

KEY CONSIDERATIONS IN ASSET MANAGEMENT DESIGN



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Acknowledgements

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Executive Summary

The design and implementation of asset management systems is an important part of the value creation process in the provision of services, particularly complex services. The provision of complex services involves the concerted action of a number of organisations contributing to the creation of value across a service provision ecosystem. Effective asset management systems allow organisations in the ecosystem to manage their assets in ways that create optimal value for the end user.

Creating an effective asset management system in this situation presents a number of challenges, however. For example, how do you align the actions and objectives of the multiple organisations, and their asset management systems, which are interacting with the assets used to provide a service?

We investigated current asset management practice and conducted a series of interviews with organisations, across a variety of sectors that are involved in the provision of complex services. The aim was to assess how organisations approached asset management, and where possible to elicit some common elements that are integral to effective asset management.

The research revealed a number of important findings related to the design and implementation of asset management systems.

- Few organisations have implemented asset management systems that are designed according to a specific methodology or design principles.
- Most firms do not view asset management as a strategic exercise, but instead deal with it in an ad hoc, reactive way, responding to market conditions and the current trading and operational environment.





There are several key elements that should be considered when designing and applying an effective asset management system, in the context of a service provision ecosystem. Notably:

- To make asset management systems more robust and sustainable over time organisations should apply horizon scanning and scenario planning in the asset management systems design process.
- Scenario planning also helps provide a degree of flexibility for those asset management systems that are heavily reliant on mathematical modelling, and as a result relatively inflexible in their scope and application.
- The effective management of assets for the provision of complex services requires communication and collaboration between multiple ecosystem members. Standardising the way these organisations interact, both at a managerial, and an IT-related information and data level, is important.
- The ultimate objective of providing a service is creating value for the end user. The concept of end-value and its specific nature from contract to contract needs to be transparent and communicated throughout the organisations involved in creating that end-value.
- Key performance indicators and other performance measures should take into account their relative short and long term impact on effective asset management and end-value creation.
- Key performance indicators and other performance measures should incentivise actions and behaviour across the ecosystem that contribute to and create end-value. They should not incentivise “selfish” actions and behaviour at the expense of value creation across the ecosystem.
- The ability to adapt to changing customers and customer requirements is an important aspect of an effective approach to asset management. Organisations should adopt a perspective that considers the management of an asset over its lifetime, rather than the management of an asset on project-to-project basis. This helps to manage an asset more effectively across multiple customers.

Organisations should build these elements into the design and implementation of their asset management systems. By incorporating these elements into an asset management methodology or framework they are more likely to be able to meet the difficult challenge of optimal asset management and

end-value creation across a service provision ecosystem. Asset management becomes a strategic function of the organisation. The end result is more satisfied customers, and more sustainable profits■

A large yellow mining truck is parked at a construction site. The truck is positioned behind a yellow metal railing. In the background, there are some industrial structures and a hillside.

Introduction

The provision of complex services, whether it is defence equipment, heavy machinery, infrastructure, national power or transport, for example, involves the concerted actions of a number of organisations operating in an “ecosystem”. Ideally, these organisations should manage the assets involved in providing the service, whether that is diggers, power equipment, or rail rolling stock, for example, in order to maximise the value obtained from those assets.

Take the construction of roads and other infrastructure, for example. This may involve the use of a fleet of heavy machines, such as diggers, worth many millions of pounds, with individual machines costing in excess of £500,000. To extract the best value from these diggers, and thus from any investment in those assets, their use must be optimised.

Note that the value extracted from the assets is linked to the creation of value for an end user – in this example, the use of the diggers on site, and more specifically the end purpose for which the diggers are used, such as road building. The value is not the possession of the asset or even its condition, but the end product of its deployment. A digger, even if regularly serviced and in excellent condition, is not being optimised if it is idle on one site when it could be used on another site, for example.

To keep track of the way that assets are used in order to maximise their productivity, organisations need to implement an Asset Management System (AMS). Our research shows, however, that surprisingly few organisations have adopted an asset management policy or strategic asset plan. Where asset management related plans exist, their design is not usually driven by underlying principles, methodology or framework. Instead, asset management policies and systems are usually driven by pragmatic market needs, such as cost management, or the need to demonstrate that all reasonable steps have been taken to maintain standards, in case of an adverse event that might lead to litigation.

Organisations tend to be far more market than asset driven. Management of assets is both reactive and non-strategic. So, for example, misplaced incentive policies can drive non-optimal asset management behaviour. Site managers incentivised through bonuses linked to production might become protective over the use of assets, preferring to hang onto an idle machine, instead of

allowing it to be used at another site where it is needed.

When new building sites are acquired the default response is often to equip those sites with new machinery, rather than optimising existing machinery to accommodate development at the new sites where possible. So while firms may know what assets they possess or interact with as part of a service ecosystem, they often have no view on the productivity of those assets.

One possible reason for organisations not implementing asset management systems more widely is the economic downturn. A good-quality asset management system requires resources, such as expert knowledge and investment, for example. The economic downturn means that companies have been closely shepherding resources rather than focusing on setting up asset management systems. Management buy-in, necessary for creating and implementing an effective asset management system, is also lacking in many organisations.

Another issue is the limited guidance available. There is some help. The International Standards Organisation's ISO 55000/1/2 standards for asset management, published in 2014, outlines new quality standards for asset management, as well as providing detailed requirements for such a system, and some clarification on those requirements in terms of practical application. The Institute of Asset Management, in its 2012 publication, has also identified key elements of an asset management system.

Meanwhile, in the academic literature, Dr Khaled El-Akruti, a lecturer in engineering asset management at the University of Wollongong, has proposed a strategic framework aimed at illustrating the detailed relationships and mechanisms between each specific asset management process and activity. This is outlined in his co-authored paper “The strategic role of Engineering Asset Management”, published in the *International Journal of Production Economics*.



These sources may acknowledge the need for asset management policies, for specific, measurable, achievable, realistic and time-bound asset management objectives, and clear plans to achieve those objectives, for example. But they do not address the practical or strategic realities of modern-day asset management.

For example, there is little consideration given to the fact that the management of assets is often the responsibility of several organisations in an ecosystem of organisations that combine to provide value. Take the rail sector in the UK. The trains are run by train operating companies, including Virgin Rail, and Southwest Trains, for example, while the trains are owned by a different set of companies, such as HSBC Rail, and often maintained by the original equipment manufacturers such as Hitachi Rail.

This poses a challenge for the design and application of asset management systems. In these kinds of situation, for example, which are common in the provision of complex services, it is unclear how existing definitions and guidelines should be implemented

across the different organisations that derive value from the assets – in this example, the trains in the rail sector.

Equally, how does the concept of organisations implementing asset management systems that align with their own objectives, and aiming to extract maximum value from the assets, reconcile with the conflicting nature of many of these objectives.

How can such a disparate set of asset management systems be designed so that the whole ecosystem (or value chain) can benefit from the assets?

We started to investigate the question above. Our study involved a series of interviews with asset managers in companies across a variety of industry sectors ranging from aviation and facilities management, to utilities and heavy equipment. These interviews were designed to understand the asset management practices these organisations adopted, the processes used to design and improve those asset management systems, and the shortcomings of these processes and their implications■





Essential Elements for an Optimal Asset Management System

Having conducted the research, it is clear that organisations involved in service provision need to acknowledge to a greater degree the importance of having an effective asset management system. This would then indeed include the need to adopt a more methodical and considered approach to the design and implementation of asset management systems. This certainly applies to the firms we have studied; however, it can be seen to be transferable to other organisations as well.

It also became clear that several elements were fundamentally important to the design and implementation of asset management systems, and obvious targets for improvement. Focusing on these elements is essential if organisations involved in the provision of complex services want to optimise the management of assets to create the maximum value for the end user.

Risk and scenario analysis

When an organisation has an asset management system in place, even at its most basic in terms of a process addressing how to handle assets, that system or process is rarely stress tested against real-world scenarios. However, this is an important step in the asset management system design process. The team tasked with designing the asset management system should, in a foresight exercise, scan for potential risks and develop scenarios against which the asset management system can be tested.

For example, how would the asset management system hold up if external conditions meant there were fewer investment in servicing assets, or that assets had to be kept in circulation for longer, as may have been the case for many companies during the recent economic downturn? What happens in the event of loss of contracts? If the market picks up, can the system cope with additional demand for machinery and the servicing of that machinery?

These issues can be mission critical for an organisation, allowing the firm to capture maximum value through new opportunities, or avoiding failure when trading conditions are difficult. By scenario testing an asset management system during the design process, and at regular intervals afterwards, it is possible to have a degree of

confidence in the system over the mid to long term.

The study also revealed that with some types of asset management system, the design specifications produce a system that is heavily reliant on mathematical risk modelling. In other words, mathematical modelling is used to determine when a piece of equipment has to be replaced – after so many flying hours or miles travelled, for example. While this modelling is important for ensuring safety, if used as the basis of an asset management system it can create a very rigid system, with little scope for the flexibility required to respond to unforeseen events.

While acknowledging the need for this type of mathematical modelling in some asset management systems, scenario planning at the design stage, or later, can help optimise these systems. Scenario planning can help to highlight the limitations of less flexible systems. It can prompt the organisation to adapt its asset management processes, building in the flexibility that allows people to take action outside the system's recommendations, should events require such action.

Standardised interfaces

Organisations involved in the provision of complex services tend to be part of an ecosystem of organisations involved in creating value for themselves, other ecosystem members, and the end user of a service. Each organisation may have its own asset management system; yet each will have a different relationship with the assets concerned, whether those assets are airplane engines, rail rolling stock, excavation machinery, or manufacturing premises.

Take the simple example of an operator of a fleet of trucks.



Although, as the main contract holder, the fleet operator may be responsible for providing value to the end user by having trucks available to use 24/7, many firms will be part of that truck fleet ecosystem. At any one time trucks may be in the workshop for repairs, having electronic diagnostics and servicing, at a tyre firm getting new tyres, being cleaned, having bodywork done, off road in storage, being sold, or being bought into the fleet. Note that this is just one set of relationships. Each organisation involved may have similar relationships with other service providers.

In addition the trucks in the fleet may also provide diagnostic information relevant to different aspects of their lifetime use and maintenance that needs collecting and interpreting.

In an ideal world the interactions between these firms would be efficient and aligned to an end objective – making the fleet of vehicles available for use 24/7. The reality, however, is that the organisations will have their own processes and systems governing the way that they interact with the other organisations and perform their tasks.

Consequently it is clear that there is scope to standardise the way that these organisations interact with one another. This is true in terms of the managerial aspects of the relationship, with discussion and implementation of processes that facilitate, streamline and align communications between members of the service delivery ecosystem. It is also relevant for the IT aspects of the relationship, with considerable scope for creating common interfaces for information exchange and analysis.

The end-value of the value chain

End-value is an important concept in asset management. Consider the example of a firm that supplies training airplanes to an airfield. The supplier's contract specifies that it must provide trainer aircraft when requested, ready to fly. However, the end-value in this instance is not the airplane, or the supply of the airplane, or even the use of

the airplane. The end-value is actually education of the trainee pilots and, ultimately, producing a trained pilot. Under the terms of the contract, if the end-value is not specified, it is possible to fulfil the contract terms without delivering value. A firm could supply an aircraft equipped for a particular aspect of flying, even though the pilots being trained have already covered this type of flying.

Effective asset management systems should acknowledge the end-value. Clarity and transparency is required with regards to the contribution to end-value throughout the value chain. Employees should be aware of the concept of end-value, and its precise nature from contract to contract should be communicated through organisations to those people who contribute to that value creation process. This process of communication should extend across organisational boundaries to include the various members of the ecosystem and enable the best performance in creating and delivering end-value.

Ideally, referencing the end-value will allow proactive performance improvement for the benefit of the end user. Take the example of a firm providing construction-related machinery to a client. By monitoring the data from the machines it supplies, the machinery provider could enable the client to use its machines more efficiently and reduce costs. With the appropriate asset management systems in place the end-user customer could also do the data analysis, and make decisions accordingly, together with its service providers.

Performance measures, definition and alignment

The concept of end-value is also relevant in the selection of the organisation's key performance indicators and other performance measures.

Before outlining the importance of the link between KPIs and end-value in asset management systems it is worth noting that long-term potential needs to be considered when selecting KPIs. For example, some organisations had KPIs linked to cost-cutting measures,



which had a knock-on impact on effective asset management in that organisation and other organisations in the service provision ecosystem.

When economic conditions are difficult it is understandable that organisations may seek to incentivise cost cutting. However, making asset purchasing decisions on the basis of capital costs and expense cutting in the short term may drive up baseline costs over the longer term and dent customer satisfaction. If a firm hesitates to renew its vehicle fleet, for example, it may save money in the short term, but a decline in productivity and the increased costs associated with prolonged use of older vehicles may turn out to be less cost effective over a period of time. This in turn may have a negative impact on customer relationships.

One solution is to account for periods of economic constraints in the risk analysis and scenario planning when designing and implementing an asset management system, rather than find the organisation unprepared and reacting to events.

It is not only consideration of the long and short term impact of performance measures that is the issue, either. Service operations should focus on the end-value generated. This means incentivising effective asset management across an entire ecosystem, with a view to optimising the end-value. However, the study produced little evidence that KPIs throughout organisations were end-value focused. In fact there was every indication that KPIs in organisations, particularly personal KPIs, but also department and wider KPIs, do not incentivise the end-value generated.

Evidence suggests that KPIs rewarding personal performance within individual contracts are common, for example. Yet these types of KPI

incentivise selfish actions over actions that benefit the ecosystem and thus the end-value. The hoarding of assets is encouraged, creating spare capacity and minimising the risk of personal underperformance, while the sharing of assets, maximising their productivity and increasing end-value, is discouraged.

Acknowledging a broader end-value perspective, and building this into the KPIs of the service ecosystem members as part of their asset management systems, incentivises decisions and actions that benefit the “greater good” and the end user. It also encourages the correct management of assets by local managers within the boundaries of each organisation.

Changing customers and customer needs

Finally, an effective asset management system should have the change management capability to adapt to changing customers and customer requirements.

Organisations tend to consider asset management on a project-by-project basis, adopting a project perspective. As a result they have a view of an asset with respect to its use within a particular project over the lifetime of that project. However, when there are multiple customers sharing assets the project perspective has limitations. It does not allow the supply of assets to be optimised depending on the different and changing needs of multiple customers.

A preferable approach is to adopt an asset perspective, with visibility of the asset over its lifetime as deployed across multiple customers. In this way if one customer is happy to have less use of an asset during a particular period, for example, while another customer needs an asset for longer, the intensity of usage and costs associated with the use of the asset can be adjusted accordingly ■



Conclusion

The research suggests that very few organisations have a structured methodology that they use to design, or that could be used to design, an asset management system. Instead, organisations that do give some consideration to the design and implementation of asset management systems tend to do so on an ad hoc and haphazard basis. And there are many organisations that do not have an asset management system, or even track the servicing of their assets on a consistent basis to optimise the use of those assets. Instead the prime driver of asset management policy and process in the majority of organisations appears to be responding to market conditions.

There is some guidance for firms wishing to design and implement asset management systems that optimise the management of assets in the context of the service delivery ecosystem and maximising end-value. ISO55001/2/3, which defines the guidance from the Institute of Asset Managers, and academic works such as those by Dr Khaled El-Akruti, as detailed in the introduction, give such guidance.

Yet none of these comprehensively reflects the practical reality of coping with the complex challenges of managing assets effectively and efficiently across a services provision ecosystem. These challenges require organisations to adopt an ecosystem perspective in creating value from the delivery and use of complex services.

Our study of complex service providers across a range of sectors points to a number of key elements that firms must pay attention to when designing and applying asset management systems. In particular, the effectiveness of any asset management system must be tested against a number of different assumptions and scenarios. Greater flexibility should be built in to those asset management systems that rely heavily on mathematical modelling and consequently may be fairly rigid in their application.

Standardised approaches should be adopted to ensure better communication and alignment between ecosystem partners. This needs to happen with both management and IT processes to ensure better coordination and collaboration among value-creating service-provision partners. The precise end-value of service contracts should be acknowledged and disseminated throughout organisations in the value-creating ecosystem.

Furthermore, KPIs and other performance measurements must be specified bearing in mind the kinds of short-term and long-term impacts of those performance measures. More specifically they should incentivise behaviour that contributes to creating maximum end-user value, and discourage behaviour that has an adverse impact on end-user value creation.

Finally, asset management should be approached from the perspective of the lifetime of the asset, rather than the asset on a project-by-project basis. This will allow firms engaged in the provision of complex services to respond to the changing needs of customers in a way that maximises end-value across multiple customers. It is by attending to these measures that firms will be able to design and implement better asset management systems■



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