TOWARDS AN ASSET MANAGEMENT REFERENCE MODEL: BASIS FOR A UNIFIED APPROACH

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Asset Management is a concept that has a very wide range of use and different level of maturity across industrial sectors and regions. Because of this, there is lots of variation in the concepts and the terminology used. In discussing the concept, the asset management professionals tend to stick to their own definitions. This situation makes it difficult to bring the concept further. The difficulties can mostly be attributed to the fact that framing an improvement in one specific approach or terminology may render it virtually inapplicable in another context. In other words, quite comparable approaches and concepts have to be invented over and over again. To prevent the chaos and in order to provide the basis for a unified resolution, a system level reference model for translating improvements into other realms would be very helpful. In this paper the outline of such a reference model is developed.

Key Words: Asset Management, Reference model

1 INTRODUCTION

Since the 1990s, the term Asset Management has seen a significant increase in use [1]. If one drops in on a live discussion or a debate on Asset management, odds are that the financial news are analyzed or put in perspective by someone from XXX asset management representing or focusing on the performance of any big financial institute (ABN AMRO, RBS, HSBC, to name a few). In the credit crunch of 2008-2009, debate was often on toxic or high financial risk assets and in normal operations terminology full of shoulders, head, the neckline, perfect storm, cup and handle, resistance line and many alike is used. Such a discussion is completely incomprehensible if one is from outside the trade or the professional touch. Yet, working through the concepts that are behind the labels, it is about development of prices or options for traded securities, and the discussions in the end concentrate on whether to buy or sell certain 'financial assets'.

Another example from the more technical side is the field of maintenance. About 25 years ago, maintenance was about the four principals of maintaining technical equipment: cleaning, aligning, balancing and lubricating, or rather retaining physical equipment in an acceptable technical condition. Nowadays it is often seen covered with the term of asset management, asset lifecycle management, or engineering asset management. In essence, asset management is still seen based on the same 4 basic actions, and nothing fully realizable of this down to earth approach and timely relevant concept can be found in any definition of asset management. See for example the definition used in the PAS55 [2]:

> *"Systematic and coordinated activities and practices through which an organization optimally manages its physical assets, and their associated performances, risks and expenditures over their lifecycle for the purpose of achieving its organisational strategic plan."*

Not wanting to ridicule the effort that has been put in to arrive at some common understanding on the challenging things that you need to do to keep your equipment fit for purpose, it should not be surprising that this definition does not get across the operational and technical maintenance engineers. In their opinion, this may just be another bunch of big, fancy words of someone who does not know how to change a light bulb. It also underlines that there is a significant communication as well as knowledge gap between the technical and the business worlds, resulting in very abstract ideologies in resolving the matters that are of true importance to the industrial sectors. Despite the hype on asset management, the relationship between more technical and managerial issues still remains immature.

A third view to be covered here is that of the energy sector, for instance energy distribution network operators of the Netherlands. When the concept was introduced around 1999 (not coincidently the year of market liberalization), it had for many novice asset managers the connotation of postponing investment. Given the context of a very high performance of the grid [3,4][1] and a very low expenditure on maintenance [5] [2] this is perfectly understandable. Investments in quality and capacity are the most significant ones at the discretion of the company, so there are very little other options. Nevertheless, looking at the situation very closely, it is significantly different from the concept as defined by existing reference frames, for example PAS 55 and alike.

Looking at the three cases that were briefly noted above, it is obvious that the governing terminology as well as the conceptual resolutions are quite different from one another. Drop a maintenance engineer on the trading floor and there will be nothing physical to touch: the assets discussed are essentially claims to some (future) cash flow of other assets. Ultimately, there are objects in the real world behind the assets, but there may be several layers of abstraction between reality and the assets traded. On the other hand, employ a financial asset manager in an infrastructure context, and he might be stunned by the idea that investments are one way traffic. You can put your money in, but getting it out by selling the asset is for infrastructures quite impossible, especially if they are buried like cables and pipelines. Finally, if the infrastructure asset manager has to work in a maintenance environment, for example a plant full of rotating equipment, none of the familiar tools will work. It is not just putting an asset in leave it for 10 of years or more like in infrastructures, assets in a plant require continuous attention, either in the form of operation or maintenance. The work of the plant asset manager does not stop at the investment decision, it just starts there.

Yet, despite the obvious differences, there seems to be a deeper unexplored commonality between the fields. In principle, every asset manager is in his or her own way and context trying to optimize value, and it constitute a functional definition per se. So the many application fields, including the ones discussed here, have the potential to derive effective solutions from a single generic concept. If that is the case, lessons may well be learned between the fields contributing to value creation process based on know-how across the fields as well as sectors. However, for this to be possible as well as pragmatically usable the generic concept should not be too far out. If the cash flow is the only idea shared between the fields, there is not much to learn. Given that Asset management captures a far more holistic process of value creation that has both short term and long term implications, at least some kind of common framework is needed. In this paper, the idea of such a generic framework will be further explored.

2 THE ANALYTICAL FRAMEWORK

Developing an analytical framework to compare different fields in order to arrive at a generic framework sounds like the Munchhausen trick of pulling yourself out of the swamp by your own bootstraps. Theoretically, one needs the generic framework to identify the areas for which the different applications should be compared to see how far they have drifted apart. However, for all practical purposes, a bit of common sense can also be good enough to get things started. For example, Komonen et al [6] have shown that in engineering asset management there is a relation between the asset characteristics, the market in which the asset is operated and the optimal asset strategy.

The idea behind this framework can be found in the recognition that the length of the planning period affects the level of uncertainty involved in the prognosis and thus the risk involved in business decisions. The longer the planning period the more uncertain predictions become. Stacey [7] divided the future development into three environments. The first is the Stable region, where the business predictions are reasonably certain, with uncertainty measured in percentages. This is also referred to as a closed future. The second environment is the Probabilistic environment. Predictions are uncertain, but there is some knowledge on the amount of uncertainty, and order of magnitude estimates tend to be correct. This is also known as the contained future. The third environment is volatile. Here predictions are fundamentally uncertain, and may be orders of magnitude wrong. This is the open ended future. Drivers behind this volatility can be diverse, but tend to be in new product development, changing market needs and changes in production technologies. On short term, market needs tend to be stable, but new product introductions can result in substitutions, even without changing the fundamental needs. The introduction of digital cameras for example did not alter the “need” to make pictures, but it almost eradicated the market for films. With regard to production technology, an example can be found in the transition in propulsion technology in shipping. The need for propulsion did not fundamentally alter, yet diesel engines economically outperformed steam engines by far and thus many steam driven ships were scrapped.

Relating this recognition to the asset strategy, if the (technical) asset life is comparable to the lifecycle of the product it produces, decisions with regard to the asset are in the stable future environment. The asset strategy then should focus on keeping the asset fully operational during its lifecycle. But if the asset life is short compared to the market, it might be

[1] The Dutch grid for distribution of gas and electricity ranks amongst the most reliable and safest grids in the world

[2] Enexis reported 20 million euros of preventive maintenance on an asset base with a book value of 5 billion euro, which equals 0.4%. If replacement value is used, it is below 0.2%

interesting to develop more durable assets. On the other hand, if the assets life is much longer than the product life cycle, it might be wise to invest in flexibility of the asset, so that the asset can be used for something else once the demand dries out. The market and technological environment thus drive the high level asset strategy and therefore the fundamental questions in asset management.

Market \ Technology	Stable (Long Life Cycle)	Dynamic (Short Life Cycle)
Dynamic (highly de-regulated)	**Specific Features e.g.** • Determine economic life • Short economic life-time • Life Cycle Planning (LCP)-approach required • Increase flexibility • New asset concepts	**Specific Features e.g.** • Determine economic and technical life time • Short economic life-time • Short pay-back time required • LCP-approach required • Manage dynamics • New asset concepts
Stable (highly regulated)	**Specific Features e.g.** • Long economic life-time • Long pay-back time • Increase life time • Life Cycle Costing (LCC)-approach • Continuous improvements	**Specific Features e.g.** • Short technical life-time • Determine technical life time • LCC-approach • New asset concepts • Improve technical performance

Figure 1: The influence of various business environments on asset strategies [6]

Another option is to use the asset lifecycle as the organizing principle for the analytical framework. The observation behind this idea is that asset managers in the gas and electricity distribution infrastructure focus on investment decision (the design phase), whereas asset managers in production facilities focus on operations and maintenance decisions (the operational phase). Given the characteristics of the system in which the asset managers operate, this is not more than logical. The infrastructure assets are mostly cables and pipelines, which are difficult to access as they are buried. The only option is remote diagnostics like leak finding programs and partial discharge measurements, but their predictive power is not very impressive. Fortunately, there is virtually no wear and tear in their use, so they do not require much maintenance. Furthermore, they are passive elements, no action is needed to make gas and electricity flow through the assets. In a production facility, operation is everything. If no raw materials are fed in to the plant, nothing will come out. Optimization of the operational parameters can result in a much better output of the plant. In chemical plants, for example, the improved understanding of the process and de-bottlenecking of the plant typically results in the end of life capacity being factors higher than the design capacity. And the wear and tear of the (rotating) equipment makes maintenance a necessity.

Many similar examples can be used show that there is a link between the asset characteristics and the main focus of asset management. The idea was explored in the EURENSEAM meeting in Seville 2009. During that session, the following list of potentially relevant asset characteristics was produced:

1. Function: Commercial versus public
2. Time Scale: Short (weeks) versus long (50 yr +)
3. Location: Fixed versus moving and Point versus distributed
4. Economic/technical assets: relative importance of assets
5. Environment (external effects)
6. Technology (mechanical, civil, electrical, software)
7. Timescale: split into Life span and reaction time
8. Market behavior: stable versus dynamic
9. Technology development: fast versus slow

Items 8 and 9 on this list in fact are the business environment parameters of the framework in Figure 1. Such attributes can effectively be used to identify the business framework that can be used for analyzing an organization's asset management system.

To test whether these characteristics were related to the way asset management was employed, a series of interviews was conducted with Dutch infrastructure asset managers [8]. The framework used in those interviews is presented below. The framework helped in getting a quick overview of the asset system.

Asset characteristics	**Environment**
• Function • Behavior • Life cycle length • Location • Type	• Market • Technology development
Key life cycle phase	**Management attention**
• Key life cycle phase	• People • Key performance indicators • Budgets • Processes • Systems

Figure 2: The framework for analyzing asset management systems

An important result of those interviews was that the interviewed organizations had a strong tendency towards specific life cycle phases. This to a certain degree can be attributed to setting the decision basis depending on where the more dominant business case exists with respect to an organization's strategic position and industry potential. This is in contrast to the widely advocated integrated life cycle approaches that focus on a seamless interface along the lifecycle. Today this largely remains a 'faith' than a fully justified or validated case. There was not a clear result in the management system to head up towards a long lasting resolution. This may have been affected by the volatile markets, financial uncertainties, and other hidden vulnerabilities of doing business. Asset owners tend to be keen on retaining additional business capacity to cope with hidden risks better than dedicating that to a long-term course. The situation can also be seen affected by the organizational history or legal constraints to a certain extent.

Given that this framework helped in differentiating the asset management systems of infrastructure managers, it will be used at a later point in time as a starting point for the wider analysis across other industrial sectors.

3 COMMON GROUND

Despite the impossibility of using the same management instruments for all assets, in terms of the process there is common ground. For every asset as explored in this paper, the central function of the asset is to deliver value. It depends on the context what that value is. In private settings generating income is generally more important, whereas in the public context other values like accessibility and equality may be more relevant. Yet, the assets have a purpose, not an intrinsic value. But purpose is something subjective, something the asset owner is free to define. Starting point of any form of asset management thus seems to be framing the context and formulating a vision and mission for the context in which the company operates.

Furthermore, the risks of the assets seem to be an explaining factor for the management attention. If the value of the assets depends on market emotions, monitoring the market to buy and sell assets at the right time is the right thing to do. Only with a long term perspective one could rely on the fair value of the underlying assets. Likewise, if a breakdown of equipment stops the facility producing goods and thus stops the generation of income, it is not surprising that Production facility asset managers focus on maintenance and operation. Similarly, disruptions and congestion of infrastructures create a significant societal cost, so it is perfectly understandable that infrastructure asset managers focus on providing capacity beyond what is economically feasible from the company perspective. It seems therefore fair to state that risk awareness is the second stage of any form of asset management. For all types of assets, risks need to be mitigated if these risks are not acceptable. Mitigation measures are required with a different time horizon as can be seen in figure 1. For the longer term policies need to be defined to reduce non acceptable risks like to increase flexibility for the stable assets in a deregulated market. In the planning process the defined policy is made specific. E.g. for utilities companies specific specifications could be set up to increase cable capacity in case a failure has occured and the cable needs to be replaced.

Finally, executing the defined mitigation measure is essential for any form of management. It will not be discussed in this paper. However, the continuous improvement of performance seems to be of major importance for asset management. Only by learning from the past the incredible levels of performance as witnessed today are possible.

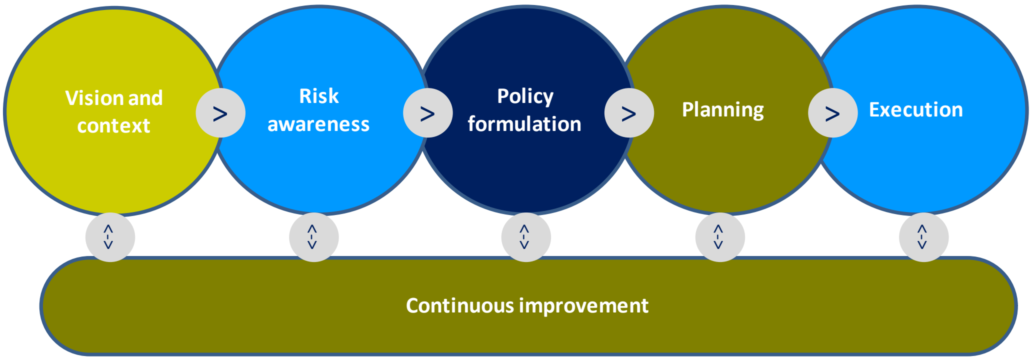

Figure 3: the generalized asset management process

4 CONCLUSION

Undoubtedly, the discipline of asset management has shown a clear growth of interest over the last few years. Despite the developments this discipline has not yet managed to provide a clear and a unified basis that can provide a good reference across different industrial sectors. This paper presented some early work to address this issue, and brought some insights from the energy distribution and other sectors where convincing practical matters exist showcasing the difficulties associated with the use of existing terminology and concepts. A unified approach can bring many benefits to the different user groups inclusive of a common reference and for further development of this important discipline.

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