

Research report 16.1 Sociotechnical systems

Trist, E.L. and Bamforth, K.W. (1951) Some social and psychological consequences of the longwall method of coal-getting, *Human Relations*, 4(1): 3–38.

The introduction of the longwall method of coal-getting into UK mines failed to achieve the level of performance improvements that had been anticipated. Trist and Bamforth investigated the impact of the new technology on the social quality of work at the coalface. Their research method involved following and maintaining relatively continuous contact with 20 coalface workers over two years. Group discussions with all grades of manager provided additional data.

Their findings indicated that the 'room-and-pillar' method, which preceded the longwall system, provided workers with greater social balance than the more mechanized system. The outstanding feature of the room-and-pillar system was its emphasis on autonomous small groups. It was common practice for two colliers – a hewer and his mate – to make their own contract with colliery management and work their own small section of the coalface, with the assistance of a 'trammer' who loaded the hewn coal into tram-tubs and removed it from the coalface. This group had responsibility for the complete coal-getting task, was self-regulating and could set its own targets, adjusting work rate to take account of age, stamina and changing working conditions. The choice of workmates was also made by the men themselves.

The introduction of coal cutters and mechanical conveyers required radically different work relationships. Colliers worked in units of 40 or more men along a single long coalface, and their work was broken down into a series of component operations that followed each other in rigid succession over three

shifts. In the first shift, two men worked across the top of the coalface boring holes for explosives. Another two men used a cutter to undercut the coal to a depth of 2 m, 15 cm from the floor. Four more men removed the coal from this 15 cm undercut, making a gap so that the coalface could drop when the explosive shots were fired. Finally, temporary 'noggins' were inserted in this gap so that the coalface would not sag while it was left standing during the next shift. While all this was happening, two more men dismantled the conveyor belt and got it ready for moving.

During the second shift, two men moved and rebuilt the conveyor belt close to the new face. A separate team of eight reinforced air and haulage ways and ripped down the remaining roof of the old face to make the new working area safe. When all this had been done, the explosive shots were fired to collapse the coalface.

The third shift of 20 'fillers' worked independently of each other to extract all the coal from their designated section of the coalface. This had to be completed before the cycle could begin again, but many factors could make this difficult.

There were many close interdependencies between all the above tasks. Failure to achieve 100 per cent performance on any task seriously disrupted the cycle, but despite this interdependence, workers were only qualified to perform their own task, had little or no contact with others, and had no sense of belonging to a whole work group. Trist and Bamforth documented many of the problems that workers had to contend with in this situation of 'dependent isolation' – where they were split off from any sense of belonging to either a shift or a total production group – and observed that one of the ways the miners adapted was to adopt a norm of low productivity.

Trist (1969) reports that the early 'conventional' longwall system eventually gave way to a 'composite' system, in which miners were multiskilled and worked in self-selected autonomous teams responsible for allocating themselves to the various jobs management required the team to undertake. This increased flexibility allowed an oncoming shift to take up the production cycle at whatever point the previous shift had left it and carry on with whatever jobs had to be done next. This sociotechnical approach produced impressive improvements in both performance and the quality of work life for the miners.

This kind of development gave rise to a proliferation of other interventions in different settings that were directed towards systemic issues such as managing the