

SMRP Annual Conference
Indiana Conference Center
October 14-16, 2013

A Practical Tool For Managing Cultural Change During A Maintenance Transformation

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In this article we describe how Bunge managed cultural change during the rollout of a major transnational upgrade to the company's approach to maintenance and reliability. We begin by outlining how social scientists realized that "culture" was a mission-critical dimension of technical change programs. Then, we describe the scope and scale of Bunge's program for maintenance transformation and we explain how culture was assessed and brought under management. Our learning from working with 30 Plants across the world will be summarized.

Beginnings: Realizing that Culture is Mission-Critical

In 1949 the UK was recovering from the ravages of the Second World War. It was essential to get the economy moving. This required huge supplies of coal but production techniques were old-fashioned. Much effort was invested in developing new and efficient mining techniques. Of particular importance was "long-wall mining", which used enormous machines to cut coal rather than the old "short-wall" method where gangs of men dug coal with picks and shovels and, sometimes, with their bare hands (the two men in the photograph are members of a short-wall gang).



In the Tavistock Institute in London a team of young industrial psychologists were asked to contribute to solving the national coal production performance challenge. One industrial psychologist, Ken Banfield, had been a miner himself. He visited several newly mechanized mines, that had started to use the long-wall method (see the lower photograph), and he came away perplexed. From the miners' point of view, the long-wall method was safer, less physically demanding and technically more interesting. Also, productivity had improved and bonuses were easier to achieve. So, miners should have been pleased with the new method. But they were not. Ken found that many miners wanted to leave and absenteeism averaged 20%. Something was very wrong.



Figure 1. Short wall mining

The Tavistock team undertook a study that would change our understanding of the factors that affected the successful adoption of new technical processes. They found that *culture* was much more important than they, and others, had realized.

The Tavistock team spent many hours interviewing miners and watching them at work. Every miner knew that the old short-wall method was dangerous and arduous. They told stories

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about frequent roof falls and the pain of digging for up to eight hours in a coal seam three feet high. In this environment men depended on each other absolutely. They developed closer bonds than could be found in many families. Then the mechanized long-wall method changed everything. It meant that men stopped working physically close to each other and a miner operated a coal-cutting machine alone. The new technical system changed the culture fundamentally. Previously there had mutual interdependence. Now, increasingly, there were superficial relationships and it was 'each man for himself'.

Managing Culture

The mining study provided insights for social scientists into how cultures form and how they change. Previously, it was widely believed that cultures emerged from the ways that formal and informal leaders behaved. The mining study showed that this was only partly true. In fact, the content of work, and the experience of working, affected how groups of people thought and felt, no matter what their leaders said. It was realized that, if we wanted to manage culture, it would not be sufficient to improve the way in which leaders sell ideas. We would need to create job related experiences that would reinforce the cultural characteristics that we wanted to encourage. A comprehensive approach was needed. There was no cheap or easy option.

Later, the Tavistock team developed their famous Socio-Technical Systems Approach. Using this helped change working practices so that miners could regain their highly valued relationships with each other. The mining culture changed again, this time for the better, resulting in productivity gains and increased job satisfaction. The Socio-Technical Systems approach was based on the fundamental principle that social and technical elements *must* work in harmony together. Accordingly, the success of a change effort requires the joint optimization of technical and social factors (not a traditional approach that designs a new technical system and then tries to sell it to the workforce and fit the people to it).

However, even using a Socio-Technical Systems approach it was found that attempts to manage cultural change were less than fully successful. This was another puzzle. What was missing? This question perplexes both managers and social scientists to this day. We think that our work in Bunge, described below, has provided part of the answer. More about this later...

So, what is culture?

So far, we have used the word "culture" several times. It is time to explore what culture is, and what it does. Culture can be usefully described as a kind of social operating system (like that which integrates all the functions in a computer). We use the word "culture" to describe the *shared* aspects of how people think, what they see as important and the codes of behaviors that they put into practice. Culture is that transforms a collection of individuals into a group.

The concept becomes clearer when we consider how culture is transferred. Consider the mining example again. Traditionally, a new recruit would arrive and he (all miners were men at the time) went through a largely unplanned process that enabled him to understand what it meant to be a team member and a 'real' miner. Older miners told him what to do, he was given books of Rules and Regulations, supervisors corrected him when he did something wrong, the General Manager visited and talked about the importance of the work. Perhaps most importantly, the new recruit watched others, interacted and imitated them. All of these factors had an impact on how he thought. Over time, he changed the way that he perceived

his working world and his place within it. It was not a straightforward process, as he had to develop new competencies and different ways of thinking (for example, he had to learn to listen to the creaking of the rocks, that previously he would not have noticed, as this might be an early warning sign of an impending rock fall).

Before long, a new recruit could not help but think like a miner. He had clear ideas about what was important, what behavior was expected from him and what he expected from others. Later on, these lessons would become so deeply engrained that being a miner became part of his personality. The new recruit had been fully absorbed into the culture of his work-group, coalmine and profession. He may become one of the members who influences how the culture changes over time, as cultures have adaptive properties. The process is known as “socialization”.

The Tavistock team realized that socialization was more than superficial learning. It actually changed people’s personalities. Later, it was found that there could be physical changes as well. In a different study medical researchers have found that a part (the posterior hippocampi) of the brain of London taxi drivers is significantly larger than normal, and grows even larger as taxi drivers gain experience. This change was caused by the work need to fulfill the requirements of the unique knowledge-intensive culture of London Taxi Drivers, who must learn 25,000 streets by heart before they are accepted into the community. Culture helps to make us who we are.

Functional and Dysfunctional Cultures

Managers, of course, spend a great deal of their time striving to influence how people think, what they see as important and the codes of behaviors that they practice. So, all managers must be interested in *managing* culture, which means defining what the culture should be, acting to increase the probability that positive (from the manager’s point-of-view) mindsets and behaviors are embedded in work groups and seeking to maintain the beneficial aspects of the culture. However, as is well known, this is far from easy to achieve, since there are other forces that shape culture in addition to what a manager wants, especially the ways that work colleagues interact and the experience of the work itself. So, frequently managers feel that they are the victims of the prevailing culture, not the master. An uncomfortable position!

If we are to manage a culture then it is essential to define, in depth, the differences between a “functional” and “dysfunctional” culture. From a managerial point of view, “functional” means that the culture helps the organization to achieve its formal objectives and “dysfunctional” cultures impede or prevent objectives being achieved and they replace managerial objectives with others.

Not everyone sees the world from a managerial viewpoint. Something that managers consider to be functional (an increase in output without an increase in cost, for example) can be seen by employees as against their interests and, therefore, dysfunctional. For the remainder of this article we will use the word “functional” to mean *managerially* functional.

The characteristics of functional cultures vary greatly. For example, airline pilots work within a restrictive and demanding culture that greatly increases the probability that they will play their role skillfully and diligently even though they are unsupervised. However, a rigid culture of this kind would be dysfunctional for a creative R&D team that needs experts to work together flexibly and adaptively. Hence, a question that managers need to answer is:

“what are the characteristics of a functional culture for the achievement of stated objectives in this situation?”

Research has shown that possessing a functional culture is a key ingredient for achieving a successful change project. This is more important than many people realize. There is a consensus amongst researchers that about 70% of change efforts fail to achieve some or all of their objectives. Our own research shows that if work culture is dysfunctional then the chances of achieving the promised benefits of a change project fall dramatically. We conclude that getting the culture fit-for-purpose from a managerial perspective is mission-critical, but what does this mean in practice? This was the question that we had to answer if we were to help a major change program in Bunge to succeed.

The Case of ARROP

For the remainder of this paper we will examine a case in detail: that of Bunge’s reliability program known as ARROP (Asset Reliability & Reporting Optimization Program). ARROP is being adopted by about 88 of Bunge’s Plants around the World. The program improves the reliability of production facilities by using standard proactive maintenance practices, metrics and reporting. It is a means of achieving the wider goal of operational excellence and uses the principles and practices of Total Reliability, a sub-discipline of systems engineering. Total Reliability addresses issues such as the probabilities of failure, frequency of failures, optimal use of resources, efficiency of diagnosis etc. It should be noted that ARROP is based on a different paradigm than traditional maintenance. ARROP is an example of a centralized, science-based system approach and *not* a decentralized craft-based approach.

The rationale that persuaded Bunge to adopt ARROP was based on two arguments. Firstly, that the costs of unreliability were greater than had been realized. Secondly, that advances in maintenance systems design and scientific advances in maintenance had reached a point when there was a coherent, radically different, proven and effective new paradigm for designing and delivering reliability in complex production processes.

Before ARROP was introduced, most of Bunge’s maintenance departments used variants of the traditional craft organizational model for servicing and repairing equipment. It is important to understand what this means in some detail. In the craft organizational model knowledge / expertise is owned by long serving craftsmen who know equipment “like the back of their hand”. Craftsmen learn their trade from masters through a formal or informal apprenticeship system. Traditionally they take great pride in the particular machines that they service and they enjoy the respect of their colleagues for their depth of knowledge and expertise. In a craft system maintenance is decentralized, with decisions about what to do and how to do it being taken by the senior craftsmen, who enjoy a high level of responsibility and empowerment.

Fortunately many the maintenance departments in Bunge’s Plants were progressive. They studied new methodologies, like systematic problem-analysis, preventive maintenance and quality assurance, and they used these ideas to upgrade their maintenance activities. However, this was seen as updating the existing craft model rather than adopting the new paradigm of Total Reliability.

ARROP offers a radically different approach to maintenance to the craft model. Its key features are:

- ARROP uses advanced scientific and analytical techniques (rather than a craftsman's accumulated experience) to assess what needs to be done.
- Reactive maintenance is avoided if possible (in a craft system effective reactive maintenance is considered to be a key success factor)
- Decisions about how, and when, to deploy resources are taken by a central planning team (not left to an individual craftsman).
- Priorities are set after a systematic and data based review of the likely impact of failures (not left to the opinion of managers or craftsmen).
- Measuring systems carefully track asset 'health' and how maintenance resources are used (whereas previously only general records were kept).

In short, ARROP is a centralized, evidence-based, scientific, strategically driven philosophy of how maintenance should be organized. A key feature is that ARROP does not improve a craft system; it replaces it (note that it is the craft system of organizing, not skilled craftsmanship, that is being replaced). This means that, if ARROP is to be adopted successfully then the culture of maintenance *must* change.

Culture Change and ARROP

The senior managers in Bunge, who became the sponsors and advocates of ARROP, had no choice. Either they succeeded in managing a cultural change or the prevailing culture would manage them, in ways that would be managerially dysfunctional.

In fact, the need for managed cultural change ~~even~~ was greater than it may appear. The reason is that ARROP requires that almost everyone who is involved in implementation becomes actively committed, open to learning, diligent and keen to experiment. Simply saying, "well if they want to use this ARROP approach ~~this~~ I don't mind" would not be enough. If it is to be successful, ARROP needs many committed converts. And achieving this is not easy! A proactive, not merely tolerant, functional culture is required.

It was not difficult, especially for managers, to see the potential advantages of the ARROP approach, since there had been many cases studies that showed substantial gains in reliability when similar programs had been implemented elsewhere. However, the benefits for those practically involved (members of the maintenance community) were harder to demonstrate. In effect, maintenance people were being asked to make many changes, including to surrender some of their autonomy, use (for them) new and sometimes complex analytical procedures, work within the tighter discipline of a formal system, keep extensive records and account for how they spent their time in much greater detail. It is to be expected that some members of the maintenance community would see ARROP as a threat rather than an opportunity.

In addition, it was recognized that managers might have doubts as well. This was because, as we mentioned above, ARROP does not improve a craft system; it replaces it. Accordingly, it is necessary to manage a major transition from a craft-based organizational approach (that is tried-and-tested, even if it is not delivering the best possible performance) and replace it with a systemic approach that, for the unit of adoption, is unproven. Moreover, since ARROP is an

integrated reliability system it needs to be implemented fully and completely. If not, it is probable that serious problems will emerge as two systems, with markedly different assumptions, attempt to co-exist. Managers, reasonably, could be concerned that such a transition would be demanding and could go wrong.

Concepts for Managing the Culture Transformation

The leaders of the ARROP implementation process realized that addressing concerns such as these would be mission-critical. If ARROP was to be implemented successfully then the culture of maintenance would need to change fundamentally. Not only was it essential to achieve a joint optimization of technical and social factors but ways would need to be found to enable members of the maintenance community to feel: “ARROP is my future and our future: it’s progress and I feel proud to be associated with it”.

Bunge needed specialist support and they asked one of the authors of this paper (Dave Francis) to help them to “bring cultural change under management”. Dave is an organizational sociologist, who was trained in the Tavistock methods and undertook research into how cultural factors facilitate or impede major change programs. His specialist consulting company had developed a toolkit for cultural assessment. This provided managers with a roadmap for facilitating the required cultural changes and, also, gave them feedback on how well they were progressing.

Many Bunge managers had recognized from the beginning that that cultural change would be a mission-critical requirement for the successful implementation of ARROP. However, they lacked a deep understanding of what this would mean in practice and, importantly, what they should do to increase the probability that the right (i.e. managerially functional) cultural changes would take place as and when they were needed. The cultural assessment toolkit introduced three new and interlinked concepts to ARROP. These were (1) micro-cultures; (2) managed cultural evolution and (3) aligned change agents.

Micro-Cultures

The concept of *micro-cultures* was new for some of Bunge’s managers. For the implementation of a major change program like ARROP there are two particularly significant cultural groups: (i) the Plant Manager’s Team and (ii) the Maintenance Community. By the Plant Manager’s team we mean the Plant Manager and those senior managers that decide upon major issues concerning the Plant’s operations and strategy. By the Maintenance Community we mean all of the people who manage, control, support and perform work on the tangible assets of a Plant.

These key groups², the Plant Manager’s Team and Maintenance Community, need to acquire a full range of required cultural characteristics, which we will outline later in this paper. The questions that needed to be answered are: “What cultural characteristics will be functional for the Plant Manager’s team to support the implementation of ARROP effectively?” And “What cultural characteristics will be functional in the maintenance community to support the adoption of ARROP to the greatest possible extent?”

Notice that we use the phrase “support the implementation” rather than “ensure that implementation is successful”. This is because a functional culture cannot assure success in a

² Other micro-cultures, for example those acting as change agents, will need to be considered, but for the purposes of this paper, we will only consider the Plant Manager’s Team and the Maintenance Community.

change program; it is but one of the things that must be right. Many other factors will be mission-critical as well, like resources, capabilities, control systems, information flows, availability of diagnostic equipment etc. However, functional culture can be a powerful enabling factor and, at least sometimes, it is a game-changer.

Managed Cultural Evolution

The second key concept is *managed cultural evolution*. A change program like ARROP will take a year or more to implement. Our research shows that the program will go through three phases.

- Firstly, the organization needs to learn, understand, explore, use and come to value ARROP.
- Secondly, those involved in putting ARROP into practice must make the new approach their own, develop a genuine learning-from-doing capability and master ARROP's principles and practices so that they have a deep understanding of how everything fits together..
- Lastly, the benefits of ARROP will need to be exploited (so that everyone benefits) and further innovation must occur, so the program retains and amplifies its life force.

We call these three phases: (1) Adopting (2) Mastering and (3) Exploiting. It is vital to realize that each phase requires *different* culture characteristics if it is to be functional. This key insight helps Bunge to manage the pace and the direction of required cultural changes as the program moved forward.

Aligned Change Agents

The final key concept relates to *Change Agents*; people that energize, shape, enroll, support and drive change. There can be many people that act as change agents, ranging from corporate managers, specialist consultants, trainers, middle managers, supervisors and, importantly, informal leaders within the maintenance community itself.

Change agents have the social power to make a difference and it is important that they are aligned, meaning that they share a consensus about ends (what ARROP should achieve) and means (how things should be done). Successful change programs are energized by webs of change agents, who are aligned with each other, and advocating the same pathways for progress.

But, be cautious, there are countless examples of people acting as change agents in ways that undermine management's ambitions. Just imagine, for example, what would happen if several respected craftsmen in the maintenance community said that, in their opinion, ARROP is an insult to maintenance professionals because it undervalues their hard won experience. If these craftsmen are opinion leaders they will shape others' attitudes; from management's point of view acting as hostile change agents.

Such dysfunctional change agency is an often observed threat. Initially, managers should hear what they have to say (they might have valid objections!). However, if they remain hostile then their influence needs to be reduced or countered.

Social science studies have shown that about one person in 20 has the personal qualities to be an "opinion leader". When an opinion leader is "one of us" then she or he is more likely to be influential than someone who thinks and acts differently. Finding, enrolling and working with change agents has proved to be an essential tool for managing culture change in ARROP.

Changing Cultural Requirements

Combining three key concepts (micro-cultures, managed cultural evolution and aligned change agents) enables us to define the characteristics for the three phases of implementation. The key features (as they relate to the ARROP case) are outlined in the table below.

	In the Adopting Phase the Culture Must Support...	In the Mastering Phase the Culture Must Support...	In the Exploiting Phase the Culture Must Support...
Plant Manager's Team (PMT)	<ul style="list-style-type: none"> - All members of the PMT obtaining a comprehensive understanding of the purposes, constructs and managerial challenges. - The development of a practical theory about how to manage the initiative as a change project. - Frequent advocacy of the merits and importance of ARROP. - Clarity about what benefits will flow to members of the maintenance community. - Openness to listen to concerns and doubts. - Preparedness to dedicate resources. 	<ul style="list-style-type: none"> - Top Plant managers being personally involved in applying ARROP in practice. - Evidence being collected on progress and the reasons why it occurred. Active learning-from-doing. - Blockages being identified and removed. - Ownership of the program passing to the maintenance people. - An expectation that ARROP methods will be used to the exclusion of other systems. 	<ul style="list-style-type: none"> - ARROP is seen as routine (“the way that we do things around here”). - Extensive data collection and analysis of metrics. - Support for continuing innovation within ARROP. - Integration of ARROP into other Plant managerial systems. - Recognition of successes, and building on them. - Intercommunication with Bunge Plants and other sources of expertise outside the company.
Maintenance Community	<ul style="list-style-type: none"> All members of the maintenance community obtaining a comprehensive understanding of the rationale, principles and practices of ARROP. - Clarity about what each individual should do to support ARROP. - Belief in benefits. - Expectation of success from the adoption of ARROP. - Frequent discussions about the practicalities of implementing 	<ul style="list-style-type: none"> - Much learning from doing. - Learning being shared between colleagues and codified. Difficulties being seen as a source of learning. - Pride in ARROP's achievements. - Deep understanding of ARROP's constructs, tools and systems. - Evidence that ARROP is delivering superior results. 	<ul style="list-style-type: none"> - New recruits use ARROP as routine. - Insights from using ARROP shared across Bunge and more widely. - ARROP is a living and energized “way of life” (not a bureaucratic system for organizing work). - Widespread celebration of individual and team achievements.

	In the Adopting Phase the Culture Must Support...	In the Mastering Phase the Culture Must Support...	In the Exploiting Phase the Culture Must Support...
	ARROP. - Informed leadership from the ARROP implementation team.		
Change Agents	- Opinion leaders (formal and informal) are identified. - Systematic efforts to enroll each opinion leader. - Asking for feedback and improvements suggestions from opinion leaders. - Encouraging “on-side” opinion leaders to become change agents.	- Change agents help in the transfer of ownership from the promoters of ARROP to the maintenance community. - Change agents use change management and kaizen tools to improve ARROP.	- Change agents facilitate innovation within ARROP’s core principles. - Change agents watch for signs of “ARROP fatigue” or slipping standards and highlight these.

The Cultural Assessment Toolkit

As shown in the table, there are important differences between the mind-sets, skillsets and activities required at each phase. Hence, the culture in the two key micro-cultures must evolve from phase to phase. For example, in the first phase (adopting) the members of the Plant Manager’s Team need to see their role as being evangelizing, resourcing, driving, enabling and monitoring. However, in the second phase (mastering) the members of the Plant Manager’s Team need to see their role as empowering, enabling, expecting, facilitating and supporting. This is a major shift in leadership style that needs to be planned.

More generally, those managing ARROP’s implementation (normally a steering committee in each Plant) need to (1) have evaluative feedback on whether the Plant Manager’s Team (micro-culture one) and the Maintenance Community (micro-culture two) have developed the required cultural characteristics. Also, it is important to note that within each phase steps should be taken to prepare the micro-cultures for the next phase in the deployment cycle.

The toolkit uses a conventional survey feedback approach to provide these data. A specialist consulting team, led by Dave, analyzes completed online questionnaires and provides social-science rigor, organization development expertise and professional ethics. Survey reports contain specific guidance as to action that can be taken to unblock blockages, build on strengths and align the culture for the required evolution of cultural characteristics into the next phase.

From a technical point of view, it should be noted that ARROP surveys ask for the informants’ assessment as to how effectively key indicator events or activities are being implemented. This approach focuses on “whether the culture is doing its work” rather than measuring abstract indicators that are sometimes used. By taking this approach the survey team are mindful that activity-orientated indicators can be affected by factors other than organizational culture, but culture is the dynamic factor. The toolkit approach, using Event

Indicators, has particularly useful as it provides evidence on whether culture is affecting behavior sufficiently.

Generic Cultural Strengths and Weaknesses

In addition to the value of survey feedback to individual Plants, there is another benefit to the use of the surveys. As more Plants are surveyed it becomes possible to detect regional and sector-based patterns. Such an analysis helps to detect generic strengths and weaknesses in ARROP itself, both in its technical aspects and in the ways in which it is being implemented. This form of assessment, known as *formative*, helps to re-form the ongoing program by providing new data and insights in ways that promote development and improvement. Formative evaluation leads to both “do better” and “do different” changes in the program.

Currently Bunge’s ARROP program is being rolled out across the world and, thus far, 30 plants have used the cultural mapping toolkit. Evidence is emerging of potential blockages that can threaten the successful implementation of ARROP and findings from more successful Plants provide insight into what can be done to unblock the maintenance organization so that ARROP is implemented fully and enthusiastically.

Generic cultural strengths in Bunge include:

- Widespread recognition why ARROP is being introduced.
- Respect for the quality of specialist training.
- Clear and detailed guidance as to how to implement ARROP.

Generic cultural weaknesses include:

- Only some Plant Managers are acting as true ARROP Change Agents.
- Maintenance people not developing “a community of ARROP practice” (sharing their learning with each other).
- Not enough evidence is being collected as to which ARROP techniques are adding the greatest value.

In conclusion

From our work on cultural change in Bunge, the key lessons that are the most useful to us are:

- It’s vital to have a toolkit for assessing cultural characteristics as an intervention proceeds;
- Managers need to hear frequently what the members of the maintenance community are saying about ARROP without judgment, since this gives essential insight into their micro-culture.
- We need to develop key senior, middle-line and informal work-place leaders as proactive ARROP change agents;
- The Plant Manager’s team must work together to (initially) drive, then facilitate and (finally) ensure that benefits are exploited for the Plant itself *and* for the people that make it happen.

Key Words: Asset Reliability, Change Agency, Change Management, Culture Change, Change Leadership, Maintenance Vision, Survey Feedback and Process Innovation.