Boosting Success of Global MES Rollouts

By combining Agile principles with a three-phase methodology, organizations can reduce the complexity and increase the speed of their global manufacturing execution system implementations.

Leading manufacturers are known for embarking upon global programs that optimize technology advancements, in the interest of achieving enterprise visibility, manufacturing excellence and a competitive edge. Examples include manufacturing and business process harmonization, IT systems consolidation and standardization across diverse plants.

So it’s no surprise that many manufacturers are incubating or executing global manufacturing execution system (MES) programs as part of their manufacturing strategies. MES implementations are challenging enough, but global MES programs involve even more complexities (see Figure 1). Typical MES challenges include selecting a best-fit MES system aligned with the company’s IT vision; choosing the right solution and implementation partner; adopting the best approach for the organization; and assembling a team with the optimal sourcing mix, including internal, external, onsite, near-shore and offshore resources.

Additional challenges of global MES include regulatory compliance, steady-state support/sustainability, language, culture and time zone differences. In the absence of a holistic, systematic and proven approach, manufacturers continually review whether they have chosen the correct system and the right partners and question whether they are following the correct approach for solution development and deployment.

Key reasons for the failure of an MES project or program include:

- Inconsistent leadership involvement and commitment.
- Faulty selection of the MES products, implementation partners and overall approach.
- Incorrect stakeholder expectations and training for MES.
- Misalignment of the MES strategy with the current and future IT landscape.

Given this scenario, manufacturers can increase their chances for MES success by using a scientific and proven deployment methodology that ensures a uniform and accelerated deployment. A deployment methodology institutionalizes processes, tools, templates and deployment best practices, and it guides teams through all stages – from initial planning and preparation, to product/partner selection and solution development, deployment and support. This white paper lays out broad guidelines for following a methodology that maximizes the success of a global MES rollout.
Mapping a Methodology

At a high level, a global MES implementation methodology includes three phases: plan, assess and collaborate/execute (see Figure 2). The following sections delve more deeply into each of these stages.

Phase 1: Planning

A meticulous approach to strategic planning is one of the most important ingredients for the success of any program. This is the time when companies identify the current state, scope and business objectives for the MES rollout and map the strategy for achieving these goals. Strategic planning should be conducted under the guidance of the manufacturing leadership team.

While planning, manufacturers should define the following, taking into account internal organizational factors (e.g., vision, mission, culture, challenges, IT roadmap and budget constraints), as well as external environmental factors (e.g., technology/market trends, competition, regulatory requirements):

- **The manufacturing information technology plan:** Identify strengths and weaknesses and determine prioritized improvement opportunities, along with their implementation roadmap.
- **Scope:** Define the scope for executing the next phase. For example, the organization needs to decide on whether to focus on a particular business, geography or category of IT systems or a combination of these.
- **MES assessment projects:** Identify the representative manufacturing sites that are good candidates for conducting MES assessment studies in the next phase.
- **Investment planning:** Allocate resources and budget for the next phase, as well as high-level financial planning to support the implementation roadmap.

Three-Phase Methodology
Manufacturers should use assessment tools, such as surveys, workshops, competitive analysis and opportunity analysis frameworks, to execute this phase effectively. This planning exercise will result in an MES strategy that considers both internal and external factors, thus ensuring alignment with the organization's goals, vision and mission.

For instance, an organization with the strategic goal of increasing throughput and regulatory compliance may discover that real-time dashboards of plant production performance would provide a competitive edge. Alternatively, the assessment may reveal that the company's cost of regulatory compliance is high when compared with industry benchmarks. The data points revealed in this phase will play a crucial role in shaping the MES strategy.

Phase 2: Assess, Analyze and Define
Once strategic planning is complete and the need for the MES system implementation/upgrade is identified, the manufacturer should conduct an assessment of the MES landscape at all in-scope plants. Such a global assessment can be accomplished by collecting information on the business, manufacturing operations and technology through surveys, questionnaires, meetings and a review of current documentation.

Following this assessment, a more detailed analysis needs to be conducted at chosen plants through on-site visits, interviews, workshops, operations data collection, reports and documentation. Data collection should include key performance area (KPA) and key performance indicator (KPI) trends/targets, as-is architecture, functional mapping (L1 to L4 shop floor layers), business and manufacturing process maps, current pain points and new requirements.

By analyzing such data and comparing the findings with industry best practices, manufacturers can define scope, to-be process maps, enterprise system architecture (L1 to L4 layers), a global MES template and an implementation roadmap. Manufacturers should use site requirement questionnaires, a requirements consolidation framework, and requirements mapping for commercial off-the-shelf (COTS) software to perform these activities.

This analysis will give manufacturers a fair idea of the kind of solution they need. This can range from a pure COTS solution, to a customized COTS (hybrid) solution or pure custom solution. Experience shows that a hybrid approach is the most sought-after, as it gives manufacturers a robust data model and proven system architecture, while allowing system customization to suit evolving processes and enable competitive differentiators. Armed with this to-be solution information, manufacturers can then assess the available MES solutions through product evaluation procedures, such as a request for information, request for proposal and MES product evaluation framework.

Another decision is the selection of local or global implementation partners, which should involve a cost-benefit analysis, ROI calculation and the development of a quantitative/qualitative business case for MES implementation. The business case will help in cost-justification, drafting a feasible approach and benchmarking at a later point in time to take corrective measures.

The key outputs of this phase can be summarized as:

- MES requirements and to-be process maps.
- MES implementation roadmap.
- MES product and implementation partners.
- Business case for MES deployment.
- Program management plan.

Phase 3: Collaborate and Execute
This tactical phase is aptly named because collaboration and execution are the overarching themes from the very beginning of an MES program. The first step here is to build global teams to execute project plans and activities. These are truly wide-ranging activities, involving disparate stakeholders who must collaborate to ensure success.

At a fundamental level, this phase leverages Agile methodology concepts, and works in an iterative or incremental fashion on two important fronts: Solution development and site deployment. Each iteration results in the development of new features in the MES solution, version release and subsequent implementation at the relevant manufacturing sites. The foremost step in this phase is to build dedicated teams with defined roles and responsibilities (see Figure 3, next page).
Other teams that play an important role (and may already exist) are the enterprise resource planning (ERP), automation and application support teams. For a multi-year global program involving many plants, manufacturers can also establish an MES center of excellence, comprising key SMEs who brainstorm on critical technical challenges, provide thought leadership and transform experience and sticky knowledge into program assets. Some of the important teams and their roles in a global MES rollout include the following:

- **Program management**: This team should own and drive this phase from start to finish by coordinating and synchronizing the efforts of the other teams to achieve the overall program objectives of cost, quality and schedule. Program management should help build the project teams; ensure training; establish processes for governance, reporting and communication, knowledge management, collaboration, risk and issue management; and define KPA/KPIs and other enablers to ensure that successive MES development and deployment cycles are smooth, quick and effective.

  The program management team also needs to leverage a global delivery model for various project teams, with a mix of onsite, near-shore and offshore team members. This would contain costs and reduce lead time, as work can happen around the clock in a follow-the-sun model. Lastly, no matter how well the program management team is orchestrating, there will always be room for improvement. Thus, it is very important that the team takes time to review current processes, invite feedback and consistently work for continuous improvement.

- **Process standardization**: This team takes ownership of in-depth process analysis at each plant, identification of common processes and best practices, and drafting of to-be solution functionalities, such as process maps, use cases and transaction rules in a reusable form. Following these activities, the team should discuss the outcomes with the solution development team to incorporate the findings into the next solution release. Process harmonization and standardization across globally dispersed plants is a major challenge; manufacturers need a dedicated team of experienced business process consultants to guide them.

- **Solution development**: This team is tasked with building the global MES template, leveraging the identified COTS products. The team works closely with the product vendor, as well as the process standardization team, site deployment teams, and quality and release management teams. Development follows the Agile methodology by initiating each iteration with a new set of requirements and best practices to incrementally enhance the COTS product into the desired MES solution for in-scope sites.

---

**Building the MES Team**
Taking an Agile Approach to Global MES Development and Deployment

(see Figure 4). Such a centrally driven, collaborative approach also helps reduce the testing and validation effort and increase buy-in of the in-scope sites. It is also important to adhere to industry standards such as S-88/95 to ensure maintainability and compatibility with other interfacing systems, such as ERP, controls and automation systems, product lifecycle management (PLM) and laboratory information management systems (LIMS).

- **Training and change management (TCM):** In many cases, too little attention is paid to training and change management. Experience shows that the TCM team plays a very significant role in system deployment and is critical for MES deployments. This is because the end users are shop floor personnel who often struggle to comprehend the big picture and can be reluctant to change. This team’s role is critical to ensuring final acceptance through tools such as stakeholder analysis, process alignment, communication and training. When handled well, training and change management can reduce implementation time, increase final acceptance and boost productivity. The TCM team should be part of the core and site teams and collaborate with these teams on planning, communication, content creation, translation and delivery (see Figure 5, next page).

- **Site deployment:** This team is based at the plants and works as a champion of the MES project. Responsible for all site-related activities, this team should include members with technical, functional, project management and TCM skills, and it should collaborate with the site procurement, infrastructure, ERP, automation, quality and compliance teams to drive MES deployment activities.

The site deployment team should work in parallel on various fronts, such as infrastructure, system, documentation and site training, and change management. Infrastructure preparation should include both front-end (peripheral devices) and back-end (server) readiness. System preparation involves fit-gap analysis, validation, localization, configuration, data migration, recipe design and testing. Documentation includes review, update or creation of various documents, such as site requirements, operating procedures, installation verifications and transition approach.
Deploying MES at a Manufacturing Site

As explained earlier, site training and change management should work in sync with the core TCM team. Figure 5 details MES deployment activities, the transition to production and post-go-live support, and handover to the application support team.

- **Continuous Improvement**: To enable continuous improvement, the program management team should collaborate with other relevant teams to build deployment enablers, such as data replication tools, recipe migration/authoring or update tools, translation tools, templates, estimation frameworks and work packages so that deployment teams operate at peak productivity levels, and deployment cycles are reduced. Following the achievement of a steady state, the manufacturer should also conduct a feedback survey and analysis to ensure expected benefits are realized and corrective actions are taken.

Meeting Global MES Challenges

![Diagram](image)

<table>
<thead>
<tr>
<th>Deployment Challenges</th>
<th>Resolution Through Three-Phase Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Ensure uniformity of deployment at individual sites despite diversity.</td>
<td>1 Global Program Management</td>
</tr>
<tr>
<td>2 Strike the right balance between customization and standardization.</td>
<td>2 Knowledge Assets</td>
</tr>
<tr>
<td>3 Ensure collaboration and minimize redundant efforts of individual project teams.</td>
<td>3 Top-down Approach</td>
</tr>
<tr>
<td>4 Mobilize resources globally while containing knowledge and costs.</td>
<td>4 MES Center of Excellence</td>
</tr>
<tr>
<td></td>
<td>Integrated Global Delivery Model</td>
</tr>
</tbody>
</table>

![Figure 6](image)
Quick Take

Fast Path to Global MES

We worked with a Fortune 10 research-based pharmaceutical manufacturer to launch a global strategic program with the following goals:

• Bridge the gap between ERP systems and shop floor controls and automation systems.
• Transform the manufacturing IT landscape and standardize the diverse application portfolio onto common next-generation technologies.
• Leverage knowledge and best practices across different plants and institutionalize them through the new MES system.

The company was looking for a global IT partner that could provide the required expertise, knowledge and processes to assess site readiness and design, as well as develop an MES solution, execute a parallel implementation and support sites across the globe following the implementation. Our Engineering and Manufacturing Solutions Practice partnered with the client in this strategic initiative, which involved a global MES rollout for over 70 manufacturing plants around the world.

We are providing a broad range of services for solution development, deployment, training and change management, and global program management. Using the three-phase methodology outlined in this paper, we have reduced deployment cycles where possible by roughly 20%. So far, 15 sites have gone live on the new MES system in 24 months (12 of which are integrated with the company’s ERP system), with a few plants going live in as little as 4.5 months. Our approach has also ensured a seamless transition and high system acceptance, while increasing productivity and sustainability.

Overcoming Challenges; Achieving Benefits

The three-phase methodology helps address most of the challenges of a global MES implementation, including the need to ensure deployment uniformity, determine where customization is necessary, enable collaboration and efficiently mobilize global resources (see Figure 6). Once organizations overcome these challenges, they can expect to achieve the following benefits:

• Shorter deployment cycles (approximately 30% reduction).
• Reduced total cost of ownership (approximately 25% reduction).
• Seamless transition, with high acceptance rate and increased productivity.
• Improved risk and mitigation planning.

About the Author

Manoj Kumar is an Associate Director within Cognizant’s Engineering and Manufacturing Solutions (EMS) Practice. He has 15 years of professional experience in the manufacturing and IT industry, with a focus on solution conceptualization/design, requirements management and process modeling for MES, EMI and other shop floor software systems. In the last four years, Manoj has been extensively involved in project and program management of global MES solution development/deployment. He holds a bachelor’s degree in chemical engineering and an M.B.A. from the Goa Institute of Management, Goa. He can be reached at Manoj.Kumar3@cognizant.com.
About Cognizant’s Engineering and Manufacturing Solutions Practice

Our Engineering and Manufacturing Solutions Practice has institutionalized a wide range of mature processes, tool frameworks, templates and industry best practices by arranging them into a three-phase MES rollout methodology, called PACE. PACE lays out a broad and flexible framework that can be adopted by manufacturers at any stage of MES development/deployment.

PACE enablers include:

- **Plan**: Inside-out and outside-in approach, survey questionnaires, competitive and opportunity analysis framework.
- **Assess**: Requirements consolidation framework, product evaluation methodology, site requirements questionnaire, implementation roadmap, MES feature and COTS mapping template.
- **Collaborate and execute**: Repository of templates for the project plan, stakeholder analysis, change impact analysis, communication master, system configuration and data collection template, boot camp, risk-driven testing, KPA/KPI-driven deployment, training plan, go-live tracking template, etc.

About Cognizant

Cognizant (NASDAQ: CTSH) is a leading provider of information technology, consulting, and business process outsourcing services, dedicated to helping the world’s leading companies build stronger businesses. Headquartered in Teaneck, New Jersey (U.S.), Cognizant combines a passion for client satisfaction, technology innovation, deep industry and business process expertise, and a global, collaborative workforce that embodies the future of work. With over 50 delivery centers worldwide and approximately 171,400 employees as of December 31, 2013, Cognizant is a member of the NASDAQ-100, the S&P 500, the Forbes Global 2000, and the Fortune 500 and is ranked among the top performing and fastest growing companies in the world. Visit us online at www.cognizant.com or follow us on Twitter: Cognizant.