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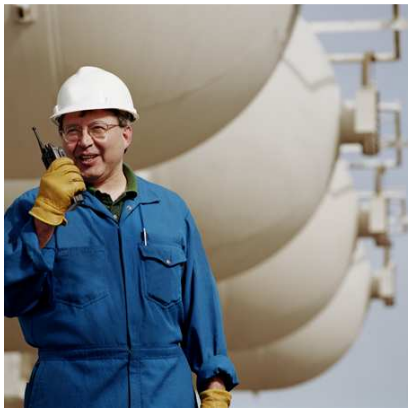
A Ventyx Whitepaper:

The Unique Challenges of Asset Service

Enabling mobile workers in asset intensive industries

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Executive Summary

Automated mobile workforce management solutions have been available to service organizations for several decades. The consumer packaged goods (CPG), parcel delivery and utilities industries were the first to pioneer such innovations with point solutions for merchandizing, route sales, route delivery, meter readings, work orders, and so on. IT organizations were quick to seize on the opportunities presented by new technologies in mobility, resource optimization, and knowledge management as early as the 1980s. The result has been a proliferation in automated field service solutions across multiple industries.

Yet, these solutions have traditionally been narrowly designed for field sales, field delivery and field service workers in non asset intensive businesses. Even those solutions deployed in the utilities industries have been limited primarily to the distribution end of the supply chain, for functions such as meter readings, provisioning and disconnects. Optimization and automated dispatch solutions in that industry are still mostly confined to reactive and short term activities. And even with a degree of automation, processes in the field are still dependent on paper.

Asset intensive industries such as mining, oil and gas, transportation, and even utilities have been largely underserved. These industries require asset service solutions. Yet, solution providers, even leading Enterprise Asset Management (EAM) vendors, continue to apply field service solutions to address asset intensive problems. While there is certainly significant overlap between asset service and field service, these are fundamentally two different domains.

This paper discusses the differences between asset service and field service. Accepting these differences requires an understanding of the overriding objective of any complex or high-value asset operation: to ensure the highest possible productivity of a given asset and thus reliable, uninterrupted and continual service and production. Also required is an understanding of the unique differences in field operations in asset intensive businesses and knowledge of the key drivers and relative priorities in their decision making.

For those that intuitively understand and appreciate these differences but do not see the urgency or priority in solutions that enable their mobile workforce, consider the following recent global trends:

- Reduced revenues and sources of capital due to the global economic crisis
- Aging workforces and employee turnover
- Aging infrastructure and increasing demand
- Increasing cost of responding to incidents
- Increasing public scrutiny forcing increasing and changing regulation
- Increasing security demands
- Environmental trends and pressure to reduce carbon footprints
- New skills and workforces and knowledge required by smart grid technologies and new green offerings and services

Traditional field service solutions cannot address or keep up with these growing demands. Only mobile asset service solutions designed specifically for asset intensive industries can pick up where traditional mobile field service solutions stop.

Definition of an Asset Intensive Business

While many may characterize utilities, mining, and infrastructure enterprises as traditional brick and mortar companies with large, immovable assets with long life cycles, nothing could be further from the truth. In reality, these operations by their very nature are highly mobile, remotely scattered, and virtually managed. They rely on immediate, continual and accurate awareness of every asset, and of every resource required to construct, install, operate, maintain, and service those assets.

For these businesses, any small failure or lapse in information flow can have catastrophic consequences resulting in tens of millions of dollars in loss, and even injuries and fatalities on a large scale. Reactively repairing the failure, or picking up the pieces after the event, is not an option.

Ventyx refers to these businesses as asset intensive. Their objective is simple – ensure assets are productive and service is uninterrupted. But meeting that objective is far from easy. Consider:

- How much did your last failure cost you and your customers?
- How many safety incidents did you experience last quarter, and how much production did you lose?
- When were you last out of compliance, how much did that cost you, and how do you prevent it from reoccurring?
- Do you know where all your resources and assets are? Are they safe? Are they productive?
- How quickly can you identify a potential problem before it occurs and mobilize your resources in the field?
- In a critical situation, do you know where all your resources are, and can you marshal them without causing or prolonging other failures?
- Do your remote and mobile teams have the tools and information needed to effectively prevent the next interruption in your service or operations?

If these questions are relevant to you and your team, then yours is an asset intensive business.

The critical importance of asset productivity and reliability

For decades, asset intensive operations have attempted to apply narrowly-defined mobile field service automation solutions to broader or more complex asset service problems. This is due, in part, to a historically fundamental misunderstanding of these two domains.

To understand these differences, one first needs to understand the overriding objective of any complex or high-value asset operation. While one can always conclude that customer satisfaction is the highest objective in any enterprise, that premise can be academic in its pursuit for an asset intensive business. Simply stated, the customer may be too far removed from the actual or practical objective at hand to drive daily operations in the field.

Ultimately, the pursuit of any asset intensive business is to ensure the highest possible productivity of a given asset and thus reliable, uninterrupted and continual service and production. This in turn, depending on the industry and the end customer, ensures profitability, prolongation of life, and so forth. For the mine, this means continued flow of ore to that mine's customers, safety for its workforce, and profitability for its shareholders. For oil and gas, it's extracting, processing and transporting at peak capacity over an aging infrastructure, while reducing the carbon footprint. For the utility, this means uninterrupted service to its end customers, safety for the public, and ultimately assurance that kilowatts do not go unbilled. For the transportation provider it can be increased ridership on an aging infrastructure. For the defense industry it can mean maintaining facilities in a state of readiness to save lives and maintain security while military budgets are getting hit hard. For government infrastructure, it means ensuring the community has the foundation upon which to conduct commerce freely and without interruption.

Asset Service vs. Field Service

The domain of asset service overlaps considerably with that of field service. The larger the enterprise, and the more vertically integrated its business or supply chain, the more likely it is to require elements of both service types.

Mining operations, for example, are heavily asset service oriented. Mine workers are thus almost exclusively focused on operating or servicing production assets. The many roles within a mine itself – shaft construction, ore sampling, drilling and extraction, shaft and utility inspections, etc. – are focused on continued operation of the mine's assets and, thus, uninterrupted production. Yet, despite all the preventive activity, all this infrastructure, whether it be drilling equipment, ore movers, power generators, or ventilators, will inevitably require repair. This by definition is reactive repair, typically associated with field service, whether performed internally by the mine operator, or externally by third parties, manufacturers or equipment dealers. These latter parties are performing more traditional field service-like activities, yet they are working on complex assets. Thus the tools, systems and data required to perform work on these assets can be just as complex and rich as many of those used by the mine operations.

Utilities, on the other hand, vary somewhat from this model depending on how far up or down the distribution chain they are. Those that own the water source, purchase their gas at port of entry, or generate their own electricity, have needs very similar to those of the mine. They or their wholesalers might own or lease the network over which they then transport their service. In either case, preventive maintenance of assets is the highest priority as any disruption can have enormous financial and legal consequences. Municipal utilities or private distributors, conversely, are often the touch point with the end customer or the premise. Their activities revolve heavily around provisioning, disconnection, upgrade and repair. As such, their service organizations typically fall into the field service domain, and specifically into the reactive and repair based business models. However, they also conduct route-based meter readings, which is more consistent with a route delivery model. In fact, they may also have a door-to-door sales force that sells energy related goods and services.

The previous examples merely illustrate the complexity and variation in the service continuum. They by no means fully represent all the asset intensive industries, which include transportation, oil and gas, public infrastructure, heavy equipment, and defense, just to name a few.

To fully understand the difference between a field service organization and an asset intensive service operation, we must understand the differences in terms of What, Where, When, How and Who.

What is asset service?

Figure 1 represents at a high level the processes that are primary to a field service organization vs. an asset service organization. There is overlap, and any one large, highly vertically integrated enterprise may actually have any combination of these models, and in some cases all.

	Field Sales	Field Service	Asset Service
Construction			X
Installation			X
Inspection			X
Maintenance		X	X
Repair		X	X
Pick-Up	X	X	
Delivery	X	X	

Figure 1: Activities associated with field sales/service vs. asset service

Unfortunately, many service organizations make the mistake of attempting to automate all these processes with a generic Enterprise Asset Management (EAM) software suite better designed to support less asset intensive industries. They may likewise choose generic mobile field service applications that cannot adequately support the complex and specific role-based needs of their asset-focused field forces.

Where are assets serviced?

Differences in roles and processes are a very clear factor in distinguishing between field service and asset service. However, environment is equally important. The environment where work happens (see Figure 2) determines not just safety requirements and key data that must be collected and monitored, for example. It also impacts the decision process for planning how to optimally allocate, assign and ultimately dispatch resources, whether for long-term capital projects or shorter-term activities.

	Field Sales	Field Service	Asset Service
Road	X	X	X
Building		X	X
Facility			X
Linear Network			X

Figure 2: Locations associated with field sales/service vs. asset service

Often, much of the asset service decision-making process revolves around getting a person or resource from point A to point B, even in a mine, or when a field worker may be permanently assigned to a large facility, where access to an asset is only possible on foot. In such cases, the street route optimization tools and algorithms in a traditional field service solution will not work. Furthermore, tracking must be performed by LAN, rather than by WAN or satellite.

Job length and whether the worker can travel by automobile or must travel across regions by air or rail, will also impact resource scheduling and routing. The physical tools required for a job are also affected by environment. The worker in a mine working on a large repair will undoubtedly have different requirements than the worker suspended over a high voltage cable 100 feet up, or a worker in the control room in a pump station. All these factors add to the complexity of decision-making around the service activity (Figure 3).

Figure 3: Decision complexity for field service vs. asset service events

The line between a remote worker assigned to relatively few jobs and an apparently single location (high degree of job process complexity), and a highly mobile worker moving from one job site to another (comparatively lower degree of job process complexity) may not be seen as important in some service organizations. Failure to recognize the different levels of complexity associated with these processes, and how that relates to support mobile workers (Figure 4), often results in attempts to solve different problems with the same tools; the wrong tools.

Figure 4: Process complexity for field service vs. asset service activities

When are assets serviced?

Assets in the previously mentioned industries typically have very long lives. For example, utilities on average plan for 40-year life cycles. This will vary, of course, by region, private vs. publicly owned enterprises, and whether the utility is vertically integrated or not. Mining assets typically are shorter-lived but their life cycles are far more intense and the struggle to prolong their lives is a daily challenge. Bridges and roads can have life cycles of 100+ years, but they are continually evolving. Assets with shorter life cycles do not require the repetitive rigor and depth of service characteristic of those with longer lives (Figure 5). Field automation in asset intensive contexts thus requires intelligent, process-based applications that are designed to support and prolong the life of the complex applications being serviced.

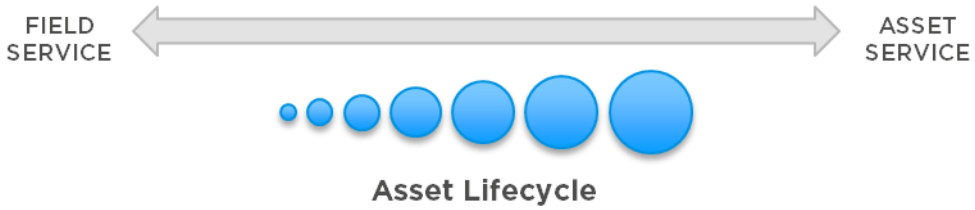

Figure 5: Asset life cycles characteristic of field service vs. asset service

The planning cycle for asset service vs. field service is likewise far longer and more strategic in orientation (Figure 6). It is premised on optimizing the productivity of the asset over the course of its life. This requires continual, relevant and accurate data collection in the field about those assets and the resources that service them. Optimized planning tools, utilizing this field data, are required for scheduling all these activities, and fitting and balancing planned and reactive work over the life of the asset, whether project-based or task-based.

Figure 6: Planning cycle length for field service vs. asset service

Similarly, the service cycles for complex assets are longer and more complex (Figure 7). Exhaustive inspection and maintenance routines and plans are required to preempt failures. This requires intelligent, process-based applications to enable field workers with all the steps, guides, knowledge and tools to perform their jobs safely and effectively for each type of activity required to service the particular asset, with all its unique requirements.

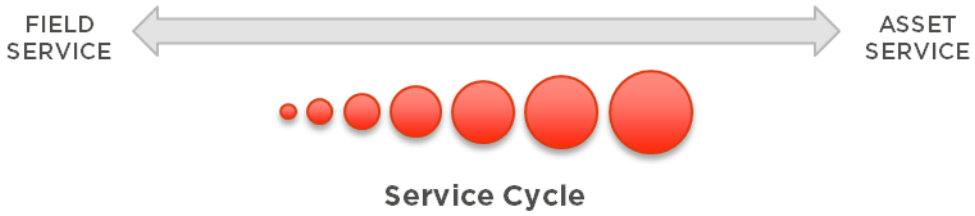

Figure 7: Service cycle complexity for field service vs. asset service

Unlike typical field service tasks, asset service activities can last for days, weeks or months, with workers often having to go back and forth between multiple assets simultaneously. The time required to physically work on a particular asset is usually considerably longer given the complex nature and potential size and location of the

asset. Working on an excavator in a shaft, or a power line on a remote ridge, or a high voltage track in a tunnel, requires greater, care and preparation, and effort than field service activities (Figure 8). Yet the pressure for timely resolution and task completion never goes away.

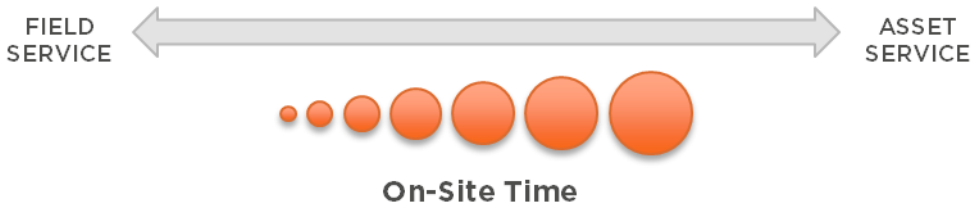

Figure 8: On-site time for field service vs. asset service

The criticality of a failure, and the impact and cost can be enormous in scale for complex assets (Figure 9). Seconds of response time can translate into millions of dollars, and potentially lives, saved or lost. The demand on automated solutions is thus greater in an asset intensive organization. Scheduling and dispatch solutions must work in real time. Mobile applications must contribute to the job at hand and not introduce administrative obstacles in the field. The mobile worker already has too many tools and variables to contend with while doing their job.

Figure 9: Criticality of response time for field service vs. asset service

How are assets serviced?

As previously mentioned, working conditions are often unsafe, volatile, and remote in asset service contexts. Comprehensive safety checks, procedures and equipment are required before work can even start, and very specific safety steps must be taken throughout the entire task, and even after the work is completed. These can be specific not only to the asset, but to its location and condition at the time. There can be no guesswork. These are prescriptive and precise actions. A simple universal form or checklist will simply not do.

Complex assets can require multiple readings, measurements and diagnostics. These can be manual in nature or be electronically collected. The results must then be processed, usually in real-time in the field, in order to continue work on the asset in question. The diagnostics required often differ from asset to asset and task to task. An application utilizing or supporting these results must be able to work with all the possible permutations and know which rules to apply and when. A monthly reading, for example, may not be relevant or may be used different than the same reading during a weekly inspection.

The tasks required to inspect, repair or maintain an asset are typically decision branched. One reading or result will often result in a unique or different step or action than another reading or result. Workers often can only be dispatched to an asset, or even just a location, and once there have to locate and identify the problem. Going

back for additional tools, information or resources may not be an option. Thus, they require a comprehensive knowledge base in their hands to independently and successfully complete their work on-site.

Most often the work must be performed while the asset is in full or partial operation, or the asset must be brought down and be bypassed with another temporary asset or process. The slightest failure can bring down an entire operation and result in millions in operational production losses and collateral damage to the rest of the physical operations. Refineries, for example, cannot go down. A stoppage would not just interrupt flow, but actually require a system purge; or worse, damage a part or cause environmental contamination.

Individual field activities can range from very mundane data collection and simple parts runs to complex engineering exercises and precision machining. In some operations, field activities can be highly specialized and assigned only to specific individuals who do nothing but that. However, in other operations, a single individual or crew must be able to perform multiple activities, as in the case of drilling crews who perform maintenance and repair on the very machinery they use.

Interdependencies between tasks and individuals are probably the greatest area of complexity in scheduling asset service. Internal and external resources must very often be scheduled and coordinated in a particular sequence to perform their work. Replacing or upgrading a power pole, for example, may require coordination with a government agency, construction and installation by a third-party contractor, surveying and engineering services, and inspection and activation by an internal team.

Who services assets?

Asset intensive organizations employ human resources with a high degree of variability in skills, disciplines, certifications, clearances, languages, etc. In asset intensive organizations, these attributes are often asset- and task-specific. When any one of these is scarce, individuals must be carefully scheduled so that when those attributes are called upon, a bottleneck does not occur. Any one individual cannot become the critical path for an entire organization. But often these attributes may be entirely absent, particularly as workforces age and assets evolve, and for that reason, automated solutions in the field must provide the knowledge, direction and tools in hand for others to pick up the activity. Waiting for people to be certified or trained is sometimes simply not an option.

Lines blur between degreed engineers, skilled machinists, certified operators and specialized technicians. In field service organizations there are often distinct white-collar and blue-collar activities and corresponding software solutions. In an asset intensive organization, making that distinction is typically not possible. For example, in the heavy equipment industry, engineers are called out to work on state-of-the-art turbines on oil platforms or remote desert regions. They require software expertise and machining skills, and may actually have to build their workshops out of mud, discarded corrugated steel sheets, and timber from surrounding forests. What kinds of solutions might this individual need in the field?

Some individuals work alone, others only as members of a crew, and yet others will bounce between crews and individual assignments as needed. The more complex the asset, the more likely it is to require a crew with multiple individuals with different tools, abilities and resources to get the particular job at hand required. In some cases a crew leader maybe the only one recording data in the field, and in other cases, every crew member may be using or updating a particular piece of data.

Key Drivers for Asset Service Organizations

The pressures and objectives of a field service organization vs. an asset intensive service organization are not mutually exclusive. In fact, field service organizations usually do service assets, whether they are consumer HVAC units, commercial facilities, or medical equipment in hospitals. The factors that impact the decisions, tools and processes are often the same. The difference is in degree and emphasis (Figure 10).

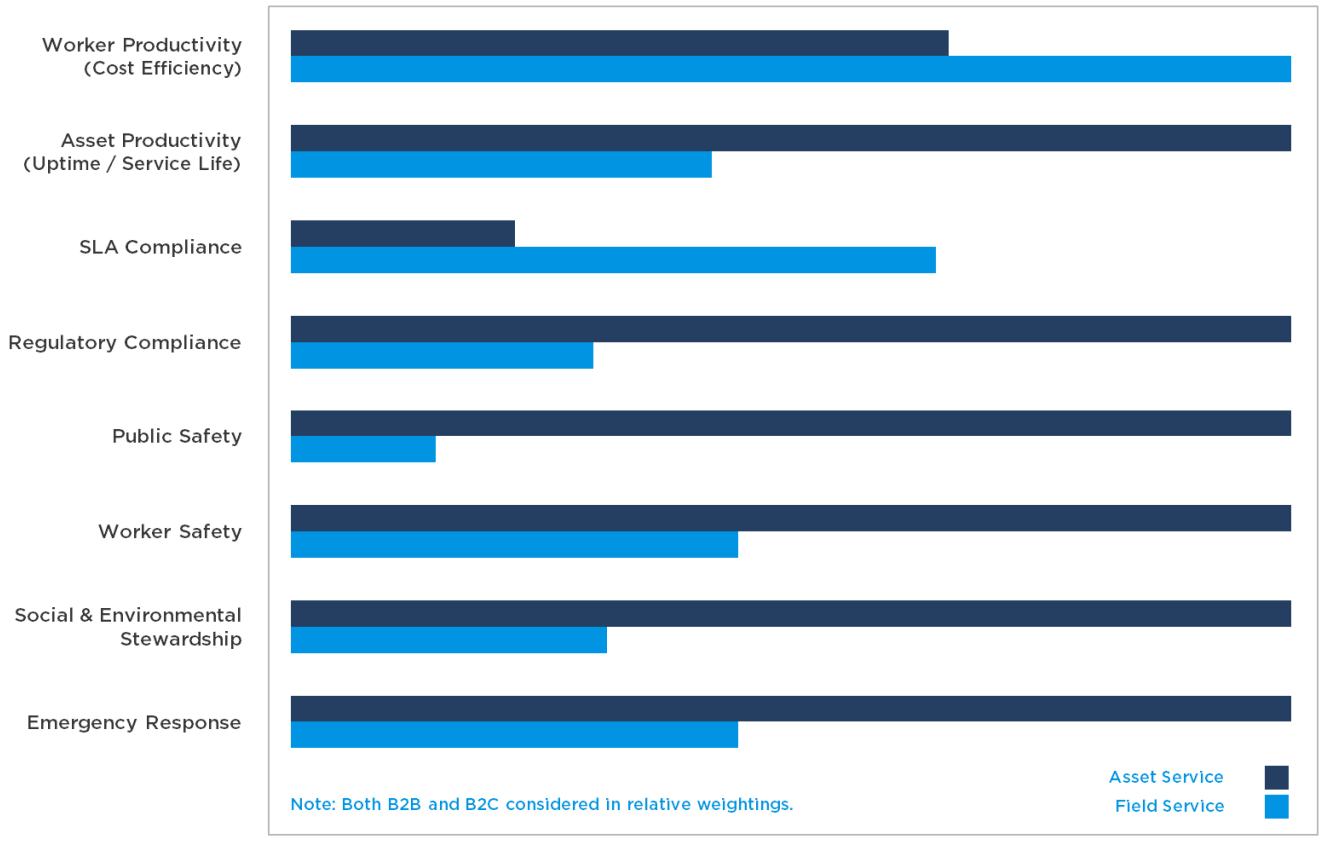

Figure 10: Driver relevance for asset service vs. field service

The relevance and weighting of these factors varies by industry, of course; and the field automation needs of these industries will vary accordingly. Figure 11 illustrates these needs for a mining operation where, for example, ore production is the most important driver for a precious metals enterprise.

Figure 11: Priority to business value for asset service in precious metals mining

Figure 12 illustrates these priorities for an energy utility on the distribution end of the supply chain. The weightings would naturally vary for transmission and generation businesses.

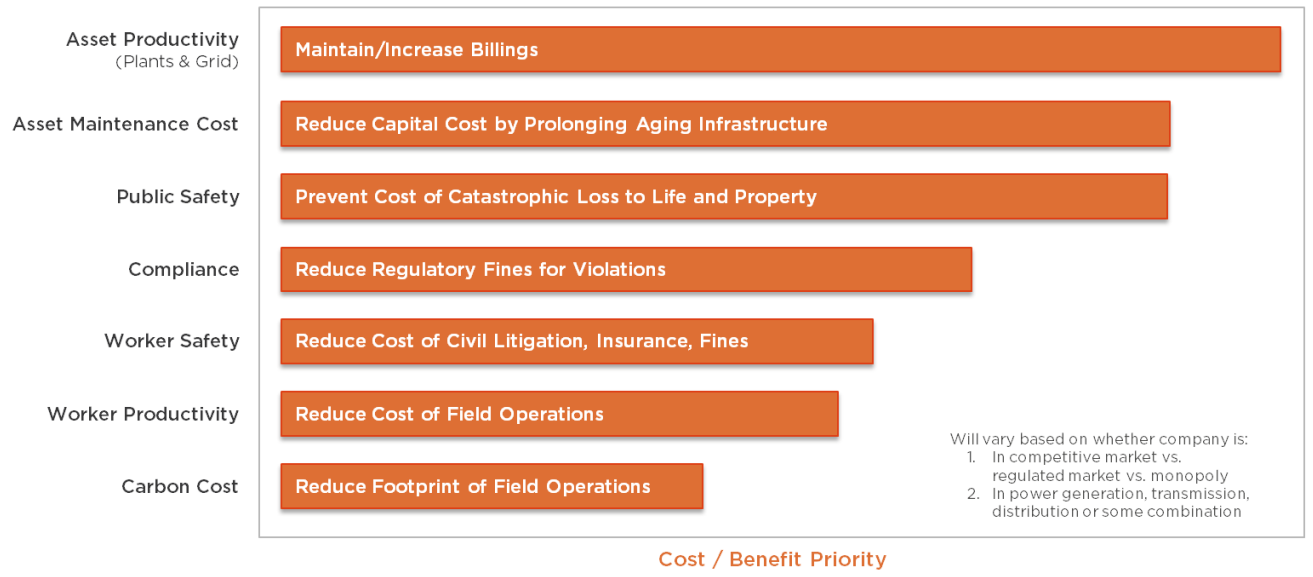

Figure 12: Priority to business value for asset service in an energy distribution utility

In asset intensive organizations, safety and service obligations to the public, employees, regulatory agencies, and other stakeholders are often a far greater priority than in typical field services scenarios. The vast majority of mobile solutions fail to take these priorities into account, and focus instead on financially-driven factors like cost of service delivery, worker efficiency, compliance with Service Level Agreements, and so forth. Of course utilities, municipal governments, and other organizations managing complex assets want to save money – but never at the cost of safety or service quality. In precious metals mines, similarly, the focus is on mine productivity and ore output rather than worker efficiency and other field service priorities.

The following are sample statements that may describe your service organization. If your enterprise is asset intensive, it requires more than just a traditional field service solution or mobile technology.

What you do when you get to the job is more important than how fast you get there

Mobile technicians maintaining geographically distributed linear or “network” assets like roads and pipelines, or complex assets in remote locations like mine sites, etc., often travel 50 kilometers or more from job to job. Other mobile workers operate in environments like open pit mines where it is vital to travel at a safe, consistent speed. Shaving down time and fuel costs is relevant in these environments, of course, but not critical compared to finding a safe route, for example.

Getting it done right is more important than getting it done fast

Depending on the assets involved, KPIs for reducing job duration potentially put quality and ultimately the safety of the mobile worker, the public, and the environment at risk. Maintenance and other work in asset intensive industries often spans days, weeks, and even months. Crews may be quite large and diverse, and the skills required can change constantly. In these dynamic situations “faster” doesn’t mean better, or is not as important as being able to work on multiple jobs simultaneously.

Compliance is more important than commerce

For heavily-regulated, asset intensive businesses like utilities and regional governments or local councils, compliance with safety and environmental regulations can vastly outweigh the commercial or financial imperatives that drive for-profit corporations. Fines levied against governing bodies for non-compliance can be staggering. Operations like oil refineries, where asset management failures can pose major safety and environmental hazards, could be shut down for culpability in a disaster. No efficiencies gained through typical mobile technology applications can compare to the magnitude of addressing these concerns by fundamentally embedding risk management in the mobile solution.

The quality of your asset management program directly impacts public safety

Organizations maintaining transportation assets that serve and convey the general public, like roads, rail, tunnels, and bridges, are charged with a level of quality assurance far beyond what typical field service workers need be concerned about. Might a bridge collapse or a passenger car derail on your watch if your mobile workforce doesn’t do its job well?

Preventive maintenance is vital to your asset management strategy

Some enterprises can afford to operate in a break-fix mode; others must maximize asset uptime as the highest priority. Frequency of proactive inspection may even be regulated. If your organization’s sole purpose is to deliver uninterrupted power or water or transport capability with zero safety or outage issues then you know how vital preventive maintenance can be.

Ensuring you have the right skills, tools, materials, and information at a job is a significant challenge

Asset intensive service organizations might work with tools worth thousands of dollars, and consume items from tiny o-rings to a 10-ton generator. Mobile workers may need on-demand access to the latest manuals and service bulletins, as well as asset maintenance history and other data from the EAM system. The mobile solution must help ensure that the right people with the right skills and the right tools need to be at the right job site at the right time, because “making do” with what’s at hand isn’t an option when it may take hours or days to get to the asset site.

Capturing, maintaining, and utilizing data in the field is as important as effectively performing the work

If you’re restocking vending machines or changing HVAC filters, you’re interested in capturing basic key performance indicators (KPIs) on how fast you were able to deliver the merchandise and perform the work. But if you’re working on complex assets in demanding environments like mines, tunnels, or bridges you’re much more interested in capturing and leveraging detailed information about the location and condition of assets to improve the overall asset lifecycle management process

Conclusion

Asset intensive industries have been underserved for decades with solutions and mobile technologies designed for field service organizations. The following recent trends are forcing these industries to take a fresh look and seek mobile solutions that address their unique pressures and priorities:

- Reduced revenues and sources of capital due to the global economic crisis
- Aging workforces and employee turnover increasing the need for knowledge-based solutions in the field
- Aging infrastructure and increasing demand forcing enterprises to move from reactive to preventive maintenance
- Environmental trends promoting a need for field optimization and best practices to reduce carbon footprints
- New green segments in energy-related industries demanding new work forces, new skill sets, etc.
- Increasing public scrutiny forcing increasing and changing regulation, particularly in developing countries where health/safety/ compliance previously was less of a consideration
- Increasing regulation/compliance requiring repeatable and reliable processes in the field
- Growth in non-traditional business lines (for example, consumer energy related products and offerings)
- Increasing security demands
- Smart Grid technologies

Asset service organizations must thus increasingly seek mobile asset service solutions that enable their field operations to:

- Detect required maintenance actions earlier, to increase proactive work and reduce reactive work and associated costs
- Respond more quickly to events without undermining the preventive operations
- Know the locations and availability of maintenance resources, including people in real-time
- Allocate resources more effectively for quick response, including safety emergencies
- Respond more organically to changing priorities
- Better enforce safety standards
- Greatly reduce the risk of catastrophic asset failure
- Comply with regulatory and legal requirements more easily
- Prolong asset longevity
- Ensure operational continuity

A mobile solution designed specifically for asset service can pick up where traditional mobile field service solutions stop, to fully meet the needs of asset intensive businesses.

About Ventyx

Ventyx, an ABB company, is the world's leading supplier of enterprise software and services for essential industries such as energy, mining, public infrastructure and transportation. Ventyx solutions bridge the gap between information technologies (IT) and operational technologies (OT), enabling clients to make faster, better-informed decisions in both daily operations and long-term planning strategies. Some of the world's largest private and public enterprises rely on Ventyx solutions to minimize risk, enhance operational and financial performance, and execute the right strategies for the future.

To learn more about Ventyx solutions visit **www.ventyx.com** or contact a Ventyx sales representative today.