PROJECT TEAMS: SOME BACKGROUND

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This paper is an account of work undertaken in both overseas and Australian organisations. The experiments have been concerned with the interaction of social and technological change. In the cases cited change was undertaken in both the sociological and technological systems resulting in dissolution of bureaucratic organisations and the evolution of self-managing, semi-autonomous, composite organisations.

Project Management is not simply dressing up an existing bureaucratic organisation. The concept implies self-managing groups with clear measurable objectives capable of being achieved with the resources available to the group. The concept of Project Management has responsibility and authority built into the social structure of a project group. (see attachment 1).

In the experiments that follow there are a number of common denominators which lead to change. Briefly, these are:

1. Change in technology
2. Impressive change in the social quality of work-life
3. Flowing from 1 and 2, crises situations evolve
4. Organisation members recognise the existence of the crises
5. Organisation members willingly participate in change.

British Coal Industry Experiments

Prior to the nationalisation and introduction of improved technology in the industry, coal mining using a "hand-got" system, that is two miners working in pairs on short length coal faces. This method provided face-workers with a social balance or cohesiveness which was subsequently lost to improved technology.

Nationalisation and mechanisation coincided with the appearance in the coal fields of economic depression and bitter exacerbation of the struggle between miners and owners. The technological change introduced was called the "long-wall method" of coal getting.

The outstanding feature of the social pattern with which the pre-mechanised equilibrium was associated is its emphasis on small group organisation at the coal-face. The groups were inter-dependent working pairs to whom one or two extra individuals could be attached. It was common for the pair to make their own contract with management and to be responsible for their own small face.

This primary work-organisation placed total responsibility for the complete coal-getting task squarely on the shoulders of a single, small face-to-face group which experienced the entire cycle of operations within the compass of its membership. Leadership and supervision were internal to the group, which had a quality of

"responsible autonomy". These pair based units contained the full range of coal-face skills. The introduction of mechanisation called the "long-wall" method effectively disrupted this technological and sociological pattern.

The Long-Wall Method

In this method, a direct advance is made into the coal on a continuous front: faces of 180-200 yards being typical, though larger faces are not common. The work is broken down into a standard series of component operations that follow each other in rigid succession over three shifts of 7.5 hours each, so that a total coal-getting cycle may be completed once in each twenty-four hours of the working week. Shifts of 40 men needed on an average face were:

Figure 1

Shift	Function	No. of Men
Shift I	Cutting	10
Shift II	Moving conveyor & props	10
Shift III	filling	20

The average coal extraction per cycle was commonly 200 tons. A medium-size pit with three seams could have 12-15 long-wall faces in operation.

The faces are laid out in districts (Figure 2). Props must be placed every 3 feet and the line of props (Figure 3) are placed immediately against a coal-face waiting to be filled off. The term "GOB" (coal mining vernacular) indicates the expanse from which the coal has already been extracted. The roof is left to collapse. Only the tunnels used for air, haulage and travelling are kept open.

When a cycle is complete, all equipment is moved forward. In Figure 2, the coal face is shown cut and waiting for the shot-fire, whose task is the last to be performed before the fillers come on. As part of the preparation work of a new cycle, the conveyer has to be moved from the "old conveyer" track (Figure 3) to the "new conveyer track". At the same time, the two lines of props on either side of the "old creeping track" (Figure 3) are withdrawn and thrown over beside the conveyer for fillers to use in propping up their roof as they get into the next 6 feet of coal.

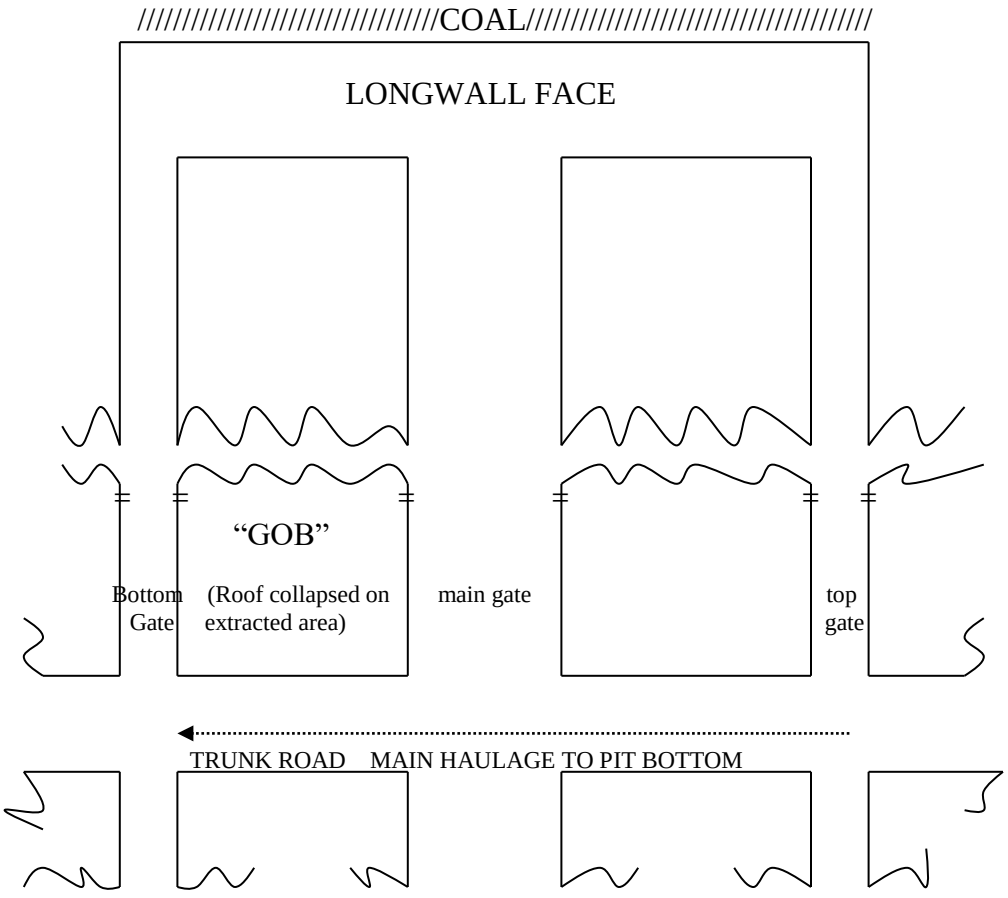
The mass production character of the long-wall operation brought a number of problems, such as ineffective communication, poor working relationships, differentiated, rigidly sequenced work systems, multi-shift cycles and the unpredictable geological behaviour of the mine increasing the probability of disorganisation of a cycle.

The working environment had dreaded conditions, such as water, heat or dust thereby making the task both difficult and dangerous. Rolls or fault may appear in a seam.

Control may be lost over the roof for considerable periods or changes may occur in the floor. These unpredictable features negate the application of typical factory types of control and supervision.

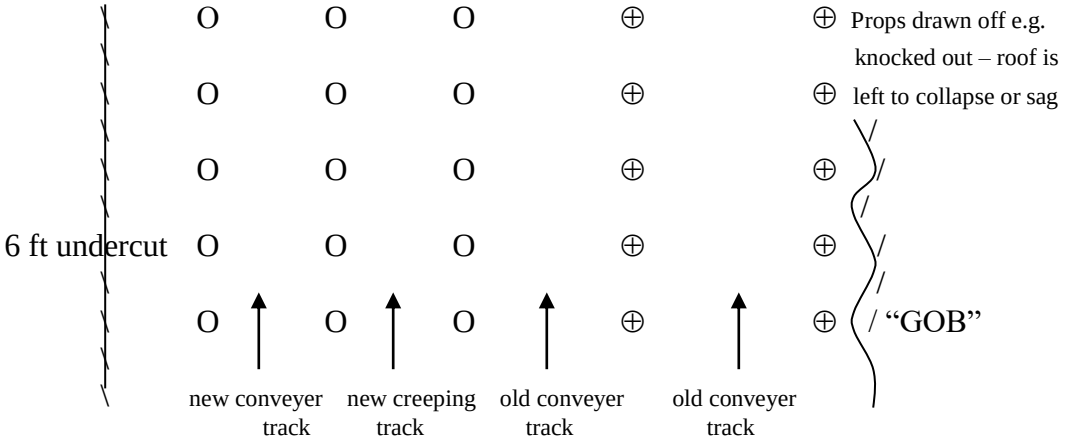
From the face-workers point of view, bad condition meant not only more danger and harder work, but less pay (because of collapses or machine breakdown) resulting in miners requiring overtime with frequent regularity which in itself created friction and tension.

Figure 2
LAYOUT OF DISTRICT, LONGWALL METHOD
(HORIZINTAL SECTION)



Another district belonging to the same seam

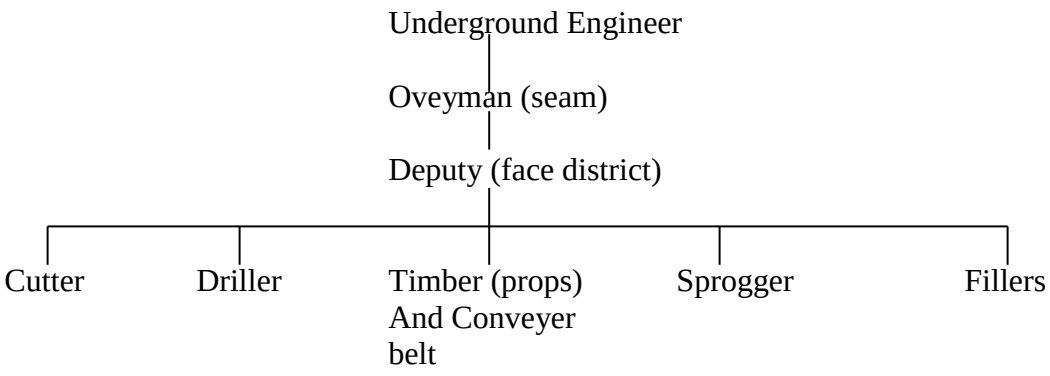
Figure 3
COAL FACE AS SET FOR FILLING SHIFT (HORIZONTAL SECTION)



Bad condition tend to instigate bad work. When they occur the smooth sequence of tasks in the production cycle is more likely to be disturbed by faulty performance. Bad work can, and does, arise when conditions are good, from personal shortcomings (illness or hangover) and social tension, in themselves independent of bad conditions; but difficulties arising from human failings are more readily and conveniently expressed when the additional difficulty, and excuse, of bad conditions is also present. The result is a tendency for circular casual processes of a disruptive character to be touched off. Unless rapidly checked these threaten to culminate in the fillers not filling off, and the cycle being stopped.

The organisational structure adopted for the long-wall method was hierarchical.

Figure 4. Conventional Organisation



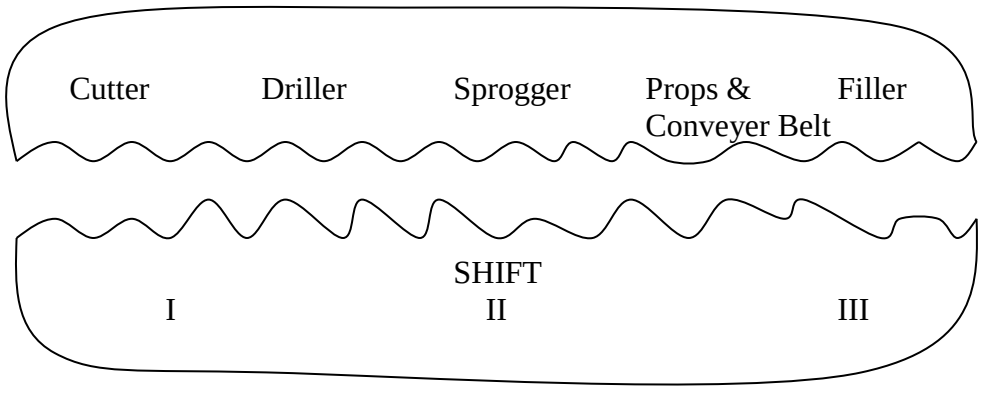
The main burden of keeping down cycle stoppages rests with the Deputy, who is the only person in the area with cycle, as distinct from task, responsibility. Generally, the authority of the deputy is incommensurate with responsibility because the deputy cannot close supervision.

Consequently, management complaint of lack of support from the men, who are accused f being concerned only with their own fractional tasks and unwilling to take broader cycle responsibility. The parallel complaint of the workers is of being driven and tricked by management, who are resented as outsiders, who interfere with sharing the hard, physical work and in the in-group life of the face. On occasions, for example, the deputy bargains with the men as to whether they will agree to carry out essential bye-work. The complaint of the men is that the deputy's promises are rarely kept, and that they have gone unpaid too often to be again easily persuaded. The strain of cycle control tends to produce a group "culture" of angry and suspicious bargaining over which both management and men are in collusion.

Given this background an experimental group was established and monitored, men could nominate themselves for various faces and teams. One team operated under the traditional organisational structure and the other worked as a "composite" group. Prior to the experiment union acceptance of the proposal was obtained.

Under the conventional method, the deputy organised the specialist groups into shifts. The "composite" group took total responsibility for face operations and task determination. That is, members of the "composite" groups were multi-skilled and could undertake tasks of other specialists. The composite group can be represented diagramatically as:

Figure 5: Composite Organisation



In the composite group if one member fall behind, any other member could assist. Any spare capacity was absorbed by the multi-skilled abilities of other group members.

Fillers, a cohesive group, under the conventional organisation saw the coal face as a series of short adjacent sections (8-10 yards long). In the corner of this length, he usually chalks up his name, but these chalk marks mean little to other fillers. Relationships of Shifts I and II to Shift III (filling) in both the work and community environment is minimal. Within a cycle, fillers are left to the mercy of the two preceding shifts. In terms of bad work left by the preceding shifts, fillers never knew what to expect, so that anxiety arises producing chronic uncertainty and irritation.

The following table indicates the main features of the two types of organisation. The conventional method combines a complex formal and informal organisation with simple work roles while the "composite" method combines a simple structure with complex work roles.

SAME TECHNOLOGY AND COAL SEAM BUT DIFFERENT SOCIAL SYSTEMS

	Conventional Organisation	Composite Organisation
Number of men	41	41
Number of completely segregated task groups	14	1
Mean job variation for members		
Task group worked with	1.0	5.5
Main tasks worked	1.0	3.6
Different shifts worked	2.0	2.9

The "composite" groups worked beside a conventional group on the face but set their own pace and absorbed workload variation without relying on reserved, unlike the conventional group. Both "COB" had to move together (Figure 3) otherwise stress would be created in the roof with risks of premature falls. The following figures indicate the level of output, stability of control and social interaction. At the time of experiment, the miners' union was under Communist control so two objectives had to be met:

1. improve conditions of the miner;

2. obtain adequate production rates (miners were paid on coal weight at the gantry).

PRODUCTION AND COSTS FOR DIFFERENT FORMS OF WORK ORGANISATION WITH THE SAME TECHNOLOGY

	Conventional Organisation	Composite Organisation
Production achievement (Average percentage of coal won from each daily cut, corrected for differences in seam transport)	78%	95%
Ancillary (overtime) work at the face (hours per man-shift)	1.32	0.003
Average reinforcement of labour (reserves), percentage of total face force	6	Nil
Percentage of shifts with cycle lags	69%	5%
Number of consecutive weeks without losing a cycle	12	65

Note: Face life was 65 weeks

Given bore hole samples in various parts of the panels, a calculation could be made as to how coal could be recovered, making allowances for erroneous material. From that a percentage recovery was calculated. For the "conventional" organisation there was a loss of 22% whereas in the "composite" group who were not pre-selected and were exposed to flu epidemics and the like, there was only a 5% loss.

Ancillary work is organised over and above a particular shift. This involved negotiating overtime with the deputy. Successive overtime tended to create tension. Throughout the life of the face (65 weeks), the conventional group averaged per man per shift 1.32 hours of overtime. The composite group averaged 0.03 hours per man per shift.

The average reinforcement of labour, that is, the amount of labour brought in from a Reserve Pool to keep the cycle going amounted to a 6% addition to the total work force under the conventional organisation and nil on the "composite" face. Moreover, there was a peculiar phenomenon which the figures showed. The best shift the "composite" group ever worked occurred when they had some absenteeism on the face. The reason for this was that the group knew they were short of labour and consequently worked harder during that shift.

The stability of a shift is one of the measures of management, the ability to maintain stability and maintain steady progress toward objectives in the face of constantly changing circumstances, nit just absenteeism but a group of input and environmental factors. This is a significant measure. There were three shifts working for 6 days per week for 65 weeks. 69% of shifts in the conventional face were in cycle lag and hence the high demand for ancillary work (overtime). With the composite group only 5% of shifts experienced cycle lag. In the view of deputy and underground engineer,

who had responsibility for 5 –10 mining operations, cycle lag was a measure of strain. As the cycle lag increases management is placed under increasing pressure. In the "composite" group, the deputy was only involved in sorting out 5% of the shifts.

When the cycle lag reaches a certain point it accumulates and places more work on subsequent shifts until the cycle runs out of control and the operation must be restarted. Cycle shut down occurred 12 times in the life of the "conventional" panel. The "composite" group never lost a cycle. However, groups stpped because they were getting too far ahead of the "conventional" group, thus creating a danger from roof stress. When this occurred stand down payment was allowed.

The Social Systems Effects of the Experiment

At union meetings the two groups and other union members decided unanimously that any further faces opened up would be organised on a "composite" basis, the conventional method was no longer acceptable. Absenteeism under booth forms of organisation are set out in the following table.

Stress Indices for Different Social Systems

	Conventional	Composite
Absenteeism (% of possible shift):		
Without reason	4.3	0.4
Sickness or other	8.9	4.6
Accidents	6.8	3.2
Total	20.0	8.2

Absenteeism in the "composite" group of 8.2% is quite remarkable given the coal mining industry in England in the 1950's. Actually, over the period of the experiment the normal level of absenteeism was 23%.

Under "conventional" conditions, absenteeism without reason was high. Many miners took advantage of the high wages by enjoying a shorter working week.

With the "composite" group if a miner did not work he knew the other members of the group had to carry his workload. Therefore, there was loyalty to the group because of the negative repercussions from other group members. Absenteeism from sickness under the "conventional" method has similar effects, that is if a miner reported sick the deputy would still put his chalk mark on the timber but would also have to bring in reserves. If a miner did not turn up for work there was no repercussion on the other members of the shift under the "conventional" system.

Another component of the accident indices in the composite group was that all team members knew what geological conditions where developing at any time, across the

whole face and would take appropriate car and action. In the conventional organisation, there was little communication between succeeding shift and, particularly on the filling shift, miners would see little of the face apart from their own little stint. With regular monotony inquiries into British mine disasters were reporting large casualty figures from failure to clear a face even when clear warning had been passed along. We can only surmise that because their bit of the face looked sound they thought they were some 'nervous Nellies' down the line.

The degree of multi-skilled in the composite group was high with members working on average at 5.5 different tasks on a shift and doing a good deal of switching between shifts. In the conventional section, men worked on only one main task and could not change shifts unless they were prepared to move to lower paid, more arduous work.

In the villages the shift system and the amount of mutual recriminations between the different shift-task groups split the local populations into 'clans'. In the pubs, the aristocrats of the pit would not mix with the pullers, and neither with fillers. At meetings of the union lodge they would physically segregate themselves and actively participate only in matters that affected their sectional interest or that of lower status miners.

No single leader was apparent at any time or were there ever any fights for such a role. Leadership was much more widely spread and was usually specific to performance of a particular group task, at a particular place and time. Movements on the face, between shifts or in and out of the group were very much decided within the group.

With the bonus on coal won the composite face managed a shift rate some twenty per cent above the conventional face. Ironically, there was not much difference in average take-home pays. In the conventional systems there were ways of making money out of inefficiency and instability, e.g. in 'other duties', make-work and overtime. Admittedly, it was a harder and lengthier way to make a shilling and one that was full of hassles with the deputy, and the lodge. The most marked differences to one observing the working of the two faces were:

1. The striking difference in orderly housekeeping. On the conventional face timber lay scattered about where they fall on being extracted, tools dropped where they were used, props arranged higgledy-piggle, conveyer belts arranged across the floor just as it was, coal spills over or off the belt left just where they occurred and the face looking as though mice had been at it. The same regulations and the same deputy covered both faces, in fact hardly a shift passed without a deputy having to go the length of the conventional face. On the composite face the deputies hardly ever had to go beyond the entrance to the mother-gate to talk to the team's contact man who usually worked bear that end of the face for just that reason. Yet the housekeeping on that face was immaculate. Props, chocks and

the belts lined up as though by theodolite, the floor under the belt leveled and re-elevated is floor-rises occurred, only the most recent of the spillage still on the floor, props neatly stacked at regular intervals and tools stacked together around certain props. The face itself when it came time to jib the cutter, it use to look as though it had been chiseled. I have dwelt a bit on this because I do not think that there is any single measure, productivity, absenteeism, etc. which is so revealing of the morale of a coal-face, where close supervision is not possible.

2. The degree to which the miners were self-motivated toward cycle completion. On the conventional face, it seemed that down-time was a welcome break, particularly if the going was bad. If some other job needed doing and even if it needed doing quickly the first thought seemed to be find the deputy and strike a rate for the job. On the composite face, it seemed to be the norm that as a person finished one job they would tidy up and processed, without order or request, to join in another job, not to automatically take a break. Or if they observed others in trouble with a task more urgent than theirs to secure what they were doing and move over to help, again, without orders and not usually waiting for a request.

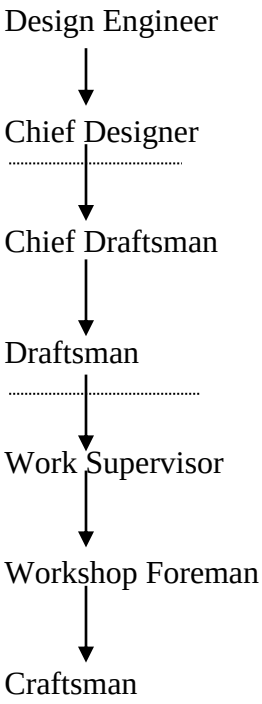
3. The degree of personal and social stress. This, like the housekeeping, was quite tangible to an observer. On the conventional face, mots of the coal seemed to be won in anger under a shower of cuttered curses for all and sundry. When it came to taking bait (crib) they seemed to melt individually into the darkness behind the face. On the filling shift men would go without saying a word from pit-head to pit-head. On the composite face it was most unusual to sense any such up-tightness. As shift change-over there was animated discussion of where the face was at; in travelling to and then across the face there was, despite the communication difficulties, active attempts to sort out how best to get about their work; throughout the shift one would see earnest discussions between two's and three's about problems that had arisen; when they broke to eat groups of varying size could be seen and they were rarely bitching. It was not a picture of men under stress.

Case: Department of Supply – Lithgow Region

This particular case relates to the development of graduate engineers.

When a graduate joined the department, he was initially given a project lasting about 12 months that would involve design, drafting and model construction activities. These phases are illustrated in Figure 6.

Figure 6. Flow of Engineer Design Projects

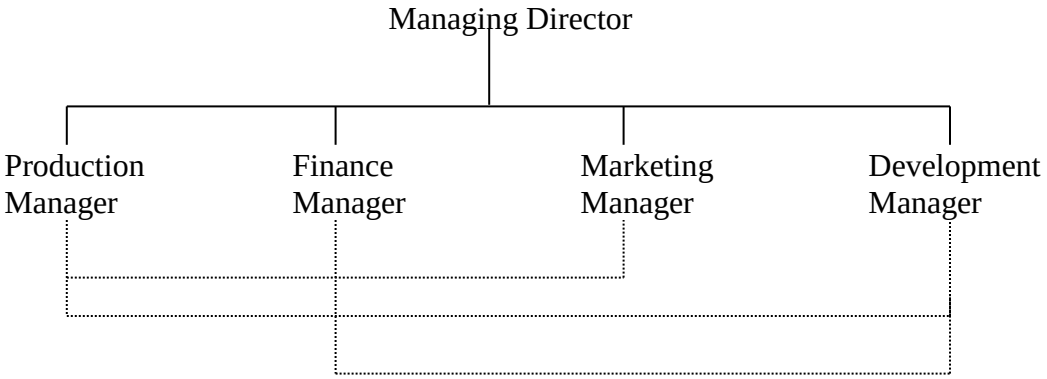


At no stage in the flow did any of the group liase to identify problems of design, workload scheduling or manpower resources. Consequently, graduate rarely completed a project within the 12 moth period. As an alternative, the graduate met with heads of disciplines to discuss the size and complexity of the project and the resources required. Discipline heads then selected manpower resources to form a group. The objective of this group was to complete the project. Within such a group the craftsman could point out that alternatives that design engineer was tossing pennies to decide were significantly different propositions when it came to machining with the equipment and work force this plant had. Similarly, the engineer craftsman and the draftsmen could certainly settle for less than a full set of detailed A1 blue prints. The design starts to become a practical design before any metal is cut and not too much Indian ink spread.

The graduate engineers got immersed in some of the practicalities of production and, as reported to me by one who came through the 'project system', actually got the satisfaction of completing one or even two projects.

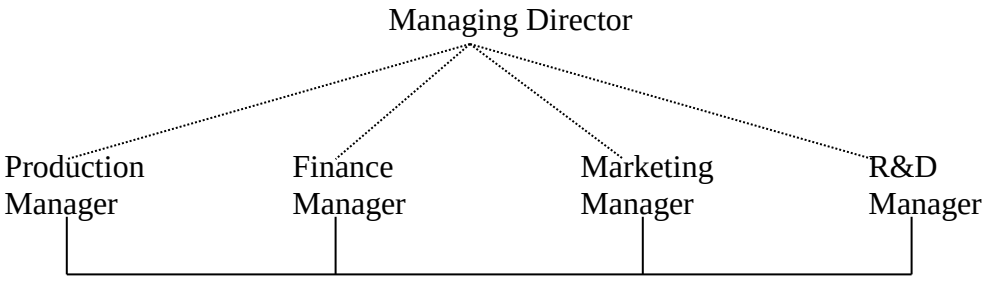
The case of Luv Petfood (1969-71)

The Sydney based company produced pet foods. What is interesting for us today is the way they developed team management. The original management structure was typically bureaucratic:



(Dotted lines represent informal lines of communication and influence). Each functional manager was judged on the performance of his function and he strove to look good in that respect. The overall performance was primarily the concern of the M.D. Even if the company failed it was important for a functional manager's next job that the failure was not publicly seen as due o his part of the business. In practice, there was a good deal of in-fighting and playing up to the boss to push one's own projects and to get a greater share of company resources.

The management had seen the very effective application of the team principle to their production line and asked themselves why it could not be applied to the work of management. The system adopted was that the functional managers, as a group of four took joint responsibility for running the company as if the MD was on holidays. Each had to wear two hats. Their original functional role and their responsibility, as a surrogate of the MD, for policies and operations in all parts of the company. In time they each found ways to delegate a large part of their original role to subordinates and found themselves with much more time to think and consult about the overall problems and opportunities facing the company. It was understood that if they got into conflict or if they agreed that the company should move in new directions the MD would be drawn in. It was also understood that if either of the two hats did not fit their careers with Luv would be in jeopardy. The alternative organisation took the following form:



The dotted lines indicate relations that can be invoked but are normally not used.

With this redefinition of responsibilities the pressure was on for all to get sufficient understanding of the other functions to participate meaningfully in evaluating policy

proposals for those functions. Needless to say some were better able to do this and thus stood out as potential MD material.

A subsequent interesting development was that they spent so much time with each other that they first discarded their individual offices, filling cabinets and phones and moved into a single open-plan office furnished like a simple 'club room'. After a good deal of soul searching they accepted that they did all need to be present all the time. Individual project work, correspondence and consultation could be done at home or where in the metropolitan area the person chose.

The management interface with production worked extremely smoothly as both were working on the team principle and both understood the need to agree on objectives and manage by objectives. This contrasted markedly with the interface with the sales force. There was a constant hassle about the objectives management tried to set and a fair amount of mutual distrust. For this reason, the team principle was introduced for the major metropolitan sales forces. It then became possible to agree objectives in an atmosphere of trust. It was no longer necessary for individual salesman to work at beating the system because collectively they became the system.

The examples I have chosen were selected to illustrate the two main forms of self-0managing groups. In the mining examples a high degree of multi-skilled was feasible and hence the processes of mutual control and coordination could operate with great finesse and little conscious formal planning. In the other examples there were real barriers to multi skilled and a great deal of conscious effort had to go into planning and reviewing joint efforts and using some formal mechanisms to ensure coordination. The areas in which we have seen project teams introduced have usually suffered from barriers to multi skilled. It is worth remembering, however, that many the supporting and servicing functions could readily move to multi-skilled. If project teams are introduced in research and development areas then one can expect trouble in integrating with bureaucratically organized office sections.

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