



COALTECH 2020

Task 7.1

Audit and diagnostic assessment of productivity in continuous miner sections

by

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Executive summary

The Coaltech task 7.1 was initiated as a result of prioritised needs assessments in the Coaltech strategic planning sessions. It was recognized that equipment and methods attracted strong attention in the research programme, but non-engineering and non-technical matters did not feature strongly. It was furthermore the view that human and social factors were probably the dominant influence on productivity, since engineering factors were relatively consistent from section to section. The variability in section performance, from world-class levels for the top performers to levels at less than half for the poorer performers, was believed to be attributable to human and social factors.

The objective of this task was therefore to understand which human and social factors exerted the strongest influences on the productivity of continuous miner sections, and to identify routes for improvement.

After performing a literature review considering various human and social issues that have been found to influence productivity internationally, locally and within the South African mining industry, the majority of the research involved mine based studies designed to identify which factors were most significant in the current organizational climate. The research techniques involved extensive interaction with all levels and functions at the mine through interviews, focus group discussions and participational observation. These techniques concentrated on learning about individuals' perceptions, and how they were shaped by the conditions they were exposed to. Behaviour of individuals, which controls organizational performance, is to a large extent controlled by the way those individuals perceive issues in the work and living environment.

In addition to the techniques aimed at gathering information on perceptions, studies of operations of a work-study nature were carried out to identify dominant sources of unnecessary losses in production. In addition, expert reviews were carried out to assess, against a more theoretical and scientific basis, how well human and social conditions were designed.

The findings of the studies identified few obstacles to efficient production in the design and implementation of the system of mining. The equipment used was generally well designed and maintained. The workforce was technically competent to perform the required functions. With a few exceptions, staffing levels were appropriate to ensure that the required activities could be carried out with minimal delays. Logistical support was also generally well provided such that mining activities could progress without delays. It is recommended that some improvements could be achieved at minimal cost by paying attention to issues falling in these areas. They are likely to be highly specific to individual sections, and examples are provided in the body of the report. Soliciting inputs from the workforce who are familiar with the day-to-day operational issues to identify specific problems and developing solutions is encouraged. *Moolman et al (2003)* have identified that, with comparable mining methods and layouts, production per shift from a well-performing continuous miner section in South Africa is at a similar level to that in advanced coal mining countries.

The major issue that was found to directly impede efficient production was difficult mining conditions, as these disrupt orderly production cycles and result in stressing of equipment. It is difficult to distinguish to what extent the conditions are within or outside the control of the mining team. To some extent, geological factors influence difficulty, while quality of mining also exerts a significant impact. What was identified is that various factors start to interact and compound each other in self-reinforcing cycles. A vicious cycle was observed triggered by the experiencing of one or other difficulty outside the control of the mining team. If the team does not feel support in some form to overcome

the difficulty, prospects of achieving start to become distant, with negative implications for morale and team dynamics. As a result, quality of mining starts to decline, further compounding the difficulties, and reinforcing the cycle.

It is likely that the above cycle repeats itself with the details varying in many instances throughout the industry. In many cases, sections enduring such a cycle experience negative attention, being subjected to discipline or threats, and this tends to further compound the problem. Support from management, even if not warranted on pure engineering or technical grounds, may be required as a psychological assistance to the team to break the vicious cycle.

The above illustrates how diverse factors combine and interact to influence productivity and performance. Relatively minor issues can escalate unless attended to before a cycle gathers momentum, and becomes more difficult to reverse. Continual monitoring, open communication and responsiveness to the situation to avoid the cycle developing are the most desirable approach. By the time productivity has dropped, it is probably already too late.

Monitoring early warning signals, many of which may be subtle in nature, on the part of supervisors would be critical. Some examples of precursive indicators would be sloppiness in work, lack of communication, reductions in team spirit, growing incidence of disciplinary cases, excessive absenteeism or growing incidence of breakdowns. Supervisors would also need to draw strongly on their human empathy skills to pick up the subtle signals, and react positively to the condition. It was observed that teams generally had the inherent capabilities required to produce at high levels provided that they had belief in their ability to perform and the motivational factors were functioning effectively.

Factors influencing the will or motivation of the workforce to apply their skills to produce at high levels and to a high quality were, without doubt, the dominant issue. These systemic influences were seen to far outweigh the human and social issues more directly impacting on mineworkers.

The primary, or even only, motivational influence overtly expressed was monetary reward. The bonus system represents a substantial part of mineworkers' remuneration, probably on average not far short of doubling pay. Although not understood in detail by the majority of the workforce, the underlying principles undoubtedly drive behaviour strongly.

The team based nature and general inclusivity of the bonus system were recognized as positive features, reinforcing the team culture of the mine. In cases where certain groupings were not included in the bonus system, or were included inequitably in their opinion, corresponding attitudes and motivation was noted. Furthermore, application of different calculation methods, bringing in additional criteria at different levels, was not regarded as equitable and created different terms of reference for the individuals falling under different systems. The lack of reward at individual level, coupled with the application of discipline at individual level, was noted as an issue.

There are a number of issues that were often repeated concerning the bonus system. They tend to focus on production quantity to the relative exclusion of other parameters which are expressed as important in the mine's value system. Often, other parameters are handled as a penalty modifying the amount due. This creates a degree of tension between what is stated to be important, for example during induction, and what is focused on in the real work environment. While there is merit in keeping the bonus system simple, it is important that it should reflect and reinforce the values of mine leadership.

The bonus system is a very contentious area evoking strong opinions. This is certainly indicative of its power as a motivating factor, and its importance to all employees. A commonly raised point is the fairness of the systems in use, with a general view that bonus payments should be equal. This is based on the viewpoint that bonuses should reflect the level of extra physical effort which the workforce feels is required to achieve high levels of production. While there is no correct answer, the fundamental notions underlying the viewpoint are of great significance. Unless addressed with common ground being reached, the differing viewpoints are likely to result in frustration and continuing sentiment that individuals are not being fairly rewarded for their efforts.

A common area of misunderstanding is tax, especially as regards bonus payments. Perceptions are common that employers are using tax as an excuse to withhold money for their own benefit. A common problem arising from bonus payments is uneven cash flow, which leads many mineworkers to develop personal financial problems. If these become serious, they can cause stress, which detracts from job performance. Furthermore, bonus payments were being perceived frequently as an entitlement or expectation, with lifestyle expenses rising to match peak remuneration levels. In this context, instead of the bonus being a positive motivator, failure to achieve a full bonus starts to become a penalty, and a system of dependency on monetary reward starts to be created.

A lack of financial life skills on the part of mineworkers to cope in a more progressive system of employment thus compromises the effectiveness of more advanced motivators. Programmes of education and counselling may be of great assistance in supporting the advances as members of the workforce gain experience in a more advanced sociological environment.

While monetary rewards were the most overtly discussed, considerable evidence was accumulated that non-monetary rewards appealing to higher levels of need are highly regarded. The need to be recognized as achievers, both by colleagues and among family members was evident at an underlying level. For example, being the last team to qualify for a semi-social, semi-educational outing was an extremely powerful motivating influence. To be effective, these non-monetary rewards need to be in the form of symbols with almost no financial value, or of substantial financial worth. Low value presents tended to cause negative reactions. When supervisors provided cooldrinks or chocolate bars as a reward for attaining shift targets, sometimes out of their own pockets, a reaction of mixed feelings was evoked. The symbolism of qualifying was important, while the workforce felt their value somehow demeaned by the low monetary value.

A further point, relating to the lack of financial life skills, is a lack of appreciation for the benefits of non-monetary recompense. Provision of non-monetary rewards is a challenging area, with many possible pitfalls, but with major psychological benefits when effective.

There has been considerable emphasis on exposing the workforce to a broader view of coal mining operations, and how the activities carried out contribute towards an effective operation. These initiatives have had a major effect on motivation, with a much-increased sense of self-worth in jobs previously regarded as mundane and pointless. This is another example where satisfaction of higher order needs is starting to become more significant. In addition, the information provided on operational performance was starting to become more meaningful to the workforce. These factors were seen as important in underpinning the development of alignment and team culture across the mine.

A significant side effect of increased exposure to business issues has been the development of growing concerns among the workforce. Having appreciated, at least to a limited extent, the functioning of the industry, signals are interpreted and discussed, sometimes with flawed conclusions being reached. Having initiated the trend, it is essential to further open discussion channels such that matters are understood accurately. In this process, trust increases in importance; some suspicion was noted during the studies. It will also be essential not to shy away from sensitive issues, as that would damage the level of trust.

Mine value systems were identified to be progressive and well balanced between pure business objectives and socially responsible corporate governance. These were articulated clearly through a variety of mechanisms, most particularly through induction programmes. However, some disparity was noted between the ideals of the value systems and the practices within the mine. One example is the emphasis on measuring production quantity in determining rewards as noted earlier, with only marginal overt measurement of other aspects of the value system. While mine leadership was observed to be sincere in expressing and communicating sound values, the systems in place did not entirely reinforce them.

Communication was a factor identified as fundamental to the effectiveness of motivational systems. Job information flowed relatively freely through the mine such that individuals had access to the information needed to function effectively. Individuals were generally well informed about performance and happenings on the mine through a combination of written and verbal communication. The communications generally reflected and reinforced leadership values. However, as mentioned earlier, gaps in communication on matters related to employment but not directly within the scope of the job were noted.

Within team communications and between functions were generally effective. These were well supported by good communications infrastructures that supported speed in communication.

Upward communications were a problematic area. Despite some good initiatives to promote more open upward communication, there was reluctance to make use of the channels made available for a variety of reasons. The most effective upward communications were noted to take place informally, perhaps during social events, rather than through a mechanism more formally established for this purpose. However, there remains a need for mechanisms to be permanently and dependably available. In some regards, there is a need for individuals to become accustomed to progressive trends in the management system, and used to a greater degree of transparency and openness. Occupational culture may need to change over extended time periods, and attempts to introduce upward communication mechanisms may well be futile.

Style and manner of communication was found to be of extreme importance. The effectiveness of essentially similar communication media were strongly influenced by subtle factors such as timing, location, language and attitude. Furthermore, communication was preferably not overly intense with the emphasis on conveying a clear message with potential for quality discussion.

Structures established to represent workforce views were generally seen not to be effective by the workforce. The union had little credibility with the workforce, as engagement in participative management practices did not allow the union to demonstrate convincingly how it was protecting its members' interests. Furthermore, through union mass meetings, the membership gained the impression that the union was not addressing the issues of greatest importance, rather concentrating on matters of union policy or on issues which management placed on the agenda. The above largely

arise from the major strides that the union has made in moving from confrontational and adversarial approaches towards a partnership with management. The challenge for both management and the union leadership is to instil confidence in the workforce that their interests are well catered for in the new dispensation.

Hostel residents' committees tended to take on a more controlling than representative role, with strong suspicion on the part of residents of collusion between members of the committees and suppliers of outsourced services.

The above create a sense of lack of representation that is disconcerting to the workforce. Trust in management's sincerity and credentials go some way to alleviating this, but it would be advantageous for management to ensure that the structures in place are perceived by the membership as effective and sufficiently powerful.

As alluded to in the above paragraphs, management systems are becoming more progressive, although there is still a relatively strong authoritarian and controlling culture. This trend has been acknowledged and welcomed by the workforce. In many cases, the workforce expectations of participative management were more advanced than the practice. Learning programmes have introduced new team based problem solving processes to the workforce, which some supervisory and middle management staff appear reticent to implement. At the mine leadership level, there is strong drive to implement progressive management practices, with policies and approaches assessed to be in line with world-class practices.

At the leadership level, strongly differing styles were observed ranging from hands-on involvement to a more enabling style demanding of strong initiative from middle management ranks. The various styles observed created distinctly different organizational cultures, and were all effective in creating positive work environments and enhancing motivation, albeit in different ways. It is considered that the style needs to be well matched to the stage of organizational evolution to allow the culture to grow through various stages as maturity of individuals develops. Individual leaders will undoubtedly have to adapt their approaches to harness the strengths in the people of the mine and address their weaknesses.

The supervisory and middle management positions are undoubtedly being subjected to a wide range of challenges. Adoption of new management methods is resisted as feelings of insecurity are created. Frequently, the human relations skills required to confidently implement new management methods have not been provided. The issues are compounded by the transformation taking place at these levels. Relatively inexperienced but well qualified individuals are supervising highly experienced but relatively unqualified individuals, many of who feel under-rewarded for the experience they contribute. Traditional white supervisors have lost the protective environment, and feel their prospects for advancement have been capped.

In addition, staff in the middle management ranks expressed strong views that they had accountability and responsibility, without the commensurate authority to fulfil their roles effectively. Their authority was largely restricted to resorting to disciplinary processes, and hence their ability to motivate positively was restricted. The level of empowerment required by staff in these positions is an important issue to support full implementation of more progressive management systems.

Examples were noted where supervisors and middle managers had adopted more participative styles, incorporating contribution from the workforce in operational decision making. Sometimes, experienced members of the workforce held de facto leadership positions among the team, and the supervisor welcomed the contribution rather than

resisting it as a threat to his authority. In teams where the supervisor saw his role as establishing the overall goals and objectives, and then acting as a resource to his team to ensure their requirements were met and no barriers to effective production existed, the best performance was noted.

Considering the nature of the human and social factors that were influencing productivity, the goal of trying to relate each factor independently in a quantitative way to productivity was found to be impractical. Had the important issues been at a more basic level directly impeding productivity, this may have been possible, but the indirect issues were found to dominate. In fact, the factors act in combination to create a well-motivated work environment. As reported in the literature review, achieving a reasonable level on every important dimension is likely to be more effective than excellence in some while falling below a critical level in others. Despite the above comments, the quantitative impact on productivity arising from establishing a motivating work environment should not be doubted. Statistics from the literature review indicate that a demotivated workforce may take three times longer than a highly motivated one to perform specific tasks.

Based on the studies, a preliminary checklist of good practices has been drawn up highlighting the most important issues that should develop a motivated and satisfied work environment.

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1 Literature review and background information

Appendix A provides an extensive review of literature relating to human and social factors which impact on productivity. It is structured in four major sections addressing respectively, management systems, occupational culture and living conditions, health issues and ergonomics. These are considered to cover the most important human and social factors that impact on productivity.

A relatively comprehensive literature base was found to be available on each of these topics internationally. Much of this literature is highly relevant to South Africa in general, its mining sector, and coal mining specifically. It is considered that many of the principles could be usefully adopted, probably with appropriate adaptation, into coal mining operations, in cases where they are not in place already. A significant volume of literature is referenced from which individuals may find information at a more theoretical level that could be used to benefit in South African coal mining operations.

A limited amount of information specific to the South African context was identified, with a substantial portion of this being in the gold mining sector. This literature was especially concentrated in the occupational culture and living conditions dimension. It is probably in this area that the greatest amount of South African context is required.

Very little appears to have been documented specific to South African coal mining. It has, however, been identified that considerable progress has been made at individual collieries in addressing human and social issues, with a considerable effort in reviewing the effectiveness of current systems. The major emphasis appears to have been on efficient work systems and functional job requirements linked with the machinery and equipment installed. These initiatives have normally been based at section level, with action plans to overcome barriers to production and enhance work organization, often addressing section specific issues. Far less attention was focused until recently on the broader motivational issues. Most mines have embarked on processes to identify human and socially based initiatives to improve section productivity as well as the quality of production and mine safety and health.

The following section of the background expands on this by providing some perspectives from key individuals in management and labour who have been extensively involved over recent years in the evolution of the coal mining sector from the human and social perspective.

1.1 Recent trends in South African coal mining

If one examines the recent history of coal mining in South Africa from the human and social perspective, two main phases are evident. The first taking place during the 1980's and 1990's was a change in the technology base of the industry, with the pervasive introduction of continuous miners. The human and social consequences of this technology change were extensive. The second phase following on was concerned with the organization of work and transformation associated with the democratisation of South Africa. These observations have been supported through interviews with *Smith (2002)* and *Majadibodu (2002)*

The change in technology base fundamentally influenced the management and workforce of mines in many ways. Firstly, and perhaps most obviously, new skills were required to operate more advanced and sophisticated machinery. This led to the industry in general reviewing skills requirements and embarking on major skills development programmes. Secondly, the size of the workforce declined substantially as a result of the higher labour productivity associated with the new technology. This had far reaching human and social consequences in several ways, including that organizations became smaller units with different culture, a workforce with generally greater experience of mining resulted, previously crowded hostels could accommodate the workforce in less cramped conditions and job stability was less assured than in the past. The ramifications of these and other factors were strongly noted in the mine-based studies. Thirdly, a more skilled workforce started to have higher expectations of its employment, and these were reinforced by the changing general political and social situation in South Africa. This latter point in particular was a strong trigger for the second phase.

Having adopted new technology and developed a competent workforce equipped with the right technical skills, the next challenge was to optimise the work organization. This encompasses issues such as defining efficient working practices, ensuring that the right resources are available as needed, and re-defining the way that people involved in the system of work relate to one another. In the recent history of South African coal mining, say over the last 10 years, a broad range of initiatives have been planned and implemented to advance the effectiveness of work organization. Much of this has involved programmes to develop different sets of human and social skills and attitudes. In addition, the integration of work activities has been refined considerably such that high efficiency is routinely achievable.

2 Research methodology

The research was conducted in two main stages.

The first comprised a literature review examining the various factors in work and living environments that have been identified by researchers as impacting on productivity. This considered international, South African and mining industry specific findings. In addition, a number of interviews were carried out with experienced individuals from the coal mining sector to obtain a high level perspective of the trends in human and social factors that have taken place recently in the coal sector. The literature review was reported on in section 1 of this report.

The second component of the research methodology involved three mine based studies, covering five continuous miner sections, to determine what has recently been and is currently influencing the productivity in coal mining operations. A range of high production and lower production sections were considered with the purpose of highlighting the critical differences, learning from the benchmark sections and identifying

the major changes required in the lower performing sections. A combination of research techniques was used to elicit the required information.

Firstly, continuous miner operations were studied to determine the major direct reasons for loss of production that impact on either capital or labour productivity. Knowledge of the direct causes of standing time for both equipment and labour is essential to understand how the more indirect factors manifest their influence.

Secondly, a range of individual and collective interviews were conducted at all levels of the workforce and in a variety of functional capacities to identify the perceptions of individuals concerning the factors in the work and living environment which influence their performance. Some of the interviews were conducted on an open-ended exploratory basis to discover what individuals believed to be the key factors impacting on productivity, while others were carried out, often in focus group mode, to obtain more detailed information on specific issues identified as important at the mine. Engaging with members of the mining workforce in different manners yielded significant insights.

Thirdly, the participational observation research method featured prominently. This technique involves living the work and social life of a mineworker for an extended period of time both to obtain first hand experience of how the conditions influence attitudes and at the same time observe and interact with fellow mineworkers to discover how they are influenced by conditions and events.

Fourthly, expert reviews were carried out to assess, at a more theoretical level, how the systems, processes and practices of the mine should influence the workforce in terms of productivity. Expert reviews were carried out to consider those issues that the other research techniques highlighted as important.

The methodology was designed to provide a comprehensive perspective of the factors that are influencing productivity either positively or negatively. In order to understand what is influencing organizational performance, it is essential to appreciate the work and living environment, how it shapes individuals' perceptions and attitudes, how those perceptions and attitudes translate into behaviours, which ultimately control how productive the section, or the mine will be. The methodology considers all these levels and gives each due emphasis.

Undoubtedly the most important controller of performance is individuals' perceptions and attitude. Whether perceptions are justified or not, based on erroneous or missing information or flawed understanding or not, they control the motivation and will of members of the workforce to perform. Since perceptions and attitudes are also more difficult to assess for a variety of reasons, a high percentage of the research effort focused on identifying perceptions and attitudes, and what is shaping them.

The final stage of the research involved consolidating all the information derived from the mine studies to develop a generalized understanding of the key issues and factors that promote or hinder high productivity. Those findings are presented in this report. Specific findings were reported back to the individual collieries that participated in these investigations at a more detailed level. This report contains the generalized perspective that all collieries may benefit from. A preliminary checklist has been developed of the key success factors and principal barriers that appear to have the strongest influences on productivity.

3 Findings

3.1 Productivity

The focus of the work described in this report is the impact of human and social factors on productivity of continuous miner sections. Before discussing the factors that were identified as having the major influences, it is important to provide clarity on the way the term productivity has been interpreted.

In literature, there is a wide range of productivity definitions. These range from a simple ratio of output in terms of units of production to input in terms of units of effort, to more socially oriented definitions encompassing notions such as the performance of productive work in decent working conditions. For example, the definition of productivity suggested by *National Productivity Institute and National Economic Development and Labour Council (2001)* captures the multifaceted nature of productivity. According to those authors, productivity is defined as creating wealth through generation and application of knowledge to make available products and services that meet the needs of the user and are consistent with social, environmental, and economic goals of the society.

Since the presence of decent working conditions is an essential pre-cursor to positively motivated performance, as opposed to productivity that may be enforced in sweat shop conditions, the alternative definitions should not carry particularly different connotations for a socially responsible employer. In fact, the value systems, or measures of organizational performance, encountered on the mines studied encompass the broader socially oriented definition of productivity, with issues such as safety and health, and morale featuring as organizational objectives, together with the employer making a positive contribution to society in general. Furthermore, quality of production, in addition to quantity of production, is an important determinant of productivity.

To some extent, it is thus semantic which definition of productivity is adopted. The studies carried out provide information on how human and social factors influence section performance in terms of the basket of parameters that define performance. Although there is a major focus on the more restricted definition of productivity, i.e. ratio of units of output per unit of input, for the most part, the same human and social factors influence the attainment of whichever performance attributes are most emphasized at the mine.

A pertinent distinction identified through the studies is that between capital and labour productivity. The dominant focus of the mines has been on capital productivity, i.e. how much does each set of capital equipment produce. This is mainly because the cost of capital and labour is in a proportion different from the conditions in other comparably mechanized coal mining countries. However, some signals were identified which show that, having pushed the availability and utilization of capital equipment to high levels, the focus is starting to encompass labour productivity, in other words how capital equipment can continue to produce at the same level with less cost spent on manpower. In this context, manpower includes service functions and management as well as the section workforce.

Steady changes in the ratio of capital and labour costs are also driving a change in emphasis. In addition, the general culture throughout the coal mining sector was focused on achieving high section throughput using the available resources rather than on producing target output with a smaller amount of resources. However, with production in many cases at least temporarily outstripping demand, the emphasis was

noted to be shifting from maximizing production per section to a consciousness of unit production costs. The consequences for the workforce of this shift were noticed to be pronounced, as a tension is created between achievement and security of employment. If the objective is to produce as much as the mine can with the current resources, that tension is not apparent. If the paradigm starts changing to a culture more conscious of operating costs rather than capital utilization, the motivational systems will need to be adjusted significantly in line with that trend.

Most of the findings in this report are based on observation of how human and social factors influence the effective use of section infrastructure and equipment, concentrating on factors underlying why machinery installed in a section is not actively engaged in producing coal. Relatively less attention was paid to manpower time not engaged in productive work, unless this compromised in some way the efficient use of machinery.

3.2 Observations on direct reasons for loss of productivity

This section outlines briefly some of the main direct reasons why production was lost during operating shifts. Activities which do not directly produce coal, but which are a necessary part of the production cycle, are not regarded in this context as a source of loss of production. The reasons underlying the various behaviours noted during the studies and identified in this section are discussed in the following sections.

It should be stressed at the outset that the behaviour of the workforce was generally very positive and indicative of a strong team based culture with good motivation to produce at high levels. Flexibility to contribute as required to team performance was the norm, even if that implied performing activities outside the direct scope of an individual's job. This encompassed both within shift cooperation as well as cooperation between functions.

The record setting performances, with production rates in excess of 100 000 tons per month per section becoming relatively commonplace, bear testimony to the ability of a large number of teams in the industry to behave extremely productively. Such performance is at an international benchmark level per section, although South African collieries would generally use a greater quantity of labour per section than overseas counterparts. Thus, while section or capital productivity is at internationally comparable levels on a shift-by-shift basis under equivalent mining conditions and layouts, labour productivity is still lagging to a certain extent. This is addressed in more detail by *Moolman et al (2003)*.

Nevertheless, even in the higher performing sections, certain behaviours were noted which detracted from production and to a greater extent in the lower performing sections.

The research team noted the most pervasive detractor from high productivity to be the need to deal with more frequent equipment or machinery breakdowns arising from operation in sub-optimal conditions. In particular, poor, uneven floor conditions resulted in equipment being unduly stressed in a variety of ways. Waterlogging of trailing power cables and general damage to equipment resulting from uneven floor were particularly common. These circumstances influence both section production through lack of availability of equipment as well as labour productivity.

A number of instances were noted where production appeared to be deliberately slowed by the workforce. While not constituting a formal go-slow, the changes in behaviour, which caused this, were subtle, but significantly influenced the production

rate. On many occasions, the production rate appeared to be varied during the shift, with the production effort at high levels only for a portion of the shift. It appeared that the team was managing its performance to a defined level rather than pushing for the best achievable.

Lack of cooperation between shifts was a further significant source of losses in production. Ineffective handover was observed on many occasions, with, for example, the location and condition of equipment not communicated to the incoming shift. There is little doubt that this was done deliberately, as a symptom of unhealthy competition between shifts, with the value of an efficient shift changeover well known to the workforce. While the healthy competition between shifts and between sections which took place in high performing environments was observed as a strong motivator, among poorer performers the objective subtly changed from striving to be the best to making sure another was worse.

Another related example is the push to achieve shift performance targets or records. Inevitably, setting of records in a single shift left a legacy of catch-up activities for the following shift, which could not be performed while pushing for production. It is possible that the long-term average production is affected by this syndrome due to losses in efficiency and some unnecessary work.

Throughout the studies, a certain amount of corner cutting was noted, although this varied from case to case. This type of behaviour was especially noted when pushing for production. Examples include not keeping stone dust within the prescribed limits, advancing bords in excess of the maximum permissible distance without forced ventilation, using makeshift tools and equipment, not using personal protective equipment at all times and not following the correct procedure when clearing clogged feeder breakers of large lumps. On occasions, pushing excessively hard for production, for example, by driving shuttle cars at speeds inappropriate to floor conditions or cutting corners in production operations, was noted as counter-productive in the longer term if equipment damage resulted.

Especially in poorer performing sections, some team members were observed not to be contributing a fair amount of effort towards the collective outcome, with consequent adverse influence on the behaviour of colleagues. Frequently, this type of behaviour tended to be exhibited by older members of the workforce. While impacting directly on labour productivity, the ripple effect on the motivation of other team members influenced section outputs, probably to a greater extent.

Moolman et al (2003) provide more in depth information in this area.

3.3 Factors directly influencing productivity

The illustration in Figure 3.1 indicates the four elements required for a highly productive work system. The discussions in this section relate mainly to the three inner segments, which are primarily concerned with the ability to work productively. The outer ring considers the broader environment within which people function, and largely influences the motivation of members of the workforce. In using the term environment, it is intended to convey the large number of influences that affect the will of individuals to contribute to their full potential, and not just the physical work environment. There is interaction between the inner segments and the outer in that, if a workforce is not equipped with the resources required to perform, motivation is also adversely affected. As later sections show, these effects can be strong, although they were not observed frequently.

The direct influences on productivity are essentially the three inner segments of Figure 3.1, i.e. the capability of the workforce, the condition and suitability of the equipment and the work organization arrangements. The studies conducted on the mines have confirmed that these elements are largely in place.

Technical job knowledge was at a high level. With a generally mature and experienced workforce that has worked with continuous miner based technology for several years, it is not surprising that this should be the case. The re-skilling programmes that were implemented to support the adoption of continuous miners have been effective, and refresher training is now regarded as a standard practice not worthy of major comment. Furthermore, a high level of awareness of hazards, safety and health issues was demonstrated, even if on some occasions the appropriate safety and health standards or safe work procedures were not adhered to. Reasons other than lack of knowledge or competence appeared to lie at the root of non-compliances. While not excusing non-compliance, it is felt that there is a good appreciation of when cutting corners would not be excessively dangerous. The low accident record on the mines studied supports this view.

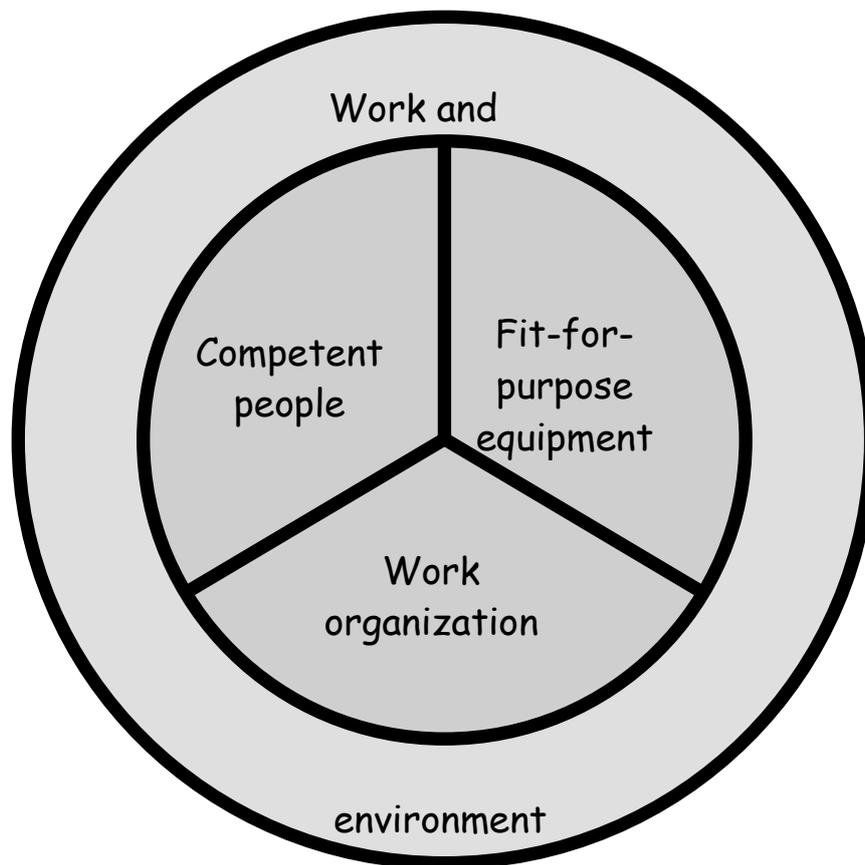


Figure 3.1 Essential elements of an effective work system

While not explored in great depth, because the existence of technical competence was not a major issue, it appears that learning methods are concentrating on generating improved understanding for the technical aspects of coal mining operations, and not just on teaching the mineworker the approved way to perform a function.

Also inter-personal skills were present at high levels as evidenced by the generally high quality of team dynamics displayed. This is a result of various behavioural interventions aimed at elevating the level of inter-personal and social skill. At the one extreme, programmes have involved formal team building exercises during which team members develop trust in one another, learn how their actions or statements influence their colleagues and solve problems together. At a less formal level, team members were encouraged to participate in events where development of inter-personal skills would result organically and greater understanding of workplace colleagues would be generated. Both approaches were identified as meritorious, each with their own distinct advantages. Some held the view that formal programmes could be expensive and time consuming while less formal events could achieve a similar level of outcome, while others had the view that formal programmes were necessary to develop a good basis drawing on the skills of experienced facilitators from outside the immediate work environment. A combination of the two is probably most desirable to optimise effectiveness, effort and cost.

An important note relating to this type of training was a degree of disillusionment and frustration with the implementation of learning in the workplace. As discussed later, the supervisory and middle management levels tend to be the most resistant to progress and change for a variety of reasons. Appropriate development of these staff synchronized with the development of maturity among members of the workforce is essential to successful implementation, for example to allow the problem solving skills which a team has acquired during learning programmes to be applied to good effect in the working environment. This is partly indicative of a competence gap in the middle management and supervisory levels, and partly indicative of a reticence to make use of new approaches. Intense coaching and mentorship would probably be the most appropriate means of developing the skills platform and ensuring that it is used effectively.

Equipment was found to be generally well designed for its purpose. The workforce did not appear to experience excessive difficulties in performing the required operations or maintenance. Trailing cables suffered from major problems especially when floor conditions were inferior and water was standing. Battery operated equipment would offer greater productivity in these circumstances, but, in good mining conditions, the difference may not be appreciable. The economics of trailing cable versus battery power has not been analysed, but the optimum is likely to be strongly case specific. A key question, with significant motivational implications, is whether it is appropriate to accommodate poor conditions through provision of equipment that will perform more robustly, or to expect conditions to be improved through good mining practices such that equipment will function properly. A middle course is probably warranted

Uneven floor was also noted to stress equipment unnecessarily, particularly shuttle cars, resulting in a need for more frequent repair and maintenance work, and lack of availability of the full number of shuttle cars to sustain full-scale production.

Availability of equipment, particularly the continuous miner, is strongly influenced by the cycle of production activities, with maintenance and necessary non-production activities occupying substantial time periods, mainly pick changing, moving from end to end and other repair and maintenance work. The expected or planned availability for coal producing work is thus low due to aspects of the system design. The suite of equipment installed in a panel is well matched to provide adequate redundancy, and follows a relatively standard pattern. Whether re-design is possible to allow production to continue while other activities take place is an open question, but innovative design to permit a higher availability could potentially elevate the section productivity.

In the physical work environment, dust and visibility were identified as minor problems, but not substantially impacting on productivity. Shift systems were identified as generally well designed. A balance between physiological considerations, practicality and accommodating social needs of the workforce was incorporated in the design. Forward rotation when moving from one shift to the next in the cycle was identified as a desirable feature generally present. Minor concern was expressed over fatigue towards the end of shifts with duration longer than the norm. Another minor issue was the lack of drinking or nutrition during the shift.

Different practices were noted around maintenance, with some sections incorporating a full maintenance shift and others performing maintenance on a more reactive basis. Provided that the cycle of production and maintenance was well defined and managed properly, and staffing was appropriate to the work cycles, no major difference in overall performance could be identified between the different systems.

A number of isolated examples were found where improvements would be possible with respect to work organization and logistics, even in strongly performing sections, and these are discussed in section 3.3.1.

The major distinguishing issues, which influence the performance of continuous miner sections, lie in the area of factors that indirectly influence productivity, largely concerned with motivation, or the will to work. Much evidence was collected demonstrating that the mining workforce had a generally high level of capability to perform provided that its members wished to apply that capability to the full.

3.3.1 Work organization

Examples of areas of work organization where improvements could be realized were a lack of sufficient diesel mechanics in one instance, and electrical sub-stations removed too far from the working faces causing delays in resetting after trips. These examples are strongly site specific but it is envisaged that in most sections similar sub-optimal practices could be identified. It is recommended that review of information to isolate reasons why certain unnecessary delays take place. Listening to the workforce, which is probably familiar with those reasons already, would be worthwhile to reap some gains in productivity, even if those would be relatively modest.

It is important to note the consequential effects of addressing issues such as this. By adopting a few minor changes, which, of themselves, may make minor differences to productivity, the workforce will become incentivised to perform at a higher level. Frustrations in working effectively escalate in their impact through their demotivating influence. By acting to deal with frustrations, the change is seen as an expression of care from individuals with authority to avoid unnecessary difficulty for members of the workforce in performing their work. In addition, if workforce input is encouraged to suggest improvement of this nature, individuals will feel more involved and motivated, which should fuel an upward spiral of participation. However, as noted later, there appear to be a number of factors inhibiting this type of involvement.

Different strategies towards equipment maintenance were observed at the three collieries studied. In one case, maintenance was integrated into the section team, with some centrally provided maintenance functions; maintenance was performed mainly by engineering services in another instance; while a separate planned maintenance shift was scheduled in another case with urgent maintenance and repair work being carried out during the two production shifts.

All of the approaches appeared to work effectively, and it would be difficult to recommend a specific approach as preferable. One feature, which is critical to the motivation of equipment maintenance staff, is that they are treated as full members of the system of production. This is discussed in more depth in section 3.4. Planned maintenance programmes have the obvious benefit of reducing disruption due to unforeseen events during the production shift.

A full assessment of the economic effectiveness of a maintenance shift is, however, beyond the scope of this research task. Data would need to be collected on a broader scale to quantify the cost structures associated with different maintenance approaches and the associated implications on production rates.

3.4 Factors influencing perceptions, attitude and behaviour

This section of the report considers the factors that influence the attitudes and perceptions of the mining workforce, and lead to the behaviours and performance as outlined in section 3.2. This section is by far the most important because, given that the basic requirements are largely in place, it is through these factors that sustainable high performance is achieved.

A wide range of factors was found to be instrumental in shaping perceptions. In general, it was found that the vast majority of the factors need to be well addressed for perceptions to be positive and for the associated performance to result. In cases where a few factors are not well addressed, the negative impacts start to outweigh the positives, and a corresponding mixed sentiment is generated among the workforce. This is in agreement with the Aeroquip Vickers case study reported in the literature review included as Appendix A.

3.4.1 Value systems and leadership

At all the mines, strong value systems consistent with responsible company governance are expressed and communicated by mine leadership. The value systems, although expressed differently, contained quite similar elements on all the mines studied. They embraced quantity and quality of production, production cost, safety and health and employee satisfaction. The value systems are thus well balanced between running an efficient business operation and an operation responsible and caring towards its employees. The value systems are uncomplicated and straightforward. They are shared with workforce, for example through induction, and indications are that the official values are well known to and accepted by the workforce.

Despite the value systems being advanced and in line with good corporate governance in a democratic society, roll-out is not entirely effective. The practice at the coalface deviates from what mineworkers are taught during induction and other official communication, and several strong opinions were expressed to that effect. The day-by-day concern at the coalface focuses strongly on quantity of output to the relative exclusion of the other elements. Quantity of production is the obvious observable parameter focused on by middle management and supervision. Furthermore, this is the issue which is most discussed as one moves along the management chain and during the course of the production shift. Safety is definitely talked about with high emphasis, normally in pre-shift meetings, but, despite this, poor safety practices are often condoned by line supervision.

The emphasis is reinforced in the measurement and reward system, with bonus payment dependent primarily on production quantity and only modified by the other elements. In some cases, these modifications are only applied to more senior levels. If safety issues are addressed, it is through disciplinary procedures applicable to individuals, while performance rewards are applied at team level.

Quite often, a few insignificant symbols were noted to undermine the value system. The workforce is very quick to note a few things, which may be very minor in themselves, but seem to speak volumes about leadership's commitment to the value system. As an example, at one of the mines, the group's social responsibility programme was interpreted by the workforce that their employer was more concerned about looking after remote communities than they were about the workforce and their families. In other instances, value statements were not understood in the same way by the workforce as was intended by the leadership. Thereafter, symbols, which were consistent with the value statement under leadership's interpretation, appeared incongruous to the workforce. This may be partly due to cultural differences in the way words and actions are interpreted. The effect is that the workforce perceives that leadership and management are not walking the talk, despite the very best endeavours on the part of leadership and management to do so.

The upshot is that the workforce deduces the value system in force from the practices that are applied, with the official value system losing a degree of credibility. In some instances, the leadership of the mine loses some credibility, while, in others, middle management levels are blamed for not acting in accordance with the values expressed by leadership. Which perception develops is largely a function of leadership style, which is discussed in 3.4.2. Furthermore, the growth of a trusting relationship is harmed significantly.

The learning from this area is twofold.

Firstly, practices at the coalface and systems for reward and discipline need to be well aligned with the expressed official value systems of leadership. This may require innovative measurement of parameters that are not conventionally measured, so that a balanced basket of measures can be used to assess performance. For example, on-going measurement of compliance with good safety practices and inclusion of this as a positive part of the reward system would be preferable to penalizing accidents. On the other hand, if the value statements are in fact an overly idealized reflection of the mine's values and not a statement of its true priorities, they should be adjusted, but it is believed that this is not the case.

Secondly, immense care needs to be taken that seemingly innocuous actions or statements are not misinterpreted.

3.4.2 Management styles and systems

At the highest levels, within the mine leadership team, highly contrasting styles were observed. A complete spectrum from dominant leadership to enabling leadership was noted. The research team can only point to the positive and negative consequences of the various leadership styles, and would not wish to conclude that any particular style should be preferred over others. Leadership remains very much an individualistic discipline. However, as organizations evolve through different stages of maturity, there may be a most appropriate leadership style to promote more rapid organizational development.

Dominant leadership with strong hands-on involvement creates a very high profile among the workforce of the mine. Provided that the leader operating in this mode continues to ensure that commitments are fulfilled, he retains credibility and earns a large stock of personal trust. A clear coherent set of organizational values is established. A strongly motivated environment is created within which the workforce feels morally compelled to perform at the highest levels. The negative consequences that arise revolve primarily around sustainability. The leader needs to continue injecting high levels of personal energy, perhaps at impossible levels in the longer term. The middle management starts to be marginalized, becoming little more than a rubber stamp. This is exacerbated if the fine dividing line between leadership involvement and micro management is overstepped.

Enabling leadership, on the other hand, puts pressure on the middle management to fulfil its functions with excellence, and potentially maximizes the use of the skills and experience, which exist at this level. A company culture develops with the leadership team strongly aligned so as to communicate as one. The leadership team enjoys the profile rather than the leader himself. There is much less direct involvement between the leader and the general workforce, with the negative consequence that messages are filtered or distorted, but the benefit that higher levels of trust are generated between the levels in the management chain. The number of levels in the management chain tends to exacerbate this difficulty, and the question needs to be asked whether all the levels are necessary in middle management. In this style, without the necessary authority and freedom to act, middle management feels accountable and responsible without the ability to control. Furthermore, there must be readiness at middle management levels to operate in the mode required by this type of leadership style. These factors have been observed to compromise the effectiveness of enabling leadership and also seen to seriously damage the level of trust between middle management, supervisors and general workforce.

As organizations move through a development cycle, three major phases are apparent. This is illustrated in Figure 3.2. Firstly, the need for change has to be established; secondly, a new order needs to be defined; and thirdly, the new order needs to become the norm for the organization. The studies have shown that the stimulus for change is coming both from leadership level and the general workforce. This is not surprising as one of leadership's main roles is to develop an improved organization, while the aspirations and expectations of the workforce have been awakened through the full democratisation of South Africa, as well as the education and growth programmes instituted by the mines themselves.

The supervisory and middle management levels feel threatened in this stage of the process for a number of reasons. Firstly, prospects of advancement are reduced for a dominantly white sub-population. Secondly, the prospect of adopting new management styles is challenging for traditionally authoritarian managers and supervisors. Thirdly, a new generation of supervisors functioning with limited practical experience and management training find it easy to revert to an authoritarian management style, in some cases basing their behaviour traits on the established role model.

At the stages of creating the need for change and defining the new order, leadership will inevitably need to play a dominating and highly involved role. However, to embed a new order in a systematic way, a more enabling style would be required such that middle management levels make full personal commitment to adopt new practices.

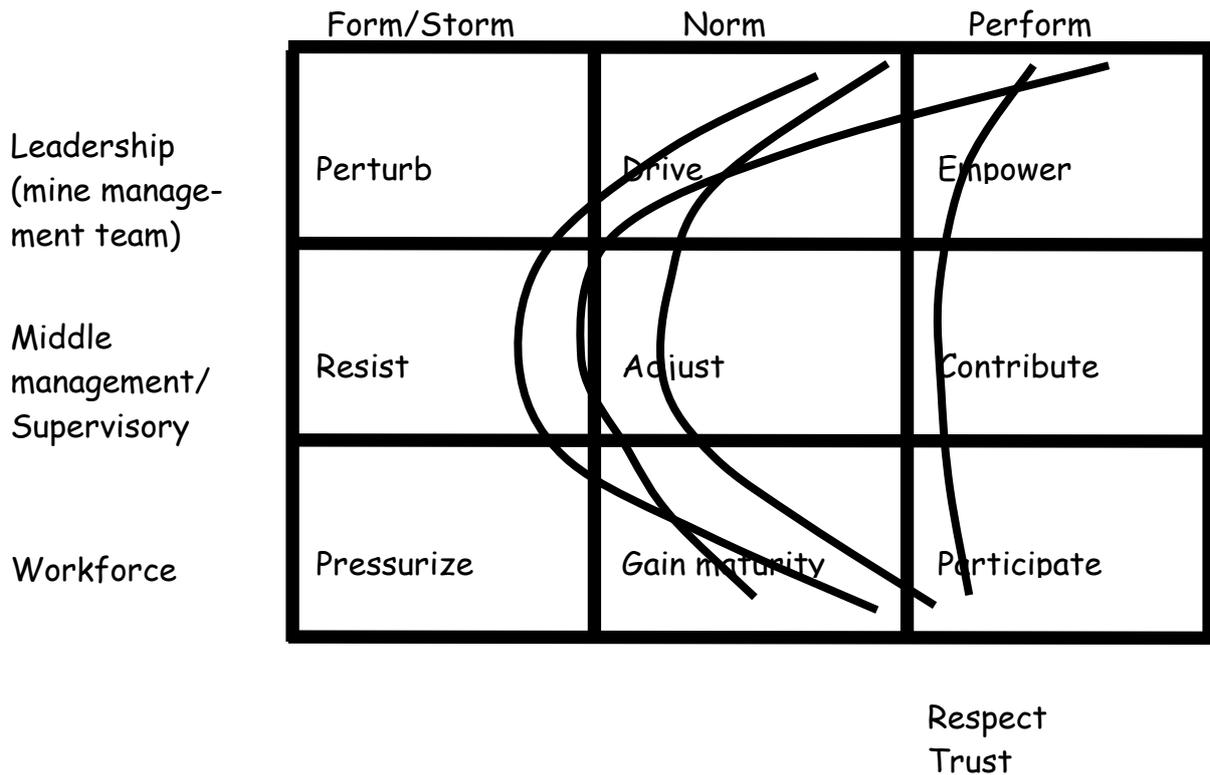


Figure 3.2 Reactions to organizational change

The major learning is that leadership style should be related appropriately to the phase of organizational development. It is probably unrealistic to expect leaders to adapt their styles radically since excellent leadership traits are very personality driven. Rotation between operations to maximize the degree of fit between leadership characteristics and organizational requirements may be a viable approach. This would apply at shaft or section level as well as at mine level.

At section management and supervisory level, some major contrasts were noted, strongly associated with section productivity. In cases where the section supervision engaged in a role of setting the direction, negotiating targets, ensuring resources were available and in good condition, responding to requests and suggestions from the team and maintaining good work standards when required, the best results were undoubtedly obtained. The mining workforce for the most part in the sections studied had a strong culture of desiring to perform, had generally high motivation arising from other factors and was highly experienced in performing the tasks associated with operating a continuous miner section. The task of supervision to a large extent involved removal of barriers, which would prevent the crew from getting on with the job. Furthermore, as discussed in a later section, there are major efforts taking place to provide the general workforce with a much wider perspective and understanding of the mining operation and the industry. This has significant implications for how supervisors and managers need to function. As one section supervisor put it, he saw a large part of his role as serving the needs of his crew.

For example, intervening in the way the team would like to organize work tended to result in decreased willingness to perform, and the need to resort to other motivational influences in a more disciplinary mode. Other examples where

motivation was adversely affected and performance suffered as a result were cases where the mining team wished to assist colleagues with domestic problems by giving the team member the opportunity to be away from work, but the supervisor was not prepared to grant permission. In addition, accepting and using to advantage the de facto leadership that experienced team members possess can be of immense value to supervisors, especially those with less practical mining experience. While it may appear as a threat to authority, particularly when the practical experience far exceeds that of the supervisor, it remains essential that the workforce's tacit skills are incorporated into operational decision making. The supervisor's inter-personal skills and empathy with his team are essential attributes in these circumstances.

There is thus an immense need for strong human relations skills at the supervisor and middle manager level to take decisions that are appropriate to the circumstances. Maintaining good standards of work using discipline when necessary, while allowing mining teams to participate actively in determining how work should be organized is undoubtedly a fine balance requiring good technical knowledge, experience and excellent human relations skills. The research team considers that the professional development provided for potential supervisors and middle managers could be improved to better fit those individuals to fulfil their functions. Furthermore, some review of the criteria for selection of individuals for appointment to these positions would be warranted. A future Coaltech project has been planned to focus on developing the ideal supervisor and middle manager for future coal mining operations in view of the critical influence which individuals in these positions exert on mine performance.

It is interesting to note that the style of less experienced supervisors, who were presumably less confident in their positions, tended to be more authoritarian than those in possession of greater experience in supervising continuous miner sections. The challenges facing new and upcoming miners and shift supervisors from historically disadvantaged backgrounds are undoubtedly immense. Firstly, they are challenging traditionally protected occupations; secondly, they often enter the function with good qualifications but very limited practical experience, and certainly far less than the less qualified but more experienced men that they are required to supervise. It is therefore particularly difficult for them to command respect, especially since there is a common sentiment that qualification barriers are preventing highly experienced members of the workforce from advancing. This is also taking place in an industry, which is shrinking in terms of number of people employed where jobs are perceived as under threat.

A common problem experienced at middle management levels is a level of authority and freedom to act that is not seen as commensurate with their level of accountability and responsibility. One middle manager complained that the extent of his authority to provide rewards extended only to giving the crew cool drinks if they achieved their target production for the shift. By contrast, the authority of middle managers and supervisors to initiate disciplinary procedures was relatively high. These factors result in middle managers and supervisors not being empowered to the extent demanded by the participative management practices that the collieries are seeking to implement. They also create a workforce perception that supervisors and middle managers personally offer very limited positive rewards for good performance, yet can penalize poor performance.

The research team sees this as an area that needs to be handled with great sensitivity. While recognizing the merit of the desire of supervisors to be able to take more personal control over the operations for which they are responsible and

to offer more meaningful positive reinforcement to their crews for excellent achievement, there is also a need to maintain sufficient commonality of standard across sections. There will remain a need for guidelines or limits within which supervisors and middle managers may operate. Furthermore, the way in which supervisors and middle managers are measured would need to be updated, for example, considering parameters such as section contribution to mine profit accommodating certain expenses, e.g. machine overhaul, which could be “capitalized” over several months. Supervisors and middle managers would then be able to take more significant decisions with full awareness over how their decisions would influence performance in terms of such measures. Undoubtedly this area requires further research, but the perceived lack of empowerment felt by supervisors remains an important issue.

Figure 3.2 illustrates the typical situations identified at the mines studied through the non-quantitative lines superimposed. The desired stage of organizational evolution is determined by the last component of the workforce to advance through the phases, and it is recommended that greatest effort is placed on encouraging supervisory and middle management ranks to accelerate more quickly into participative management practices, recognizing that some supervisors are already operating at advanced levels.

3.4.3 Communications

Effective communications underpin almost every other aspect of operation of the mine’s human and social systems. A wide range of issues, which were causing concern, could be traced back to failures in the communication system. These failures were extremely varied.

With respect to direct job matters, communications appeared generally sound, with some exceptions. Pre-shift meetings provided the workforce with information relevant to the forthcoming shift. During the shift communications within crews and between crews were generally efficient to manage normal operations as well as to deal with unexpected situations.

Other downwards communication took place through notice boards and newsletters. These were effective for communicating matters of general job related interest, for example the general performance of the mine. They also served to reinforce the leadership value system confirming for example the commitment and importance to leadership of safety. Furthermore, these communications were seen as supporting the general educational effort to enhance the appreciation of the general workforce in gaining understanding of the mining business. It was noted as important that such communications should be made available at locations where mineworkers would pass by regularly. The shift waiting place, the clocking in facility or around the changeroom were good places.

Physical communications systems such as telephones and radios were used to good effect in ensuring that everyone was continually in touch, especially to expedite dealing with problems. It was noted that openness of communication required good protocols to be used. A problem was noted on several occasions between shifts, with important information not being passed from one shift to the next. This was interpreted as a consequence of unhealthy competition between shifts that arose for a variety of reasons, and was commented on in the previous section.

Operational data was also available rapidly and accurately to all levels of management from supervisor upwards, in many cases through fully computerized and networked mining equipment. These systems were observed to assist greatly in decision-making processes.

One of the important features of effective communication was to keep the message short and to the point. However, in one instance, the pre-shift meeting was felt by the workforce to be too short to permit all of the important issues to be discussed.

While participative management was being actively pursued on all the collieries studied, the extent to which input from the workforce regarding how the section was operated was not to the fullest extent. In one case, the crew had been complaining for an extended period that the cutting drum of the continuous miner required overhaul, yet the management turned down the request. The management had responded by examining the cutting drum and declaring that, in their best professional engineering judgement, the cutting drum was still in good condition. Eventually, a decision was taken to provide a refurbished cutting drum, with a consequent major improvement in production. The lessons from this anecdote are quite significant.

- Whether the management or the workforce was correct as regards the condition of the cutting drum is not really material; it cannot be determined whether the refurbishment acted as a placebo with production improvements resulting from the improved morale or whether the refurbishment was truly warranted
- The negative effect of not responding to the workforce input hurts morale, especially when this contradicts the implementation of a participative management culture. In particular, it is likely to inhibit the willingness of the workforce to contribute positively with its skill and experience on future occasions
- The trust of the workforce in the sincerity of management to change from autocratic management systems, and in other matters, is prejudiced if suggestions are not taken up

With respect to responding to suggestions for improvement emanating from the workforce, it is necessary to be sensitive to the situation and maturity of relationship. The workforce's inputs have traditionally been used to a limited extent in deciding what changes should be made to mining operating practices. In order to encourage stronger positive and constructive inputs from the workforce, and grow that type of behaviour, it would be important to be overly accommodating of inputs with the goal of reinforcing that the contributions are really wanted and not just being asked for as a matter of form. As the relationship matures, understanding grows and a culture of participation is created, questioning of inputs may become more appropriate without stifling the willingness to provide inputs. The process of discussing suggestions then becomes part of an educational process to generate broader understanding of the coal mining business.

With the growth of understanding and participative management becoming a norm, it should become easier to discuss workforce suggestions and not adopt all. Furthermore, the quality of suggestions is likely to become higher through the workforce gaining more experience. One of the important qualities of a supervisor or manager in a participative management culture is to allow the team to acquire learning through mistakes to a certain extent. It is essential that no blame or

sentiment that failure proved that the supervisor knew better should follow on from a failed suggestion. However, that level of operation needs to be based on a high level of trust.

In general, as noted earlier, workforce inputs were taken into account most strongly in making arrangements for team members to take time off to deal with personal and domestic problems. Accommodation of reasonable requests was seen to elevate morale of the team, while the reverse was true when requests were turned down.

Outside the direct job environment, there appears to be a need for a much higher level of communication on employment related issues. Numerous misunderstandings were identified among members of the workforce on various issues, with the most common being the tax system. If innovative ways of rewarding performance are to be fully effective, understanding of tax matters starts to become important so that the workforce can realize how alternatives can work in their best interests. In the current circumstances, a large number of myths abound about tax, such as the employer is creaming off a portion of remuneration due to employees for its own purposes. These create a sense of ill-feeling and dilute the effectiveness of bonus payments. The fact that bonus payments will inevitably attract income tax at higher rates than basic income, due to the sliding scale of tax rates applicable to income, creates unfortunate impressions unless a sound understanding can be generated.

Rumours also abound concerning the provision of fringe benefits and other benefits of employment. As the workforce grows in maturity and gains stronger appreciation for financial matters, to a large extent through the educational opportunities provided by the employers, the questions being asked are becoming more insightful and probing. There is a need for more transparent provision of information on mine policies so that the entire workforce can appreciate the fairness and equity in how employment benefits are provided. If there is any lack of fairness and equity, of course this should be remedied, but from the studies conducted, it is believed that major efforts have been made to ensure fairness and maximize the choices available to individual employees. Of itself, the latter trend places a new responsibility on the employee, which he may often be ill-equipped to cope with due to a historical lack of life skills education. It is recommended that employers should take further steps to ensure that their workforces have access to education and counselling which can help them in such matters.

Some noteworthy initiatives to provide enhanced appreciation of mining operations and the functioning of the coal sector of the economy were noted. For example, in one case employees were given insights into the full cycle of coal production and usage through visits and exposure to various aspects. Undoubtedly, these experiences were received as valuable and enhanced the feeling of worth and importance in the job that a specific mineworker was performing, with consequent increases in motivation and morale. Such provision of insight also raises new concerns that the general workforce was probably oblivious of in the past. Once understanding has been awakened, continuing deepening of that understanding starts to become imperative so that the implications of events or circumstances can be grasped appropriately. The management of the mine must be prepared to discuss such issues openly and transparently, interacting with the workforce according to the level of maturity and sophistication which has been achieved. For the most part, this was observed to take place, but with a degree of reservation.

Upward communications appear to be a generally problematic area. While there were policies at each mine to encourage upward communication, for example open door policy, mass meetings, small facilitated working sessions to contribute ideas and suggestions, suggestion boxes, and structures for communication such as hostel residents committees etc, none of these was truly effective. In most cases, the research team identified certain issues that were regarded as important to the workforce that management of the mine was not fully aware of. In a number of cases, the mine management felt that a specific issue had been explained adequately, yet the workforce was not satisfied that closure had been reached.

Open door policy was observed to be misinterpreted quite significantly. The expectation to the general workforce was one of ready and instant access to any incumbent throughout the management hierarchy, while management expected that issues should have been discussed at the appropriate level before being escalated with appointments needed to consider an issue, more in the manner of a grievance escalation procedure. The above may be a slight exaggeration, but illustrates the mindset. Irrespective, management took comfort in the fact that few issues were being raised through the open door policy, while the workforce felt frustration that the open door policy was not accessible in the way they had hoped. In addition, for the middle management, a strong discomfort was felt by many as they felt that it compromised their authority and their actions could easier be called into question. The workforce frequently expressed a fear of reprisals from managers passed over through use of the open door policy, and was reticent to make use of it for this reason as well. The upshot of all of the above was that the open door policy was not effective in fulfilling the intended purpose.

It is believed that, until a culture of full transparency is built, with supportive management, which responds to mistakes and problems constructively, in place and trusted, systems for upward communication will be resisted no matter how well they are designed.

The structures established for upward communication also appeared not to be fulfilling their functions.

The workforce had very little faith in their union as a structure to look after their interests. With the move to participative management, the union has moved from an aggressive, confrontational attitude to one of negotiation and reaching consensus, while caring for the needs of the workforce has become a greater priority for management. While this should, and probably does, represent a more effective mechanism for ensuring that interests of the workforce are advanced, the strong perception is that the union representatives have sold out to management. This is exacerbated by the union pushing official COSATU policies at the expense of matters that are more important to the workforce. As an example, the union continually pushes the provision of family units and abandonment of the single sex hostel system as a policy issue. While some of the workforce would like to see this development, a strong sentiment remains that the mineworker's real home is away from the mine where his roots are, and his work at the mine serves to finance the development of a more prosperous future in his home community. The hostel lifestyle serves well in that regard.

The upshot of these factors is that the workforce feels that management is almost more aligned to looking after their needs than their union representatives.

Hostel residents' committees seemed to take on the role of induna, being more concerned about controlling the activities of residents than looking after their

interests. Some serious accusations were raised by hostel residents that the committee was unduly influenced by the outsourced service providers responsible for running the hostel. The mine management was observed not to be strongly involved in the affairs of the hostel since it had been outsourced. Hostel residents generally felt that they had a very limited voice to have issues of importance to them addressed.

Facilitated breakaway sessions to discuss issues and identify improvements were another mechanism of limited success. Mineworkers appeared reluctant to share their views in a vertically integrated group forum. Lack of sufficient trust in other participants, including the facilitator, appeared to be important factors inhibiting effectiveness.

Interestingly, the most effective upward communication was at social events where issues ended up being raised, to some extent by chance, in an informal and casual manner. However, this mechanism requires a fortunate combination of circumstances to be effective, and cannot be relied on for addressing matters on a regular basis.

An observation of importance is that, historically, South African society mitigated strongly against upward communication due to a combination of social, language and racial barriers. It should be expected that the process of breaking down those barriers would be long term before individuals are comfortable to express themselves more openly. Behaviours learned over many years cannot change rapidly, and tolerance is required to support a change process. If upward communication is to be successfully encouraged, it is essential to create trust that the communication will be taken seriously by responding positively to its contents, and to avoid creating a perception that upward communication is encouraged for the sake of political correctness. Some evidence was noted that perceptions of the latter are being generated, and some doubts were expressed regarding the sincerity to act positively in response to upward communication. In the initial stages of transforming the nature of workplace and social interactions, it is necessary to be overly sensitive to such issues.

In the view of the researchers, no systems for upward communication can be effective until the trauma associated with past historical divisions has healed fully and the autocratic nature of the mining sector has been reformed. This process can be accelerated, and is being on all the mines studied through the methods referred to in this report, but it will still take a long time for trust to reach the levels at which people feel free to communicate openly without fear of criticism, ridicule or being ignored.

An initiative to advance the breaking down of barriers was the organization of cross-cultural social events that take individuals out of their normal social environment and encourage cross-cultural interaction. Undoubtedly such initiatives make it easier for individuals to communicate with one another on a more open basis.

Structures for upward communication appear to be generally ineffective. The established structures are generally the line management itself, the union, a hostel residents' committee and facilitated forums aimed at discussing issues of importance to the workforce.

There is not much faith from the general workforce in the functioning of the union. At union mass meetings, the union office bearers report to the membership but

generally fail to do justice to the issues of real importance to the membership. Shop stewards are perceived to be in the pocket of management because of the more amicable and constructive relationship than was the case in the past. This is a natural consequence of a move to a more participative style of leadership. Nevertheless, judging by the report back to their membership, it seems that the union representatives are being dominated by the management representatives in terms of the issues on which discussion is taking place. Union representatives need to play a more forceful and assertive role in the spirit of participative management systems without reverting to a confrontational and adversarial position. Senior management of the mines should build and maintain a relationship founded on trust and take care to avoid dominating the union management relationship. Finally, the union representatives need to convey the message to their membership that interests of the workforce are being adequately represented through new means, and provide demonstrable evidence that the union's new approaches are more effective than the methods previously adopted.

The hostel residents' committees appear to have taken on the role of the induna system. Instead of representing hostel residents in lobbying for improvements in conditions, they take on more of a controlling and disciplining role. In many cases, the hostel residents' committee is closely involved in selection of outsourced catering, cleaning and other service provision companies. The workforce is generally suspicious of the credentials of their supposed representatives with allegations of bribery and corruption being commonplace. There is a fine dividing line in the customer client relationship between reasonable entertainment of clients and intent to exert undue influence on decisions. To the mind of the workforce, this line appears to have been overstepped.

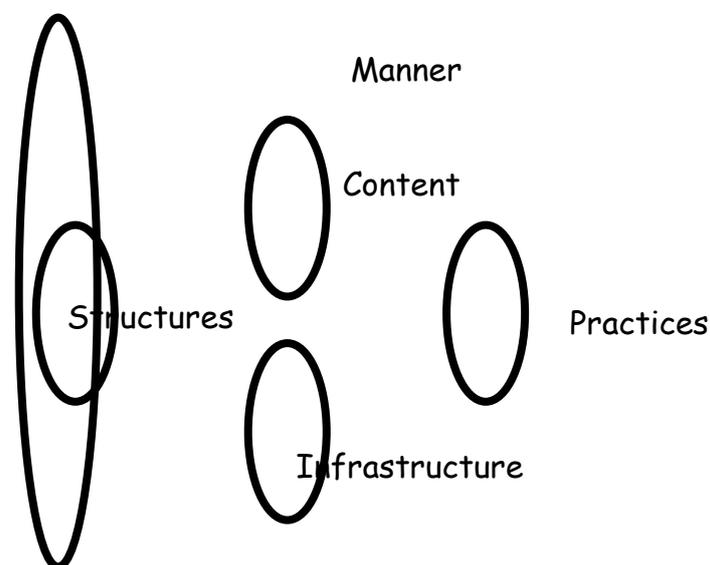


Figure 3.3 *Key elements of the communication system*

Figure 3.3 illustrates the key components that lead to effective communication. Infrastructure, through which information of all types can flow rapidly and clearly, is essential. Established structures and practices, for example regular newsletters or bulletins, which create order for communication and assist individuals in gaining access to the information they need, are complemented by opportunities for informal ad hoc communication. Information content needs to be selected

carefully to ensure all relevant messages are communicated but to avoid overload. Excessive content is equally as problematic as provision of too little information. Explanation and provision of context are important elements which need to be coupled with the raw content if messages are to be effective.

Most importantly, the communication system needs to be conducted in an appropriate manner. This refers to intangible aspects such as the timing, location and attitude. These subtle attributes of the communication can outweigh the more tangible aspects to the extent that excellently designed communication strategies fail in their purpose. Where communication was most effective in the study sites, a great deal of effort had been placed in influencing people's manner of communication with one another through establishment of norms and standards, for example always greeting people by name and interacting with courtesy and respect.

3.4.4 Remuneration and rewards

When asked directly, the almost universal response from mineworkers was that the financial benefits of employment were the dominant motivator, and cited by many as the only reason for working. However, there was considerable indirect evidence that other rewards of employment counted heavily.

On the side of financial rewards, there is a strong weighting towards non-guaranteed remuneration. Typically, the bonus payment adds more than 50% to basic pay, obviously depending on how highly performing the section is. The bonus payment is largely determined by production quantity, with some modification to take into account other parameters of importance to the mine. This was discussed earlier under the leadership and value system section. The bonus calculation formula thus departs from the value system as expressed, and creates a new implicit value system. This leads to behaviour aimed at performing in terms of this value system, with, for example, several instances being noted of work practices not complying with proper procedures to avoid compromising production.

On the other hand, the workforce appears to find it difficult to understand why bonus payments are not directly correlated with production quantity. Some disenchantment is noted when one section achieves higher production than another, yet its bonus payment is less. This may be indicative of some lack of understanding of the methodology for determination of bonus payment, although it is more likely that individuals are merely trying to find reasons why their remuneration should be higher and expressing discontent when the rules do not work in their favour.

There is an undeniable tension between a bonus system which drives behaviour in line with the mine's value system, and a lack of complexity in the calculation method. This tension is strongly evident in viewpoints expressed by members of the workforce as discussed earlier in this report. Without introducing unnecessary complexity, the dominant objective of the bonus system should be to reflect and reinforce appropriately the mine's values, with each element appearing as a positive reward for good performance. Effort should be placed on measuring important parameters such as quality of production, compliance with safety standards and other key measures, which may be difficult to determine, as these are important determinants of overall productivity under a less restricted definition of the term. A visible effort would, of itself, be an expression of management commitment to the values. In parallel, explaining the bonus determination method to the workforce needs to be concentrated on. The lack of numeracy which exists

among the workforce should be accommodated in those explanations. A convenient means, which was observed to function effectively, was through discussion of the reasons why different sections received different payments on a month-by-month basis.

As discussed earlier in this report, there is evidence of many issues where the general workforce is battling to cope with the responsibilities imposed by a more mature employment relationship and general lifestyle. If the advantages of a more mature and responsible workforce are to be reaped in full, issues such as calculation of bonus payments need to be addressed properly, through appropriate education and counselling. There is evidence that this is happening, but could be accelerated with appropriate intervention. It is believed that the language medium to be used could be an important aspect influencing the effectiveness of such interventions.

One feature of the bonus system, which created a minor degree of tension, was the application of different formulae to different employment levels. For example, in some instances, a poor safety record was only applied as a penalizing factor at supervisory or managerial levels, and not to the general workforce. This leads to a minor lack of alignment between the ways decisions are made at supervisory level and by members of the workforce. As a principle, it would be preferable that the same criteria are applied visibly to all to ensure full alignment of behaviour.

The viewpoint that bonuses, or positive reinforcement, are applied at team level, whereas discipline, or negative reinforcement, is applied at individual level, was commonly identified as anomalous. This was particularly stated in the context of a lack of recognition of individual achievement, although some instances of giving individual recognition were observed for dedication, commitment or individual contribution on an ad hoc basis. Although the anomaly is appreciated, it is difficult to envisage how it could be addressed. It is only practical to measure performance rigorously and equitably at a team level, with individual contributions being assessed more subjectively. Furthermore, rewarding team performance is a strong reinforcer of positive team dynamics. On the other hand, instances warranting discipline tend to arise from negligent or malevolent individual actions. It is therefore suggested that the anomaly has to be accepted.

What is perhaps more pertinent is the matter discussed under management systems concerning the authority of supervisors and middle managers to initiate disciplinary processes against individuals, without the power to significantly influence positive rewards provided to the team.

There is a general complaint that basic pay is too low, and mineworkers have come to depend on bonus payments to cover their monthly financial commitments. This influences the attitude towards the bonus payment, and mineworkers generally regard it as an entitlement for meeting the standard rather than as a reward for good performance. Achieving a bonus of lower than the norm is seen as a penalty for poor performance, and the bonus is therefore not entirely functioning as a positive motivator.

An important consequence of the variable monthly remuneration, which mineworkers receive, is frequent difficulties with microlenders. Associated with the mindset that the bonus is an entitlement, monthly expenditure escalates in times when bonus payments are high, with the result that commitments are unaffordable in months when production is below average. Counselling and education to assist mineworkers in handling a variable cash flow would avoid

running into personal financial difficulties, which can inevitably adversely affect work performance due to stress and distraction. Alternatively, a degree of smoothing of bonus payments could contribute to addressing this type of problem, although it may cause a degree of complexity difficult to understand and also be unpopular with the workforce.

The bonus systems were generally inclusive of all functions on the mine. This strongly reinforced team culture, especially between engineering and maintenance staff outside the section and section employees. In the case where certain functions were not part of the bonus system, less committed attitudes were noted on the part of those functions to their activities. Even if employees were not obliged to perform certain activities, they were willing to do so in order to advance production in cases where they were eligible for bonus payments.

There was a strong general sentiment among the workforce, extending to supervisory and section management staff, that bonus payments should be equal for all, irrespective of the function they fulfil or their job level. In all cases, the bonus system provides for bonus payments to be a percentage of basic pay. This is obviously an extremely contentious issue, with fundamental values at its heart. The research team would consider that the viewpoints expressed are based on more than purely monetary issues, but rather on a fundamental viewpoint from the workforce that it is their effort that results in production. Implicit in the workforce sentiment is the view that management is needed to establish and operate the mine and warrants high basic pay in view of the high qualifications required for these functions, but the effort of the workforce is what determines production rate more than management input.

A particularly sensitive aspect of the bonus system is how the performance targets are established. The general basis for setting targets was to divide the mine's required production equally across sections, and to modify to a minor extent to accommodate difficulties of mining. As noted earlier, quantity of production was the dominant feature in determining bonus payments, and target levels for other parameters were set equally. There was a common feeling from lower performing sections that they put in more physical effort in overcoming difficulties without being realistically able to achieve the required production results. The consequences of this are a serious reduction in morale, which impacts negatively on production quantity and quality.

Undoubtedly, this is a very complex area, with far reaching consequences for productivity. There is a huge range of factors that contribute to a difficulty index. Objective assessment of these and their productivity impact would be an immense task. Furthermore, in many cases, it is almost impossible to distinguish between difficulties that are inherent to the area in which the section is operating and difficulties arising from poor mining practice. For example, uneven and water logged floors, which were observed to seriously hamper productivity, may arise due to combinations of above average water ingress from surface, geological discontinuities, poor floor control during the cutting cycle, unavailability of floor grading equipment etc. In many cases, these factors will also impact on one another.

There is no doubt that high performing teams work in such a way as to handle inherent difficulties through effective means. This is partly a result of good planning and partly through effective application of effort, or working smartly. Achievement of total fairness in setting of targets would appear to be an overly ambitious objective, and probably not warranted. A more realistic objective may

be the determination of section production targets, which are perceived by all as reasonable.

Although no process was observed to achieve this, negotiation between section supervisors to agree how the required mine production should be shared between the sections may be the best approach. In some companies, a means of ensuring reasonable negotiation is to modify the bonus by a factor that measures how close every section on the mine came to achieving its target. It thus would become incumbent on high performing sections to agree to a higher target so as to give the lower performing sections a better prospect of achieving their target. However, such a process would probably create a degree of complexity beyond the current level of sophistication. That type of process would become appropriate at a stage when section team dynamics are fully established, and it is desired to focus on establishing a mine level team based culture.

The workforce is also very aware that today's record is tomorrow's standard. This is entirely appropriate as part of a continuous improvement strategy, and, for that matter, the workforce has similar expectations of the mine's management in terms of the way in which it operates. The result is that a sophisticated game with unwritten rules is being played out, in which performance remains ahead of target, but not too far ahead so that the target advances too rapidly. Concerns that improvement in productivity will lead to reductions in the number of people employed also influence the way in which this game is played, as discussed later. This is regarded as a healthy dynamic, indicative of more mature understanding of business principles and the broader coal mining sector and appreciation for the tensions between various objectives.

The upshot of the above deliberations is as follows. The major concern about target setting is that sections that have a relatively easy target are not stretched to perform to their full potential, whereas low performing sections are not motivated to perform due to the difficulty in making the target. Some adjustment may be warranted to accommodate difficulties, and address both of the above aspects. However, great care should be taken that any adjustments do not adversely affect the motivation of high performing teams, and become an excuse for poor performance by lower performers.

Despite the contentious aspects and a certain amount of disenchantment with the bonus system, it remains a very strong influence on the performance of the workforce. Being based on team performance, strong dynamics are created through which team members ensure that everyone contributes effectively. Peer discipline was noted in a very positive light, with pressure to perform being exerted on non-performing team members in a responsible fashion by fellow team members. This was particularly noted in highly performing teams, while the lower performers were less concerned about achieving targets because they were seen as out of reach. At the same time, team members retained sensitivity for colleague's personal difficulties, and would cover for them when warranted, for example to sort out issues in their home environments. Especially in highly performing sections, the team dynamics were at a very advanced stage. Since the remuneration system appears to encourage such positive team dynamics, it is concluded that the motivating aspects are essentially sound.

While non-monetary rewards of employment are downplayed in statements by the workforce, on several occasions, comments were made that indicate how needs other than material are of importance. For example, one mineworker expressed that he wanted his family to feel proud of his performance when he could bring

home an item symbolizing his or his team's achievements. The desire for recognition, at least in this instance, appears to outweigh the need for monetary reward, although there would be a preference that the item symbolizing the achievement should be of utilitarian value. On other occasions, immense production effort was noted to achieve a daily production target that would qualify the team for an educational visit to a related facility. The motivation to qualify was particularly high since the team was the last on the mine to achieve the target. It is not certain whether the stigma of being last to qualify was dominant in team member's minds or whether the visit itself was a highly attractive prospect. Irrespective, the value of non-monetary rewards appealing to higher order needs in Maslow's hierarchy was demonstrated.

Another particularly common practice is the issuing of cool drinks, sometimes from the supervisor's pocket, for the shift following a shift that achieved a pre-determined target. The principle of providing something which can be seen as an item that would be needed to achieve good production in the first place has to be questioned (it is a bit like promising to give an Olympic athlete the world's best running shoes if he first sets the world record!). Much as the workforce expresses a sentiment of being insulted by being given cold drinks and chocolate bars like a school child, the token associated with making the target is worked hard for. The personal donation from the supervisor is appreciated, although there is suspicion that the financial sacrifice is insignificant compared with the returns that the supervisor will receive. The research team would conclude that the symbolism of the reward is more important than its intrinsic value, although the sentiments associated with this type of practice are complex and mixed.

Healthy competition with other teams is an important element. The will to be the best is particularly strong at shift supervisor and miner level, and is translated into a team effort. Recognition of achievement through symbolic events or gifts is an important contributor to morale. By contrast, a certain amount of unhealthy competition was noted between shifts as discussed earlier, especially in poorer performing sections where the primary desire appeared to be avoiding being the worse performing shift.

Substituting financial payments by offering of "gifts", while probably well intentioned to be in the interests of all, was seen to be a dangerous practice. Firstly, when delays were experienced due to the complexity of arranging for workers to select from a limited list and for the gifts to be obtained from suppliers, disenchantment was experienced. Attitudes developed that the mine management was not living up to its promises and commitments, and was creating a scheme to delay the payments of bonus money. Secondly, rumours started that the cost of the gifts to the mine was less than the value quoted to the workforce. Thirdly, the symbolism of the gift as a celebration of an extraordinary achievement was not created, partly due to the preceding two factors. Probably, the tax efficiency of this method of remuneration was not appreciated in the midst of these sentiments. It appears that great care needs to be taken in implementing this type of reward scheme to avoid any ill feeling developing. In this particular case, instead of developing a happier workforce, the negative implications on morale cost the mine greatly.

According to *Cronje (2002)*, the most powerful form of reward in terms of motivating and encouraging performance is when the rewards are intrinsic (i.e. the reward stems directly from performing the activity well), tangible, immediate and unexpected. Analysis of the reward system in the coal sector reveals that rewards are generally extrinsic, tangible, delayed and expected. This is an almost

inevitable consequence of the need for fairness in apportionment of financial rewards, and it should be expected that the positive motivational aspects would be reduced. However, a number of innovative methods of rewarding good performance, which exhibit more of the characteristics referred to by Cronje, were noted during the studies, and evoked strongly mixed feelings. The fact that the workforce has, for example, strong recollection of a celebrity performing at the mine to celebrate achievements in production, and the fact that there is considerable debate over whether that form of reward was appropriate are sure signs that events of that nature have created a major impression. Of importance is the challenge to conventional mindsets, and the spirit of communal celebration that is generated.

The research team would conclude that the balance of rewards in place is generally healthy and creates strong motivational influences. A strategy of core performance (not just production) driven reward under a framework well-known and common to all, coupled with innovative rewards at least partly appealing to non-monetary and higher level needs is desirable. The innovative rewards are likely to be once-off in nature to remain effective, and continuous inventive thinking is required to retain freshness and impact. While fairness should be strictly observed in the core performance driven rewards, and these should not become the subject of contention and debate, innovative rewards should rather be unexpected, spark open discussion and different attitudes and hence remain memorable.

3.4.5 Position of organized Labour

The role of organized Labour is an important one in progressive management systems, but considerably different from the one which unions were filling under a more confrontational management paradigm. As the management system advances, with negotiated agreement on significant issues being the norm, a partnership spirit is created in which the prosperous future of the company and all of its staff are intimately and inextricably linked. Instead of the management union interaction consisting primarily of seeking to maximizing each party's share of benefits, the new relationship is moving to one seeking to maximize the available benefit for sharing.

At the current stage of development of the relationship, there was considerable evidence of sincerity and desire to move forward into constructive interaction. Management was observed to share considerable information to the union representatives about company strategy and performance to enable more meaningful dialogue. Union representatives have responded positively, and participate in the process. Nevertheless, due to historical lack of exposure to business issues and technical aspects, the representatives find it difficult to interpret the vast body of newly available information and appear to end up dominated in the interactions.

The workforce appears to have major concerns over the functioning of their representatives in the new relationship. The union membership feels, from their representatives' reports at mass meetings, that highest priority is given to topics for discussion placed on the agenda by management, while the issues of most importance to the membership are given cursory attention. Furthermore, issues pushed from a COSATU policy perspective appear to attract more attention than those matters of greatest concern to the workforce. For example, provision of family units is an issue high on the COSATU agenda, while the mine workforce

may not find this a particularly important, or even desirable, objective, largely depending on the demographics of the specific situation.

While the workforce does not appear overly concerned that its interests may be in jeopardy, they have lost faith in the structures of their representative union to a considerable extent. There are even mild allegations that union officials are somehow in the pockets of management. A strong onus thus exists for both management and union leadership to obtain commitment to the new partnership mode of operation and to promote the benefits thereof. Furthermore, the active union role in the partnership needs to start becoming more visible to the workforce, with management also encouraging the placement of union initiated issues on the agenda for discussion.

A further union related issue is the polarization of membership of different unions, largely along racially divided lines. Incumbents who remain members of a minority union feel inadequately represented, especially in collective bargaining processes. This seems to be a particularly important issue for the artisan function.

3.4.6 Education, advancement and growth

A wide range of educational initiatives were encountered during the course of the mine-based studies, aimed at expanding the understanding of the workforce on how individuals' functions relate to the broader coal mining operation and to generate appreciation for the functioning of the coal sector. Visits to the coal export terminal at Richards' Bay, team building sessions cutting across functions on the mine and training aimed at explanation of the coal production cycle are examples. There is no doubt that these initiatives have helped in improving the self esteem of workers who have only recently appreciated the importance of their role in the chain of production. Furthermore, an understanding of how one person's job impacts on another's has underpinned and reinforced team dynamics and cross-functional cooperation.

For most members of the general workforce, aspirations of advancement appear to be virtually non-existent. A lack of educational qualifications effectively disqualifies them from moving to supervisory positions despite long periods of service through which they have gained vast experience and skills. There is a general recognition that there is no prospect for competing with higher qualified young miners who are entering the mine with minimal practical experience. This is without an expression of any resentment or antagonism, and the main aspiration appears to be improvement in the performance of the job. The major expectation is to be remunerated higher in recognition of the greater experience in performing the job.

Among those with qualifications that position them for advancement, there remain strong perceptions that blacks are promoted more slowly than whites, and that earnings for blacks are at a lower level for the same job. These perceptions need to be contrasted with those described in the subsequent paragraph, and should also be considered in the context of the transformation imperative which each group and mine is expressing strongly.

Another important aspect of advancement and growth concerned white incumbents in supervisory and middle management levels. In an industry where general declines in employment levels are being experienced, prospects for advancement are limited. In particular, there is a trend to reduce the top heaviness of the management hierarchy, with the number of levels being reduced.

However, there is pressure at the same time to achieve transformation targets within the management ranks, especially through the promulgation of the mining charter. The combination of these factors is creating a perceived squeeze among the traditional white supervisors and managers, with a strong feeling that their prospects for future advancement will be limited. At the same time, the experience of these members of the workforce is an invaluable asset to the industry.

The supervisory and middle management levels involve major challenges to manage the advancement and growth paths for individuals. It appears that the mines are adopting a realistic and responsible approach aimed at achieving rapid demographic transformation consistent with the availability of the skills and experience required to perform a job, while also retaining the traditional expertise base. It will be virtually impossible to satisfy all objectives simultaneously in this area.

3.4.7 Employment stability

The coal mining sector has experienced considerable reductions in employment levels over the past two decades arising from the introduction of continuous miner based operations and improvements in section productivity. In a market where the production volume is limited, improvements in productivity will inevitably equate to job losses.

Several expressions of concern were noted among the mining workforce about employment stability. Memories of retrenchment are relatively fresh and mineworkers are continually reminded of retrenchment programmes when they return home during their leave and meet retrenched workers and their families. Although retrenchment is less prevalent than in recent history, mothballed sections and growing stockpiles of coal create concerns, which influence the will to produce at the highest levels. A question that abounds is, "If we produce this month to full potential, will we have a job next month?"

The educational processes giving greater insights into the functioning of the coal sector have improved the workforce's ability to interpret information and events. While reactions to events are now better informed and information flows more freely, an almost inevitable consequence of the current phase is a wide range of unanswered questions. The previous blissful ignorance has been replaced by a more questioning environment. Undoubtedly, these are positive developments, but there must remain a willingness to address sensitive issues at a mature level retaining transparency and openness. The industry's current approach in this regard is assessed to be progressive.

A novel approach to allay concerns around employment stability identified at one site was to provide mineworkers with viable alternatives to employment in coal mining through establishment of small businesses related to the coal mining operations and associated community. Under the scheme, which is currently at pilot stage, the mine would provide support in various forms over a limited time period to assist a potential owner of a small business to become established. Some of the reactions of the workforce to this scheme are quite instructive, and are based on a sound understanding of the process of sustainable business establishment.

A strong degree of mistrust of the scheme was evident, with attitudes prevalent that it was just an easier and cheaper way for the mine to reduce staffing levels. A

perceived lack of flexibility over where the business could be based and what type of business could be established raised concerns over whether there would be a viable market. The time period of three months over which it was expected that the business should prove its viability was regarded as too short. The final concern was that no opportunity would be provided to gain the skills necessary to establish, manage and operate a business. It needs to be pointed out that several of these perceptions were not a fair reflection of the scheme being implemented. Better communication of the terms of the scheme could perhaps have avoided some of these negative perceptions from developing. At this stage, the scheme has probably strengthened concerns over the prospect for retrenchment, and it remains to be seen how well it becomes accepted in due course. It will be the scope of a Coaltech task during the forthcoming financial year to review on a broader front the effectiveness of schemes to support the establishment of SMME's around coal mining operations.

3.4.8 Vicious and virtuous cycles

At one of the study sites, a strong illustration was observed on how many of the above factors fitted together and reinforced one another in strong cycles.

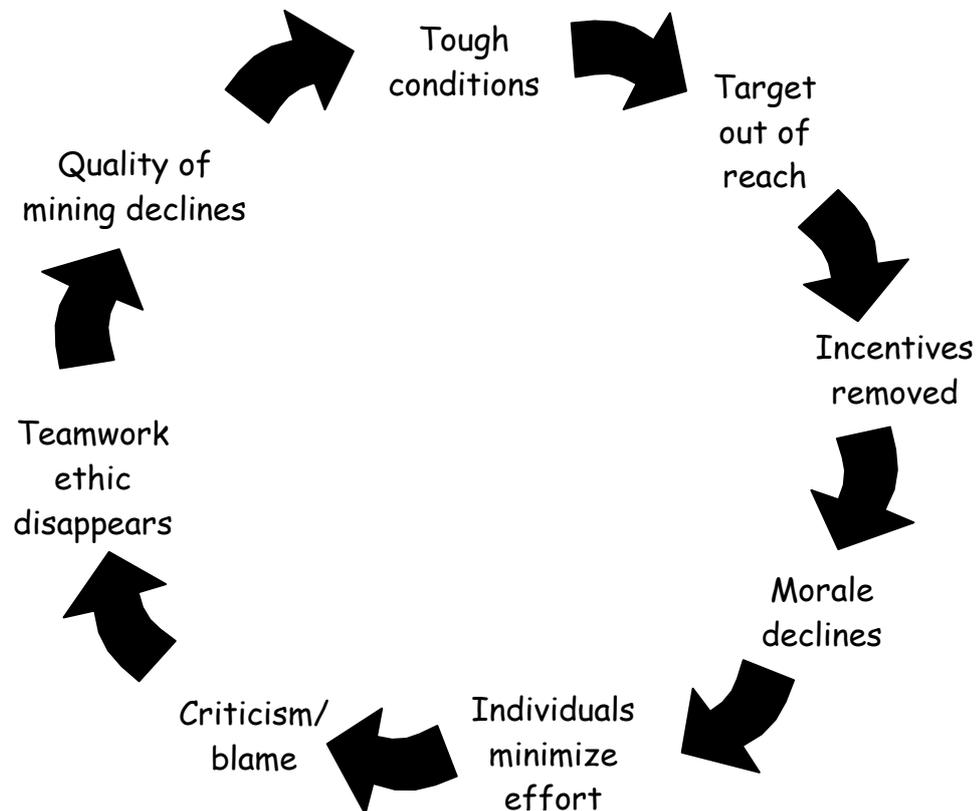


Figure 3.4 The vicious cycle of productivity decline

Figure 3.4 illustrates how a vicious cycle can develop which erodes and destroys motivation, and leads to poor performance. The cycle is initiated when conditions become difficult or challenging. Provided that the team feels that the challenge is manageable, it is able to put in place measures or increase its effort to cope, especially if the difficulties are regarded as temporary. However, in the specific example observed, a section was mining in difficult conditions, at least partly

arising from geological factors and other factors outside the control of the crew. The team felt that the cutting drum of the continuous miner required overhaul, and requested accordingly to have it repaired. Although the management responded positively to the request, they reached the conclusion that the cutting drum was still operable, and no full overhaul should be carried out. Some concession was granted in the targets for production to take cognisance of the mining difficulties. At the same time, the section was being threatened with closure as a result of production rates not being up to standard. The sentiment of the workforce was that, under the difficult conditions, and without a refurbished cutting drum, the target production was out of reach. Positive incentives had thus disappeared, with the result that the quality of team dynamics declined substantially. Desire to achieve team goals was substituted by a desire to minimize individual effort, and the shifts started negative competition to avoid being seen as the poorer performer. Not surprisingly, the quality of mining declined with the result that difficulties were exacerbated, and the negative dynamics became even more acute.

After a significant interval, a decision was taken to refurbish the cutting drum, even though engineering staff did not consider this was justified. The effect on the section workforce was quite dramatic as the vicious cycle was broken. A belief on the part of the workforce that they could achieve with the refurbished cutting drum resulted in strong morale and positive team dynamics being restored. At the same time, a section supervisor with greater human empathy was transferred to the section. Performance was up to target and bonus payments could be realistically received. It is not certain that the improvements were sustained, but this series of events demonstrated that the skills and capability existed in a low producing section to produce at high levels provided that the workforce was motivated to do so. Figure 3.5 illustrates how the combination of reinforcing positive factors can stimulate performance. Throughout the cycle, conscious effort is required by all role players to act consistent with enhancing its effectiveness.

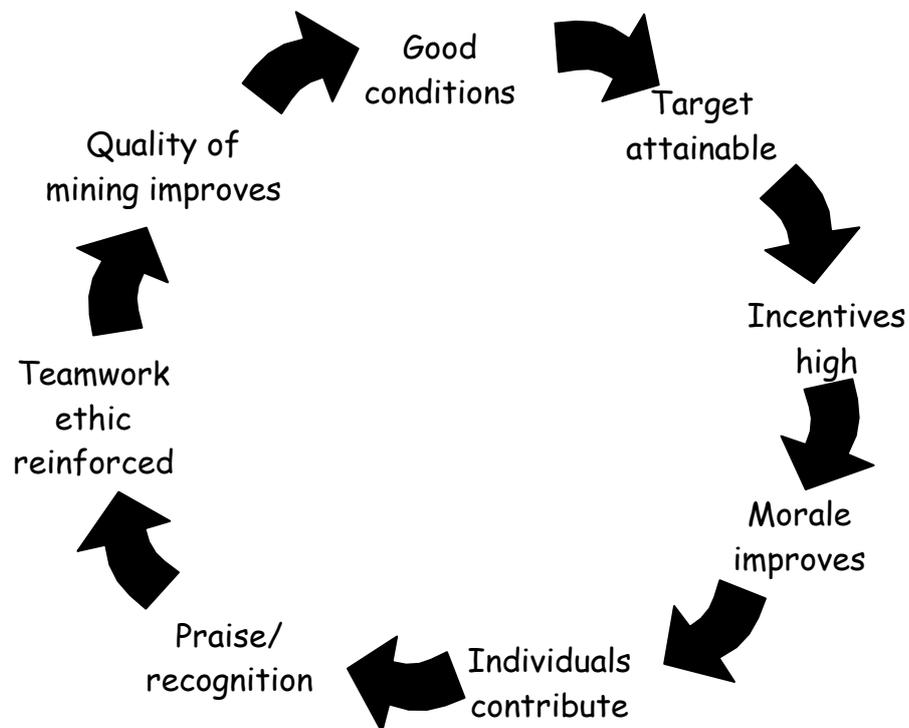


Figure 3.5 A virtuous performance enhancing cycle

This chapter of events was an extremely instructive example of the importance of motivating factors. Whether the reality of the situation was that the cutting drum was instrumental in hampering good performance or not is unimportant. The powerful psychological effect of positive attention to support the team in addressing its difficulties was undoubtedly a strong influence. By contrast, negative attention, such as threats of closing the section if performance did not improve, had relatively little impact on performance, and possibly worsened morale due to the stress created. This was especially relevant since the section workforce did not feel capable of performing under the perceived adverse conditions, and the workforce felt powerless and helpless. The psychological contract that was created between the section workforce and the managers responsible for the cutting drum decisions, even if it was not expressed explicitly, virtually compelled the workforce to achieve a good performance.

An important point to note is that the section workforce had previously been one of the highest performing on the mine until the negative developments took place.

While the powerful effect of being responsive to and supportive of the workforce cannot be doubted, reasonableness needs to be maintained, and checks and balances are needed to ensure that requests and suggestions remain realistic. It is suggested that part of the solution to this could lie in some of the comments relating to rewards. With the growing maturity of the workforce and educational initiatives that are in place, a greater appreciation for the concepts of cost, production, revenue and profit is present. While the systems for determining bonus should be kept as simple as possible, introducing a cost target as well as a production target would help in keeping requirements more reasonable. Discussion of the tension between incurring cost and making production easier to achieve would encourage the section workforce to be more restrained in suggestions since they would personally experience the consequences in the bonus payment. This type of approach may be overly ambitious at the current stage of growth.

It is considered likely that this type of vicious cycle manifests itself on many occasions throughout the coal sector. While high producing teams need recognition of their achievements and good support to continue at their levels of performance, major improvements in average section productivity will only come from bringing low producing teams to a higher standard. In many cases, creating self-belief and providing morale building positive attention will go a long way to achieving that result.

3.4.9 Living conditions

A considerable amount of diversity was noted between the mines studied in terms of living conditions. To some extent, these depended on the geographical location of the mine and its surrounding infrastructure, as well as the demographics of the workforce. In particular, this influenced the percentage of mineworkers who chose to make use of the mine hostel accommodation.

The physical accommodation made available to mineworkers in the hostel has without doubt improved substantially over time, to a large extent due to the significantly reduced population of hostel residents. In many cases, each hostel resident had his own private sleeping area, with a communal living area. Surprisingly, a common attitude was a fear of sleeping in individual accommodation, partly arising from an experience where one mineworker passed

away in his sleep from natural causes, and was only found several days later. A relatively high degree of flexibility, consistent with ordered communal living and elimination of squatters and vagrants, was granted to hostel residents.

Many mineworkers elected to live in the hostel to keep away from the dangers and difficulties experienced in life in townships or squatter camps. This particularly applied to older migrant workers who did not wish to become victims of crime, and appreciated the more secure hostel environment. In particular, travelling to accommodation outside the mine after late shifts or before early shifts was a problem. To many, the hostel offered a cost effective option, which allows them to repatriate a larger portion of their earnings to their family where they look forward to retiring in due course. The living out allowance offered would not be sufficient to obtain accommodation, food and other living expenses available at no charge in the hostel.

At least at one of the mines, some of the younger mineworkers elected not to take advantage of the living out allowance, despite the fact that they preferred to live in the social environment of a neighbouring township. They chose to make use of the hostel facilities only for eating and cleaning, but not day-to-day living.

At another mine, a process is underway to do away with hostel facilities entirely, and only a small percentage of the workforce currently stays in hostel accommodation. The demographics of the workforce at this mine appear to hail from more local communities, with the result that family living predominates, and a move to family based living units is acceptable. It remains to be seen how the minority who still prefer a hostel based life style will respond to this development.

At mines more remote from established communities, lack of availability of affordable public transport to access amenities was a problem area. While many amenities were available on the mine, workers found difficulty in addressing all their personal needs, especially during certain phases of the shift cycle.

Two common trends were identified across the mines studies. Firstly, outsourced services were used to provide for the catering and cleaning needs of residents. The quality of service was found not to be entirely up to the standard that would be expected by the residents. As discussed earlier, the communication structures appeared to be failing the residents in terms of getting the needs addressed. Allegations that the official representatives were unduly influenced by the service provision companies were heard on more than one occasion. Furthermore, there was a lack of clarity regarding to whom the outsourced service provider would be accountable. The administration of the service contracts was outside the direct control of the mine, although the mine would feel the adverse effects on morale occasioned by less than adequate living conditions.

Expert review of the nutritional content of the diets revealed that they were well balanced and appropriate to the type of work which mineworkers were expected to carry out. However, the food was often not prepared to satisfy the tastes of the workforce, with different ethnic backgrounds having distinct preferences. Furthermore, the full diet was not always available to provide latecomers with the complete balanced meal. A problem with canteen hours not fitting effectively with shift times was also noted.

While probably not representing a major impact on morale, attitudes and productivity, it is envisaged that these issues could be addressed at minimal cost and effort. For example, adapting cooking methods and food preparation

techniques to satisfy the range of tastes among the hostel residents would involve a small amount of learning on the part of kitchen staff.

To make improvement more sustainable, a shift in mindset is required. The hostel residents should be regarded as the customers for a service. After all, they are effectively paying for the service by not taking a living out allowance. Within the constraints of budget, the hostel residents should be entitled to expect a service level, and the service provider should be accountable for achieving that level. Perhaps the mine should measure the performance of the service provider through the number of justifiable customer complaints not addressed satisfactorily. As a more advanced stage, the hostel residents could have input on the service level which they would collectively wish for, with the costs of any collectively agreed enhancements in service level being handled through a payroll deduction. Such participation could contribute towards growth in the maturity of the workforce regarding business and financial issues. The mine would need to monitor to ensure that the hostel infrastructure is maintained to an acceptable standard and to ensure that a process of this nature were handled fairly. An essential pre-requisite to this type of initiative would be a significant shift in the way hostel residents' committees function.

A further important observation was a lack of management awareness of certain issues of importance to hostel residents. In a sense, it is fitting that management should at least partially withdraw from a paternalistic role, and expect the hostel residents to take on more responsibility for assuring satisfactory conditions. However, authority would need to be positioned commensurate with the responsibility, with a managed transition taking place.

Hostel living conditions are likely to remain an area where continuous improvement is required to generate and maintain satisfaction among the workforce. There is no absolute level above which satisfaction would be guaranteed, as it is human nature to compare the current condition with previous experience in most issues involving material possessions or conditions.

Freedom of choice regarding living arrangements has been substantially improved. However, in some cases, entitlements, for example living in accommodation in the mine village, remained rank dependent. While this was probably not an issue of practical significance, the policy was seen, in principle, as a contradiction of leadership values. Furthermore, in another case, the observation that certain levels were entitled to rent houses at nominal rental whereas lower level workers would have to pay a much more substantial monthly fee, was regarded as unequal treatment. While the mine policy was probably entirely fair, and may have operated in the best interests of employees from a tax perspective, the perception created was unfortunate. It is a fact that these types of policy have their origins in history and are a legacy of previous service conditions. The fact that they remain in force has the habit of reminding people of discrimination, and causing them to question the sincerity of transformation.

Although few racially based issues were noted throughout the studies, a common perception was that black residents in mine houses received inferior service from maintenance functions than white residents, mainly in terms of the time to respond to maintenance requests. The research could not substantiate whether these perceptions were accurate, and hence what would be an appropriate means to address the perception. Either the perception needs to be dispelled if facts indicate that service is provided equitably, or corrective action should be taken to remedy a racial anomaly.

3.4.10 General issues

In general, a strong degree of racial harmony was observed throughout the studies. This was especially the case in the workplace environment where team culture was, for the most part, "colour blind". All the mines had strong policies in place regarding good race relationships and equity, and these were enforced strictly if overt racially based incidents came to the attention of management. Dismissals were a likely consequence of inappropriate racially based behaviour.

Some tension was evident at the shift supervisor level in isolated cases. The dynamics of unhealthy competition mentioned earlier came into play in cases where an experienced white supervisor and an inexperienced black supervisor were seeking to prove themselves better than the other. It is not possible to state categorically that this was racially based, and the behaviours consisted of subtle lack of cooperation rather than direct hindrance. Especially at this level, there are undercurrents of antagonism, with blacks feeling they are not treated equally, and whites experiencing competition that they have not been used to. A specific perception was that black supervisors are paid less basic than their white counterparts.

In the social gathering places, both in the working environment and outside, racial polarization was noted. Commonly, individuals of colour were made to feel uncomfortable if they made use of facilities that were traditionally reserved. In some instances, this was noted to be consciously expressed, but, for the most part, more subtle, possibly sub-conscious, signals were the source of the discomfort. In part, these distinctions related to supervisors and workers participating in separate social groups, as there remains a strong racial distinction between these groupings despite the major strides of progress, which have been made. The language in which an individual is more comfortable to engage in social conversation and interests that tend to relate to cultural backgrounds are two factors that will inevitably influence how social interaction takes place. In this context, a conscious desire to avoid social interaction with members of other racial groups was not observed. The form of social interaction is rather ascribed to the development of natural interest groups.

Also, as noted earlier, blacks felt that they obtained an inferior level of service in areas such as the maintenance of the mine housing in which they lived.

In summary, while some legacies remain, the racial divide of the past has largely been closed, due in no small measure to leadership initiatives and educational programmes to develop team dynamics and social skills. The latter have been particularly effective in developing trust and appreciating the strong commonalities of values, despite individuals coming from different cultural backgrounds.

The issue of language was not particularly highlighted by the members of the workforce with whom the research team interacted. Nevertheless, it is believed to be quite significant. Varied opinions were expressed concerning Fanakolo. While generally regarded as a pragmatic common medium for conveying important functional messages, some felt that Fanakolo could be used effectively as a common medium for general communication. In the view of the research team, the former is probably true and valid. However, a key aspect of communication is that it should be elevated above a purely functional level of giving and acknowledging instructions. A richer communication medium is required to permit explanations to be provided, to incorporate a greater degree of courtesy and to

allow individuals to express themselves more fully and get to know one another more completely. Despite a degree of basic proficiency in English being the norm for all, probably for the majority of the mining workforce, this will remain a second language that will inevitably result in some reticence in communication.

Probably the lack of emphasis on language to some extent arises from people recognizing it as an intractable problem. However, its importance in influencing inter-personal relationships should not be under-estimated. Encouraging a culture of multi-lingual communication in which all individuals experience an equal degree of insecurity and discomfort may be an interim means of pushing people to communicate more openly and expressively until such time as general comfort with a common medium of communication develops. The latter is without doubt a long-term objective.

An aspect regarded to be of great importance was composition of the mining team. It was noted that teams in which most of the members had worked together for extended periods exhibited some very desirable characteristics. The level of understanding between team members was at a high level, both at the sub-conscious and conscious levels. In many cases, members of such teams tended to live in close proximity to one another and to socialize together, sharing personal concerns and common interests. Interestingly, the social interaction involved significant job related discussion illustrating the conscientiousness and commitment to performing well. One characteristic of these teams was the ability to disagree and argue, expressing opinions without guard, but to end up with a good committed solution.

Some experiments were noted where some team members from a high performing team were introduced temporarily into a low performing team with the aim of boosting performance. This tended to reinforce negative perceptions of self worth among the team that was not producing highly, creating a stronger impression that management did not believe the team could perform on its own. As discussed under the vicious and virtuous cycle, a major reason for loss of good team dynamics was the loss of self-belief and associated reduction in morale, and not a lack of fundamental capability.

Another source of frustration was the deployment of team members from a low producing team to perform or assist in specialized or difficult functions, for example, breaking of dykes in another section. This was regarded as disrupting the team's efforts to produce highly, and detracting from their prospects of achieving the performance standard, while assisting other sections in achieving. Although probably optimal for mine level results, the negative effects on section morale, with the perception of withdrawal of management support for their efforts, were pronounced. Such redeployments could probably be sold in a positive light, especially if an extraordinary bonus procedure were put in place to reward good performance, and public recognition were made.

In the context of the foregoing discussion, to some extent the shift supervisor level, and even more so the section supervisor level, are not entirely classified as team members. At these levels, on occasions, rotation between teams was seen as beneficial. First, this supported development of a uniformity of culture. Secondly, fresh insights were brought to the team's operating methods, as the different strengths and weaknesses of section supervisors were compensated for. Thirdly, the psychological impact of new leadership in the section triggered review of the way things were being done, perhaps leading to abandonment of approaches that were not proving successful. Under the right circumstances, the

introduction of a new section supervisor would of itself function as a positive stimulus of morale. Decisions about rotation of supervisory and management staff would need to be very case dependent, and taken with great psychological empathy. In particular, no connotation of failure on the part of a supervisor should be implied in a role rotation.

3.5 Checklist of good practices

This section highlights the key elements identified from the studies that appear to most strongly influence productivity and overall performance of continuous miner sections. Those elements, which appear to be largely in place, are not emphasized in the checklist, and the following represent the major elements where improvements would arise.

- Work organization theme
 - Logistics, work organization and resourcing are continuously reviewed and improved incorporating workforce suggestions
 - Drinking and nutrition during the shift is encouraged
 - Shift changeover is efficient, with excellent communication of all pertinent information between the shifts
- Team dynamics theme
 - Stable teams with good inter-personal dynamics are encouraged
 - Team based problem solving skills are developed through facilitated training including supervisors and middle managers with their teams
 - Team proposals concerning arrangements for handling personal matters are generally accepted
 - Healthy, positive competition between teams is encouraged consistent with cooperative attainment of mine level targets
- Organizational values and leadership theme
 - The mine's value system is explained clearly and understood
 - No overt or covert symbols exist which contradict the value system
 - Mine leadership and management in all things they do and say enhance the workforce's trust in them
 - Operating practices and management practices are consistent with value system
 - Mine leadership adopts strategies appropriate to the stage of organizational development
- Remuneration and rewards theme
 - The bonus system is complemented with other forms of reward
 - Bonus payments are inclusive equitably of all functions on the mine
 - The parameters measured in the bonus system reflects and reinforces the value system of mine
 - Criteria for determining bonus payments are the same for all
 - Reasons for actual bonus payments are explained to achieve adequate understanding of recipients
 - Targets for performance are set fairly accommodating inherent difficulties
 - Financial lifestyle education and counselling is in place as a means to permit effectiveness of more advanced motivators and flexible rewards
 - Innovative rewards appealing to non-monetary and higher level needs are offered in continually novel forms
- Supervisory and management style theme
 - Supervision and middle management is granted authority to offer positive reinforcement commensurate with their accountability and responsibility

- Coaching and mentoring is available to supervisory and middle management staff to assist in acquiring more advanced human relations skills and adopting more progressive management techniques
- Supervision and management is supportive of sections experiencing challenges
- Supervisors and middle managers at all times provide direction and act consistent with the mine's value systems
- Supervision and management act rapidly to address reasonable concerns and issues raised by the workforce
- Tacit skills of the workforce and de facto leadership of experienced team members are used to best effect in planning and managing section operations
- Communications theme
 - Communication infrastructure permits timeous and accurate conveying of information
 - Communication systems and practices support availability of accurate, rapid and relevant information in understandable forms
 - Communication practices are sufficiently, but not overly, systematized
 - Communication content is well chosen to provide maximum relevant information without overload
 - Official communications reflect and reinforce the value system of the mine
 - Communication manner is respectful and courteous
 - A conscious effort is made to develop a culture where free and responsible upward communication becomes the norm without fear of criticism
 - Sensitive issues of importance to the future of the mine and the industry are discussed as openly as reasonably possible
- Organizational structures theme
 - The union and other structures are adequately representing the issues of importance to the workforce
 - The basis of constructive negotiation between management and the union is accepted as an appropriate operating principle by the workforce
 - The union pro-actively raises issues important to the workforce in interactions with management
- Living conditions theme
 - Hostel residents are treated as customers for hostel services
 - Procedures for appointing outsourced services providers in the hostel are transparent
 - Responsibility and authority for managing outsourced service providers to hostel residents is appropriately in place
 - Appropriate structures are in place for ensuring that hostel residents' needs are represented and well addressed
- General issues theme
 - Personal growth and development opportunities are made available
 - Education about the broader functioning of the mine and coal sector is in place
 - Open discussion of business related issues is encouraged
 - Issues that influence employment stability are discussed openly and actions are taken to cope with these in a socially responsible manner
 - Negative perceptions and rumours are taken seriously and addressed constructively and rapidly
 - Satisfaction of the workforce with conditions is monitored and areas of dissatisfaction are acted on visibly and promptly by management
 - Management is seen to care for the well-being of employees

4 Conclusions

The studies conducted identified a generally advanced and mature situation with respect to human and social conditions. Advanced value systems and policies are expressed at leadership level, with good balance between business imperatives and socially responsible corporate governance. An organizational culture of learning was strongly evident at every site visited, with a continuous improvement philosophy entrenched at mine leadership level. This was evidenced by the positive reception for the research team at the collieries that participated in the studies, and their interest in acting on the findings that resulted.

The basic human and social factors appear to be well in place. Technical competence is well established in the workforce, equipment is generally fit for purpose and work organization is efficiently designed with some minor exceptions. The critical factors determining section performance related mainly to the will and motivation of the workforce to perform. In well performing sections, comparing equivalent mining conditions and layouts, production is at comparable levels to those in international benchmark operations on a shift-by-shift basis, according to *Moolman et al (2003)*.

The monetary reward system was identified as a powerful and effective motivator. The team performance orientation of bonus payments was found to reinforce team culture. Its inclusiveness further encouraged cross functional cooperation as well as between shift cooperation. To some extent, the bonus system has created a dependence which forces high levels of production to satisfy monthly expenses, and has thus ceased to act as a positive motivator. An element of unhealthy stress was created through personal financial difficulties associated with variable remuneration. Lack of financial lifeskills among mineworkers was identified as a problem that could be addressed through counselling and education. Non-monetary innovative rewards appealing to higher orders of need, particularly those offering recognition in front of colleagues and families, were seen to be highly positive.

While the expressed values and policies are progressive, implementation into operations is not consistently complete. Management and supervisory styles at section leadership level were found to vary from autocratic to participative, with consequent effects on team dynamics and morale. Where supervisors were responsive to the needs of their teams, sought to provide adequate resources, removed barriers to production and did not interfere unnecessarily in team suggestions, high production resulted from the high morale to produce. Making effective use of the tacit skills base and experience of the workforce, to the extent of allowing de facto leadership to emanate from team members, was seen as strongly positive. Mine values and policy are strongly against racism and these have translated into a more cohesive and tolerant workforce. Although some racially based issues and attitudes were noted at a covert level, these were rare, and dealt with severely if serious incidents occurred.

Measurement systems, through which monetary rewards are determined, are not representative of the full range of parameters identified as important in the mine's value system, but focus on production quantity. While this has the merit of simplicity and ease of understanding, practices underground are skewed towards attainment of performance in terms of the measures in force. Furthermore, the credibility of the value system is undermined to some extent as the established operating practices are not fully aligned.

Communication is a critical aspect with bearing on every human and social issue identified during the study. Without good communication to support the implementation of systems and processes, their effectiveness would be jeopardized. Content, medium, practices and structures for communication are all important aspects, while the manner of

communication encompasses many intangible aspects such as timing and attitude. The latter were observed to have a serious influence over the effectiveness of the communication and the reaction of the recipient.

Information systems and good communication media ensured that production related information was readily available to all requiring it for rapid and effective decision making. However, ineffective communication on certain issues outside the immediate production environment was at the root of lack of understanding in some cases and was the source of some demotivating perceptions. As progressive management systems and styles become implemented more pervasively, a higher premium is being placed on the quality of communication such that motivational systems can have full effect. Upward communication was identified as a problematic area with no completely effective systems established. The reasons for this lie partly in historical organizational cultures.

The union has significantly adjusted its position with the adoption of progressive management practices from the previous confrontational and adversarial position. This has led to a sense on the part of its membership that they no longer have strong representation, and a loss of faith in the effectiveness of union structures. There is a major challenge for both union and management leadership to restore a feeling of confidence in the effectiveness of institutionalized structures for protecting the interests of the workforce.

Significant efforts have been made to good effect in escalating the broader awareness and appreciation of the coal mining business. The motivational effect, which arises from workers understanding the important of their efforts as part of the bigger coal mining picture, is substantial. In addition, the understanding contributes towards the effectiveness of more advanced motivational influences. However, the increased understanding also starts to raise new concerns that need to be addressed pro-actively through open discussion and interaction, re-assuring where possible, but also jointly developing effective plans to cope with externally imposed changes.

The research method, addressing a vertically and horizontally integrated spectrum of the mining workforce through a multi-disciplinary team, linking theoretical aspects with practical observation, is considered to have been effective in unearthing the major human and social factors which are influencing the productivity of continuous miner sections. Understanding how the perceptions that drive behaviour are formed and shaped through the myriad of influences to which mineworkers are exposed was a central part of the research. It is considered that the major emphasis for continued improvement in coal mining operations from the human and social perspective should be rooted in consolidating the systems which are responsible for the relatively positive perceptions and attitudes that were noted.

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Appendix A Review of literature on human and social issues

A.1 Management systems

Jack Welch of General Electric, one of the world leaders in advanced management practice, stated, "The idea of liberation and empowerment for our workforce is not enlightenment – it's a competitive necessity." It is considered that many of the principles and practices, which have proved effective for General Electric as well as many other companies, are equally relevant for the South African coal mining industry. This section of the report examines key features of the management system that would be regarded as essential in a progressive organizational culture.

A.1.1 Efficacious and efficient management systems: an introductory approach

For a company to be dynamic and able to face change, it is imperative to have management systems that respond specifically to that company's organization. A management system may be needed for several aspects of business, such as quality warrants, security and economical issues, and special attention must be given to the integration of the systems. Any organization that has one or more management systems must use a pre-established standard as the guideline to the conception, development, implementation and maintenance of such systems. A standard must be defined as a reference or a mark. The concept of the standard is useful not only to support the conception of a management system, but also to establish the form and devices to implement this system.

Within such a premise, the concepts of management efficacy and efficiency can be used to define the two basic standards: efficacy standards, which are the processes, controls and devices necessary to compose the management system and enliven the efficacy standards. To achieve its aims successfully, a company must establish strategic references, which must be taken into account the organization's aim, view of business and values, from environmental, strategic and organizational premises. Total quality management has an important role to play in developing an efficacious and efficient management system.

A.1.2 Effective Management Systems: The key to growth and profitability

To be effective in today's dynamic and competitive business environment, a manager, and indeed, an organization must think in the systems mode. Technological innovation has simplified the collection of data into sophisticated information systems. With appropriate management information systems in place, managers can focus their attention on the creative elements of management such as developing strategy, searching for new opportunities and competitive advantages, and optimising the use of the organization's resources. Without such systems, the outcome of events will be determined by forces beyond the manager's control. As a result, no matter how "hard" people work, the future of the organization remains at risk. As *Rossetti and DeZoort (1989)* affirm, a modern business organization must either adapt to changes in management information systems or face a decline.

It is essential that management systems become an organic part of the spectrum of an organization's management procedures. The manner in which an organization "manages" itself is crucial. Merely adopting information technology (IT) does not assure success according to *Bruns and McFarlan (1987)*. With good systems, an organization will be in a better position to identify its strengths and weaknesses and make more effective use of available information.

Table A.1
Functional areas and functional units in an organizational system

Functional Area	Functional Units
1. Strategic Management	1.1 Establishing company policies
	1.2 Executive Information System
	1.3 Strategic planning
	1.4 Pricing
	1.5 New product development
	1.6 Public relations
2. Financial Management	2.1 Management Information Systems
	2.2 Data Base Management System (DBMS)
	2.3 Cost accounting and controlling
	2.4 Current budgeting
	2.5 Capital budgeting
	2.6 Financial projections
	2.7 Cash management
	2.8 Tax accounting
	2.9 Periodic physical and financial inventory control
3. Sales and Marketing	3.1 Marketing communication
	3.2 New product introduction
	3.3 Market research
	3.4 Pricing
	3.5 Forecasting and projections
	3.6 Sales development and maintenance
	3.7 Customer service
	3.8 Direct sales force
	3.9 Indirect sales force
4. Human Resources	4.1 Employment management
	4.2 Performance evaluation
	4.3 Compensation management
	4.4 Benefits and services management
	4.5 Training and development
	4.6 Employee relations
	4.7 Safety and health
	4.8 Equal employment management
5. Production Control	5.1 Production
	5.2 Scheduling and dispatching
	5.3 Production reporting
	5.4 Shipping
	5.5 Maintenance and Engineering
	5.6 Warehousing and Receiving
6. Material Management	6.1 Purchasing (vendor selection, ordering)
	6.2 Shop Work Order Scheduling
7. Administrative Services	7.1 Billing
	7.2 General accounting (A/R, A/P)
	7.3 Invoice matching
	7.4 Payroll
	7.5 Office services
	7.6 Records
	7.7 Intra-company newsletter

The system assessment is the starting point for such an effective management system. A dynamic view of the organization can be achieved by identifying the subsystems and the various functions that must be carried out to make the organization prosper / productive. The functional areas and functional units could be as shown in Table A.1.

After identifying all functional units (they can change, of course, with time and with different organizations), we must then identify all items of information that each unit needs to carry out its function(s). Clearly, this is an ambitious task. Building an effective information system is difficult and time consuming. Yet, experience has shown that in the long run performing a Management Information System (MIS) development thoroughly and methodically will pay for itself many times over.

Table A.2 provides a list of information requirements for strategic planning, a functional unit in the functional area of Strategic Management, gives some indication of the scope of work needed to develop a comprehensive MIS.

A.1.3 Aspects of Human Investment (What's your ROI on People?)

Establishing a strategy to determine your "return on people" can improve employee morale and enhance your company's bottom line.

The words "downsizing" and "rightsizing" became popular business jargon during the 1991–92 recessions. Given the uncertain financial climate of today, many organizations are again looking to these methods to cope with the difficulties that economic volatility brings to an organization. Many are wondering if paring back on the workforce is the answer, unaware that there are better solutions.

In some cases, downsizing may make sense for larger corporations. Laying off employees produces an immediate and significant reduction in a company's payroll expenses, which makes the bottom line look better in the short run. However, the fact is that downsizing is generally not a viable cost-reduction strategy, particularly for smaller companies. Small- and medium-sized employers simply do not have the bench strength to spare, and each time an employee is eased out the door, she or he takes along a significant amount of the company's priceless know-how. When times improve, it will be difficult to replace those skills or knowledge, and the company will be at a disadvantage.

Downsizing is much like radical surgery – the patient may survive, but is in a weakened state. Any downsizing initiative also leaves the organization's survivors (the employees left behind) overloaded, and often with work they have not been trained to do. Employees are stressed, and some may burn out and leave. Consequently, morale often declines, which can have a significant impact on the bottom line. For these reasons, downsizing often causes more problems than it solves.

Use a "manage through" strategy.

To meet the challenges of today's unforgiving business environment, it is better to take a more strategic approach using the fundamental business performance measure of return on investment. Few organizations apply the concept of ROI to their employee costs. However, when we stop to consider that payroll and benefits are probably the company's largest recurring expenses, and that people are the "engine" that drives the success of the company, then we realize how vital measuring and managing return on payroll is.

Table A.2
Definition of information needs in a management information system

Functional Unit	Information Needed	Source
Strategic Planning	Company product market size, by product, for past five years.	Data Base Management System
	Company sales, by product, for past five years.	DBMS
	Projected Company product market, for next five years.	Market Research
	Projected Company sales, by product, for next five years.	Forecasting and Projections
	Current equipment and facilities status	Maintenance and Engineering
	Projected capital expenditures, next five years	Capital Budgeting
	Personnel requirements for next five years	Production
	Projected new product development, next five years	New product development Market research New product development
	Financial requirements for next five years	Financial projections
Pricing and materials	Direct cost of production	Cost accounting
	Projected market size	Market research
	Price elasticity of demand	Pricing
	Cross elasticity of demand	Pricing
	Current price levels in the industry	Market Research
	Client relationships	Customer liaison
New product development	Projected new product demand	Market research Applied research Current customers
	Effectiveness of new products	Prototype products testing
Information systems	User information needs	All departments
	Information system budget	Current budget
	Information system development resources	Capital budget
Cost accounting & controlling	Direct cost of materials	Purchasing
	Cost of production	Production reporting
	Inventory cost	Materials
	Cost of maintenance and general upkeep	Maintenance Warehousing
	Shipping costs	Shipping
	Receiving costs	Warehousing
	Order processing costs	Warehousing
Current budgeting	Current income	General accounting
	Current expenditures	General accounting
	Long-term planned expansion	Strategic planning
	Projected market development	Market research
	New product development	Market research

By simply analysing your return for what you invest in your workforce, you will develop some ideas about where you can improve. By increasing the return on your “employee” investment, you will improve your bottom line without having to lose valuable staff.

The first step in understanding your ROI on employee costs involves calculating the “I” in ROI. In other words, how much do you invest in your employees? It is a simple calculation that includes salary, benefits, training, the employer’s share of payroll deductions (such as Employment Insurance), and a proportionate share of the administration (overhead) costs. Most accounting programs can generate a variety of statistics and reports, so once the system is set up, it is easy to keep track of developments in this area.

Next, you should look for the kinds of day-to-day issues and frustrations that drain productivity from your organization and reduces the “R” you receive.

Turnover.

Every time an employee leaves an organization, she or he takes away know-how as well as the time and money you have spent training them. Turnover may also mean a loss of relationships with important customers and suppliers. Then consider the other part of the “turnover” issue, which is the cost of recruiting, hiring and training a new employee. Add these two types of costs and you will start to understand what turnover does to the bottom line.

Absenteeism.

Occasionally even the best workers miss work because of illness. However, if employees feel appreciated, enjoy their work, and believe they have good prospects for the future, they will put in a lot more effort getting in to work, even if they do not feel 100% healthy. Conversely, frustrated and unfulfilled employees will use sick days as a way to get away from a stressful work environment.

How do you know if absenteeism is a problem? Industry averages, compared to your own workforce absenteeism rates, can give you an idea of how your organization stands. To find the cost of absenteeism, simply calculate the daily cost for each employee and multiply it by the number of days missed. Remember that every day that an employee is not on the job is a day for which you are paying, but not receiving the benefit.

Workers’ compensation payments.

These may be part of your absenteeism problem. If your company is paying a higher premium than others are in the industry, it may be because your company’s record of time loss is higher in comparison to other organizations in your economic category. It can also be due to lack of training or high turnover, which results in a high percentage of employees who are new to the job and unfamiliar with its hazards. Another cause of high workers’ compensation payments can be employees who are de-motivated to the point that they will exaggerate a slight pain – or even no pain – into a debilitating injury that will keep them off the job for weeks, or more.

To know how well your organization is doing in areas such as this, compare it to others in its industry or size. You can get data from Human Resources Development Canada, the Conference Board of Canada, and from some private consultants. Some industry associations also conduct surveys of their members.

Morale.

While most companies realize that highly motivated employees will be more productive than those with low morale, few go so far as to calculate the effect morale has on the bottom line. Employees can give you an honest and accurate assessment of their morale level, especially if they are assured that their answers will not be used against them.

If employees indicate that they have a morale level hovering around 70%, it means they are likely somewhere around 70% as productive as they could be. The employee is not really “absent” in the sense of not showing up, but a task that would take an hour for a motivated employee might take three for one with low motivation.

If low morale means that you are only getting 70% of the value of your payroll-related expenses, you may see a need to look for ways to improve your employees’ morale – and therefore their effectiveness. By putting a dollar value on the effect of morale level in your organization, you will increase your motivation to improve even a good situation. In many cases, low morale eventually manifests itself in high absenteeism and turnover, the costs of which are often significant. It is much better to fix the situation before it reaches that point.

Better data means a better diagnosis

Having accurate information is very important before taking action. It is important to realize that members of the management team often have a very different perception of the organization than other employees. Management members may see it as an exciting, dynamic place to be, while those further down the organization’s pyramid may see it as just a pay cheque.

For this reason, a third-party human resource professional may be able to get a better handle on your organization than can be done internally. Outsiders may be able to get more frank and complete answers from your workforce, provided employees are convinced that their truthfulness will not jeopardize their future with the company, and that management is truly interested in making positive changes.

Quite often, if there is a low morale problem, there is also an issue with trust: employees are unlikely to trust management until some changes are made. Particularly in such cases, a trained facilitator’s ability to ask questions such as “What’s it like to work here?” and get an informative answer can tell the management team what it could not find out on its own. As well, professionals with experience in this field can bring you the benefit of experience gained elsewhere.

At the end of the diagnosis phase, you should have a clear picture of your organization’s workforce effectiveness, expressed in terms of what might be called “ROP” – “return on people”.

Diagnosis leads to improvement

Even in good economic times, the marketplace is constantly changing. Even the most successful organization needs a positive “ROP” strategy. Possibly one of your best sources of ideas for improvement is your employees themselves. Asking them “What would it take to make this a better place to work?” will generate many ideas. Some will be workable, some not. It’s important, however,

not to raise expectations that improvements are in the future if you do not intend to act on what you learn.

In many cases, employees will be filled with ideas of what management can do to improve a workplace. A good consultant / facilitator can move this around and ask them to consider what they themselves can do to make it better. Find out what employees can do given the authority, ability and resources. If they need money to make them happy, it pays to ask why, how much, and how the company will know they're getting a good return on the investment. If it's support from management, or the ability to take time off from daily duties to make the changes they see as needed, what is involved?

By making the commitment now to see a value on your "return on people", and putting in place a program for making the situation better, the sooner you will start to reap the benefits.

A.1.4 Aspects of management training and development: A case study.

Management development philosophy and model

The Aeroquip-Vickers management development task force identified what a best in class organization needed to do in management development. The key activities applied to Aeroquip-Vickers included:

- Growing more talent internally.
- Allowing our managers to develop broad visions of our company, customers and markets.
- Letting managers manage through coaching.
- Viewing our people as our source of competitive advantage.
- Requiring all managers to be oriented and have a broad understanding of Aeroquip-Vickers.

The management development philosophy developed by the team and adopted by the company is as follows:

Management development is a shared responsibility within Aeroquip-Vickers that ensures they will hire talented people, and, through continuous learning and development, their people will meet current and future challenges.

- Aeroquip-Vickers will provide access to resources and opportunities.
- Managers will take an active role in the development of their people.
- Individuals will take initiative for their development.

Another way to think about management development is to look at it as a process designed to ensure that the right people are in the right job. The model shown in Figure A.1 was created by the Aeroquip-Vickers task force, and provides a way of understanding the interconnection of activities associated with management development.

One of the key findings from the task team benchmarking was that those companies that seemed to be the best at developing qualified managers were those that did all the things in the model. They did not have to be best at all things, but they did have to do them all.

For example, having the best performance review process would not by itself ensure that you got the right people in the right job. Superior performance in a piece of the process was not as important as good performance in all of the process. Thus, a systems approach to management development was required to accelerate management learning and performance.

Aeroquip-Vickers managerial success profile

Aeroquip-Vickers's management development objective was to put in place a management development process that provided the structure and systematic approach for development to occur on the job.

With a management development philosophy and model, they next developed an Aeroquip-Vickers Managerial Success Profile. This profile addressed the question of what skills, traits and competencies Aeroquip-Vickers managers needed in order to be successful in the future. The top 50 managers in the company were given a deck of cards. Each of the 67 cards in the deck had a managerial skill or competency on it (for example Strategic Agility) and a behavioural definition of that skill or competency.

The managers were then asked, "What will be the skills and traits needed by general managers to lead Aeroquip-Vickers into the next 5 – 10 years?" The managers were asked to sort the deck into three piles; a pile with the 22 skills that would be most important, a pile with the 22 skills that would be the least important, and a pile of the remaining 23 cards. The sorts of the top 50 managers were combined and the results of that combined sort were compared with success profiles of leading companies.

In the end, the top management of Aeroquip-Vickers adopted a list of 25 skills and traits that fell under five general categories that were determined to be representative of the critical management competencies required to be successful in their business.

Now with a management development philosophy, a management development model, and a managerial success profile they had all the ingredients to begin a more focused management development effort within Aeroquip-Vickers.

These three components would become the hallmarks of their management development system that would change their approach and practice of improving management performance at their own organization.

A.1.5 Knowledge Management: The new challenge for the 21st century.

Knowledge management is an emerging discipline. The American Productivity & Quality Center (APQC), a non-profit education and research organization which fostered the creation of the Malcolm Baldrige National Quality Award, defines knowledge management as "the strategies and processes of identifying, capturing and leveraging knowledge" to enhance competitiveness as reported in *Manasco (1996)*.

According to Gartner Group findings for 1998, implementation of knowledge management systems has begun, and is currently being deployed by most large companies. One third of Fortune 1000 companies are now including knowledge management initiatives in their 1999 plans according to *Smalley-Bowen and Scannell (1999)*.

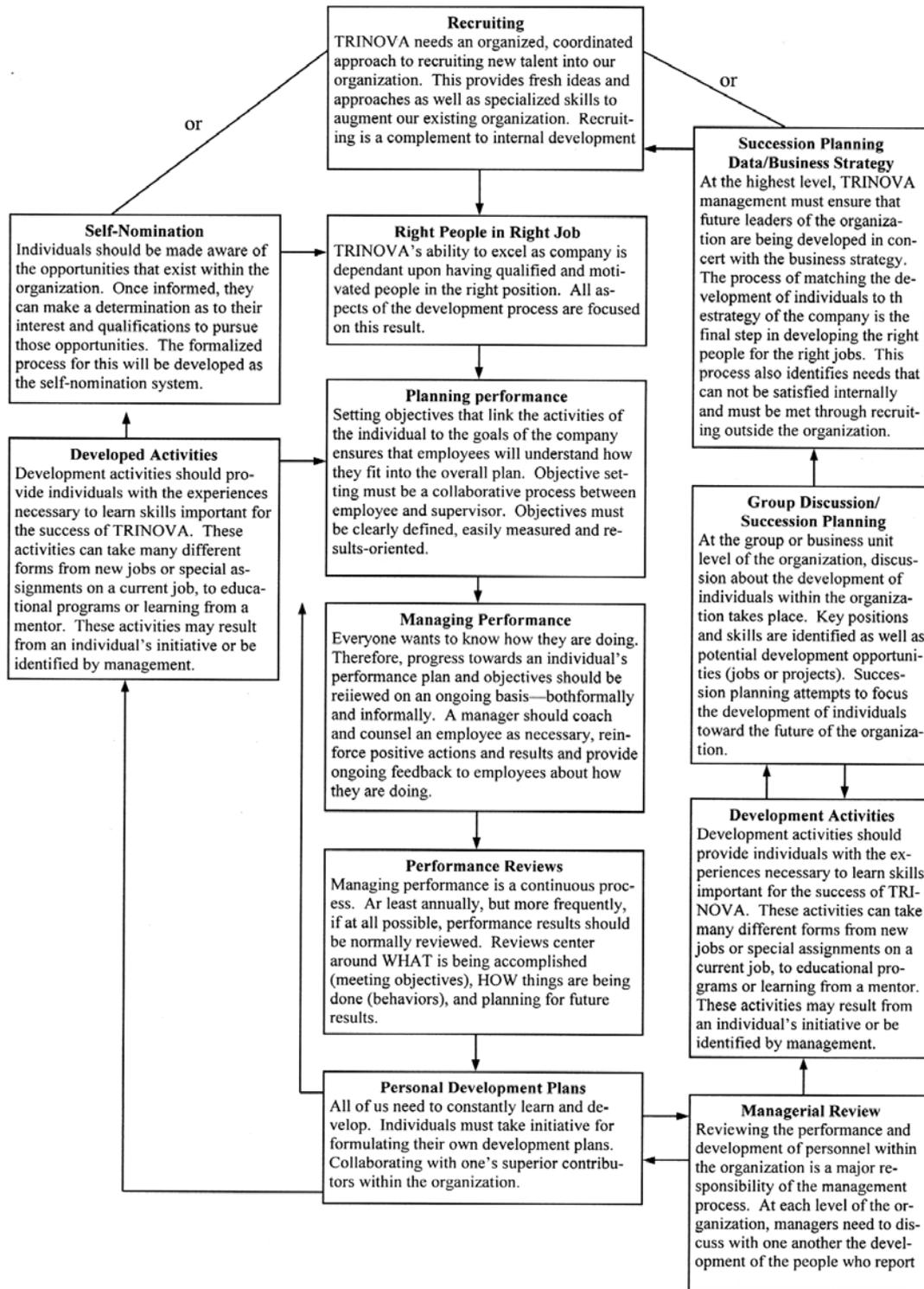


Figure A.1 The Aeroquip Vickers management development process model

According to a study of successful knowledge management projects, knowledge management was at least partially responsible for a major transformation of one large consulting firm. The transformation was extensive in terms of a market

improvement in financial results for the firm while engaged in knowledge management practices. Line consultants drew heavily from the firm's centralized knowledge centres, accessing previous presentations to other clients, process and system design specifications, work plans and other project-oriented collateral and artefacts. Senior managers described knowledge management as the core of the consulting strategy, and the concept was pervasive in the company's internal and external documents, as reported in *Davenport et al. (1998)*.

Teltech's efforts in creating a structure for knowledge management are instructive not only for external purpose, but also for internal practice. It is clear that if knowledge is to be leveraged, it must first be categorized. The thesaurus-based, matrixed approach used by Teltech may be the "best practice" since knowledge is usually communicated and sought in words.

Also, it is clear that Teltech's operation is labour intensive, requiring employees with a high level of information skills and customer service. Also, the expense of maintaining the Expert Network, as well as development of the integrated source map, are financial factors to consider. It is clear, since at this point there are no obvious competitors to Teltech's operation, that the financial challenge exists. Teltech's approach to knowledge management adheres to the framework defined earlier in this paper, an exception being that it is an actual external service for companies interested in acquiring knowledge from experienced knowledge workers.

Substantial progress has been made in Ernst and Young's approaches to knowledge management, but several challenges remain, inclusive of: embedding knowledge in an ever changing technological environment; maintaining support with increased usage; and buy-in from front line staff. The knowledge management approach is a conceptual orientation, differing greatly from a history at Ernst and Young of a pragmatic approach. To meet this challenge Ernst and Young consultants were now evaluated, in part, on their contributions to, and use of, the knowledge banks.

Also, the task of measurement of return on investment is difficult at best. A "dashboard" was created assessing such topics as value delivered, reusable content created, thought leadership, presence of subject matter expertise and state of networking environment. It was noted that "some level of faith" was required to fully justify knowledge management investments. The revenues in the US consulting practice in 1995 rose by 44 per cent, which surpassed all targets. Also noted was the embryonic phase of development this discipline was still undergoing and the understanding that many challenges and changes remain according to *Davenport (1997)*.

In the case of Microsoft, it is evident that for a period to be successful it would require the involvement and teamwork by everyone in the organization. This is a model that is clearly valid in business practices, but essential to the discipline of knowledge management. Also evident was the fact that time and resources would be substantial to collect knowledge competencies and develop a competency model to rate employees.

The Microsoft case study reveals security issues pertaining to building a competency database that included access rights based on the nature of the data. Also, there was the concern over the access to all data by department supervisors. Finally, the project was built to maintain employees competency in order to gain strategic advantages over competitors.

Hewlett Packard has recognized that there are several knowledge sharing initiatives, such as training techniques, marketing intelligence, etc., which can advance their position in a global marketplace. It is clear that the level of resource commitment in gathering data and dissemination of data is high, but the gain is important to remain a leader in quality and productivity as indicated in Table A.3.

It is clear, upon analysis of these conclusions, that important aspects of this discipline are regarded in similar manner through out the intellectual and business community. These aspects include a direct correlation between the implementation of knowledge management “best practices” and quality improvement, as well as increased productivity.

Several recent studies report results that solidly show knowledge management initiatives growing in large corporations, up more that 100 percent from 1998, encompassing more than half of all major enterprises according to *Petch (1999)*. Table A.4 provides a detailed approach to the implementation of knowledge strategies and practices within an organization.

Table A.3
Knowledge management effects on quality and productivity

Case Study	Quality Improvement	Increase in productivity
Teltech	Access to network of thousands of experts in technical field. Development of software provided an integrated view of source information in a matrix environment. Teltech’s resources focused on adding value to information.	Development of non-hierarchical knowledge structure resulted in more efficient data search time. Higher project success level in utilization of external information
Microsoft	Employees acquired new and higher level job skills. Created an on-line competency profile for jobs and employees that matched skills to projects.	Increased communication among employees. Increased advantage margin over competition.
Hewlett Packard	20 knowledge-sharing initiatives enacted. Created knowledge sharing network to bring decentralized workforce together.	Increased knowledge areas such as competition, marketing, product development and customer service. Increased advantage margin over competition.
Ernst & Young	Formulated knowledge strategy that involved the rapid application of knowledge, models and approaches to client situations. Three of E&Y business units were involved in creating the knowledge, storing the knowledge and automating knowledge.	Led to 44 percent increase in revenues. Knowledge transfer enabled consultants to remain competitive.

Table A.4
Steps for implementing knowledge management strategy

Step 1	Form powerful coalition	Senior management supports
Step 2	Communicate vision	Incorporate the message into daily company activities
Step 3	Establish teams	Create needs assessment team and sub teams
Step 4	Analyse needs	Conduct needs assessment
Step 5	Identify and acquire knowledge	Determine tacit knowledge, collect internal knowledge
Step 6	Design technological structure	Warehouse knowledge, both internal and external
Step 7	Test technology	Run system test
Step 7	Maintenance of technology	Conduct needs assessment update meeting
Step 8	Re-test	Run system test
Step 9	Training of knowledge workers	Conduct company-wide training programs on use of knowledge management tools
Step 10	Roll-out use of knowledge management practices	Initiate use of intranet developed data repositories
Step 11	Track usage	Refine reporting techniques
Step 12	Systems go live	Track return on investment
On-going	Measure quality and productivity	Communicate performance levels and continual improvement opportunities.
On-going	Measure performance of knowledge management practices	
On-going	Conduct needs assessment meetings	

Standards bodies, ranging from the International Accounting Standards Committee to The Conference Board, are making important progress on performance measurement methodologies as reported in *Petch (1999)*. Performance measurement will be a key issue in knowledge management initiatives since there is little precedent upon which to establish ROI. As an emerging and dynamic discipline, the creation of a standard measurement of knowledge management reflected on the balance sheets is still in the formation stage. Once achieved, the result will be a rapid response from global business leaders to implement knowledge management “best practices” in order to remain competitive.

Knowledge Management implores you to look at informal networks and protocols, any and all approaches to sharing experiences and know-how, as well as any and all cultural, technological and personal elements that spur creativity and innovation in response to changing stimuli. The effects of knowledge management on quality and productivity are evident by an internal and external awareness of collective strength and the ability to respond and instantly organize to meet market demands and opportunities. Clearly, knowledge management is the new challenge for the twenty-first century.

A.1.6 The perceived impact of team-based management systems on organizational effectiveness

Team-based management or self-managed teams have been called the “second industrial revolution” because of their incredible impact on today’s business practices according to *Fisher (1994)*. Fortune magazine called them “the productivity break through of the 90’s”. Management guru, *Peters (1995)*, calls the self-managed teams “a basic organizational building block”. Team-based management systems are not only used in manufacturing industry, but in the service sector as well. From insurance companies (Shenandoah Life Insurance to schools (Dade County, Florida) to zoos (San Diego Zoo), work teams have worked wonders at companies like Boeing, Volvo, Hewlett Packard, and Federal Express as described by *Ankarlo (1994)* and *Labich (1996)*. In fact more than 50 per cent of all Fortune 500 companies utilize them, and *Ankarlo (1994)* estimated that by the year 2000, 90 per cent of all North American organizations would have at least some type of self-managed work teams. In some companies, empowerment is used as the umbrella term for increasing employee involvement in decision-making through self-managed work teams. Empowerment is more than involvement; it represents a high degree of involvement in which employees make decisions themselves. According to *Pett and Miller (1994)*, employee empowerment is the concept of enabling subordinates to have the authority and capacity to make decisions and to act for the organization in order to improve both individual motivation and organizational productivity.

Fisher (1994) likens it to mathematical function. This function has four variables: authority, resources, information and accountability. All the variables must be integrated and offered or the task of empowerment is void.

Thus,

Empowerment = f(Authority, Resources, Information, Accountability)

Conger and Kanungo (1998) add that empowerment is more than just the delegation of authority; it possesses the essence of motivation and self-actualisation as described by *Pett and Miller (1994)*.

Pett and Miller (1994) define the process as follow. “Empowerment is defined here as a process of enhancing feelings of self-efficacy among organizational members through the identification of conditions that foster powerlessness and through their removal by both formal organizational practices and informal techniques of providing efficacy information.”

Employee empowerment did not become a business concern in the USA until the 1960’s and 1970’s. Now, managers like Chief Executive Officer Jack Welch of General Electric are preaching the power of empowerment. Welch, having had an autocratic reputation, states, “The idea of liberation and empowerment for our workforce is not enlightenment – it’s a competitive necessity of attention to quality” according to *Madonna et al (1992)*. Such an environment calls for a more dynamic, adaptable and creative system. Many feel that employee empowerment is the solution.

The self-managed teams that are most popular today are of two broad types: work teams and problem-solving teams. A problem-solving team is similar to a task force that it is formed for temporary purposes. While problem-solving teams are temporary, work teams, used by two-thirds of US companies, tend to be

permanent. Rather than attack specific problems, *Dumaine (1994)* reports that a work team does day-to-day work activities. Self-managed work teams are groups of employees (five to 12) with all the technical skills (as well as the authority) needed to direct and manage themselves according to *Stokes and Steward (1991)*. *McKee (1992)* reports that they are appointed to manage themselves because the team members are those employees familiar with a particular aspect of the company.

Barry (1991) and *Brucker (1995)* report that self-managed teams have been credited with saving hundreds of millions of dollars, achieving conceptual breakthroughs, and introducing unparalleled numbers of new products. Self-managed team activities are expected to lead also to improved self-development for participating employee, enhance aspects of one's "psychological quality of work of life" according to *Dumaine (1990)* and *Lawler (1975)* and to increase productivity, increase market share, improve pricing, and cost reduction according to *Dean and Evans (1994)* and *Sirkin (1993)*.

Despite the frequency with which self-managed team programmes have been adopted in work organizations, *Ankarlo (1994)* reports that there is a paucity of knowledge generated by independent evaluators using rigorous methods as to the impact of participation in a self-managed team on employee attitudes and behaviours. The available studies are limited to testimonials from managers and consultants who have implemented self-managed team programmes, for example *Bowen and Lawler (1994)*, *Grates (1994)*, *Holpp (1994)*, *Overman (1995)* and *Sirkin (1993)*.

Rewards and limitations of self-managed teams

The central theme that runs through most of the studies on self-managed teams reflects a common belief that the use of self-managed team programmes generally improves organizational effectiveness. *Sirkin (1993)* argued that self managed team programmes can produce greater satisfaction, reduced costs, faster and better decision making, improved pricing and increased market share. *Stokes and Steward (1991)* stated that there are at least eight sound business reasons for organizations to adopt the self-managed approach: reduce costs, reduce workforce, increase productivity, get closer to customers, fewer layers of managerial bureaucracy, shorter time to market for products and services, increase employee motivation and commitment, and increase recognition of individual employees' contributions.

Flanagan (1994) showed that self-managed team participation led to improvement in employee productivity, efficiency, quality and a steady stream of innovations at an IBM plant in Lexington. In another study *Burrows (1993)* indicated that attitudes, behaviours and effectiveness all improved as a result of self-managed teams at Texas Instruments Inc, *Brucker (1995)*, reported that the real key to the re-engineering momentum at Union Carbide Corporation was workforce empowerment. "Our employees correctly credit themselves for reaching a \$575 million cost-reduction target on schedule" reported by David Brucker, vice-president for Engineering and Operations at Union Carbide Corporation.

From a different perspective, *Stein (1994)* suggested that most of today's total quality management (TQM) processes fall short of empowering employees. It has been stated by some critics that the greatest struggle in implementing TQM is getting the employees to embrace and adopt the principles. In a recent survey, Arthur Little found that only 36 per cent of the companies felt that the TQM and the

team approach were assisting them in their ability to compete. The cause for such a high failure rate has been cited as being the lack of proper planning and implementation. *Labich (1996)* reported that team-based management systems have been worked wonders at companies like Boeing, Volvo, Hewlett-Packard and Federal Express, but they were not as effective for many other firms. He stated that, "A team is like having a baby tiger given to you at Christmas. It does a wonderful job of keeping the mice away for about 12 months, and then it starts to eat your kids."

Unfortunately, employee empowerment does not come easy. Empowerment means providing so-called "subordinates" with the knowledge, skills, information and resources, along with authority to use these traits without always having to "check-in" or ask permission from upper-level management. *Bowen and Lawler (1994)* argue that in order for self-managed teams to be effective, managers must be willing to share information, rewards, knowledge and power to make decisions that influence organizational direction and performance. Managers must realize that a self-managed-team approach is not a failsafe idea. It takes a tremendous amount of work and dedication of time and resources.

The self-managed team concept also has been credited with helping to improve morale, reduce costs, improve quality, increase productivity and improve organizational performance as reported by *Brucker (1995)*, *Dean and Evans (1994)*, *Overman (1995)*, *Sirkin (1993)* and *Stokes and Stewart (1991)*. The claim by proponents of the team-based management concept and findings from organizational behaviour knowledge suggest five research questions to guide an investigation of the relationship between team-based management systems and organizational effectiveness, satisfaction, productivity and quality:

- (1) To what extent does the degree of familiarity and utilization of team based management systems vary across a variety of settings?
- (2) Do team-based management systems achieve their stated objectives of influencing and enhancing employees' job satisfaction?
- (3) Do team-based management systems seem to contribute in any measurable extent to perceptions of higher levels of organizational productivity?
- (4) Do team-based management systems achieve their stated objectives of improving quality of products and services?
- (5) Do team-based management systems lose momentum and their positive contribution to organizational effectiveness after a short period of time after implementation (one of three years) as claimed by critics of team-based management systems?

Studies on team based management systems have investigated these five research questions and evaluated the impact of implementing team-based management systems on organizational effectiveness. Several significant findings have emerged as discussed below.

The attitudinal results provide support for the claims of team-based management proponents that the technique improves participants' productivity, quality, satisfaction, performance, and appears to be effective. The influence of participation in self-managed team techniques on organizational effectiveness was tested statistically for directionality and magnitude as well as for dependency.

Statistical analysis was found to indicate that involvement in team-based management systems was positively related to perceived changes in satisfaction with opportunities for participation at work, to accomplish something worthwhile at work, and enhancing opportunities and skills needed for advancement in some of the organizations surveyed. Furthermore, participation in the team-based management programmes was positively related to perceived changes in communication, job meaningfulness, challenge, productivity, quality and performance among employees in more than half (58 per cent) of the surveyed organizations. At the same time, almost 42 per cent of the surveyed respondents who implemented team-based management techniques indicated that their stated objectives of influencing and enhancing organizational effectiveness. One way to explain this finding is by suggesting that the stated objectives were too high; too much was expended from team-based systems. Hence, stated objectives were not met.

Additionally, the results showed that there were several significant factors, which may have contributed to self-managed teams' success among more than half of the surveyed firms who had implemented team-based management programmes. Among these factors were the following: clear goal statement and understanding of authority, capacity to make decisions, support and commitment by senior management, detailed implementation plans to perform self-managed team projects, cross-functional teams, highly effective communication channels, management with courage and hard work.

The results also indicated that team-based management was a huge job and was a complex task, and must have an innovative and continually challenging environment. Some of the reasons which may have contributed to team-based management's failure among some of the survey respondents were the following: inadequately having the authority and capacity to make decisions, lack of an effective methodology to implement team-based management plans, lack of an effective feedback, lack of credibility and skills needed, lack of support by middle managers and lack of true employee empowerment. These findings coincide with the claims of many academics that success in team-based management systems requires managers to know how to organize, inspire, deploy, motivate, enable, measure and reward the value-adding operational work, for example *Bowen and Lawler (1994)*. Another finding from this study showed that more than half (54 per cent) of the surveyed respondents disagreed with the statement which indicates that a team-based management system loses its momentum and its positive contribution to organizational effectiveness after a short period of time after its implementation. At the same time, almost half (42 per cent) of the surveyed respondents who implemented team-based management techniques indicated that their self-managed team programmes had less significant contributions to their organizational effectiveness after one to two years of their implementation because of lack of executive, leadership support and participation.

A partial implication drawn from those studies indicates that the introduction of a team-based management programme into an organization further requires the introduction of multifaceted changes in person-job relationships and the whole organizational hierarchy. These changes include top management roles and behaviours. The role of a team leader is much more difficult than that of a traditional manager. A team co-ordinator must be able to resist telling the team what to do and allow the team to make mistakes. The co-ordinator acts as a resource to the team by providing its members with the information they need to run their business, by asking for solutions to problems rather than proposing solutions, and by anticipating future problems. Lasting productivity and quality

gains will be realized only through effective utilization of people and the system within which they operate.

Another practical implication of this study is that the team-based management concept can be seen as a strategy to increase motivation, quality, productivity and customer satisfaction. Self-managed teams serve as the main building blocks of the organization. However, they are not simple or easy to create, develop and support. Implementation is a tedious task requiring careful consideration of factors critical to the success of this revolutionary programme. Companies must realize that it takes time and resources to implement teams and reap their rewards. There must be training and education of employees at all levels of the organization in order for workers to release their fears and grant commitment to such a project. Open communication and support assists in resolving problems associated with resistance, frustrations and misunderstandings. When the time comes, the payoffs will be great. Productivity, quality, customer satisfaction, quality of work life and more will be improved.

A.1.7 Top management leadership, employee empowerment, job satisfaction and customer satisfaction in TQM organization

Today, more than ever, the long-term survival of many manufacturing and service organizations is considered to be inextricably linked to the ability of these organizations to produce goods and services that meet or exceed customers' quality expectations. Therefore, organizations are searching for approaches to managing people and production systems in ways that assure the transformation of inputs into quality outputs that meet or exceed customers' expectations. Total quality management (TQM), because of its focus on customer's satisfaction, arguably is the most widely discussed approach to directing organizational efforts toward the goal of customer satisfaction. Its tenets are continuous improvement, top management leadership commitment to the goal of customer's satisfaction, employee empowerment, and customer focus. Advocates of TQM hold that the goal of customer satisfaction is achieved through top management commitment to creating an organizational climate that empowers employees and focuses all efforts on the goal of customer's satisfaction. A positive relationship between leadership and commitment, and employee empowerment (leading to job satisfaction) with customer's satisfaction is assumed.

Both the trade and academic literatures on TQM suggest many different leadership strategies and practices for empowering or involving employees in quality-related decision-making processes. However, few empirical studies, outside of the Malcolm Baldrige Award programme, have been done to sufficiently document these relationships and to determine which of the many suggested strategies and practices are effective in bringing about the intended results (employee empowerment, job satisfaction and superior customer satisfaction).

Siehl and Schneider surveyed organizations that formally introduced TQM as a means for identifying the management strategies and practices that are effective in bringing about employee empowerment, employee job satisfaction, and, ultimately, customer satisfaction. Their objective was to provide empirical assessment of the assumed relationship between top management leadership and commitment, employee empowerment, job satisfaction, and customer satisfaction. Such assessment should provide guidance to organizations in the design of empowerment and job satisfaction components of their TQM programmes.

Another objective was to provide empirical assessment for the TQM-based literature.

In almost all of the TQM literature, employee involvement, empowerment, and top management leadership and commitment are identified as crucial elements of a successful TQM programme. *Bowen, Siehl and Schneider (1989)*, *Bower (1994)*, *Camp (1989)*, *Deming (1982)*, *Mendelowitz (1991)*, *Roberts (1994)* and *Senge (1994)* are notable examples. *Lawler (1994)* referred to employee empowerment as one of the most important tenets of TQM. *Thomas and Velthouse (1990)* define empowerment “as intrinsic task motivation that manifests itself in four cognitions reflecting an individual’s orientation to his or her work roles.” By intrinsic task motivation, they mean “positively valued experience that an individual derives directly from a task that produce motivation and satisfaction.” The four cognitions they identified are meaningfulness, competence, impact and choice. Meaningfulness is the value of the task goal or purpose in relation to the individual’s own ideas or standard, and competence is the degree to which a person can perform task activities skilfully. Impact, on the other hand, is the degree to which behaviour is seen as making a difference in terms of accomplishing the purpose of the task, while choice is the causal responsibility for a person’s actions. A more operational-level and process-oriented definition of empowerment was offered by *Bowen and Lawler (1992)*. They define empowerment as, “sharing with front-line employees information about an organization’s performance, information about rewards based on the organization performance, knowledge that enables employees to understand and contribute to organizational performance, and giving employees the power to make decisions that influence organizational direction and performance”. In *Zemke and Schaaf (1998)*, employee empowerment means turning the “front line” loose, and encouraging and rewarding employees to exercise initiative and imagination.

One of the most frequently referenced definitions and constructs of empowerment has been offered by *Conger and Kanungo (1988)* who define empowerment as “ a process of enhancing feelings of self-efficacy among organizational members through the identification of conditions that foster powerlessness, and through their removal by both formal organizational practices and informal techniques of providing efficacy information.” This definition implies strengthening the effort-to-performance expectancy or increasing employee feeling of self-efficacy. According to Conger “empowerment enables employees to accomplish task objectives”. These definitions are derived from the management theory of power and authority delegation that gives an employee the right to control and use organizational resources to bring desired organizational outcomes.

In practice, employee empowerment centres on strategies or interventions that strengthen employees’ self-efficacy or confidence in accomplishing task objectives. The management literature on employee empowerment identifies contextual factors and strategies that promote and support empowerment. For example, *Burke (1986)* suggests that a way to empower employees is to express confidence in them together with establishing realistic high-performance expectations for them. *Block (1987)* adds the creation of opportunities for employees to participate in decision-making and giving employees autonomy from bureaucratic constraints as empowerment strategies. Comparatively, *Benis and Nanus (1985)* suggest the strategy of setting performance objectives for employees that are challenging and inspiring. Also, *Hackman, Oldham, Janson and Purdy (1975)*, *Kanter (1979)*, *Oldham (1976)*, and *Strauss (1977)* suggest performance-based reward systems and enriched jobs that provide autonomy and control, task identity, opportunities for career advancement, and task

meaningfulness as ways to empower employees. At the organizational level, however, *House (1988)* and *McClelland (1975)* suggest that empowerment could be achieved through employee selection and training programs designed to provide required technical skills together with a culture that encourages self-determination and collaboration instead of competition.

Thus, in TQM organizations, employee empowerment is operationalised by encouraging employees to respond to quality-related problems and giving them the resources and authority to do so. Also, employees are delegated authority and allocated resources to make quality improvement decisions in their jobs. *Rubenstein (1993)* reports that, in manufacturing environments, employees are empowered to accept or reject the quality of work-in-process and finished work. To *Colzon (1987)*, the empowerment strategy is to free employees from the rigorous control imposed by instruction, policies and orders and, in their place, give employees the freedom to take responsibility for their ideas, decisions, and actions.

Obviously, from the preceding discussion, a primary objective of employee empowerment is to create a workforce that is energized by an enhanced ability to produce products or services that meet or exceed internal and external customers' expectations. In the context of TQM, it is generally held that organizations best meet this objective when top management is committed to the goal of customer satisfaction and by creating an organizational climate that emphasizes customer satisfaction. It is generally held also that empowered employees have higher levels of job satisfaction and performance primarily because of their involvement in goal setting and in making decisions that affect their work. *Blankburn and Rosen (1993)* reported some preliminary evidence of these outcomes in their study of Baldrige Award-winning companies. However, other researchers have failed to show unconditional relationships between involvement and participation in decision-making and improve performance, for example *Cotton, Vollrath, Froggatt, Lengnick-Hall and Jennings (1988)*. Additionally, *Bowen and Lawler (1992)* and *Lawler (1988)* show that the effectiveness of empowerment and involvement in causing improved organizational performance is contingent upon other organizational factors such as a firm's competitive strategies, technology and the nature of the firm's relationship with its customers.

Similarly, studies on the relationship between job satisfaction and performance have failed to show a strong and unconditional link. For example, *Laffaldano and Mucinsky (1985)* concluded from their analysis of results from several studies that, at best, the relationship between job satisfaction and performance is very weak. Though this finding supports most previous studies, *Petty, McGee and Cavender (1984)* found a higher and consistent positive correlation between individual job satisfaction and individual job performance. Also, *Bhagat (1982)* reported a positive relationship between employee job satisfaction and job performance. However, this relationship is moderated by time and organizational pressures to perform. A stronger relationship between job satisfaction and performance exists only when job satisfaction results in employee commitments that in turn produce desirable organizational citizenship behaviour, according to *Williams and Anderson (1991)*. This behaviour is the willingness of an individual to engage in extra role behaviour that is not generally considered a part of an individual's job description.

Employee empowerment, organizational culture, and customer satisfaction

Hauser and Clausing (1988) report that TQM's primary focus of customer satisfaction, measured by an organization's ability to meet and exceed its customers' expectations, often requires TQM organizations to maintain close contact with customers through post purchase surveys, sales people, marketing, and customer relations department. Additionally, the customer satisfaction focus requires the interactions between front-line employees and customers to be pleasant experiences especially for the customer. This latter requirement is facilitated by empowerment, involvement and understanding of the emphasis that the organizational culture places on quality. *Schlesinger and Heskett (1991)* and *Schlesinger and Zomitsky (1991)* found that employees' perception of service quality positively relates to both job satisfaction and employee self-perceived service capability. Also, *Fulford and Enz (1995)* found employee perception of empowerment to have an impact on employee loyalty, concern for others (including customers), and satisfaction. The implication of this finding is that enhancing employee service capability through empowerment contributes to employee job satisfaction, job commitment, pride of workmanship, and what *Anderson, Rungtusanatham, and Schroeder (1994)* called employee fulfilment or the degree to which employees feel that the organization continually satisfies their needs.

Related findings reported by *Tornow and Wiley (1991)* are that employee attitudes – measured by feelings about reward for performance, work itself, management practices, satisfaction with the company, work group climate, and a culture for success – are related to customer satisfaction. Here, customer satisfaction is in terms of customer service, product quality, customer orientation, product functionality, and training. These measures of employee attitudes are similar to those of employee job satisfaction. Thus, employee perception of organizational climate and work content (job satisfaction) is related to customer satisfaction. These findings support and extend earlier works of *Parkington and Schneider (1979)*, *Schneider and Bowen (1985)*, and *Schneider, Parkington and Buxton (1980)* that showed relationship between customer satisfaction and employee perception of an organizational culture or climate that emphasizes quality.

The overall results of the employee empowerment study support the findings of earlier studies that suggest the existence of relationship between top management leadership, employee empowerment (i.e., delegation of decision-making authority), and employee job satisfaction. This finding supports *Fulford and Enz (1995)* who found the perception of empowerment to impact on employee loyalty, concern for others and job satisfaction. Also, employee job satisfaction induced by job-related factors could in turn lead to improved customer satisfaction as reported by numerous authors including *Bhagat (1992)*, *Caldwell (1984)*, *Chacko (1982)*, *Ford (1973)*, *Hackman (1977)*, *Herzberg (1968)*, *Herzberg, Mausner and Synderman (1959)*, *Kim (1984)*, *Latham and Steele (1983)*, *Lawler, Mohrman and Ledford (1992)*, *MacGregor (1960)*, *Petty et al. (1984)*, *Thomas and Velthouse (1990)* and *Vroom (1964)*.

Successful TQM programmes involve and empower employees, according to the employee empowerment study, by putting in place processes that bring multiple perspectives to bear on quality decisions, and delegating sufficient authority to employees to make both individual and collective decisions. Additionally, we found that these TQM organizations have communication systems that facilitate lateral and vertical flows of information critical to total quality objectives and actively involve employees in the definition of the organization's quality missions

and objectives. Furthermore, these programmes empower employees to resolve customer complaints quickly and effectively, and continuously train employees on teamwork, problem recognition, and problem-solving skills.

Another finding is that employees' involvement or participation in TQM is facilitated by employee satisfaction with communication at lower organizational levels, availability of job requirement information, enhanced promotion, and development opportunities, and availability of information about the organization's values, vision, and strategies. Employee satisfaction with the organization's reward and recognition systems, organizational adjustment to a total quality culture, training and retraining programs that facilitate continuous improvement, and health and safety provisions in the job environment also facilitate employee involvement and participation in TQM programs. These findings are consistent with the assertions of *Caldwell (1984)*, *Gufreda, Maynard and Lytle (1990)*, *Lawler et al. (1992)*, and *Tannenbaum, Weschler, and Massarik (1961)* that effective participative management requires an organizational culture that supports involvement (an element of employee empowerment). The resulting improvement in employee job satisfaction then leads to improved customer satisfaction. The findings also suggest a strong and active role for top management in creating an organizational culture that promotes total quality. These top management roles should include initiating and maintaining a total quality culture by being actively involved in reviewing progress of critical quality programs, making available sufficient resources to implement total quality initiatives; and devising credible reward systems that recognize employees' and managers' contributions to total quality objectives throughout the organization. Finally, *Lawler and Petty* found a strong relationship between employee empowerment and job satisfaction, and between job satisfaction and customer satisfaction.

Besides these findings, the employee empowerment study shows that employees are generally receptive to the idea of empowerment. However, they are not enthusiastic about being empowered to judge and either accept or reject the quality of the work of peers. *Idstein (1993)* and *Whitney and Smith (1983)* suggest that this may be due to employees' desires to avoid interpersonal conflicts (that may result from the exercise of such authority) and to maintain group cohesiveness that contributes to effective teamwork and group performance.

The value of the employee empowerment study is the empirical basis it provides for some frequently suggested management practices and strategies for achieving employee empowerment and participation in TQM organizations. The findings provide a prescriptive outline for the design and implementation of employee empowerment, top management leadership and commitment roles, and job satisfaction components if a TQM program. Additionally, the findings support previous studies that suggest a strong association between employee empowerment and customer satisfaction, for example *Miller and Monge (1986)* and *Woolridge and Floyd (1990)*. However, they disagree with *Adam (1991)* and *Locke and Schweiger (1979)* who found only a modest association between employee empowerment and customer satisfaction. The findings can provide managers with a framework for formulating employee empowerment strategies, to management leadership and roles based on what has worked in many organizations that have successful TQM programs.

In service organizations, especially, a perception of satisfaction by customers, to a great extent, depends on the quality of the interaction between employees and the customer. As noted by *Schlesinger and Heskett (1991)* and *Schlesinger and Zomitsky (1991)*, this interaction needs to be a pleasant experience for the

customer. Obviously, employees who find their jobs unpleasant cannot convey pleasantness to customers during this interaction. This, according to our findings, underscores the importance of employees who are satisfied with their jobs as a result of their empowerment and perception of the emphasis that organizational culture places on quality. This, again, is facilitated by top management leadership and commitment to the creation of a total quality culture that emphasizes, among other things, employee empowerment in terms of their participation and involvement in the organizational decision-making processes and their access to job requirement information.

Finally, there is an ongoing debate about the merits of TQM because not every organization has realized the associated benefits. This may not be due to the failure of TQM as a management philosophy but to its half-hearted implementation. Some organizations are willing to implement only those aspects of TQM supported by the existing organizational culture, and are not willing to undertake the total cultural transformation that TQM requires. For example, most employees did not feel that they had been given sufficient authority to reject or accept the quality of their own work. Second, most did not agree that they were actively involved in the definition of the organization's total quality missions and objectives. These views, if widely held, can undermine the effectiveness of TQM efforts in these organizations. The fact that an organization claims to have a TQM programme does not necessarily mean that TQM is fully and well implemented.

Implication for management

A successful adoption of TQM as a competitive strategy requires both structural and cultural transformation. For example, our finding that associates the success of TQM programs with lateral and vertical flows of information has implication for the design of organizational communication and management information systems. Also, our finding, which associates employees' commitment and participation with employee satisfaction with an organization's adjustment process to a TQM culture, emphasizes the need for employee involvement in the cultural change or adjustment process. Finally, the strong relationship between top management leadership and commitment and employee empowerment and customer satisfaction suggest a visible role for top management especially in creating and sustaining an organizational culture that focuses on customer satisfaction.

A.1.8 Aspects of employee capability

In a major research project, *Schlesinger and Zomitsky (1991)* identified the importance of a very strong "customer-employee satisfaction mirror", i.e. a strong, honest open relationship within which the customer posed complaints, the employees tried to honestly and urgently solve the matters, and the customers repeated purchases and became apostles of the company's products and services. Dimensions important to customers were, as indicated in Table A.5:

- ease of doing business with the company;
- competence of service people;
- the timeliness of the services;
- service representatives' availability and concerns for customers; and

- the interest displayed by service personnel in helping customers.

However, it was the investigation of the sources of employee satisfaction that yielded the most interesting results. About two-thirds of employee's satisfaction levels were caused by just three factors:

- the latitude given employees by their management to meet customer needs;
- the authority given them to serve customers; and
- possession of the knowledge and skills needed to serve customers.

Table A.5
Determinants of frontline employee capability (adapted from Schlesinger and Zornisky (1991))

Determinants	Explanatory power
Latitude is given to meet customer needs	36,6
I have the authority to serve the customer	19,2
I have the knowledge and skills to serve the customer	12,9
Rewards are provided for serving the customer well	7,3
Customer satisfaction is a high priority with the director/manager	4,2
Production requirements are reasonably balanced with serving the customer	3,1
Supervision overall is satisfactory	2,8
Underwriting training is satisfactory	2,1
13 other determinants	11,8
TOTAL	100,0

When combined with rewards for serving customers well, these factors in total accounted for more than 70 percent of the job satisfaction experienced by frontline employees (service workers). These factors comprise much of what we may call “**capability**”.

From this study it is evident that “**capability**” is made up of several components, including:

- the latitude to deliver results to customers;
- a clear expression of limits within which frontline employees are permitted to act;
- excellent training to perform the job;
- well-engineered support systems, such as service facilities and information systems; and
- recognition and rewards for performing well, determined at least in part by the levels of customer satisfaction achieved.

Many other research projects proved that there is an additional factor to the “capability” formula, and that has to do with “selection”. It is evident that best-performing employees

appeared to care most about their capability and that of others around them, and that “winning” employees seemed to value working with “winning” customers and other “winning” employees. It is therefore logical to conclude that the selection of employee and customer is critical to the successful development of a high-capability frontline service organization.

Fundamentally it has to do with hiring people with the right attitude, and it also means that leaders/managers has a major responsibility to involve the work force meaningfully and ongoingly in job-and customer-related matters.

We learn from this capability cycle, illustrated in Figure A.2, that greater latitude to meet customers’ needs, resulting from the right selection, training and empowerment, should be one of the main focal areas in growing a company’s competitiveness.

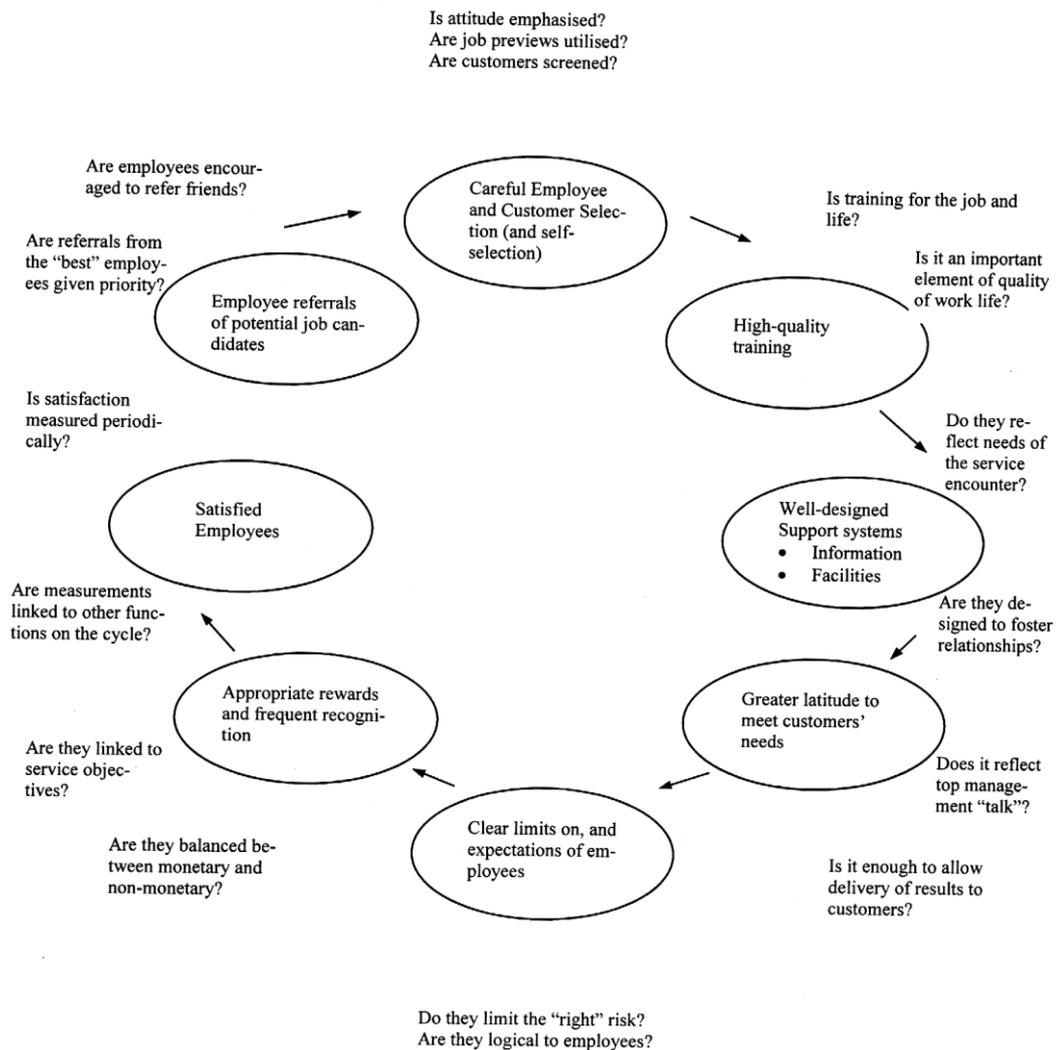


Figure A.2 *The capability cycle and associated challenges adapted from Beer and Gabarro (1999)*

A.2 Occupational culture and living conditions

This portion of the literature review considers issues of occupational culture and living conditions. It is divided into two parts: factors influencing productivity and previous South African mining industry studies.

A.2.1 Factors Influencing Productivity

Prokopenko (1987) argues that productivity improvement is not just doing things better, but doing the right things better. The author states that factors affecting productivity need to be identified and controlled. Three main productivity factor groups are identified, being

- Job-related
- Resource-related, and
- Environment-related

These productivity factor groups fall within two major categories:

- External (not controllable)
- Internal (controllable)

The internal factors are subdivided into two categories: hard (not easily changed) and soft (easily changed). Hard factors include products, technology, equipment and raw materials. Soft factors include the labour force, organisational systems and procedures, management styles and work methods.

Prokopenko (1987) argues that the soft factors of enterprise productivity could be addressed through the Quality of Work Life (QWL) approach that discards outdated human resources policies and improves the use of human resources in an enterprise.

Gescher and Kleiner (1990) state that lagging productivity is a barrier to effective competition. In order to gain the competitive edge in domestic and international markets, companies need to equip themselves by improving and developing their human resources strategies. Three major influences on productivity are identified by *Gescher and Kleiner (1990)*, being management factors, employee factors and job environment factors.

a) Management Factors

Motivation is essential in boosting employee morale and in improving the QWL. The authors argue that motivation is the least expensive method of improving productivity, yet companies do not make use of it due to traditional, authoritarian management styles. The main aspects of QWL include the following:

- Autonomy
- Recognition
- Belonging
- Employee development
- Rewards, and most importantly
- Dignity and decent working conditions

The notion of democratic work environment relates to one of the main aspects of QWL stated above, *dignity and decent working conditions*. According to *International Labour Organisation (2000)*, decent work means productive work, in conditions of freedom, equity, security and human dignity. It means productive work in which rights are respected, which generates an adequate income, in a

safe and healthy working environment, with adequate social protection and above all, where human dignity is respected and preserved.

b) Employee Factors

Gescher and Kleiner (1990) argue that management and workers need to support and complement each other. In other words, motivation and improved productivity is not just a function of management, but depends to a great extent on the employees' *willingness* and *capacity* to perform.

Oborne (1987) argues that management must know what the needs of the worker are and how to satisfy his/her needs. This must be done on an individual basis since people have different needs through screening and selection. This could optimise work design, task analysis and work organization by either *fitting the job to the man* or *fitting the man to the job*, thus enhancing the performance of the worker.

According to *Gescher & Kleiner (1990)*, five basic needs drive an employee, being

- Economic security
- Belonging
- Control
- Recognition
- Personal self-worth

Management's attempts to fulfil these needs must reinforce positive behaviour. *Gescher and Kleiner (1990)* provide a controversial example. If an employee is thought to be lazy and incompetent, that assumption will be transmitted to him either verbally or non-verbally and that person will eventually reflect those traits. Managers are a chief source of confidence and dignity for employees, and they must act as such, distributing workloads fairly. This therefore supports the argument that a very important factor in maintaining the dignity of an employee is the manager's attitude, perception and expectations of that employee. A manager's attitude toward employees tends to perpetuate a self-fulfilling prophecy.

Research done in Europe reveals how Physical Fitness Programmes (PFP) effectively curb the absenteeism rate. It argues that such programmes do not only reduce absenteeism, but they also lower health-care costs. These studies do not only encourage regular physical exercise, but also recommend learning to live a healthier life through a variety of beneficial health concepts such as proper eating and stress management. *Gescher and Kleiner (1990)* argue that, by participating in a health programme, workers can release stored-up energy and frustration in a constructive manner.

Harrison (2000) states that, referring to the state or condition of life at work that employees experience within their organization, absenteeism can have adverse impact on the performance of individuals, their co-workers and the organization for which they work, yet most companies have no idea how absenteeism influences the financial status on a monthly basis, as they don't measure the absence correctly.

c) Job Environment Factors

Gescher and Kleiner (1990) argue that the company should identify those factors that influence productivity the most and manipulate them to maximize worker performance

Identify and remove constraints/blockages such as:

- Improper tools
- Outdated equipment
- Lack of sufficient time to complete a job in a quality manner, and
- Lack of supervision, information and money

In order to identify constraints, input from affected employees is essential.

The physical environment also plays an important role in influencing employee performance. This is where ergonomics comes in.

- **Lighting**
Brighter light seems to improve individual performance, but it should not be so bright as to cause fatigue. Dim lighting makes workers to be susceptible to distractions and are less able to concentrate.
- **Air conditioners**
Many of which have inadequate filtering systems and allow dust and smoke to re-circulate within the workplace. Air conditioners often irritate allergies simply by re-circulating dust. This is relevant in the South African mining industry given the occupational diseases resulting from dust exposure. Heat stress and heat stroke are other areas that need serious attention.
- **Noise**
Should be kept down to a minimum. In the South African mining industry, cases of ear deafening have been reported. This costs the industry a lot of money in the form of compensation for work-related illnesses.

In a comprehensive study of underground migrant mineworkers, *Molapo (1995)* identifies a range of stresses that impact negatively on the lives of miners. She identifies the constant fear of rockfalls and other seismic events. Interviewees complain about a lack of respect from their supervisors and the fact that their illnesses are not taken seriously. The over-consumption of alcohol is just one of a range of serious behavioural problems as a result of jobs and other social strains endured by migrant underground workers. The study identifies the need for workers to live with their family either temporarily or permanently near the mines. The proximity of families should curb miners' interactions with prostitutes, which would in turn limit the escalating cases of STD's and HIV. The presence of spouses and family will also provide a better social support system from which the miner will be able to draw some psychological strength in trying times.

McNamara (1995) shows how individual privacy and security is adversely affected by noise and other disturbances of dormitory residence. The enclosed nature of hostels means that individual disputes can exert a ripple effect.

This is confirmed in the study by *Moodie and Ndatshe (1994)* where a number of respondents, when asked about their involvement in violent conflict on the mines, said that compound life caused them to experience what seemed to them a

regression into childhood memories and actions. Certainly, the psychological effects of grown men living in the disciplinary environment of communal dormitories has yet to be investigated comprehensively in the context of South African mining.

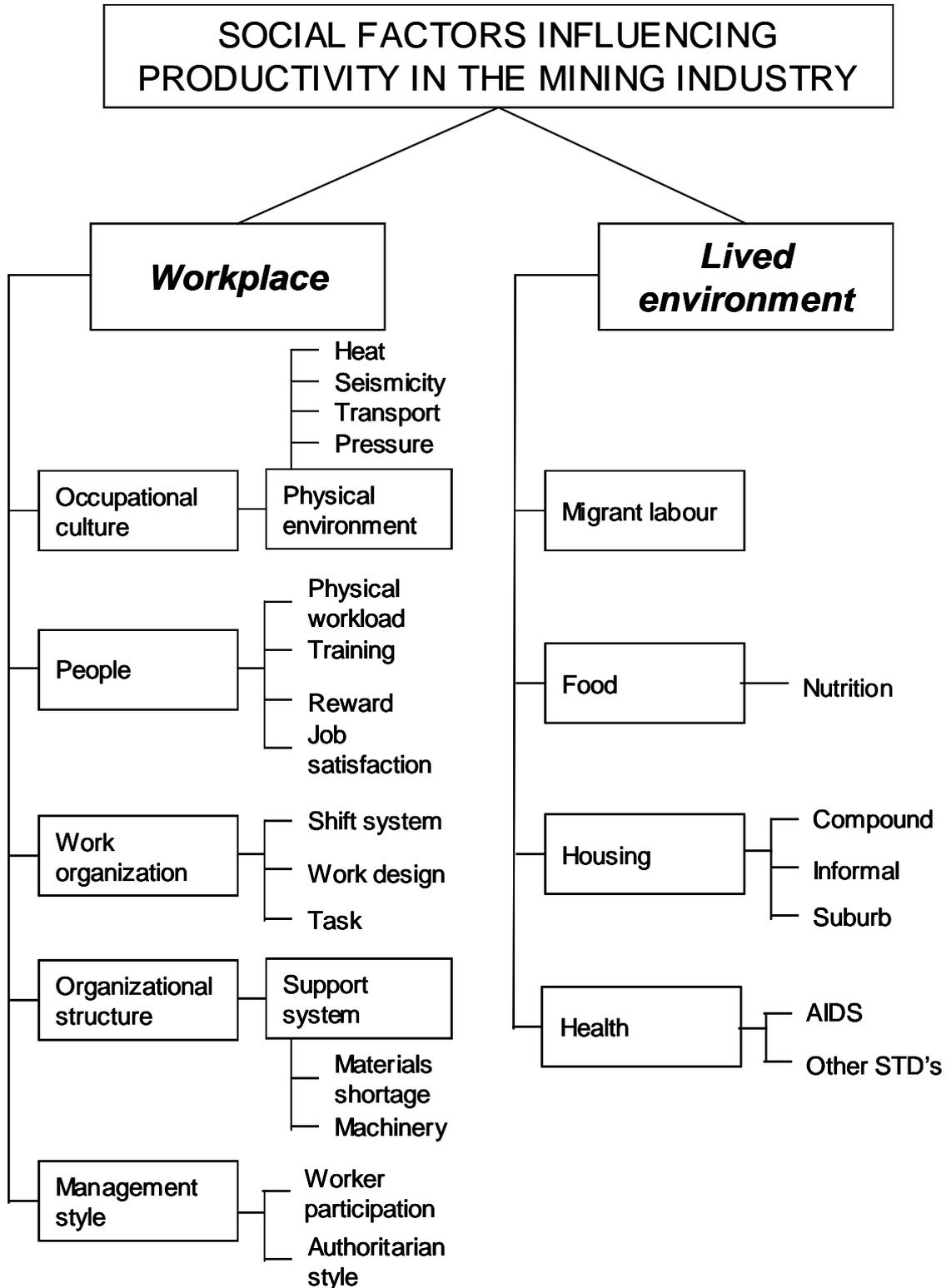


Figure A.3 Social factors influencing productivity in the mining industry

The combination of external and internal factors influencing productivity is summarised in Figure A.3.

A.2.2 Previous South African mining industry studies

De Vries and Radise (1980) describe a day in the life of 52 black underground workers on four gold mines. The report provides a description of the methods used to gather the data that could be implemented by mines so that they can examine their own procedures and practices regularly and identify problems created by them for corrective action to be taken.

Existing mine procedures and practices strongly influence the everyday routines and cycles of workers. To examine these effects on underground workers it was decided to conduct a survey on four gold mines belonging to four different mining groups and situated in four different geographical areas. Fifty-two randomly selected men were followed for one day and their activities were recorded, the times logged and the men's perceptions of how they were affected were recorded. The method, which could be applied by mines to monitor their own circumstances, is described in the report.

The time spent on various activities from waking until sleeping, was obtained by following them. The men who were followed gave their perceptions of how the mine procedures and practices affected them. Although the majority of workers experienced problems with travelling, work and food, there was also a minority who were severely affected. The analysis of the data reveals that although the majority of the workers appeared only to experience the normal inconveniences associated with working and living on gold mines, a number of them were severely inconvenienced by the mine procedures and practices.

Impressions of workers revealed that prior to work, some men were woken up too early, had a poorly prepared breakfast, had exceptionally long waits for cages, had long waits at the waiting place, took a long time getting to work, arrived late at work and were turned back by their supervisor. At work, some were insulted and assaulted by the supervisor, had long working hours, had no food at work, had no break from work and received no overtime pay. After work, they suffered long waits for cages, suffered discrimination in cages, found little food left (choice items used up), found cold shower water, found the pay office closed and had little time to deal with their personal matters.

There did not appear to be any procedures to cater for many of the problems experienced by the men on the four mines surveyed.

Many of these impressions were confirmed by the observations undertaken. Mines could use the techniques that are described by *De Vries and Radise (1980)* to evaluate the conditions of their workers so that corrective action can be taken.

The report identified four major problems that the mines need to address:

- Discrimination in cages (this has implications for the morale of the worker)
- Assaults and insults by white supervisors
- Excessively long hours of working and travelling
- The provision of food and hot shower water for latecomers

Some mines may have procedures for dealing with these problems but the point is unless they are monitored regularly, a question mark remains next to the effectiveness of the procedures.

De Vries and Radise (1980) provide a useful insight into a day and the quality of life of underground black mineworkers. However it does not determine whether the same men were inconvenienced over an *extended period of time* or whether a large proportion of workers from time to time had to similar experiences to those mentioned in the report. This could only be established if workers were followed for a longer period and their movements were monitored regularly. Therefore, it can be argued that this is where the research tool of *Participant Observation* could be more useful.

Their report recommends that mine management may find it fruitful to follow men who have been identified as latecomers for a number of days to determine the extent to which they are repeatedly inconvenienced by mine procedures and practices.

Webster, Moodie, Stewart, and Psoulis (1999) argue that existing research on underground mining has neglected the experiences of the mineworkers themselves. Their report draws on the first-hand experiences of fieldworkers who spent six weeks underground at Elandsrand and Tautona goldmines in the first half of 1999.

In order to identify the key impediments to deeper mining, the fieldworkers were positioned at various levels. They constantly observed and recorded examples of heat stress, seismic activity, transport problems, pressure and pollutants.

They conclude that risk taking is an integral part of the occupational culture of mining. Mine workers take for granted the dangers and discomforts of deep level mining and have developed ways of coping with them. All the key impediments to deeper mining (heat, seismicity, pressure/ pollutants and transport) are already being experienced at current levels.

The report identifies poor planning and lack of communication at the interface between the stope teams and line management. It recommended that the decision to mine deeper be suspended until these problems of work organisation at current levels are adequately addressed.

What became clear from the research is that deep level mining requires a different type of miner, a different way of organising work and a change in the organisational culture. The report concludes that the current labour process remains inefficient and requires radical reform, not only in the interest of safety but also to increase productivity.

The research method used by *Webster, Burawoy, Stewart, Phakathi, Omar and Fakier (2001)* is based on the idea that accurate research findings need to be predicated on first-hand knowledge and experience of actual mining practice. Knowledge of what happens underground and the way in which workers experience managerial systems and work processes is only possible by *living in the time and space* of informants. This is the only way to gain, it is strongly held, an adequate perspective of the *occupational culture* of workers.

The motivation of this method can be crudely summarised by the dictum '*He who feels, knows.*' Experiential knowledge is consequently prioritised. For it is the

practical, lived experience of men who spend the bulk of their working lives underground and whose working knowledge, practical 'know how' and tacit skills which are so crucial to mining, that remains virtually unexplored and is critical to the broader development of the knowledge base of mining practice.

The objectives of the research team were consequently *to get close and stay close* to men who work the rock-face, to share the experience of these men by living in their world and to observe, participate, learn and interact with them.

Apart from living in Motebong hostel and working underground, a researcher made productive use of Tautona's and Savuka's recreational facilities, as well as a popular nearby hotel, spending time with miners and shift bosses, gleaning valuable insights thereby. Certain days and weekends were used to stay in mine-owned accommodation in Fochville and Cartonville with a (white) miner and spend time in a family environment.

A researcher joined the local mine soccer team and accompanied men beyond the mine on excursions to neighbouring towns. Privy to discussions and gossip in this context proved extremely valuable as a source of information of what men really thought about life and work on the mine.

Central to the transactions researchers made with informants was the commitment by researchers to ensure comprehensive feedback.

These sessions were all in different ways exceptionally beneficial to researchers as they were not only fora to test ideas and provisional hypotheses, but resulted in corrections, clarifications and provided new information. Even more importantly perhaps was the consistent role they played in sensitising researchers to the broader context of the industry, the issues confronting it and the extent to which concerns raised by social research had inevitably been raised by active participants within it. This led fieldworker researchers to conclude that the answers to the issues, problems and concerns faced by the industry were, in virtually all respects, best resolved by those most intimately involved within it.

This report identified a number of physical constraints (shortages of materials, breakdown of machinery, geological constraints) and organisational constraints (the decentralisation of budgets and the imposition of standards) to productivity. The combination of these constraints forces improvisation and workers need to make a plan, *planisa*, either as a result of an instruction or out of the team's self-initiated action.

Planisa is a Fanakalo injunction, entreating miners to employ their skills and ingenuity to tackle the day-to-day problems posed by the endemic uncertainties of underground mining. *Planisa* works on the assumption that workers possess a rich occupational culture and deploy well-developed tacit skills. The report describes this as a form of workers' 'counter-planning' to that of management.

The report proposes that the process of skill formation be reconceptualised in a way that takes its cue more directly from workers' experience and knowledge of the workplace and develops its practical curriculum in a far more systematic manner along such lines. This is a more organic, realistic approach to change. It seeks to reconfigure the existing order to more adequately and efficiently realise the talents and potentials of the existing workforce. Actual mining experience is the primary element in this model.

A.3 Productivity and health

The literature described in this section was generated through a search on the Medline search engine using the terms *productivity* and *health*.

Koopman et al (2002) report on the Stanford presenteeism scale developed to measure the impact of health problems on individual performance and productivity. Application of this scale to 175 individuals shows that, even when employees are present at work, there can be decreased productivity and below normal work quality that has been called decreased presenteeism.

Ramsey et al (2002) found, through analysis of a database from a national Fortune 100 manufacturer, that diabetes is a significant economic burden on employers. Their analysis included both medical and reduced productivity costs.

Manocchia et al. (2001) considered to what extent and how sleep problems among the chronically ill are associated with decreases in work functioning. The chronic illnesses they considered included clinical depression; congestive heart failure; diabetes; myocardial infarction; hypertension; asthma; back problems and arthritis. They identified monotonic relationships between the severity of sleep problems and decreases in productivity.

Helge (2001) considered the issue of turning workplace anger and anxiety into peak performance. Helge argues that workplace anger and anxiety should be preventable, with occupational and environmental health nurses as a resource for ensuring that the work environment does not have dysfunctional aspects. Dignity and respect are key factors in avoiding anger and anxiety, and hence enhancing the productivity of employees. Furthermore, this article promotes the harnessing of human emotions for enhancing productivity.

Bush and Autry (2001) examined data from the National Household Survey on Drug Abuse, considering information on workplace policy, workers' health, productivity, absenteeism, job turnover rates, and accidents and injuries due to substance abuse. Their research reviews the importance of the effects of substance abuse on workplace performance and the effectiveness of industry responses, such as outcomes of the Drug Free Workplace programme.

Feng et al. (2001) investigated the impact of problem drinking on employment, specifically considering the impact of alcohol consumption on productivity. Through a sample of 4898 women and 3224 men across 6 southern USA states, they could find no significant negative relationship between problem drinking and employment, and concluded that the costs of problem drinking may be overstated.

Also in the area of drug related research, *Halpern et al. (2001)* considered the impact of smoking status on workplace absenteeism and productivity. Their sample included former, never and current smokers. They found that workplace productivity is increased and absenteeism is decreased among former smokers as compared to current smokers. Productivity among former smokers increases over time towards values seen among never smokers.

Ahasan et al. (2001) considered the adaptation to night shift and synchronization processes of night workers. They identified that night shifts cause fatigue and circadian disruption that can lead to health and safety problems through decrease in psychophysical and physiological functions. They proposed methods to reduce fatigue and circadian disruption and thereby limit influences on productivity.

Monk et al. (1996) also considered shift work related issues. They focused on the aspects of safety and productivity, and identified the problems that develop and why performance can be impaired. They proposed disadvantages and advantages of different shift rotation systems.

Patel et al (2001) examined patients' perspectives on the burden of recurrent genital herpes in terms of health-related quality of life, health care resources and workplace productivity. Through a cross-sectional survey in 5 countries using the MOS-36 item short form health survey (SF-36) and recurrent herpes quality of life questionnaire, they found that 45% of patients estimated that their work effectiveness was reduced by 25-50% due to their symptoms.

Wahlqvist (2001) found that patients with gastroesophageal reflux disease had a mean 2.5 hours absence from work per week, 23% reduction in work productivity and 30% reduction in productivity while doing daily activities.

A.4 Ergonomics

Ergonomics can be defined as the study of human abilities and characteristics that affect the design of equipment, systems and tasks in the work environment, according to *Clark and Corlett (1984)*. The goals of ergonomics are to decrease the risk of injury and illnesses (especially those related to the musculoskeletal system) and also to improve worker and system performance.

A useful concept in understanding the occupational application of ergonomics is that of the 'ergo system'. An ergo system consists of three primary interacting components: the human, the machine or technology, and the environment. Humans have certain capabilities and limitations that need to be considered during their interaction with machines and tools. Tasks are not performed in a vacuum and the interaction between human and technology always takes place in a certain workspace, which is located in a specific physical and psychological environment. A defect in any of the components of the ergo system could potential increase health and safety risks for the human operator, and also result in reduced system productivity.

Ahsberg et al., (2000) report that, as far as the human component of the ergo system is concerned, worker fatigue has been identified as one of the major barriers to work performance, and is often the reason given for human physical and mental performance not being at the required level.

Human fatigue refers to two sets of conditions. One is exhaustion as found after physically demanding work and the other is a psychological experience of mental fatigue. The kind of fatigue caused by hard muscular work is termed "acute fatigue". Depleted muscle energy sources and/or poor nutritional status will accelerate the onset of acute fatigue. Acute fatigue results in a loss of efficiency, which is temporary and is overcome by rest and/or the replenishing of energy sources in the body. Mental fatigue refers, generally speaking, to a group of phenomena associated with impairment, or loss of efficiency and skill, and the development of anxiety and frustration. This latter condition is not only due to mentally demanding work, but can also be the result of boredom and/or sleep deprivation. Chronic fatigue, which will not improve by rest or sleep, is largely a psychological problem characterized by boredom, loss of initiative and progressive anxiety. Shiftwork, and in particular night work, is associated with decreased quantity and quality of sleep. Such changes to sleep manifest themselves in measures such as increased sleepiness, fatigue and accident

risk according to *Fletcher and Dawson (2001)*, *Kielblock (1995)* and *Smith et al. (1998)*.

There is an increasing realisation in industry that ergonomics is important, not only for worker comfort, safety and health, safety and health but to improve productivity. *Helander and Burri (1995)* have identified that, because of increased technological complexity in many industrial operations, the need for ergonomic design has actually increased. The human operator can only, and to a limited extent, adapt to poorly designed human-machine systems. Poor designs could impact on the operators' ability to work efficiently and safely, thereby becoming a barrier to optimal system performance according to *Skepper et al. (2000)*.

In the business world, ergonomics is considered to be a powerful tool for improving work environments for people as well as overall profitability. *Helander and Burri (1995)* estimated that, at IBM, ten years of ergonomics measures have generated savings of approximately \$130 million.

Macroergonomics can also be used to enhance organisational effectiveness. Where traditional ergonomics is concerned with the "micro" work environment, the fit of people to their workstations, for example, macroergonomics is the field in which the overall physical environment is "fit" to the business objectives of the organisation. Using a macroergonomics approach, a broad view of all the elements of the business is taken. *O'Neill (1998)* identified that these include the design of the organisation, the technological subsystem, the people subsystem, the physical work environment, and external factors that may affect the business.

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