Value Driven Maintenance®

Creating shareholder value with maintenance

Mark Haarman, Managing Director, Mainnovation, The Netherlands

Key words: shareholder value, core competences, best practices, benchmarks,

"***What is actually the added value of maintenance?" is a frequently heard question in boardrooms the world over. Even though maintenance is often critically important, few maintenance managers are able to answer the question convincingly. Especially when they are asked to express the benefits in terms of economic value added or shareholder value - the language increasingly being spoken in European boardrooms .***

For this reason Mainnovation developed the Value Driven Maintenance® methodology. VDM builds a bridge between traditional maintenance philosophies and managing by shareholder value. Not only does VDM simplify the boardroom discussion, it also shows that far from being a cost center, maintenance is actually a major economic value within the overall business performance.

1. What is value?

Before you can manage by shareholder value, you have to understand what exactly *value* is. Reference to financial literature reveals that *value* is defined as the *sum of all future free cash flows, discounted to today*.

This sounds impressive, but what precisely does it mean? Let's start by looking at the first part of the definition. A cash flow is the difference between income and expenditure. This is not the same as the difference between revenues and costs, because that's an item that can be greatly influenced by accounting practices. Some companies use highly creative lease, depreciation and reservation techniques to keep their book profits artificially high (or low!). This does not always contribute to shareholder value. Newspapers have been crammed with articles on this subject in the recent past.

The second part of the definition stems from the knowledge that the value of a cash flow is related to time. One euro is worth more today than one euro next year. This is because you can deposit a euro at the bank today and use it to generate income over a period of one year. Therefore, we have to adjust future cash flows.

2. Value of maintenance

A maintenance manager is likely to say: "This theoretical approach is all very well, but what good is it to me in practice? The value of maintenance comes from delivering *maximum availability at minimum cost!*" While this is true in theory, it's little help in the day to day operation. This is because you have to prioritize: do you want to reduce costs or increase uptime? Is a 1% increase of uptime just as valuable as a 1% reduction of costs? And how do you determine the value of safety? VDM provides answers by identifying the value potential of the four value drivers in maintenance and enabling you to manage by those drivers (see figure 1).

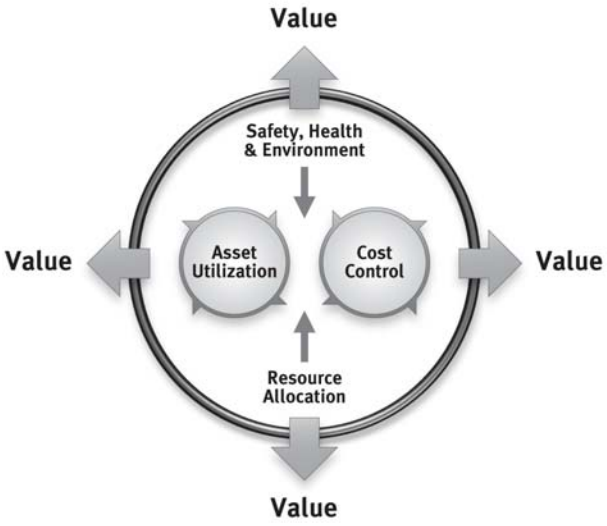

Figure 1: Maintenance Value Drivers

Figure 1 shows what maintenance is all about. Today's maintenance managers are constantly balancing between higher machine availability (asset utilization) and lower maintenance costs (cost control). In doing so, they must take into account the growing body of laws and regulations covering safety, health and environment. To make everything work, they need to use the right technicians, spare parts, knowledge and contractors (resource allocation).

For all four value drivers, maintenance can help to increase a company's economic value. In a market where there is more demand than supply, greater machine availability results in more products, more income and thus higher value. On the other hand, lower maintenance costs produce higher value by avoiding expenditure. The same applies to resource allocation. One example is a technical storeroom. Smarter inventory management of spare parts can enormously increase value for a company.

Similarly, the safety, health and environment (SHE) factor affects value. SHE accidents tend to necessitate substantial expenditure, with resulting negative cash flows. Damage caused to personnel, environment and image, for example, will increase expenditure. An even greater danger is loss of the license to operate because of inability to comply with SHE legislation. No license to operate means no production and no income.

3. Value potential

Maintenance managers must show where there is potential for value within their maintenance organization. VDM provides calculation models and tools for this purpose (see boxes 1 and 2). Note that the result of the calculation of value will differ markedly depending on the industry involved. In the bulk chemical industry, for example, there is currently less demand than supply and worldwide prices are under considerable pressure. The value potential here lies mainly in controlling costs and the smarter deployment of people and resources. In the pharmaceutical industry, the situation is the other way round. Demand for medicines continues to grow but the technical availability of the production process is relatively low. This matter is obviously receiving attention. The SHE factor here is becoming more and more important with the growing role of the FDA (Food & Drug Administration) in the European pharmaceutical industry.

4. Value and time

The next example shows that value depends not only on the industry concerned, but also on time. In the aviation industry, traditionally the focus was on increasing fleet availability and meeting the regulations of the Aviation Authorities. As a result of the attacks in the US on September 11, 2001, there has been a (temporary?) reduction of the demand for air travel. This reduces the importance of fleet availability. At present, many airlines are concentrating on controlling costs. This requires an enormous turnaround, one in which the VDM methodology guides the way.

5. Value and competences

Once the value potential has been identified, the maintenance function must be organized accordingly. Which competences are, and are not, important? There will be little point in giving priority to reducing the stock of spare parts if the value potential lies in more uptime. Unfortunately, we all too often see that these decisions are not made by the maintenance department. VDM does do this, however, and it makes a link between value drivers and core competences (see figure 2).

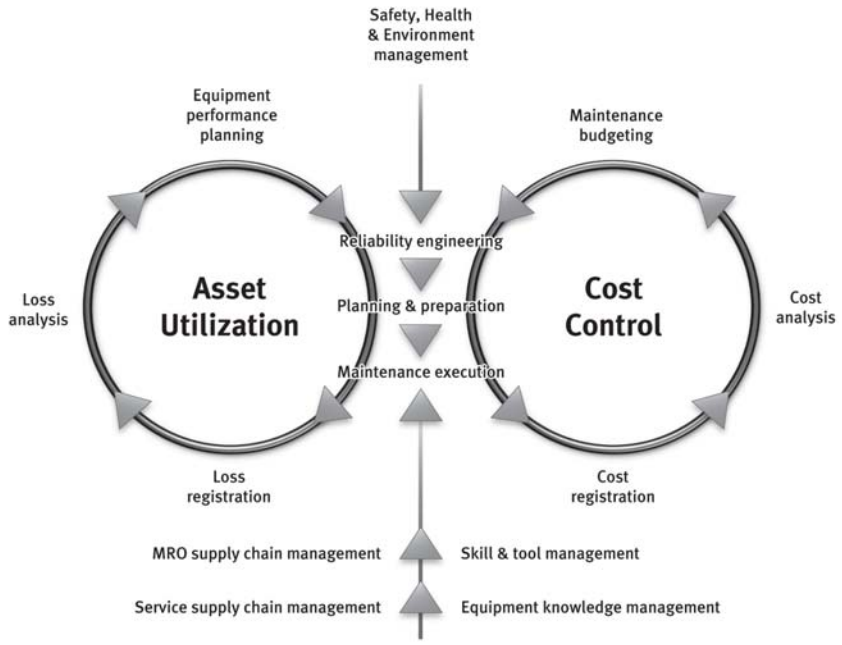

Figure 2: Maintenance Core Competences

Take the example of bulk chemicals. The market situation means that most value is currently achievable by controlling costs. So the right-hand value circle must be configured from *maintenance budgeting* to *cost analysis*. The opposite applies to the pharmaceutical industry. There, the left-hand value circle must be organized from *equipment performance planning* to *loss analysis*. Interestingly, both value circles include the competences of *reliability engineering, planning & preparation* and *maintenance execution*. These competences are the link between the four value drivers and thus form the heart of VDM.

6. Value and best practices

Now that we know the important competences, the next step is to organize and control them in the right way. For this purpose VDM puts forward best practices from leading maintenance organization. Total Productive Maintenance (TPM) thus enjoys a reputation mainly as the best practice for registering, analyzing and improving production losses (asset utilization) in discrete production. In contrast, Asset Based Costing (ABC) is a proven best practice for properly controlling maintenance costs. Using these best practices, a technical department can quickly become a professional maintenance organization that adds value to the overall business performance. In VDM terminology, this is called the Most Valuable Maintenance Organization (MVMO).

7. Valuable?

Is VDM valuable? We and a growing number of multinationals in Europe and the United States think it is. Managing by value is not just a must, it is the only way to discover the true significance of maintenance. VDM makes maintenance more than a cost center because it contributes in various ways to a company's economic prosperity. In fact, VDM confirms what we already thought, but now we have the proof!

References:

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Mark Haarman MBA
Managing Director, Mainnovation

Address:	Lange Gelderse Kade 8 3311 CJ Dordrecht The Netherlands
Telephone:	+31 (0)78 6 14 67 24
Fax:	+31 (0)78 6 14 67 27
E-mail:	mark.haarman@mainnovation.com
Website :	www.mainnovation.com

Box 1: VDM formulas

The definition that *value is equal to the sum of all future cash flows, discounted to today* is translatable into the following formula:

$$PV = \Sigma \{CF_t / (1+r)^t\}$$

Where:
- PV = value (present value)
- CF_t = future free cash flow in year t (cash flow)
- r = discount rate

To calculate the value of maintenance, this formula can be applied in the following way:

$$PV_{maintenance} = \Sigma \{F_{SHE,t} \times (CF_{AU,t} + CF_{CC,t} + CF_{RA,t} + CF_{SHE,t}) / (1+r)^t\}$$

Where:
- $PV_{maintenance}$ = value of maintenance
- $F_{SHE,t}$ = SHE factor in year t (% of compliance with SHE regulations)
- $CF_{AU,t}$ = future free cash flow in year t from asset utilization
- $CF_{CC,t}$ = future free cash flow in year t from cost control
- $CF_{RA,t}$ = future free cash flow in year t from resource allocation
- $CF_{SHE,t}$ = future free cash flow in year t from SHE
- r = discount rate

Box 2: example of VDM calculation

Say a paper factory produces 1,000,000 kilograms of high-quality paper each year, with 50% asset utilization. The price of each kilogram of paper is € 10, with a profit margin of 15%. The factory's annual maintenance costs come to € 500,000 and it keeps € 300,000 of spare parts in stock. The annual management costs for the inventory of spare parts (personnel, space, insurance, etc) equals 15% of the value of the stocks. The maintenance concept is of a highly corrective nature, with a SHE factor of 70%.

Based on a thorough reliability study, the reliability engineer has recommended giving the maintenance concept a strongly preventive nature. Each week an extra one-day inspection will be carried out by two technicians (mechanical and electrical). This will increase annual maintenance costs by 52 x 2 x € 500 = € 52,000.

Given the preventive nature of maintenance, the reliability engineer expects to increase asset utilization to 55% and to reduce the inventory of spare parts to € 250,000. The new maintenance concept will not influence the SHE factor.

This makes the value of this improvement proposal:

$F_{SHE,t}$ = 70%
$CF_{AU,t}$ = 5% x 1,000,000 x 15% x 10 = € 75,000
$CF_{CC,t}$ = € - 52,000
$CF_{RA,t}$ = 15% x 50,000 = € 7,500
$CF_{SHE,t}$ = 0
r = 16% (internally determined discount factor)

$PV_{maintenance,\ t = 0->10} = \Sigma \{ \ 0.7 \times (75{,}000 - 52{,}000 + 7{,}500) \ / \ (1 + 0.16)^t \} = € 103{,}189$

$PV_{maintenance}$ is greater than zero, so there is an increase in value and the recommendation should be adopted.