein (1976) argues that "one of the most common pitfalls in the operation of democratization schemes is an insufficient release of management-level information to employees"; and on the other the CBI (1976) states "One of the basic requirement for effective participation is that all those involved should have made available to them certain basic information, without which constructive criticism and comment is impossible".

That effective workers participation or opposition is enhanced by adequate information is therefore the third assumption of this paper. It is also one supported by management research (Pettigrew, 1972 for example) and one which further research is unlikely to contradict.

The fourth major assumption is that 'adequate' or 'appropriate' information is related to the structure of the organisations concerned and to the objectives and strategies of those involved. This assumption is widely recognised in MIS thinking and will
be confirmed by the evidence examined later in this paper.

What are the implications of these assumptions? The main one is that there is a need for worker information systems (WIS). To follow the argument of MIS theorists (e.g. Cloot 1972, Open University 1974): from the mass of data available within (and outside) the organisation, various forms of information must be extracted. This information 'collection' should be problem-oriented rather than means-oriented, i.e. that information gathering should be related to particular activities and objectives rather than being an end in itself. In turn, this implies that some form of information system will usually be necessary to structure the available data as well as defining unfulfilled information needs. Hence for workers to pursue their interests, some form of WIS is necessary.

WORKER INFORMATION SYSTEMS

The argument so far is that WIS are needed for workers to pursue their interests effectively within organisations. To make an analysis of WIS, we need to define more clearly what is meant by a WIS. Any definition must take account of various factors, in particular:

a) the range of activities which can be seen as part of a WIS, which are more or less systematically structured;

b) the variety of objectives and strategies of workers in organisations;
c) the types of organisation within which the concept is applied.

Bearing these factors in mind, a worker information system is defined as the range of processes by which information relevant to workers in an organisation is gathered, monitored, analysed, stored and disseminated. This definition covers a wide range of activities, both informal and more structured. It is also a definition which can be interpreted in many different ways - the key word in this context being "relevant". This if we take the two general views quoted above, it would include a side range of cases: from the internal newspaper of a corporation to the information obtained by trade unions in collective bargaining.

To clarify these different types of WIS a distinction will be made between "oppositional" and "participative" WIS. An oppositional WIS is one which is created by the workforce (or part of it) independently of management in a situation where conflicts of interest are usually explicit: the typical case being that of trade union activity. A participative WIS is, in contrast, one which is to some degree integrated with the MIS of the organisation and which generally is in a situation where some basis of consensus is seen to exist. The distinction between these types of WIS will not always be clearcut, especially if different groups are attempting to pursue varying strategies: in such cases some combination of elements of
oppositional and participative types will coexist.

To complete this stage of definitions, the different ways in which information in a WIS may originate will be discussed. Just as management information comes from different sources and in different ways, 'worker information' does not just come from one source. In general, four types of source may be used which I have called disclosure, formal, informal and illegitimate. Disclosure involves such information as company accounts which must be disclosed publicly or to the workforce. Potentially this area is growing as a source of information, particularly to trade unions, with the provisions in the Employment Protection Act, Industry Act, Health and Safety at Work Act and other recent legislation. However, critics have pointed out that this legislation is unlikely to force an unwilling management to disclose all the information the various Acts are intended to cover. (Marsh & Rosewell 1976, Gospel 1977).

Formal sources of information are those which, although not within the area of disclosure, are officially sanctioned by management within the organisation. Thus the giving of information to employees about the financial state of the organisation or its current workforce come within this category, as would information obtained by worker directors in the course of their work. In contrast, informal sources
are those outside the formal type and would include a large
variety of sources from gossip to apparently unconnected
events such as (in a case quoted below) a letter withdrawing
an offer of employment to a person not working in the
organisation. The key difference between formal and in-
formal sources is that in the former information is
purposefully disclosed whilst in the latter it is not.

Fourth comes what I have called illegitimate means. All the
above would generally be seen as legitimate ways of obtaining
information, even if some do not like the way it is used.
Illegitimate means are those which do not come within this
category and in which the workforce gathers information by
breaking existing social norms or rules. Thus raiding
management files would come within this category, as would
the collection of information normally seen as 'management's"
from those who originate or process it. This type of
information will usually be obtained purposefully, sometimes
illegally or at some risk of those involved. One final
point: although this source has been called illegitimate,
it may be seen as legitimate by those obtaining the information.

Given these four sources of information - and means of
information gathering - we should be able to examine some
existing organisations and look at their WIS. In doing this,
it is not assumed that the information obtained by the
workforce is a result of a formally designed WIS (just as management information 'existed' before people started designing MIS). Rather a first step is to look at existing flows and sources of information, and then - if at all - to look at the possibility of a more appropriate WIS.

In doing this, three general cases will be taken. In the terminology of T243, these can be described as at the subsystem, organisation and multi-organisation level. The first is of job redesign with workgroups, the second of higher level participation schemes, particularly workers cooperatives and the third of multi-plant corporations from the point of view of trade unions, particularly shop stewards.

CASE A: JOB REDESIGN AND WORKGROUPS

The relevance of information systems to job redesign has not been widely recognised. Wilkinson (1970) argued that analysis and possible redesign of information systems was a key aspect of job redesign, as have Hedberg (1977) and Clegg & Fitter (1978). Hedberg notes the initiatives of some Norwegian local unions in the development of information systems for production control and shop management, whilst Clegg & Fitter give a fairly detailed account of a project in a UK sweet factory, which will now be discussed.
In the sweet factory, a particular department was divided into two lines and the workforce into line operators and packers. Sweets were made in batches. Before the job redesign project in the department, fairly complex statistics were produced by the factory's management information function from data provided by the department and the work study function. The principal statistic was a measure of 'efficiency' - the actual production level as a percentage of the target taking account of 'allowable' time losses, e.g. machine breakdown. Clegg & Fitter point out that feedback on performance to the shop floor was:

"1) late (2-3 weeks after the week in question)
2) in summary form (for a whole room, for a whole week)
3) complicated (and not understood)
4) irregular and critical (when performance was low), and
5) systematically inaccurate (unfairly depressing performance levels)."

As a result, the staff "felt cynical about the information system and management's motives" as firstly it was the supervisors who took the main operating decisions and secondly actions of the departmental manager took "actions which were perceived by the staff as in appropriate and unfair - in particular, criticising people who already thought they were working hard enough". In fact, the shop floor perception of a fair work pace was very similar to management's - a factor which emphasises the importance of a relatively
accurate information system. The information system was therefore a factor in "demotivating" operators, who understood it only in the very broadest terms and saw it as irrelevant to sweet production. Information gathering was therefore lax at the best of times.

Following a job redesign exercise in which the department was organised into two semi-autonomous work groups, who planned and organised their own work to meet target figures agreed with management, the inadequacy of the old information systems soon became apparent. These "... to dealing with the new method of working: quite simply they were management systems designed by managers to enable them to plan and evaluate the production process. Now that staff controlled their own working day, these old systems became unsuitable ... Without ... feedback they could not regulate their own behaviour." Part of the problem was that the concepts used by operators (number of batches) were different from those in the MIS (efficiency) even though there was general agreement on a 'fair' target.

These, and other, problems led Clegg & Fitter to put forward a set of criteria for the new information system which are summarised below:

1) consistency of information with operators' concepts
2) consistency with desired work organisation
3) accuracy, or at least lack of systematic biases
4) perceived as fair by management and workers
5) responsiveness to events giving feedback enabling work groups to regulate behaviour
6) straightforwardness
7) consistency with existing MIS
8) reasonable administration cost

A new information system based on these criteria was introduced. Amongst its effects were an increased demand by operators for, and understanding of, feedback of information. Another was that due to the better feedback to operators when targets were modified, e.g. due to breakdown, the supervisors saw modifications as more important than when they were just fed into the MIS and demanded more say over such matters, which previously were decided by a clerical assistant. The changes have also had repercussions on other functions within the factory.

Having spent some time describing this case how does it fit into our picture of WIS? First, it is clear that we are dealing with a participative system. Second, we are concerned with a sub-system within a single organisation and that its operation is dependent upon many other sub-systems. Thus at this level it is likely that there will be both significant and relatively numerous constraints upon the degree of redesign of both jobs and information systems. At the same time, the information system - in giving feedback to the workforce - is a significant both in motivation and in determining the potential effectiveness of job redesign. For example, the speed of feedback and the concepts used to present information
are key factors.

Third, we can see that whilst 'disclosure' and 'illegitimate' means are not particularly significant in this WIS (this can be argued to be a general feature of a participative WIS), 'formal' (largely the MIS) and 'informal' (particularly the operators' own perceptions and observations) are very important. Further, in using both different concepts (efficiency by management, batches by operators) and having different feedback times, conflicts were being structured into the department.

Fourth, the WIS in this case was fairly closely integrated into the organisation's own MIS and other functions. In this case, it would appear that this strengthens its potential for motivation and feedback as well as increasing the importance of control of the WIS. As Clegg & Fitter point out, the information system can reinforce or hold back changes in work organisation - in other words there is a feedback relationship between the WIS and work organisation. So also the supervisors' attempt to control adjustments to targets under the new information system (see above), as well as their connivance in altering information about early finishing fed into the MIS when targets are met or exceeded so as not to reduce management's utilisation figures, illustrate the importance of control of the WIS.
To summarise, we can see from this case the importance of WIS in changes at workgroup level, as well as the particular form such a participative WIS may take and some criteria for choice. These conclusions are reinforced by Hedberg (1977) in his analysis of job redesign at Volvo Kalmar (for a detailed description see Lindholm & Norstedt, 1975). In this well known case job redesign led to greatly increased information needs for: "An overall picture of the production systems has to be compiled, at the same time as required information is fed forward to other teams for planning purposes, and fed back for performance evaluation and correction".

In this Volvo case, the WIS for each work group has been designed as part of the overall MIS which includes several packages of computer systems. From the point of view of the work group these include:

1) a process control system, controlling and directing workflow as well as feeding forward potential work load to the work group
2) a production control system, giving specifications for each car
3) a quality control system, feeding back quality control results to the work group.

The technology utilised (computers) is clearly part of a more total 'formal' WIS then that used in the sweet factory case and it is uncertain how significant 'informal' means are.
Again control of the WIS is important for as Hedberg argues, "the apparent decentralisation of responsibility to the work group will be matched by a corresponding centralisation of the ultimate control. The new information technology undoubtedly strengthens management's overall control. At the same time it is clear that the new technology offers a potential for increased autonomy in each group of workers."

Thus in Volvo, the WIS forms an integral part of both job design and the organisation as a whole and is highly integrated with the MIS, as the Figure shows:

Figure: Information systems at Volvo-Kalmar (from Hedberg 1977)
So, as has been argued about job redesign, increased and more appropriate information at workgroup level may centralise and improve management control whilst decentralising many operational decisions. Thus such ideas of WIS may well become part of 'participative management' thinking and organisational design in the future and be devised by management as a deliberate policy. (see, e.g., Nadler et al, 1976)

CASE B: WORKERS' CO-OPERATIVES AND HIGHER LEVEL PARTICIPATION

So far we have looked at workers information systems at the 'sub-system' level where we are dealing with relatively undifferentiated groups (functionally and in terms of power). In this analysis the following points stressed:

(1) the importance of control over the information system;
(2) the significance of differing perceptions of information, and hence of the way information is made available;
(3) the links between one group and the wider organisation, and between the information system and other factors, e.g. work organisation;
(4) the variety of feedback effects in which the information system plays a part.

When we move 'up' to the level of an organisation, with differentiated sub-groups, the problems become more complex. This section examines workers co-operatives - another case of largely 'participative' WIS - where there is at least a theoretical commitment to worker participation. The focus
will be on the ways in which WIS function and the relevance to co-operatives of a more systematic approach to problems of information.

Several authors have emphasised the need for 'management-level' information if non-managerial members of co-operatives are to exercise effective influence at higher levels than their own workgroup. As Hedberg (1977) points out, the provision of management information may not be sufficient for the purposes of workers or their representatives. Information on wage rates and productivity, for example, may well be available but put together in a form designed to answer management questions. He argues that existing organisational bases may not need much expansion to answer such questions whereas the filtering of information will be different for managers and workers. This gives a picture of a 'participative management information system' (PMIS):

Figure: Participative Management Information System (from Hedberg, 1977)
Whilst this approach is very relevant to what I have called 'formal' aspects of the WIS, it does not cover the 'informal' ones or consider adequately the use of information as a power resource and the control of the information system. First, however, existing mechanisms for worker information will be examined.

Except in small 'collectives', management remains an identifiable part of workers' co-operatives. Again, in contrast to collectives, representative structures usually exist in enterprises above a certain size - with, in general, increasing significance in terms of worker participation in larger enterprises, i.e. representative democracy increases in importance compared with direct democracy. A somewhat crude model can be constructed as shown in the figure:

![Diagram showing main information flows in a co-operative's WIS](image-url)
Using this model, Airflow (a 200 employee workers' co-operative in light engineering) will be discussed. The main channels of information from management to workforce were through annual general meetings, a company magazine, notice boards and communication through individual managers at lower levels. Various representative bodies existed, notably the Community Council, nominally a form of supervisory board but in practice ineffective in this role, and the Consultative Group, composed of the workers representatives and directors, which discussed matters raised by the workforce. This functioned more as a channel of communication (as was intended) than as a bargaining framework - with most of the discussion involving either directors explaining policies or decisions, or workers' representatives putting forward their or shopfloor views on decisions and proposed courses of action. There was also a significant amount of consultation by management of the Group's chairman. Workers' representatives would then pass on information and obtain feedback from the wider workforce.

Our research showed that these channels were used: in a survey covering half the workforce 72% said they read Consultative Group or Community Council minutes (on notice boards) "quite often". 25% discussed issues with a representative "quite often" and a further 34% did so "occasionally". 58% of the sample attended that year's AGM, whilst 67% would do so in future and a further 20% might do so. There was also evidence of increasing knowledge of the company's structure as a co-operative.
On the other hand, workers did not feel that there was full information. Asked for their views on the statement that "Management keeps employees in the dark quite unnecessarily: there should be far more information on company matters", 40% agreed (12% strongly) whilst only 19% disagreed (1% strongly). However when asked about their previous employer 74% agreed (52% strongly) indicating that Airflow was felt to be providing significantly more information.

Answers to such questions on provision of information were similar in Michael Jones, a 40 employee retail jeweller in Northampton. Disclosure of information to workers was greater than at Airflow - individuals could, for example, get information on the salaries of all members including directors. 'Community Meetings', a monthly general meeting of all members, were far more important than at Airflow as they 'made' major policy decisions. Representative structures were less important - the main form being 'action groups' around different issues, e.g. pay levels and the legal structure of the co-operative. These 'action groups' were 50% management and 50% workers representatives elected by the Community Meeting.

Although Community Meetings had considerable nominal power, 54% of workers interviewed felt they had gained little except information from them. This did not mean that they were felt to be worthless as 58% felt they had learnt "quite a bit" at
them. So participatory bodies may function more as a channel for information then a means of effective worker influence despite employee ownership and nominal control. This was reflected in our observation that the directors (about 10% of those employed) made about half the statements/interventions in Community Meetings as well as the great majority of proposals relating to management policy and strategy, even when these proposals were directly related to workers' interests. One issue - that of redundancies - highlights this point. Despite considerable misgivings on the part of employees, management proposals to make redundancies were accepted at a Community Meeting. This issue was particularly critical given co-operatives' general commitment to maintaining employment for their members. It also illustrates how information can be used in such situations and some of the obstacles to effective worker influence in higher-level decisions.

(a) **Only one alternative policy was presented:** The directors' proposal to make redundancies had been triggered by the bank's threat to withdraw its confidence. The workforce was presented with a choice of accepting the directors' proposal or closing down the firm.

(b) **Insufficient information and time to devise alternatives:** Formally presented with the proposal at a meeting (although informal reports had been circulating for several days) there was no time to prepare an alternative strategy, e.g. different cuts or a reduced level followed by negotiation with the bank. Also, employees did not have easy access to relevant information.
(c) **Problems of interpreting information:** Even if there was effectively full access to management information, workers would most probably have had considerable difficulty in interpreting it to form a basis for alternative policies.

Information given to workers through formal channels, e.g. at Community meetings, was not easily understandable by non-managers and was presented in terms and concepts, some of which would not necessarily be easily conceptualised by many of the workforce. On the other hand, the information provided was wide-ranging, the period of feedback relatively fast and the ability of the workforce to interpret the financial and other information gradually increasing.

Thus, even when there are fully participatory bodies with the nominal power to make decisions, information is a key factor on limiting the potential influence of non-managers. These problems relating to information must, however, be seen in context: it is not just lack of availability of information which is the problem, but also the ability to understand, interpret and use that information.

Underlying the above discussion has been the division of labour between managers and non-managers in the organisation. Whilst this is a fundamental division, there are other divisions within an organisation which are relevant to a discussion of information - the division of labour between different functional departments of the organisation. This relates particularly to 'informal' processes of worker information.
March and Simon (1958) stressed this aspect of information within organisations. They argued that perception was a key factor and that information would be interpreted differently, or "selectively perceived", by different departments in accordance with their own preconceptions and frame of reference. Combined with this, the greater the variety of sources of information and the more information was limited - "channelled" - to certain members, the more perceptions would differ.

The extent of links between departments, both formal and informal, will affect this. An adapted version of their model is relevant here (see figure):

![Diagram: Information and inter-group conflict]

*Figure: Information and inter-group conflict*