

Four Steps to Building an Executable Digital Transformation Roadmap for your Mid-Sized Manufacturing Operations.

InSource Solutions
Whitepaper

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Abstract

An effective digital transformation of plant operations requires more than technology. It must also plan for changes in people and processes, then apply disciplined execution to achieve and sustain consistent and predictable results. Employee-owned ***InSource Solutions*** *has a proven roadmapping methodology that can drive — and accelerate — greater efficiency, productivity, and profitability in your manufacturing or industrial enterprise, just as we have done for thousands of other clients This white paper will explain this roadmapping model in greater detail and how it can deliver a technology-agnostic and executable digital transformation plan with specific and prioritized steps that will provide tangible results to readers' operations.*

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Digital transformation, turning hype to reality — and results

For the first time since the 1980s when the U.S. began outsourcing manufacturing to lower-cost countries in a big way, the tide has turned. Now, with "onshoring" in vogue, it's time to reinvent manufacturing in America. However, for small and medium size industrial enterprises, doing it alone can require skills and resources they may lack, plus pose all kinds of potential pitfalls. These can make a journey toward a plant's modernization seem an uncertain endeavor full of risks. That's where InSource Solutions can help.

Today's U.S. manufacturing landscape is diverse. Highly regulated domestic industries, such as food, beverage, pharmaceuticals, and life sciences, as well as highly competitive commodity ones, such as consumer packaged goods, have embraced automation and digitalization in their operations to expand their margins and market leadership. So have the aerospace and automotive industries.

Of course, the top firms in these industries, mostly public companies, have long had the large capital resources to make the needed investments. In contrast, many privately owned U.S. manufacturers — often suppliers to these larger companies — have kept pace with their customers' demands as best they can, using legacy equipment and processes operated by veteran personnel, albeit with increasing challenges on numerous fronts.

Modernization challenges facing small and medium-sized manufacturers

Among these latter companies, their capital-intensive production infrastructure may often be outdated. Although their machinery may have been depreciated long ago, downtime and the need for greater flexibility may well be increasing. Spares and repairs typically become more difficult to get, while the tribal know-how to operate, maintain, fix, and improve equipment is shrinking with worker retirements.

As a result, it's becoming increasingly hard to sustain internal staff resources with the broad and relevant experience needed to support complex systems and integration among them. Manufacturers need their people to focus on work that drives direct value in the products they provide.

Manual processes may also be showing their shortcomings, especially in accurate and timely data collection as well as in quality management and root-cause analyses. Even if data is being collected from the field level and upwards, many manufacturers don't have the capacity or expertise to use it to their advantage. Still, the idea of a full digital transformation of their operations may seem more hype than an achievable reality with tangible results and worthwhile returns on needed investments.

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These issues not only have hard costs associated with them but opportunity costs, too, in terms of competitiveness, brand reputation, and employee staffing and retention. If those challenges weren't enough, the world's business context has dramatically changed in recent years:

- **Inflation**. While many manufacturers can pass on inflation's costs to customers with higher prices, their products become unaffordable eventually, so revenues start to drop.
- **Pandemic disruption.** Although the global pandemic has subsided, its worldwide supply chain impacts have been profound. We see an increased need for more efficiency and agility on production floors to contain costs and respond faster to changes. This has made operational resilience even more of a competitive advantage today.
- **Sustainability.** In an age of environmental, social, and governance (ESG) concerns, companies of all sizes face pressures from various stakeholders, including customers and employees, to have greener, more sustainable operations by reducing energy use, emissions, and waste wherever possible.
- **New buying behaviors.** As B2B customers and their ultimate consumers continually shift their preferences and buying behaviors, manufacturers must be able to adjust production to align accordingly. Flexibility is key, from procurement through final product delivery.

To stay competitive in such dynamic business and economic environments, manufacturers are seeking to apply new technologies and practices in their plant modernization efforts. But, as with so many such initiatives, it's easier said than done.

Avoiding DIY pitfalls and the shortcomings of big consultants

Fact is, doing an end-to-end or even a partial digital transformation of mission-critical production processes cost-effectively and with minimal disruption using inhouse resources can be difficult. That's especially true given the need to maintain current production schedules and customer commitments, but having limited expertise among your staff, who also have their day-to-day jobs to perform.

Unfortunately, many industrial enterprises have attempted massive digital transformations focused primarily on technology, sometimes driven mostly by their vendor and resulting in costly failures. These companies are understandably reluctant to attempt such initiatives again. At the same time, other manufacturers don't know where to start or how to move forward, so they may turn to big consulting companies for help with their digital transformation journey.

In too many of the latter cases, after a manufacturer has invested a lot of effort, time, and money, the consultants — who may never have worked on a factory floor — deliver as their plan a high-level vision of digitalization's end-goal but with little advice on achieving it. In fact, it's often drawn from a template used for other clients in a similar industry and adapted for a particular client's circumstances.

What's lacking is any specific evaluation of their client's current processes and overall digital maturity, guidance on how to implement better ways of working and where to start, plus a prioritization of those steps in the form of a roadmap that ranks each step with its business value and potential ROI.

Put manufacturing veterans to work for you

InSource Solutions is different. Our consultants and customer success team members *live and breathe* manufacturing. And, as we'll explain in more detail later in this paper, our four-step digitalization roadmapping process provides what's mentioned as missing above, in great part by following the ISA-95 model set forth by the non-profit International Society of Automation (ISA).

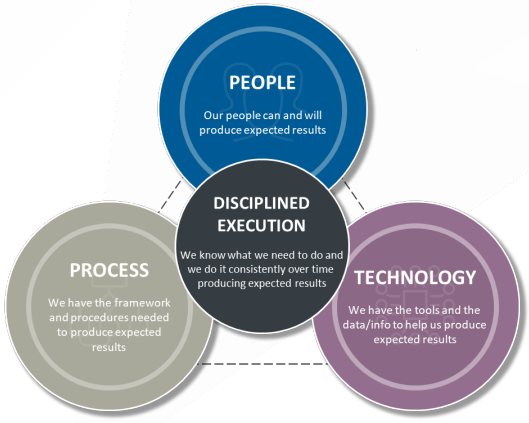
We also seek to ensure your plant modernization aligns with your business goals. To achieve that, we employ the key performance indicators (KPIs) of the non-profit Manufacturing Enterprise Solutions Association (MESA) International. These assist our clients in prioritizing where in their operations new technology investments can deliver the most value, then helps measure that value's realization.

Even more importantly — and again, unlike most consultants and technology providers, including system integrators — we know that goal-setting and technology point solutions are insufficient for effective plantwide modernizations. People and processes must change, too. That's why our digital transformation roadmapping also considers the changes needed across your people and processes, while striving to preserve as much of your existing infrastructure as economically feasible.

Who is InSource Solutions?

Based in Richmond, Virginia, we're an employee-owned firm consisting of veteran manufacturing engineers and supporting team members who realize that technology alone is insufficient for reinventing American manufacturing. People, processes, and disciplined execution

To integrate people, processes, and technologies, we provide our clients industry-leading offerings — hardware, software, and services — from world-class suppliers, including AVEVA Solutions (formerly Wonderware). But overall, we are technology-agnostic. We focus first on desired outcomes and can integrate a client's preferred vendor technologies as well as interoperate our solutions with their legacy OT environment.
We invite you to find out more about what we can do for your industrial operations by visiting us at https://insource.solutions



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Building closed-loop data flows for continuous performance monitoring and feedback

At InSource Solutions, our digital roadmapping process ensures we keep your business goals always in view to shape the plan we're creating for your enterprise. It then facilitates data flows from your customer to your shop floor and back again for a closed loop of continuous performance monitoring and feedback. This enables and enhances these five important capabilities every modern manufacturer should have as integral in their operations:

- **Visibility and traceability** across the entire organization to view enterprise-level KPIs and scorecards aggregated from multiple plants and edge devices. This also allows you to selectively share operations data across your enterprise, supply chain partners, and customers.
- **Schedule optimization** that synchronizes your supply chain, sales and operations plans around improving delivery times, quality, and business agility while reducing costs, waste, and rework.
- **Manufacturing execution** that enables you to align your work processes and operate according to optimized production schedules.
- **Connected workers** empowered to apply themselves in ways to improve productivity, quality, and safety measures; to reduce errors in manual processes and hand-offs; and to continuously develop new skills.
- **Advanced analytics** to monitor KPIs and provide insights into improving operations in terms of reliability, efficiency, quality, and sustainability, the latter by cutting waste and energy use. As appropriate and available artificial intelligence (AI) and machine learning (ML) can be introduced for real-time condition monitoring, condition-based maintenance, and other applications.

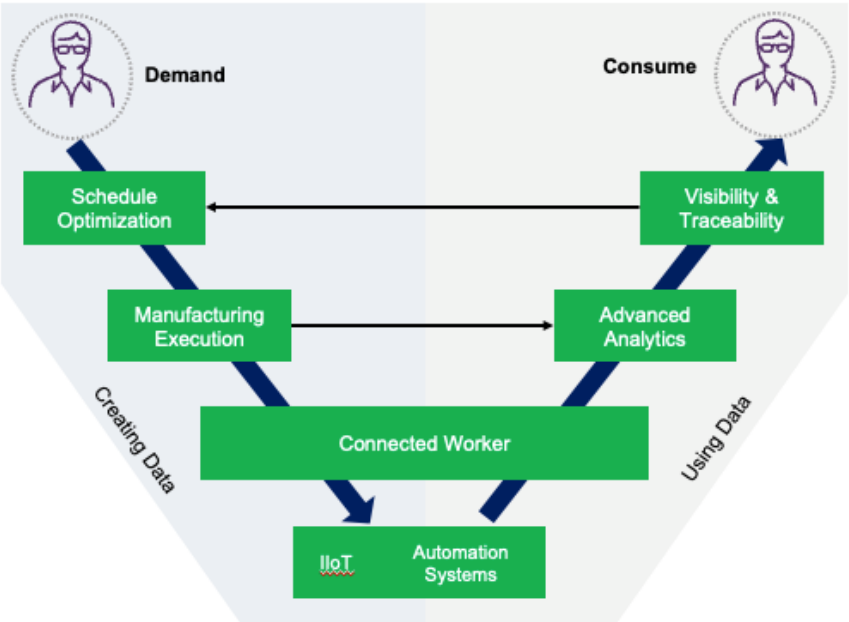


Figure 1. *Five key capabilities needed for success are enabled by closed-loop data flows from the plant floor to the customer and back.* (Diagram credit: AVEVA)

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Four steps to building an effective digital transformation roadmap

The high-tech industry has used the roadmap metaphor since its beginning. Technology roadmaps. Product roadmaps. Launch roadmaps. Many other industries use the term, too. After all, it's a great way to describe the journey — including anticipated twists and turns — from today's current state of a company's operations to a future state, which will presumably improve business outcomes.

At InSource Solutions, when we develop a digital transformation roadmap for clients— a process we call "roadmapping" — it's actually the final deliverable with specific, value-scored action steps to get you to the destination.

We derive it by closely collaborating with you and your key stakeholders, which typically includes IT, engineering, floor personnel, and relevant back-office and third-party partners. With all these stakeholders substantially involved, the organizational change management that's required (e.g., technology and process communications, training, adoption, and utilization) is usually much easier.

Our InSource Solutions roadmapping process involves these four high-level steps with more details about each following:

#1. Determine your destination — future state, aligned with business goals.

#2. Understand where you are now — current state of people, processes, and digital maturity.

#3. Assess improvement options — ranking their operational value and prioritization.

#4. Roadmap delivery — specific 1-, 3- and 5-year plans for digital transformation and modernization.

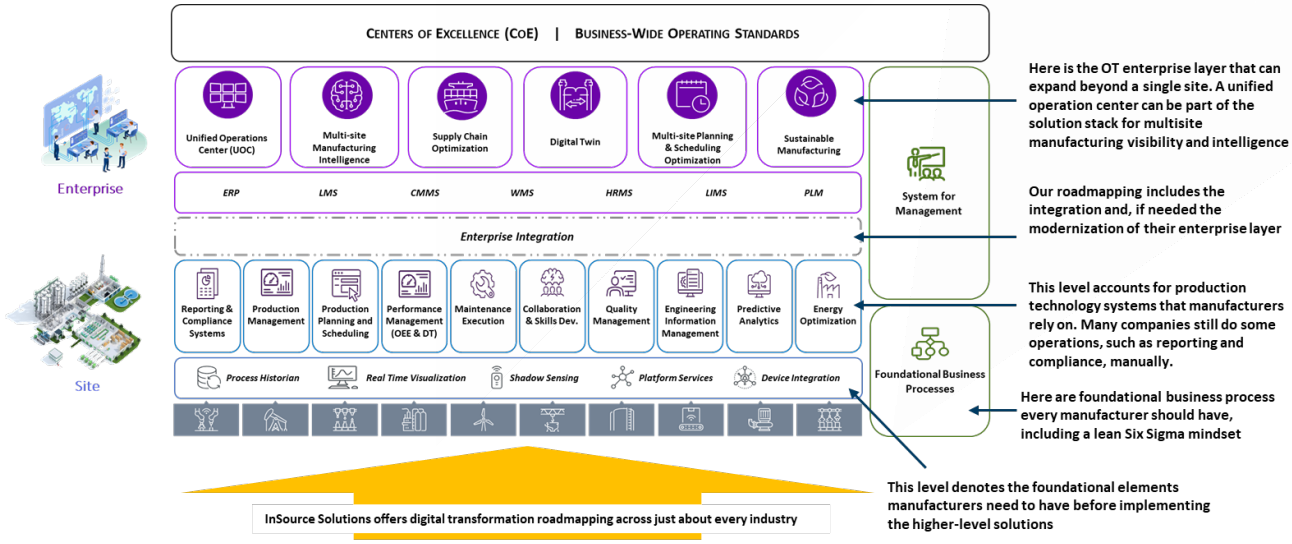


Figure 2. *The comprehensive, multilayered basis of the InSource Solutions digital transformation roadmapping process.*

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1. Determine your destination — a future state aligned with business goals

With onsite visits and deep discussions with stakeholders, we seek to understand your business thoroughly: its current business and economic context; and what trends in those contexts are most affecting your operations, sustainability, profitability, growth, and competitiveness.

A clearly defined destination — with its value rationale, business drivers, and guardrails against risks — will provide your organization the all-important "why" behind your digital transformation to enlist everyone's support in its success.

Our team will also look at pressures and what you are looking to achieve. For example, we want to understand if you have any problems with product quality, capacity, or have lots of downtime. Are you looking to transform the way you work? As mentioned, your InSource Solutions team members include manufacturing veterans who can discuss these and other operation issues knowledgeably and understand underlying issues and downstream impacts.

2. Understand where you are now — current digital maturity and state of people and processes

The next step in our digital transformation roadmapping is to evaluate your operations' digital maturity. In fact, we use 224 ISA-95 benchmark criteria across the following 10 functional areas:

1. Order processing
2. Production scheduling
3. Production control
4. Material and energy control
5. Procurement
6. Quality assurance
7. Product inventory control
8. Product cost accounting
9. Product shipping administration
10. Maintenance management

Below are the criteria that the ISA considers to be baseline characteristics of a modern manufacturing enterprise. Figure 3 shows the ranking system we use to evaluate the ISA-95 criteria and determine your organization's digital maturity. On a scale of 0 to 5, the latter indicates the most digital maturity.

Score Rank	Digital Maturity Scoring Benchmark Criteria
0	Not Applicable
1	Paper-based records, manually input; or procedure doesn't exist
2	Paper-based records, transcribed to digital form. More than 1 hop to digital
3	Digitally entered and viewed electronically but not a part of a larger system with processing rules engines, i.e., data entered directly into Excel spreadsheet
4	Digitally entered and viewed but disconnected from other business systems
5	Digital and fully integrated and automated

Figure 3. *ISA's digital maturity scoring benchmark criteria*

We also use the MESA KPIs, such as those in Figure 4, to help you see where operational changes — whether involving technology, processes, people, or some combination of the three — can have the biggest positive impact on your operations and business.

This way, we can use research-validated KPI improvements when finalizing your digital transformation roadmap, so you can prioritize the investments we may ultimately recommend (after our assessment) based on the greatest value they will bring to your enterprise and customers.

MESA KPI	Improvement Range
MFG Expense per unit	10% reduction on average
Adherence to schedule	3.5% improvement
Materials per standard unit	Upwards of 7.5% decrease
Volume	Range of 7-17% improvement
Yield	Reduce extract losses by 3-10%
Inventory	10-20% reduction in inventory
Process variability	5-10%reduction in process variability
Quality	Improve first time right by 5-15%
Productivity	Improves productivity by 8-18%
Sustainability	Decrease WAGES consumption 5-25%

Figure 4. *MESA KPIs used to gauge business value of operational changes to help prioritize investments in digital transformations.*

Diving deeper into your manufacturing operations, we walk your plant floor to learn about its production information flows, talk to your people, including line workers and supervisors, to validate those flows. We produce a comprehensive, end-to-end schematic of the flows as shown in Figure 5. While doing so, we look for improvement opportunities.

The schematic in Figure 5 came from an InSource Solutions beverage client and represents one example of the problems the company was experiencing prior to embarking on digital transformation road mapping, Due to the large amount of manual information handoffs, there was an assumption that it had sufficient inventory of lids to fit on a large run of cans about to be filled with one of their beverages. When the assumption was found to be faulty, production had to stop for four hours until enough lids were procured to allow the run to finish. Automation of raw material consumption with real-time production could have prevented this costly disruption and others like it.

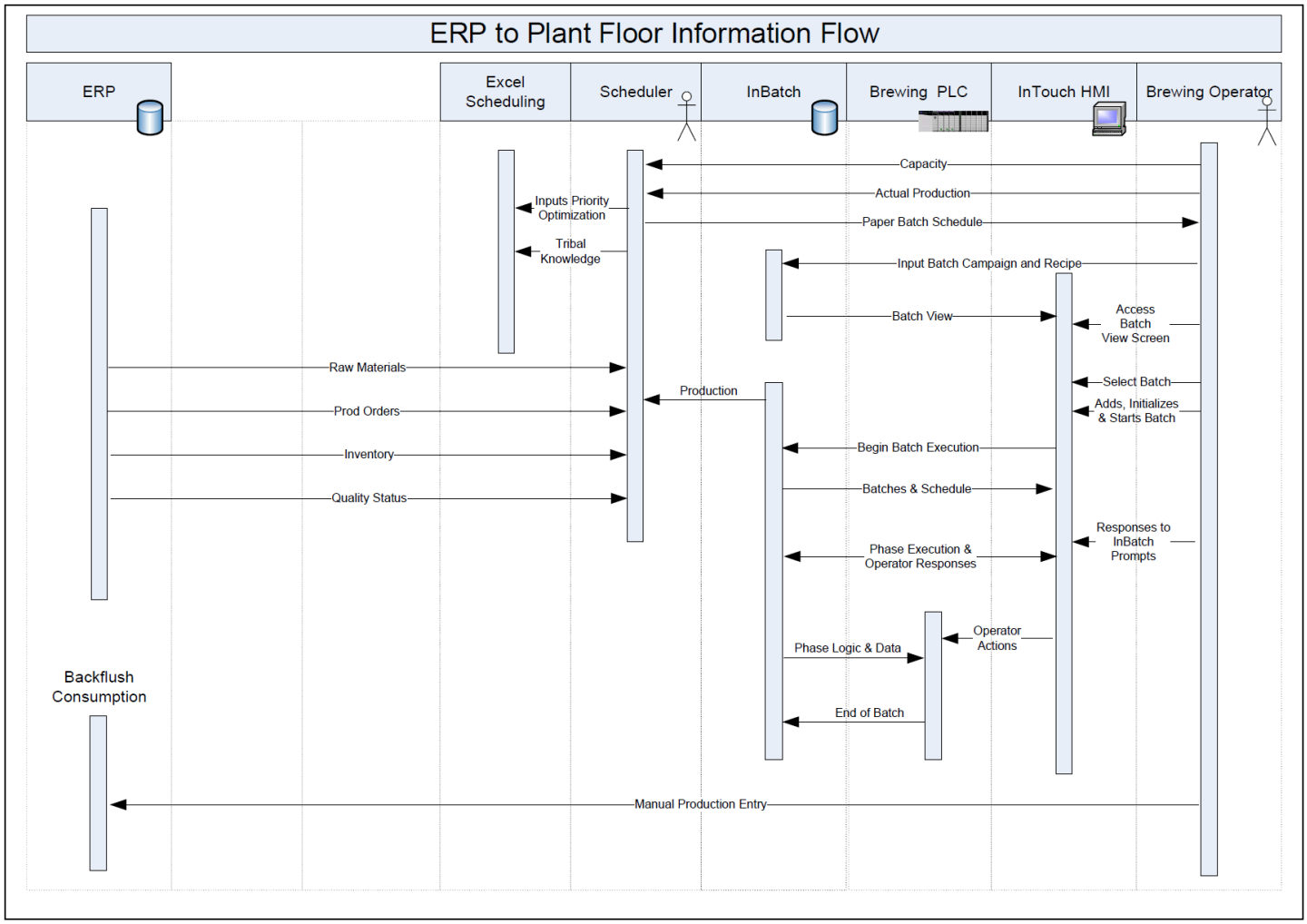


Figure 5. *Diagram showing the information flow from a client's ERP to the plant floor.*

In addition to assessing your digital maturity, we conduct a thorough evaluation of your people and processes. This helps us understand how well your workforce is enabled to drive and maintain the changes that are needed to drive optimal results.

For this we use approximately 120 criteria from nine different categories of Total Productive Maintenance (TPM) and Lean Six Sigma manufacturing principles. While TPM focuses on proactive and preventive techniques to improve equipment reliability by disseminating responsibility for maintenance and machine performance, it also seeks to improve employee engagement and teamwork across operations.

We look at how this process fits into your plant floor's work processes. This is a "boots-on-the-ground" series of activities, including performance walks during different shifts, observing shift handovers and their pre-shift meetings, plus sitting in on daily and weekly plant floor and plant management meetings.

Then, as part of your roadmap report, we provide you with polygon charts of both your digital maturity and our assessment of your employees and processes, shown in Figures 6 and 7. These charts are examples drawn from a recent InSource Solutions client engagement. Not only do they provide visual summaries of where you are relative to your industry averages, they provide us with a starting point to recommend where you make the most valuable improvements.

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Digital Maturity

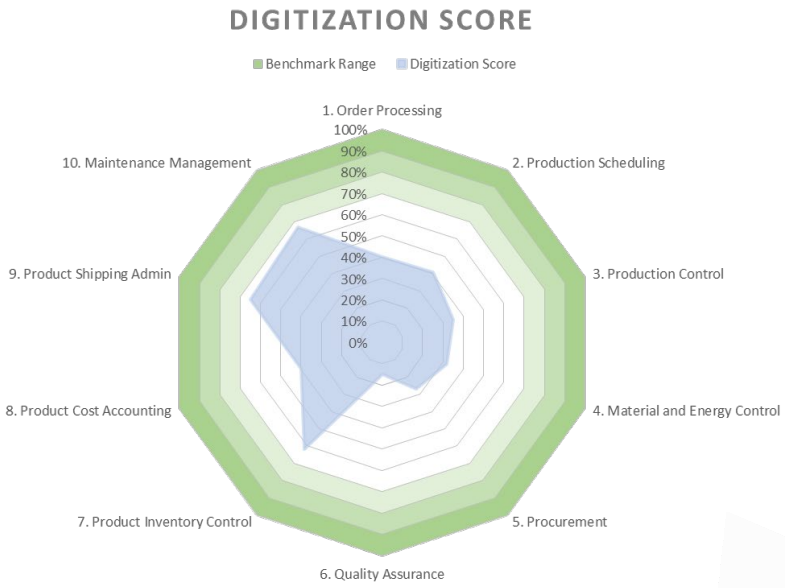


Figure 6. *Star chart showing the digitalization score of an InSource Solutions client. The green rings show the benchmark range of 70% - 100% for maturity. The blue area is the client's digitalization score (i.e.: digital maturity) based on our assessment.*

People and Process Maturity

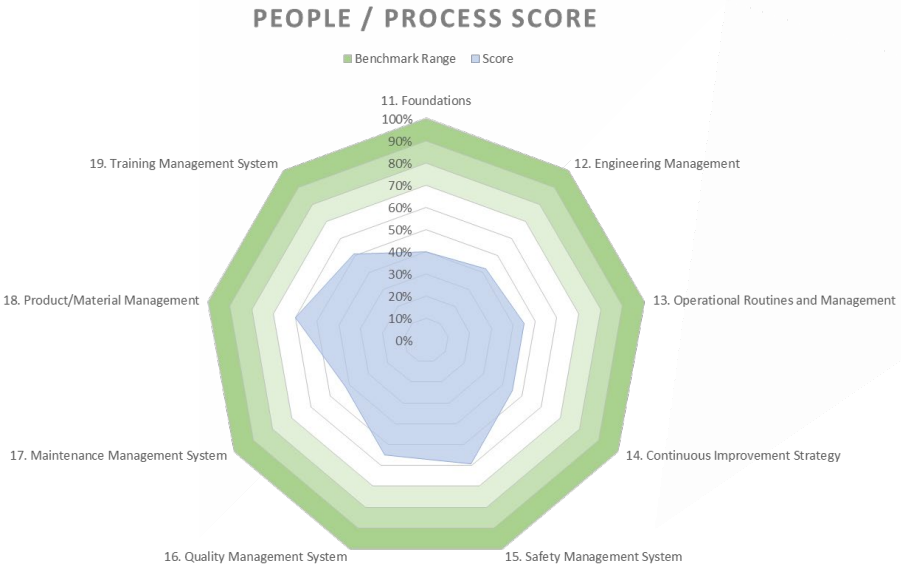


Figure 7. *Star chart showing the people and process score of an InSource Solutions client within a benchmark range of 70% - 100% and assessed in terms of nine different categories based on TPM and Lean Six Sigma foundational ways of working.*

3. Assess improvement options — ranking their operational value and prioritization

Based on our discovery and assessment results from Steps #1 and #2, we will develop a set of recommendations to improve your operations. We'll derive them from successful peer organization digital transformations and on our experience across a wide range of industries.

We will present these recommendations in a graphic format, such as depicted in Figure 8. It combines the technology and people and process assessments into common categories. The areas with the largest opportunity for improvement are shown in the upper left, decreasing in their relative value, as they are shown down and to the right.

This graphic provides a starting point for an interactive discussion with stakeholders about the relative merits of our recommendation rankings before making them roadmap priorities.

Once the team has reached a consensus on our recommendations, we incorporate them into your roadmap as the numbered priorities shown in Figure 9.

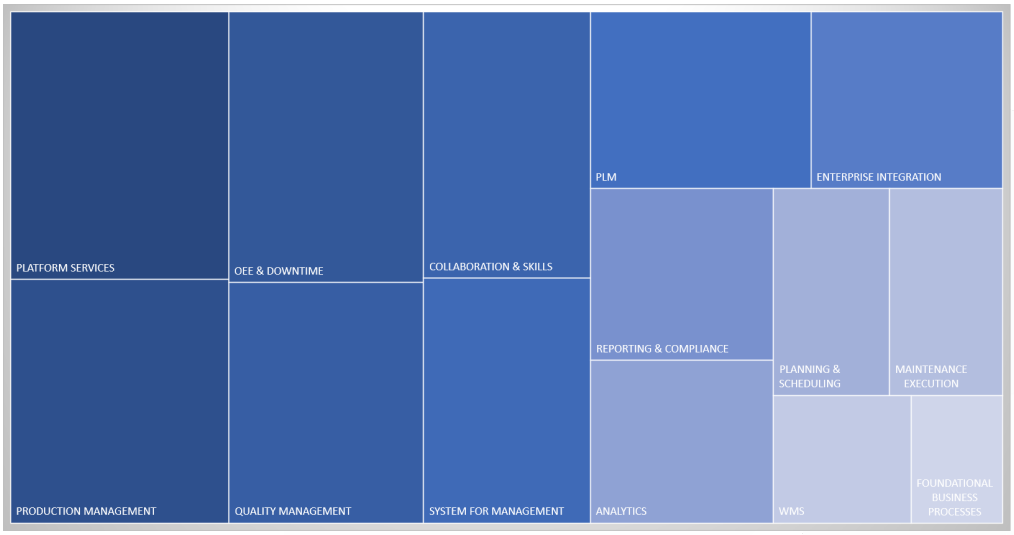


Figure 8. *Graphic illustration of an InSource Solutions combined component value ranking of improvement categories, with the greatest value in the upper left and lesser value in the lower right.*

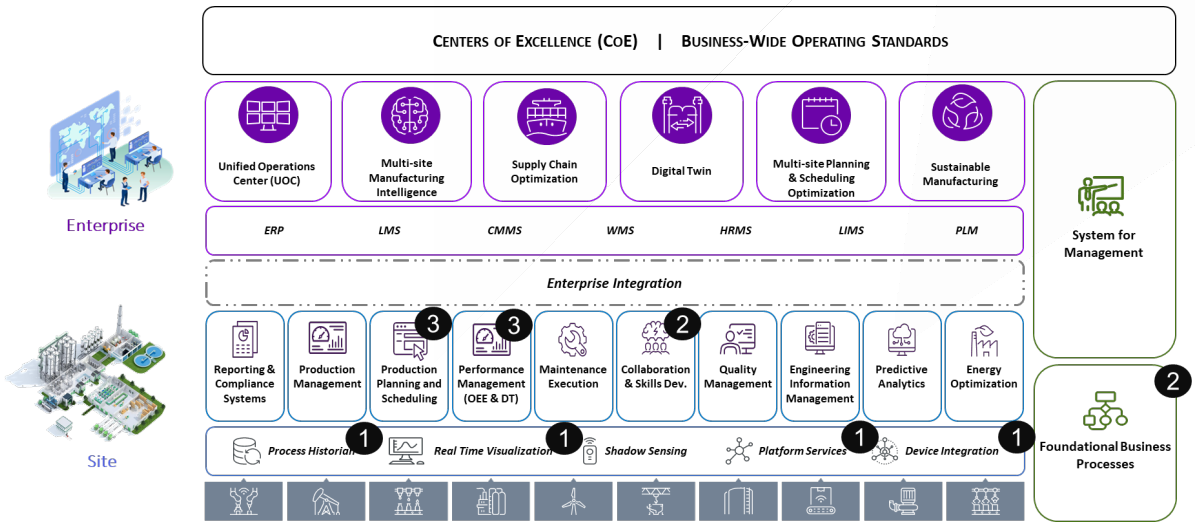


Figure 9. *Your "GPS map" showing where your investment priorities reside on your roadmap with turn-by-turn investment recommendations.*

4. Roadmap delivery — specific 1-, 3- and 5-year plans for digital transformation and modernization

At this point, we'll be ready to deliver an actionable roadmap of 1-, 2- and 5-year durations that will provide you specific and value-prioritized steps to increased digitalization in your operations, plus process improvements and ways to better engage your people. Your roadmap will define each step from your starting point as a sequential "turn" that aligns with the priority consensus of you and your stakeholder team and in a logical order that accounts for key dependencies. Each of these turns — they are summaries from an actual InSource Solutions client in Figures 10, 11 and 12 — are backed up in greater detail about what needs to be done.

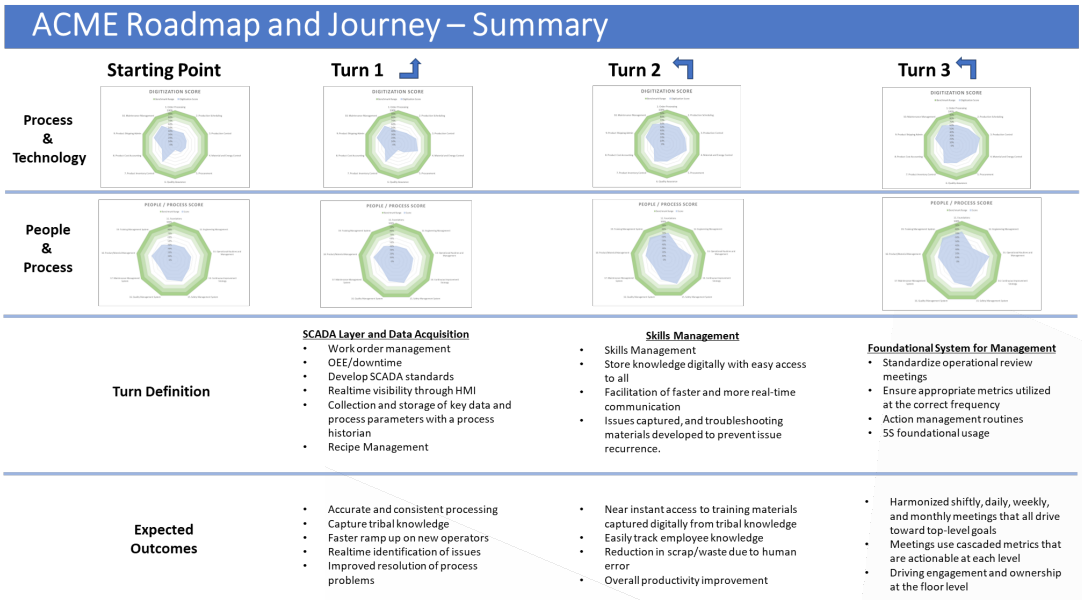


Figure 10. *Client Roadmap and Journey, page 1 of 2, showing specific steps as sequential "Turns" each with substantial how-to backup detail in your deliverable.*

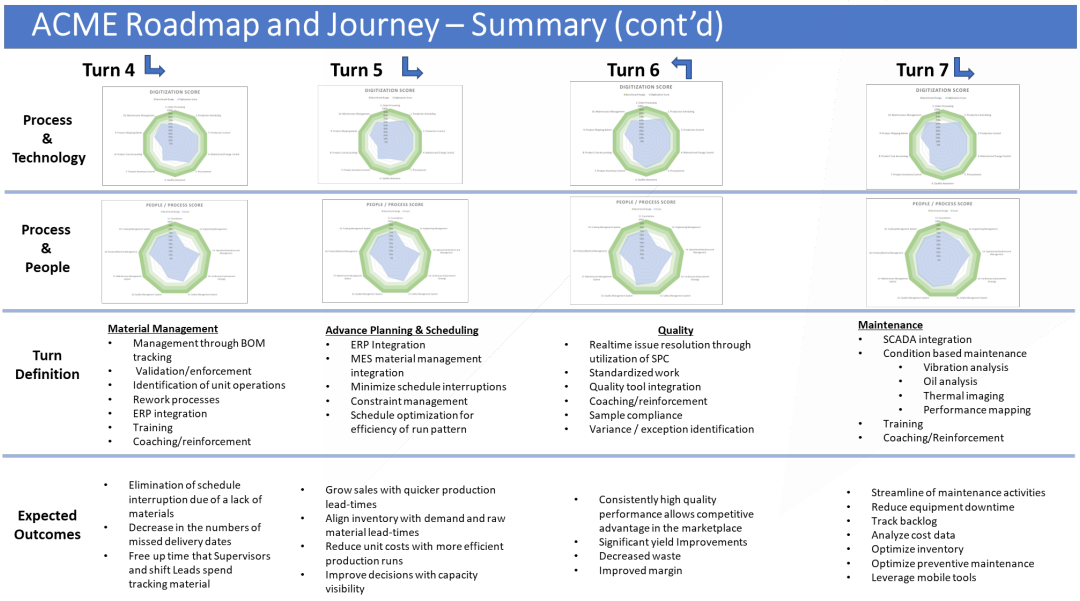


Figure 11*. Client Roadmap and Journey, page 2 of 2, again showing specific steps as sequential "Turns" each with substantial how-to backup detail in your deliverable.*

Item	Description	Maturity	Adoption	Fit
1. Foundations	**Establishing the objectives**	**2.95**	**2.45**	**2.6**
1.1 Goal Alignment	Are the organization's goals and objectives communicated and reinforced throughout the organization?			
Are the organization's goals known by staff? Can they articulate them?		3	3	2
How successful is the organization at achieving the goal?		2	3	3
How do new goals or changes to direction get communicated?		2	2	2
Do staff daily activities and routines work towards the goal?				
1.2 Annual Operating Plan	What is the mechanism for determining next year's forecast, costs, capital activities, and manpower?			
How is the forecast determined and updated?		3	3	3
Who are the key contributors?		4	2	3
What is the financial calendar (fiscal, annual)?		4	3	3
Is it zero based or incremental?		3	3	3
Is there evidence that a 3-5 year strategy/improvement plan has been created?		4	2	3
Are top losses for each KPI used to derive planned improvement projects and KPI targets?		4	3	3
Is the strategic improvement plan used to guide factory's strategic direction and operation?		3	2	2
How do current marker/industry conditions impact revisions?		2	3	2
How does the organization gain visibility to relevant parts?		3	3	2
1.3 Operational Foundations				
Does the site use %S effectively for workplace organization?		2	2	2
1.4 Key Performance Indicators (KPIs)	Are KPIs used, defined, aligned to company goals, and have assigned ownership? Do KPI targets exist to measure real-time behavior and performance?			
What plant level KPIs are used?		2	2	3

Figure 12. *Example of the roadmap we provide for optimizing your processes and people in parallel and in support of your digital transformation. Improvement opportunities are coded in yellow.*

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We ensure your success via disciplined execution

With a detailed InSource Solutions roadmap in hand, the disciplined execution of its prescribed turns is now critical to realizing a return on investment. That's where the InSource Solutions Professional Services Team can come into play.

Our people are experts at orchestrating technology, processes, and people to ensure rapid adoption and utilization of new solutions, then reinforcing the changes to sustain and evolve them well into the future. Ultimately, your digital transformation is not about project success; it's about organizational success.

It's important to keep this in mind: Deploying technology is the easy part, relative to the people part. Time and again, studies have shown that major technology implementations can fall short of delivering their expected outcomes because organization change management was neglected.

That's why your successful digital transformation involves more than the proper installation and commissioning of the required technology solutions. It also demands that the associated process changes occur. Even more, you must plan for effective change management that starts at the top with visible executive sponsorship and then frequent communications of the "whys" and "hows" among all of the employees and supervisors across your plant floor as well as those back-office staff supporting them. Getting input and feedback from these different stakeholder groups will ultimately accelerate adoption and utilization during and after the launch of your new systems, processes, and workflows.

Adoption coaching for faster utilization, business outcomes, and investment returns

While InSource Solutions offers professional services for your initial deployment, configuration, and commissioning of your technology solutions, we also offer technology adoption coaching and management consulting via our SightBridge™ System for Management consulting group. If you have gaps in your staffing or plant floor expertise, our managed services can help you close them.

After core application training, every solution needs to be incorporated into your plant floor's daily routines to achieve lasting success. Asking operators, supervisors, and staff to exit basic training and immediately dive into day-to-day application is a major risk.

Given our experience in manufacturing, we know users need regular, interactive reinforcement to move from basic knowledge to understanding to fully valuing the new toolset they're using. The SightBridge™ System for Management not only ensures communication; it guarantees adoption. Using it, we will operationalize your solution and maximize the value it brings to your business, as shown in Figure 13.

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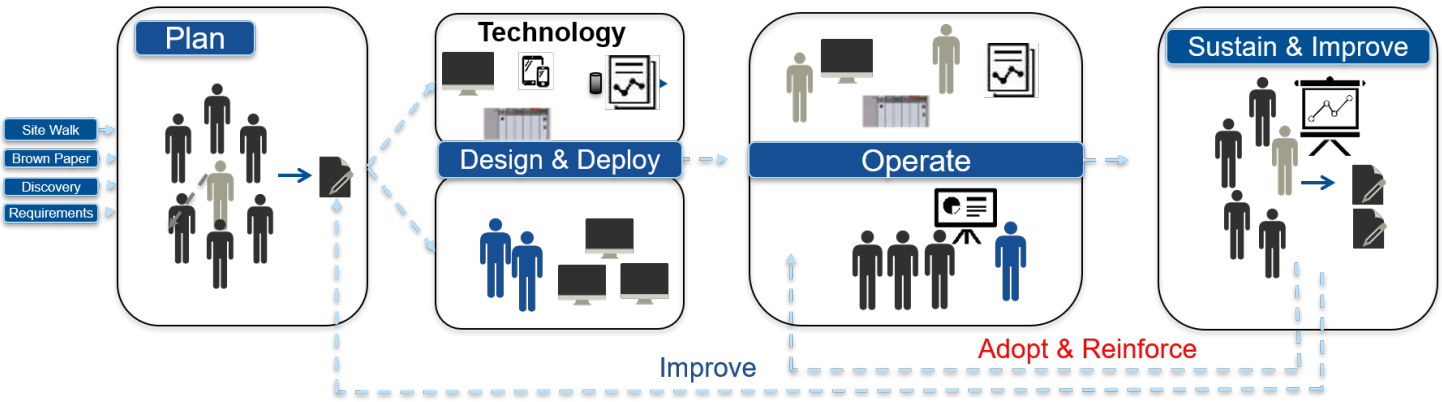


Figure 13. *The SightBridge™ System for Management can provide adoption coaching for faster utilization, business outcomes, and investment returns.*

The illustration emphasizes “Adopt & Reinforce” because new technology is useless without adoption. And positive reinforcement of its use through recognition of its constructive impacts (qualitative or quantitative) on factory performance will help increase its utilization, which will, in turn, help to maximize return on investment.

A common misconception is this the job of workers’ supervisors. While supervisors must certainly be engaged and trained as change agents, experienced outside assistance can help build everyone’s confidence and trust in the new solutions.

In that role, we will work shoulder-to-shoulder with your plant floor team across all shifts to ensure their questions are answered, issues are addressed, and training gets positively reinforced. Ultimately, this results in the right data being captured, used, and appropriate actions being taken as a result.

Too often, we witness a solution’s deployment that is almost effective but needs a champion to move the group from tacit acceptance to the full adoption and realization of its full value. We will align your reports, dashboards, and workflows with how your team operates and act as the champion during the implementation phase of meetings and interactions. The local team will have moved from basic understanding to seeing the tools used effectively using a personalized management system.

Success stories from the private and public sectors

Universal Fibers

Saved 1,000s of Hours Yearly in Creating Certificates of Analysis



Problem

Transform quality system from a practice to a competitive advantage

Solved through

Removing manual data collection and reporting through a fully integrated IoT solution. From debated quality results to daily reports for approval with a complete work record of accountability.

Seminole County, Florida

Efficiency Serving 440,000 Residents



Problem

Efficiently deliver safe drinking water to 440,000 residents with lean staff

Solved through

Reliable operating standards with real-time views and reports generated on demand in minutes with autosave and fast disaster recovery for the system.

Start your digital transformation journey today

As manufacturers and other industrial enterprises in both private and public sectors face growing operational challenges from aging infrastructure, misaligned or outdated processes, and workforce retirements, the need for a comprehensive modernization and digital transformation becomes more urgent.

InSource Solutions stands ready to assist with technology-agnostic solutions, process design, and adoption coaching,— throughout an engagement lifecycle that for many of our clients lasts years if not decades.

With InSource Solutions as your strategic partner and trusted advisor, your modernization journey starts with our four-step digital transformation roadmapping process we detailed in this paper and recap here:

#1. Determine your destination — future state, aligned with business goals.

#2. Understand where you are now — current state of people, processes, and digital maturity.

#3. Assess improvement options — ranking their operational value and prioritization.

#4. Roadmap delivery — specific 1-, 3- and 5-year plans for digital transformation and modernization.

Since our 1997 founding as an employee-owned firm, our team of veteran manufacturing experts and their supporting professionals have led hundreds of modernizations across scores of different industries. This cross-industry experience enables them to bring ideas and best practices from one industry to another.

They understand business and keep up with ever-changing technology and trends that these days include smart sensing, cloud and edge computing, artificial intelligence and machine learning, advanced data analytics, cybersecurity, and much more.

Most importantly, they know how to cost-effectively apply these technologies in manufacturing and industrial operations to achieve tangible business outcomes. They can do so while minimizing the costs and risks of DIY approaches.

We invite you to visit us at www.insource.solutions to learn more or contact us to schedule a complimentary, no-obligation consultation to discuss your needs and how InSource Solutions might help you to address them.

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Why InSource Solutions?

InSource Solutions is your adept partner, providing the insight, experience and expertise to help businesses like yours drive continuous improvement initiatives — with proven world-class solutions. Today, those solutions are at work within some of the world's largest and most complex manufacturing environments.

About InSource Solutions

InSource Solutions is a 100% employee-owned, North American-based leader in simplifying success for industrial environments by integrating technologies, optimized processes, and empowered people to drive outcomes. InSource transforms manufacturing using software, and IT hardware combined with professional services for initial deployments and upgrades, managed services, and adoption coaching. InSource delivers digital manufacturing solutions that are scalable and sustainable. As an AVEVA Select Certified Support and Training Partner, InSource conducts in-person and virtual training to enhance the utilization of AVEVA software solutions.

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