# Enhancing profitability: Service Lifecycle Management, product architecture, and carryover content

## Summary

A Service Lifecycle Management system fully or even partially engaged with concept design and product development can add million's to the bottom line for many manufacturers.

Early engagement in product planning and concept design necessitates the clear enunciation of a strategic vision for the service lifecycles of future products and actively shapes future product content to deliver it. It allows product architecture to answer to service drivers in a way that would not be possible if service and service repairability is only considered in product integration stages of development or even later.

In addition, early engagement allows for better integration of both new technologies, which now must address an overarching service lifecycle strategy, and carryover technologies, where lessons learned from the carryover content's current aftermarket lifetime can be accounted for or capitalised upon in the emerging design.

## Introduction

Often repetitive aftermarket failures incur immense costs for manufacturers that could have been avoided by changes to the architecture of a product early in the design lifecycle. Examples include the positions of major components such as turbines, steering gear, running beds or suspensions, or engines, that subsequently define and constrain the package of a whole host of subsidiary parts and systems and that define 'hard point' interfaces between these and other major systems.

Major opportunities to deliver significant cost-avoidance are all too often missed simply because an absence of process integration prevents qualified aftermarket expertise providing valuable assistance and insight for engineers responsible for major paradigm-defining decisions in early design stages such as concept design and layout—a symptom of broken service lifecycle management.

Early intervention of this kind is especially important when a new vehicle configuration incorporates carry-over technology because, in these cases, the ability to alter the configuration of carry-over items is limited.

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A similar challenge exists with systems-development channels where constituent technology components are developed 'ex product', with a view to eventual integration not into a single end-product, but into a range of end-products. Here again, opportunities are often missed to 'feed in' service requirements and strategies as a means to ensure that new products and technologies support long-term service lifecycle strategies.

# Engagement

## Service Lifecycle Management means having a service lifecycle strategy

Initial discussions around technology shape are in fact invariably around technology inclusion, often looking many years ahead. The implications of GPS technology have been as profound for agricultural machinery as they have been for shipping, but, for your product, what should GPS technology be doing for the service lifecycle?

And in fact, the question is broader… what is the service lifecycle strategy pertaining to *any new technology* that may potentially be included on your product, and how could it potentially meet the needs that the service community is telling you that they have, and fulfil what it is that their customers are saying they want? -- with a keen eye on current product performance in the 'real world' feedback is brought from markets including information relating to current issues, client practice and market wants and needs

Thus, in a holistic and healthy service lifecycle management process, aftermarket input into the early stages of concept development and product cycle planning should not only define the strategy for how the product will be supported in the service lifecycle; it should also contribute to the definition of the product itself.

## From product cycle planning and concept design to concept design and layout

With product assumptions and direction still fluid, service involvement in product and lifecycle planning and concept design activity facilitates a clear view of a proposed product's inception and content from a service lifecycle standpoint. This allows service engineers to plan for support for forthcoming development projects, and it means that defined service strategies will be implemented as a part of and in conjunction with nominated products and product technologies.

Through this engagement directly with research and research projects' life cycles, it then becomes a necessity to integrate service into technology development processes. Service requirements now need representation from aftermarket subject matter experts, raising the profile of the service lifecycle in product development and enhancing new products' service lifecycle profit opportunities. In this way technology development supports service goals to improve aftermarket support for vendors and the service community, to improve the client experience, and to deliver the future service strategy.

As concept design matures and layout of major systems begins, well-defined service lifecycle goals and requirements become fundamental considerations. Service engineers engaged here now have a well-supported case to argue for architectural parameters that will save costs or add revenue opportunities in the aftermarket cycle. The capability of Teamcenter to integrate carry-over or comparator product data into a package at this stage can be critically important: some defined service requirements could be represented as Service CAD Geometry integrated on a daily basis into the package and that can be reactively and easily updated in Teamcenter Visualization Mockup as different proposals are compared.

As technology development matures, service representation also becomes active within technology integration and supplier selection forums. Technology, technology elements, or particular suppliers' technology solutions are now also considered in terms of their service lifecycle cost opportunities and alignment to the defined service lifecycle strategies. As well as factors relating to production cost, durability, or manufacturing cost, proposals weighed one against another will now also be considered on the basis of measurable service lifecycle attributes such as turnaround time, repair or maintenance cost, MRO logistics, or compliance with customer needs and wants.

# Benefits

## Carryover content and vehicle architecture

Properly integrated Service Lifecycle Management facilitates the delivery and fulfilment of service requirements that impact on fundamental architecture and design, and in so doing can allow for direct aftermarket experience of carryover content to be accounted for in new product designs.

In one example from our experience at CAD-IT, our engineers worked with an automotive OEM's upstream processes for a new generation vehicle incorporating a brand new body design and suspension configuration but utilising existing diesel and petrol powertrains. In early product cycle planning discussion, the client had laid down a clearly-defined service strategy for the engine, including definition of service intervals and turnaround times for routine maintenance tasks and for parts deemed to be a higher warranty cost risk. In this client's processes vehicle body and suspension geometry was frozen well in advance of systems integration and product development, where downstream service engineering support was traditionally located.

The initial proposals for the engine bay body structure and front suspension geometry resulted in a package environment that positioned the front suspension strut towers in close proximity to the cylinder heads of a carryover diesel engine. When investigating this package service engineers quickly found that this configuration could have a significant impact on potential warranty cost, due to a large number of fuel system and cylinder head related procedures requiring disassembly in order to remove the engine from the vehicle. Service CAD Geometry was introduced into layout visualisations to provide a representation of the service and tooling access to the fuel rails and fuel injectors (in addition to withdrawal path volumes for fuel injectors and cam covers), and as a result a package proposal that met the requirements of service was agreed upon.

Early involvement with the vehicle meant that major changes to the body design could be justified before these critical designs were frozen. Through the publication of the Service CAD Geometry this issue was distributed at a high level to all areas of product development, resulting in the continued package protection of the areas around the cylinder heads for service access. In warranty costs alone, anticipated savings resulting from these changes amounted to many millions of dollars.

This example, among many others, shows that, with clear direction and visibility of the relevant requirements, a product can be designed and developed to meet all of the required criteria, to address any weaknesses and in-market experience relating to carryover content, and with no additional cost or compromise due to late change.

## Service-specific technology

The clarity of strategic purpose integral to service lifecycle engagement with product cycle planning and new technology delineation and development, in part resulting from CAD-IT's engagement with our clients, has also pioneered service-specific research projects to deliver advanced servicing technologies for future client platforms. In each case the service-lifecycle focused systems developed in this way were developed to be migrated across the client's complete product range, allowing for a consistent approach to service messaging and client information, supporting a competitive position in the marketplace and enhancing the client experience of the product.