

Successful Organisational Development of Asset Management Organisations



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Abstract Maintenance/Asset Management organisations are often not functioning at an optimal level. The reason for this, apart from the obvious possibility of poor management, is frequently to be found in the communication gap between those who manage the organisation and those who perform the actual upkeep of the equipment. This phenomenon is also known as the maintenance/asset management strategic gap (Coetzee in Maintenex conference, Johannesburg, [7]). This circumstance is created by the gap in tuition/training of these individuals, their difference in world view, difference in actual/perceived status, and internal organisational politics. But, whatever the reason(s), the fact is that this gap exists and causes difficulty in driving through positive change, and often results in a poor organisational culture. Mostly, this situation leads to lower than optimal availability and reliability of the organisation's production system. This then leads to relatively low production and high maintenance cost, with the consequence of lower than possible profits being achieved. This paper discusses a methodology for rectifying this situation. This method, although being developed and taught from the late '90s, and parts of it being tested in the early 2000s, has only relatively recently been afforded the opportunity of being tested fully at a production organisation, DMS Powders, in South Africa (Coetzee in Maintenance Forum, [5]). This paper expounds the method, and adds a short case study of the process and the results achieved.

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1 Introduction

Most Asset Management/Maintenance Departments in industrial organisations struggle with achieving excellent results, due to the complexity of the function. This was highlighted when the commission of enquiry into the poor results/high cost of maintenance in Britain in the 60s suggested widening the scope of the function to the full equipment lifecycle. Their suggestion of incorporating a Terotechnological Department in such organisations did not gain traction then, but was the spark that eventually led to the creation of ISO 55000.

It is important to note that the upkeep of equipment can only be successful if the total equipment management and maintenance function functions in total harmony with the objectives to be achieved through the equipment. This is not at all easy to achieve.

The complexity of the manufacturing systems and the techniques employed in manufacturing/production organisations requires an increasingly sophisticated approach to the management of the asset management function. At the same time there is a world-wide trend towards a widening in the gap between maintenance management and maintenance operations, which leads to the maintenance function not performing at the level which is required for long term business success.

There is thus an urgent need for bridging this strategic gap by strong maintenance strategic leadership, which promotes top to bottom team forming in the business to achieve results that are commensurate with the highly developed technological, procedural, and systems base of the Asset Management function.

The solution to this is often sought through moving the maintenance organisation to world-class on a step-by-step basis [1, 2, 12]. This paper suggests and illustrates the results obtained using an alternative stepped approach. This is effected by recognising that the organisation, like the people of which it consist, develops more naturally through a paced learning process than through a step-by-step technique by technique implementation.

2 The Asset Management Strategic Gap

The functioning of the Asset Management organisation can be understood as the combination of a few control cycles. In particular, this includes a strategic cycle, a tactical cycle, and a work control cycle in the model known as the Maintenance Cycle model [8]. This is shown in Fig. 1.

Following from the Maintenance Cycle model, Fig. 2 shows a diagrammatic representation of the order in which the main components of the maintenance cycle model should be implemented. It particularly identifies the dependence of the main components on each another. The bottom-most component (the execution of maintenance work) is the end result that should be achieved by the maintenance organisation. But this (bottom-most component) is dependent on each of the components above it.

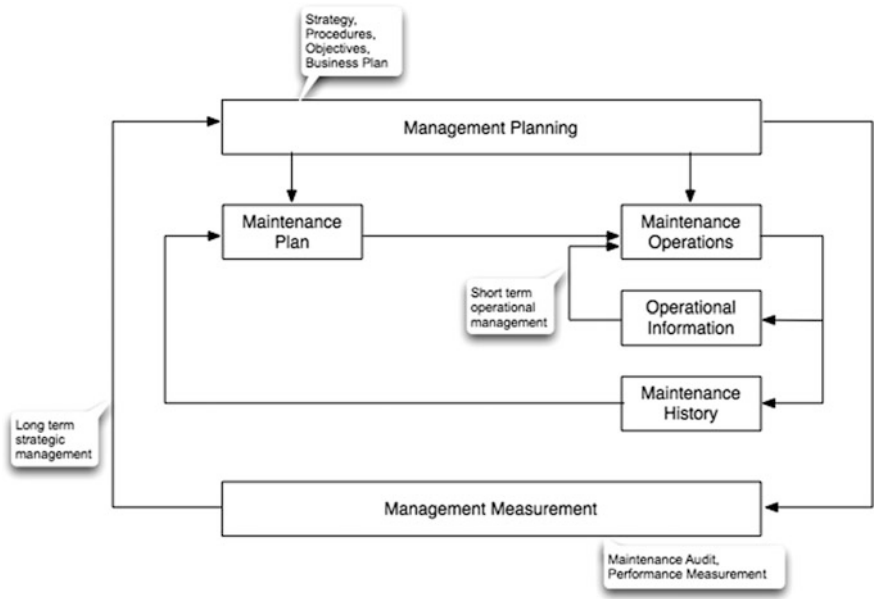
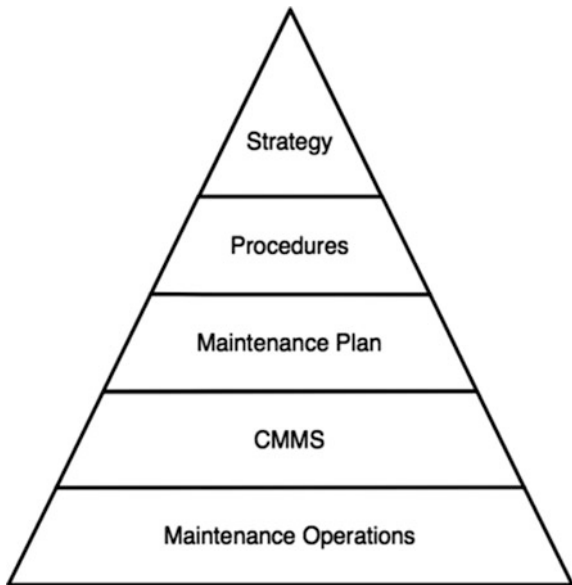


Fig. 1 The maintenance cycle [8]

Fig. 2 Strategy implementation triangle [4]



In particular, the most important (and foundational) component is the maintenance strategy, which dictates what procedures should exist and to which the maintenance plan is sub-ordinate, and so forth. The maintenance plan is then driven through the CMMS to identify the work to be done by Maintenance Operations.

Coetzee [7] pointed out that the maintenance organisation is an organism of which the various parts must function in full harmony towards the achievement of a maximum contribution to the success of the business. He also stated that such harmony cannot be achieved by only implementing highly sophisticated (and localised) solutions to problems experienced in sub-parts of this organism. Examples of such localised solutions are RCM, or a new CMMS.

Nevertheless, it is very tempting to address only one or two of the levels in the triangle, which are perceived to be under-developed in some or other way. But this ignores the holistic nature of the maintenance organisation, and inevitably does not result in the benefits sought after.

If the Asset Management organisation understands these principles, all this might work well apart from one commonly experienced problem: the Strategic Gap. If one investigates the reasons for non-success of Asset Management organisations, typically through an audit, one almost invariably realises that there is something fundamentally wrong in the way in which the organisation communicates up and down the hierarchy, in the fabric of cohesion of the perceived strategic direction of the organisation. This is the Strategic Gap [7], which is shown in Fig. 3.

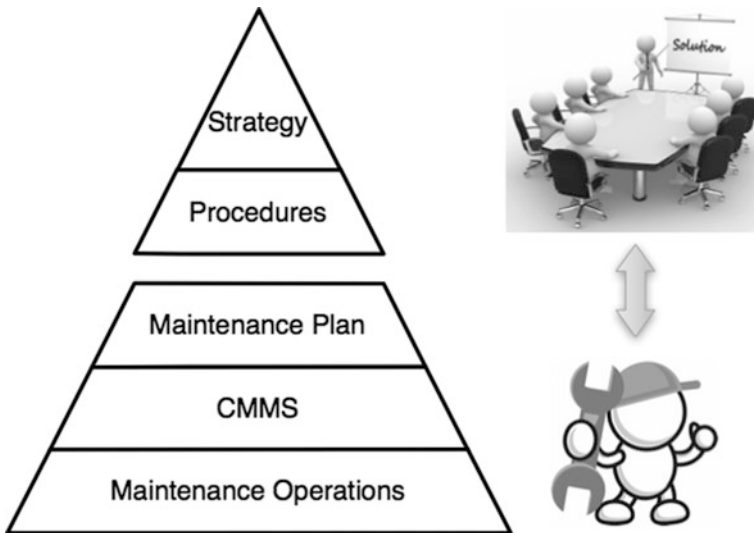


Fig. 3 Strategic gap [7]

This strategic gap shows itself in the organisation through the following symptoms, which gives a clue regarding the source of the gap:

Managers' view	Supervisors/Workers' view
Supervisors/Workers are not open for their ideas	Management are in an ivory tower—totally divorced from reality
Want to implement new concepts	Want to get on with the job
Arrange meetings to effect change, but without much result	Go with the flow, but keep on doing the job as they know best

3 Implications of Traditional Maintenance Practice

The leaders in the field of Asset Management are engineers of one or other discipline. They understand the technological background of that specific discipline well, but are typically no experts in understanding the failure mechanisms of the equipment under their care. Furthermore, they are mostly also not well equipped for their role as the leader of people. All this lead to the typical Asset Management/Maintenance organisation at best delivering under-optimised results. This in turn causes the production organisation not achieving the expected profitability.

A major problem is that many of these leaders do not recognise their lack of understanding of these issues. They are thus blind leaders of the blind, as is so often evident when performing audits.

4 Attempts at Improvement

Many consulting organisations realise that the issue of achieving excellence in Asset Management is to be addressed bit by bit. The Maintenance Function (and even more so for a fully developed Asset Management function) is an intricate function, having to apply technology driven solutions through people, using elaborate procedures and logistics. You just cannot change a poorly performing Asset Management function to a World Class one with a few strokes of a magic wand.

Therefore, the logical answer is to divide the task into manageable parts, and implement these parts one by one. However, the problem in all this is which part should go first, which second, and so on, to achieve success.

It would thus seem as if the prevalent thinking in organisational development in becoming World Class involves addressing one by one facet at a time.

One example of such an approach is that of the Physical Asset Management Practice of Coopers & Lybrand (later PricewaterhouseCoopers) under the leadership of Campbell [2]. This is a four stage approach, starting by developing leadership in the organisation, followed by developing control measures, then

continuous improvement through the application of RCM and TPM, and finally by taking quantum leaps using Process Reengineering.

After the death of John Campbell, this approach of PwC was modified to a three step model [1], where the first step Develop Leadership is followed by putting in place a variety of System Essentials, followed by the last step Choosing Excellence using RCM, Continuous Improvement, and Evidence Based Asset Management (EBAM).

Another popular approach is to start with Basic Maintenance, and then progress through Proactive Maintenance towards Strategic Management of the function, and then on to World Class. One well-known organisation practicing this type of approach is SAMI (Strategic Asset Management, Inc.), with the following 5 stage development path [12]:

- Stage 1: Planned Maintenance
- Stage 2: Proactive Maintenance
- Stage 3: Organisational Excellence
- Stage 4: Engineered Reliability
- Stage 5: Performance Culture

All these approaches can possibly lead to success, depending on exactly how it is applied. However, because success is dependent on how well one gets the total maintenance team aligned and activated, the amount of energy that goes into persuading all individuals to agree with the change of direction and supporting the team effort wholeheartedly can be immense.

Whichever method is used, success can only be achieved through a holistic approach [8]. The total Asset Management organisation is an organism consisting of people with individual opinions, implementing a myriad of technical solutions/processes, and utilising many different management methods/procedures/systems. Such system must find an equilibrium state, with agreement and cooperation between all the role players.

5 Measuring the Outcome of Improvement Drives

One of the important tools in improvement drives is a proper measuring instrument. This mostly takes the form of an audit of some or other kind. While such audit can be devised from different perspectives on the Asset Management function, Table 1 gives a short synopsis of the auditing scheme used for the process reported on in this paper.

Table 1 Auditing scheme employed

Main measurement area	Sub-measures
Results achieved	Availability of plant/equipment, reliability, operability, quality, equipment condition, safety, cost, client satisfaction
Strategic excellence	Asset management strategy, procedures, objectives, business plan, performance measurement, auditing
Tactical excellence	Maintenance plan, maintenance planning, maintenance supervision, quality of execution, operational purposefulness
Systems	Systems driven management, systemised processes, CMMS, management reporting, effective use of reporting
Asset management logistics	Work place design, supply of spares, rotables management, maintenance equipment, tools, manuals, fault tracing support, document management, classes of personnel employed
Asset management technology	Condition monitoring, test facilities, fault tracing/diagnostics, machining facilities, servicing facilities
People centredness	People’s commitment, training relevance/adequacy, experience relevance/adequacy, training matrix per post type, depth of technical expertise, alignment of personal and business objectives, team functioning
Leadership	Leadership programmes, managerial acumen, management focus, management control
Asset management improvement	Furthering of learning, furthering of innovation, learning through failure, use of RCFA, problem solving competence
Asset management culture	Personnel attitudes, motivation, confidence in business processes, responsible and transparent communication, cooperative relationships, trust, rework, low personnel turnover

6 Components of the Process

The idea of a learning organisation was coined by Senge [14] in 1990. The learning organisation is one “where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured ...” [14]. The learning meant are what Luthans and Youssef [10] call *Tacit Knowledge*. It is not the knowledge that you acquire in the formal education system, or even the experience that you have before joining the organisation, but it is the knowledge that the people of the organisation build themselves as part of the social structure of the organisation. It is the knowledge built by the teams in the organisation as they interact with each other. The process of building tacit knowledge is slow, but it defines the culture of the organisation and its success if it is led in the right direction.

The core of the phase by phase methodology put forward in this paper was originally published in 2005 [6]. It is based on the principle that an organisation consists of people, and people need to be led slowly towards building new tacit knowledge that defines a new winning culture for the organisation. Technical and

systems development is seen as part of this process of the development of tacit knowledge and not as separate “technical only” developments. The point is that the total success of the organisation depends on people, so they must be led to believe in the organisation’s goals and its processes. And this is a slow process. To achieve this, two aspects need to be driven, using a phase-by-phase approach, namely the content and the depth at which the content is developed and implemented in the organisation.

The content elements (leftmost two columns of Table 2) were defined to be:

1. Analysis: The improvement process is dependent on regular measurement and evaluation. Each phase of the process starts and ends with an audit (see Table 1). In parallel with this a SWOT analysis is performed where the personnel of the Asset Management organisation evaluates themselves. These analyses are used to focus the whole process on the most critical aspects identified by the outside auditors, and the personnel of the organisation.
2. Strategic Level aspects. These include the Asset Management Strategy, Management Procedures, Objectives, Business Plan, Performance Measurement process, and the Audit instrument. These aspects all follow from the outer (strategic) loop of the Maintenance Cycle, shown in Fig. 1.
3. Tactical Level aspects. These include the Maintenance Plan, the CMMS, Supervision, and Planning aspects. These all follow from the inner (tactical) loop of the Maintenance Cycle, shown in Fig. 1.
4. Business Focus aspects. The business focus includes the Maintenance Focus, Management Focus, and Business Culture.
5. Training.

The depth of application is increased during the three phases of the use of the methodology. These are shown as the three levels in Table 2.

The three phases identified in Table 2, which are each nominally applied over a period of one year, are:

1. Basic: set the scene for the later phases, lay the foundations. See the descriptions per the various content aspects in this column.
2. Intermediary: build on the successes of the basic phase, by implementing a “60%” solution.
3. Advanced: refine to a full level of Maintenance Excellence—goal is 80% of World Class.

The result is developed cumulatively as illustrated in Fig. 4. Each phase addresses all 5 the content elements listed above, but at progressively increased intensity, until the total result on the right is achieved.

Two important aspects which are central to the successful development of the Asset Management organisation, per the scheme above, regards the closing of the strategic gap, and building a new organisational paradigm involving all the people in the organisation.

Table 2 Phased approach to Asset Management Improvement projects

Aspect	Strategic element	Level		
		Basic	Intermediary	Advanced
Analysis	Audit	Main areas of shortcomings	More deeply entrenched 'sins'	Show 'societal' problems
	SWOT Analysis	First identification	Refine SWOT	'Know yourself' (without excuses)
Strategic level	Strategy (or policy)	Philosophy, mission, vision, basic elements	80% Strategy	Final Strategy
	Management procedures		20% of procedures (based on Pareto)	Detailed procedures
	Objectives		Basic annual objectives	Detail annual objectives
	Business plan		Basic plan with budget, capital plan, facilities plan	Five year Business Plan, detail annual plan, zero based
	Performance measurement		Identify, measure '20%' indices	Integrated Performance Measurement instrument
	Audit instrument		Basic instrument, use annually	Detailed instrument, use annually
Tactical level	Maintenance plan	ID critical MSI's, start history collection	FMEA/FMECA for MSI's, ID critical Failure Modes	Detailed RCM for critical Failure Modes
	CMMS	Increase width of use of present CMMS	Wide/deep use of CMMS	Changes to the CMMS. New tasks from RCM
	Supervision	Supervisory training	Assimilation of supervisory training	High interaction with planners and production
	Planning	Planning training	Optimise use of planning principles	Advanced planning principles, improve interactivity
Business focus	Maintenance focus	Basic care, focus on MSI's	CBM, focus on Failure Modes (FM's)	Proactive maintenance, including CBM, UBM, CI
	Management focus	Manage strategy elements, focus on MSI's	Manage objectives, business plan, focus on FM's	Manage strategically, focus on Excellence
	Business culture	Culture assessment, develop team culture	Team forming, find solutions to problems	Reduction of variability; Top to bottom team-forming

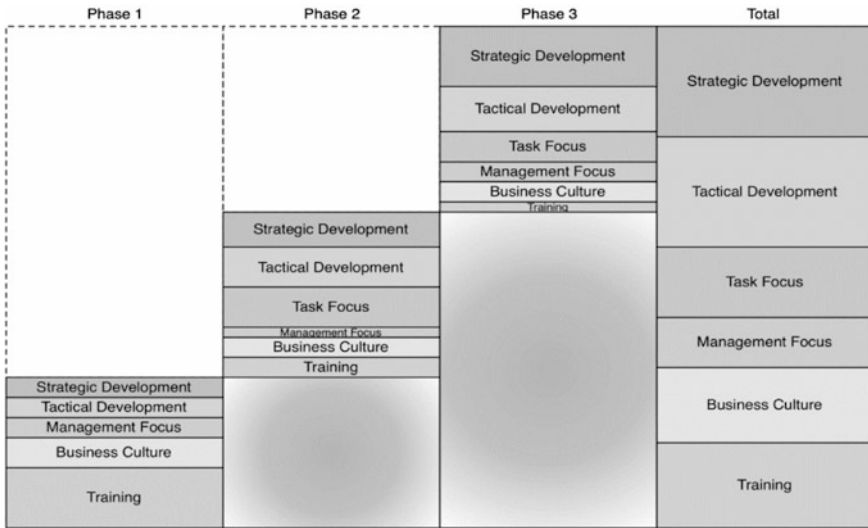


Fig. 4 Phased development during Asset Management Improvement

The solution is to take a cross section (the strategically most dominant one) of the maintenance organisation and address all these aspects (the ones listed in Table 2) simultaneously. The idea is to take a slice from the organisation (engineer, supervisor(s), planner(s), artisans) and build the new business culture in that slice, grappling with some of the most critical issues in the organisation. In the application at DMS Powders, the whole maintenance organisation was segmented into 4 such slices, and each group during the first phase tasked to analyse, using Root Cause Analysis, one of the critical management weaknesses they identified in the SWOT analysis.

This process of inter-level therapy is based on the principle of Top to Bottom Team Forming [7], which brings all levels together in a single team to discuss mutually important issues and find solutions for them. In this process the engineer finds that artisans have good inputs and can add much to make his/her own ideas even better. Also, the artisan finds that the engineer does have good, practical ideas that are worth pursuing. This process also brings about a relationship between leader and follower, which is conducive to the engineer being able to lead the organisation from the front [9], with the followers willingly following.

The result of this all is that the strategic gap is removed, the communication from top to bottom and bottom to top is improved substantially, and a new, common organisational paradigm (culture) is built, which materially improves the functioning and profitability of the organisation. An added benefit is that it contributed to DMS Powders’ objective of using effective teams and team synergy towards long term sustainability [11].

7 Successful Application Example

DMS Powders in Meyerton, Gauteng, South Africa, produces and markets ferrosilicon powders for application in dense media separation (DMS) technology. Dense Media Separation is a process involving the suspension of high-density powder in water to form a dense media, which is used to separate heavy mineral particles from lighter non-mineral particles in a sink-float process.

The company outsourced its maintenance functions over a number of years, which led to the maintenance function progressively falling back into pure fire-fighting. Furthermore, a very poor business culture, as well as very poor maintenance outcomes resulted, with a commensurate decline in business profits.

M-Tech Consulting Engineers, a company specialising in Asset Management Strategic Consulting, were approached to implement a maintenance improvement project to rebuild the lost organisational capability, and improve the business culture of the maintenance department [3].

The project ran over a five year period (middle 2011 to middle 2016), longer than the nominal three year period, mainly due to DMS organisational constraints.

This resulted in a huge improvement in the audit outcomes of the department (from 31% of World Class before the project started to 48% at the end of the first phase, 61% at the end of the second phase, and 75% at the end of phase 3). The second last statistic was corroborated by an independent external auditor, while the last was the result of a totally independent ISO 55000 audit.

DMS Powders experienced a 16% increase in income over this period (adjusted for the Production Price Index, based on 2011 = 100%). All of this cannot be attributed to the Maintenance Improvement Project alone, but it played a very significant part in the improvement achieved.

The results of the Maintenance Improvement Project also included a reduction in production resource consumption [13]. A research project at the University of Pretoria, submitted as a Master's Thesis, used DMS Powder's actual data to prove a reduction in the use of raw material, and including power, water, and production time inputs as the maintenance situation improved.

This, in the opinion of the authors, conclusively proved the experiential concepts as put forward by various authors (notably [1, 2, 4, 6, 9]) in Sects. 2 and 4 above.

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