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September 2009

Is Broad Use of Predictive Modeling in the Cards for Service?

Leading service organizations, especially those that deal with complex asset-intensive industries, are predicting a transformation of their service operations away from the traditional break / fix maintenance model that has characterized post-sales service over the past years. An April 2009 Aberdeen survey confirmed past data captured from service executives revealing that service firms across all market maturity levels expect their involvement in total asset lifecycle management to increase significantly over the next two years. This transformation will require a new, more sophisticated and more forecast-centric approach to service operation.

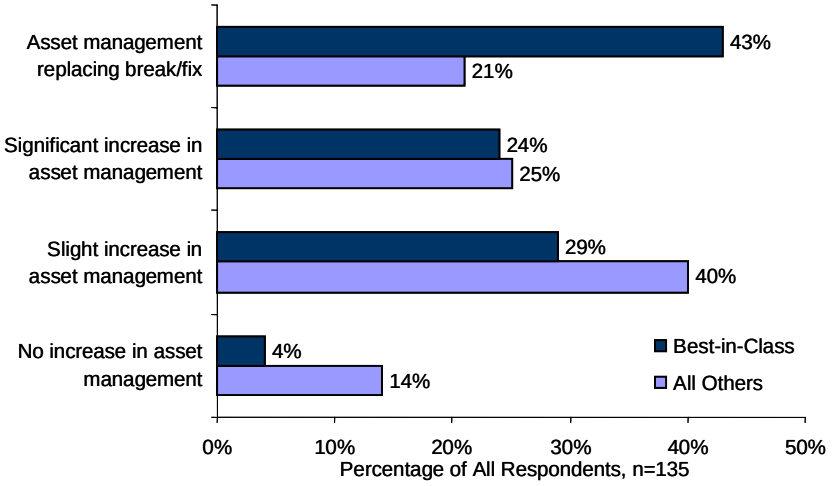
Analyst Insight

Aberdeen's Insights provide the analyst perspective of the research as drawn from an aggregated view of the research surveys, interviews, and data analysis

Setting the Stage for Transformation

Service executives across all companies responding to Aberdeen's 2008 survey on optimal parts and distributed asset tracking predicted involvement in overall asset lifecycle management to increase over the coming years. As Figure 1 shows, a significant percentage (43%) of top firms feel that Asset Lifecycle Management will actually replace the current break / fix environment that typifies today's service operation focus. This finding is consistent with service trends Aberdeen identified in past research toward more predictive and value-based services and away from reactive, often difficult to manage, service strategies. These findings were confirmed in a 2009 study on *Remote Product Service*, detailing increasing intentions for companies to stay involved in overall Asset Lifecycle Management.

Figure 1: Anticipated Involvement in Asset Lifecycle Management



Source: Aberdeen Group, 2008

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Previous Aberdeen research has also shown that service organizations that can accurately forecast service demand and align resources to meet that demand achieve significant gains in workforce utilization, first time fix and Service Level Agreement (SLA) compliance. Survey results from Aberdeen's 2008 *Forecasting and Planning* benchmark report indicate that companies that had implemented both demand forecasting and resource planning saw improvements of 27%, 22%, and 18%, respectively, in these key areas from their technology deployments.

In the area of predictive modeling, Aberdeen has seen leading service organizations begin to embrace simulation analysis as a way to better predict service demand and events. Eighty percent (80%) of Best-in-Class organizations from Aberdeen's *Get Smart: Business Intelligence for Service Organizations* benchmark report either had implemented or developed plans to implement predictive modeling to aid service decision-making. This was three times the number of less mature firms.

Service organizations are being driven to assume greater asset management responsibilities and have seen the value of forecasting and modeling centered on service operations. The combination of these factors with the reliability-centered maintenance strategies in place throughout the aviation, defense, nuclear power, and other asset-intensive industry segments, presents a logical step for these organizations to adopt a predictive approach to manage the financial and operational risks associated with maintaining assets on behalf of their customers.

Aberdeen Insights — Predictive Modelling and the Department of Defense and Beyond

This need for better predictive modeling is also being stated by the US government so as to improve the lifecycle management and boost the MRO of assets controlled by the United States Department of Defense. Notes from the Committee of Armed Services in the National Defense Authorization Act for Fiscal Year 2010, indicate that the committee "is concerned about spare parts inventory and supply management by the (armed) services." Notes also indicate that the Government Accountability Office has recommended that spare parts inventory and supply management should be strengthened by improving demand forecasting procedures and by monitoring the effectiveness of providing operational information to item managers. The Committee of Armed Services also encourages the DoD to adopt advanced predictive modeling and simulation methodology that incorporates the asset demand influencing factors to include time, usage, aging of parts, origin of critical parts, maintenance, and logistics support for all aviation and ground equipment programs. In addition, the committee also encourages the DoD to establish pilot programs to demonstrate the benefits of demand forecasting models to reflect cost savings, reduced reliance on unscheduled maintenance, and increased efficiency in supply chain management and budget projections.

Source: National Defense Authorization Act for Fiscal Year 2010, Report on Armed Services, House of Representatives

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In addition to notes and recommendations to the DoD, it is also noteworthy that programs like the Joint Mine Resistant Ambush Protected (MRAP) Vehicle Program (JMVP) are continuing to expand their use of predictive modeling, and that the Expeditionary Fighting Vehicle (EFV) program is upgrading/ramping up the modeling & simulation component of its lifecycle management program.

The focus on asset lifecycle management within the armed forces is also reflected in the renaming of TACOM (Tank-Automotive and Armaments Command) to the Life Cycle Management Command (LCMC). PM LAV (Light Armored Vehicle), a component of TACOM/LCMC, has led the way with advanced predictive modeling for the United States Marine Corps over the past few years.

The Case for Asset Performance Modeling

Forecasting asset uptime and reliability is certainly not a new concept within the maintenance and repair and field service environments. As previously mentioned, leading service organizations have long recognized the value in forecasting service part needs, technician resource demand, and potential asset maintenance requirements to enable preventive maintenance strategies and service capacity planning. Effective forecasting became critical to meeting customer expectations and avoiding severe penalties with the growth of Performance-Based Agreements (PBAs) guaranteeing a level of asset uptime. In fact, Aberdeen found that 73% of the service organizations it surveyed for the *Managing Risk and Reward in the Performance-driven Service Chain* benchmark report either offered or planned to offer performance- or usage-based contracts to customers.

Table 1 indicates what has typically been included in the commitments of performance-based contracts. Most often, performance contracts provide for specific hours or percentage of asset uptime in exchange for a longer-term customer commitment. Less than half of these agreements included guarantees for productivity, actual hours of asset usage (availability), and quality. As service offerings and customer relationships become more complex, with customers requiring more risk and reward sharing between themselves and the OEM service providers of their serviceable assets, the need for more rigorous forecasting around asset performance is evident. Enabling effective spare part management processes, parts distribution strategies and appropriate repair versus replace analysis, and PBL pricing decisions, all require a rigorous approach to performance modeling.

"If historical trends are all you look at to forecast service workload, then you need to take your rose colored glasses off and see what is really happening. There are so many changes that are taking place every day; only using one method of planning is far outdated."

~ Manager, Services, Large Construction Equipment Manufacturer

Table 1: Performance-Based Service Contract Commitments

Contract Commitments	Percentage of Service Organizations Providing
Contracts guarantee a number of hours of equipment uptime	67%
Contracts require long-term commitment from asset operator, minimum of two years	43%
Contracts guarantee a specific amount of equipment productivity	33%
Contracts guarantee number of hours of equipment usage (i.e. "power-by-the-hour")	31%
Contracts guarantee equipment will meet a target for "yield" of quality material produced	24%

Source: Aberdeen Group, 2007

Case in Point - Department of the Army Utility Helicopter Program Office

Maintaining worldwide readiness of the US Army's fleet of Blackhawk weapons systems is, by definition, a mission-critical undertaking. Ensuring that the helicopter fleet is available whenever and wherever needed, as well as equipped with up-to-date technology can be a daunting undertaking – one that requires proper planning and intricate forecasting to maintain parts availability.

David Frey, Logistics Management Specialist Department of the Army said, "We recently changed models of the helicopter airframe which called for a change in rotor blades. This one change in turn generated a very complex set of requirements around parts needs for both legacy fleet, new models as deployed, and repair scenarios for both considering multiple usage variables and duty cycles. We needed to know with a high degree of confidence how long to stock parts for the older model, when new parts would need to be available and what the appropriate crossover points would be. When you're dealing with multi-million dollar part decisions, this is a critical undertaking."

To reach a level of predictability in its asset management process around the Blackhawk, the Army implemented a predictive modeling solution developed by Clockwork Solutions to provide the answers. The system, which uses a highly sophisticated modeling engine that accounts for a large number of variables and runs multiple modeling scenarios to develop a predictive maintenance analysis to aid in preventive maintenance, asset replacement decisions, parts forecasting, stocking and deployment options, and overall asset lifecycle analysis. While somewhat complex to implement, the system has proven to offer some key advantages to the Army's civilian asset management group. One cited example is the "Fly Forward" utility which allows the Army to simulate usage of a helicopter over a number of

hours and predict the health of all onboard systems based on both historical and predicted system lifecycles. This provides maintenance and reliability engineers with the necessary information to schedule preventive maintenance, reducing cost, and ensuring ultimate asset availability.

"The main difference," says Frey, "is that other systems are backward looking as far as future predictions. That might get you close, but when you're dealing with decisions of this magnitude, with this much on the line, close isn't good enough. We went from a system that enabled us to make a reasonable guess at what the requirements would be to one that gave us a high level of assuredness in our decisions, backed up with the model and data to support those decisions. And the audits that have been done so far have proven the approach."

While the benefits have been demonstrated, Frey did say that there were challenges in adopting a new type of predictive model. "It was a tough sell at first," he says. "We had systems in place that we'd been using for quite some time and making a change required a change in thinking. When you work with a system for a long time you expect a certain type of output. When you're presented with a different solution than what you're expecting, it takes an absolute leap of faith to trust the new data. I see the value and the numbers clearly support the value but we're still early-stage with this type of approach and there will still be some resistance. But I do believe modeling and simulation will become a requirement for the type of systems we're supporting especially going through the variable spending cycles that the military typically sees. We simply can't afford not to make use of predictive modeling."

A New Type of Predictive Model

Many service organizations are content to use centralized knowledge warehouses and historical trend analysis to predict future service demand and asset reliability. While building a service model based on solid historical data can yield better predictive and preventive maintenance and improvements in part management, these models can come up short when dealing with complex assets, especially fleet assets with multiple duty cycles. Managing a large fleet of transportation assets, as in military vehicles, commercial aviation equipment, industrial equipment, mining equipment and the like, can require more than development of a standardized predictive maintenance model based on historical data. Often, duty cycles of individual fleet components vary so significantly that adopting a common predictive service model based only on historical analysis can result in unexpected asset failures, poor contract performance and can, depending on the type of asset, generate life-threatening events.

Recognizing the shortcomings of historical analysis to manage asset lifecycles in complex logistics systems, companies are developing alternative predictive models. These optimization systems, often built on predictive modeling methods like the Monte Carlo method, which uses computerized sampling of all variables within an asset pool to derive a more specific asset

reliability index, can present a more accurate and individualized view of the assets within an overall fleet. These systems have been found to be most appropriate where the asset fleet is large and diverse. While more costly to acquire and sometimes more challenging to integrate, these advanced asset lifecycle modeling solutions can generate more accurate maintenance strategies and more profitable results for service organizations, especially those asked to service mission-critical or complex assets.

Implications for Service Executives

Regardless of the type and nature of equipment being serviced, current trends indicate a clear movement toward asset lifecycle management and service built on a risk-sharing productivity platform between OEM service providers and customers. Service executives should consider the following as they evaluate their strategy to address this trend:

- **Slay the data dragon.** No matter which forecasting model is ultimately adopted, one fact is clear: detailed, accurate information on things such as asset history, repair trends, and performance levels will be required. Development and maintenance of a centralized knowledge warehouse of asset information, along with data collection methods that boost accuracy and limit redundant data entry will be critical.
- **Understand the level of forecasting ability that's required for your customer set.** Adopting a forecasting / predictive model that doesn't account for all variables can be financially disastrous for service organizations as they adopt performance-based service contracts. When the assets are military, medical or aviation, these failures can become life-threatening as well. Conversely, adopting a predictive modeling solution that is more complex than required for the class of assets being serviced can also negatively impact profitability and performance.
- **Build scalability into your systems.** Given the current trend toward asset lifecycle management it can be anticipated that systems and business processes used to enable risk-sharing and performance-based logistics contracts are inevitable and will grow more complex and pervasive. Investing in technology that can address increasing asset lifecycle needs beyond pure maintenance is a solid business strategy.
  From a solution selection point of view, it should be noted that in an effort to meet these increasing asset lifecycle needs, service parts management solution providers are increasingly looking to add functionality to manage forecasting and advanced planning capabilities. At this stage, the advanced predictive maintenance and logistics management capabilities involved in overall asset or part lifecycle management are only available via a handful of Service Lifecycle Management solution providers.

- **Embrace the break / fix to asset lifecycle management change as a profit generator**. The Best-in-Class service organizations understand the potential business gain in both profitability and competitive differentiation from adopting long-term service agreements that drive asset performance. These long-term agreements are typically higher profit (when modeled accurately) and build a longer-term, stronger relationship with customers.

Predictive modeling around overall asset quality and lifetime performance is a logical next step in the evolution of many service organizations' business models. Like many of the transformation enablers that have been deployed within the post-sales service environment, those organizations that build and implement the solid business disciplines and workflow processes to best capitalize on advanced technology tools will see significant performance and profit gain from these trends.

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