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Global MES Rollout Strategies: Overcoming Localization Challenges in Multi-Country Deployments

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Abstract: Rolling out MES across many countries is hard. Each site has its own set of rules, tools, and working methods. A global plan must still fit local needs. That is the challenge. Many companies attempt to use a single MES setup across all locations. This often results in delays, confusion, and resistance from users. What works in one plant may not work in another. Language, regulations, and manufacturing workflows vary from country to country, and even within some cases, from plant to plant. For successful implementations and rollouts, it is crucial to establish a bridge between global objectives and local needs. It is necessary to plan, listen, and adjust throughout the process.

Additionally, support after the launch is just as important as the initial rollout. This study explores the factors that influence the success or failure of global Manufacturing Execution System (MES) projects. It is based on a real case from a worldwide manufacturer with strict rules and complex sites. This study examines the rollout of MES in various countries. It covers the steps, problems, and what leads to success.

The goal is to identify what helps people use it effectively and maintain consistency in system operation across sites. The findings support that both schools and companies learn how to scale MES in real-world settings. This can guide future projects in digital manufacturing. This study is based on a real case from a global manufacturing company. The company operates in a highly regulated, rules-based industry. It rolled out

MES across many production sites. Each site required robust tracking, process control, and integration with ERP systems. The goal was to study how the rollout worked in practice. It examined problems, deployment time, user buy-in, system health, compliance, and integration. The study employed both numerical data and stories to provide a comprehensive picture. Data came from project documents, talks with IT staff, MES leads, and plant supervisors. Surveys and feedback were also taken from floor workers and rollout teams.

Results from different sites were compared after launch to assess their performance. The study found that global MES rollouts can work and lead to strong user adoption. However, success depends on local changes, good planning, and strong teamwork. After rollout, fine-tuning and addressing regional gaps remain challenging and require a clear focus. The study showed that MES rollouts can be completed in approximately three to nine eighth per site. This proves that a global setup is possible. However, success requires precise planning, strong control, and local adjustments. One plan will not work everywhere.

Good rollouts depend on more than just the tech. Require adequate planning, local support, and adaptable regulations. The study offers clear steps for future MES projects. It emphasizes the importance of post-go-live support, user training, and customized plans tailored to each site.

Keywords: Manufacturing Execution System (MES), Global Deployment, Localization, Digital Manufacturing, Multi-Site Rollout, Change Management, MES Rollout, Infrastructure Gaps, Cloud-based Solution, Manufacturing, Sustainability Indicators, Regulatory Compliance.

1. Introduction

Rollout involves adding sites in steps, by region or product line. A pilot approach begins with one site, then expands once things work. Before rollout, each site must be ready. That means checking tech systems, team skills, and daily processes. Change is hard, so companies must train people, deal with pushback, and support new ways of working. The MES also needs to integrate [1] with other systems, such as ERP [2] and SCADA [3]. Picking the right vendor matters, too—they must offer support, flexible tools, and follow industry rules. Effective data management helps maintain a clean and consistent approach across all sites. There are also many challenges. Local regulations, units, and languages vary. Some plants have more advanced technology setups than others. Different work cultures [4] need different training and messages to get people on board. To handle all this, use a global MES template that all sites can follow. Establish a center of excellence to guide teams and provide support. Set clear goals and track them. Train staff well, using the correct language and support tools. MES rollouts look different across industries. In the pharmaceutical industry, the focus is on batch control and strict regulations. In the automotive sector, speed and traceability matter most. In fast-moving goods, it is about making quick changes while maintaining product quality. Each one needs a plan that fits. Rolling out a global MES presents numerous significant challenges. A considerable challenge is striking the right balance between international standards and local needs. Too much of either can hurt adoption or control. Many plants also have different tech levels, which can slow things down. Getting people to accept the change is hard, too, especially across cultures. The MES must integrate with other systems, such as ERP and SCADA. If these links do not function properly, the entire setup can suffer. Managing the rollout across many sites takes strong planning. Without it, teams can face delays and uneven results. Keeping data clean and the same across sites is another primary task. Insufficient data leads to bad decisions. Security and compliance rules also vary, so companies must protect their systems and comply with local laws and regulations. A significant issue is integrating MES with other systems, such as ERP or SCADA, especially when each site has a different technical setup. Change management is another big piece. Culture, training, and worker support shape how well people accept the system. Finally, MES costs a lot. The benefits may take time, making it hard to prove value early on.

Although MES is used more widely around the world, research on global rollouts remains limited. Most research focuses on single sites or industries, with limited guidance for global MES rollouts. Teams lack flexible rollout templates. Culture and change resistance are also understudied. This results in poor adoption in certain regions. Integration problems are also ignored. Many companies face issues when linking MES with systems like ERP and SCADA. There are no shared ways to measure success. Without standard KPIs, it is hard to

track performance or prove value. Few studies have examined how global teams manage security and legal regulations. That adds risk during and after rollout. Finally, most vendors are not studied closely. Companies often lack assistance in choosing the right vendor or scaling across multiple sites.

This study examines the requirements for implementing MES across multiple global sites. It focuses on planning, system links, team readiness, and how to handle rules in different places. The goal is to find what works, what gets in the way, and where current methods fall short. Key topics include planning rollouts and establishing rules at both global and local levels. It also raises questions about how much the MES can be standardized across sites and when adjustments are needed. The study also examines how companies measure success and demonstrate value through clear metrics. Security and legal rules are always of top priority, as each country has its specific demands. Lastly, selecting the proper MES setup — whether cloud-based [5], on-site, or hybrid — can significantly impact the system's performance.

2. Literature Review

2.1 Research, Case Studies, and Identifiers

Studies show that localization is one of the most challenging aspects of global MES rollouts. Each site (sometimes country) has its own set of rules, tools, and working methods. This creates a factor between international standards and local needs. If the system is too rigid, users push back. If it is too loose, it can lead to loss of control and compromised data quality. Language is another barrier. MES interfaces, alerts, and reports must match local languages to avoid confusion. Units of measure can also vary. A mismatch can lead to errors or unsafe operations. Regulations add more pressure. Rules from groups like the FDA or the EU vary by country. Each site must meet its local legal needs while still working within the global system. Time zones and work cultures matter too. What works in one country may not work in another. Training and support must be tailored to each team. One-size-fits-all approaches often fail. Finally, IT setups differ. Some sites have strong networks and tools, others do not. The MES must work well across all of them, or risk delays and extra cost.

2.1.1 Standard VS. Customize

Research indicates that striking a balance between global standards and local needs is essential. Many headquarters push for the same MES setup across all plants. However, each site often requires adjustments to comply with local laws, culture, or working practices.

This creates conflict. Too much control from the top can lead to poor adoption. Too much local freedom can shatter system consistency.

A standard solution is to build a core MES template. This holds the key features used across all sites. Then, add local modules that can be adjusted as needed. This maintains system stability while allowing each plant to operate as required.

2.1.2 Regulatory Compliance Adherence

Rules for manufacturing systems vary from one location to another. For example, quality and safety of products in various industries, particularly those involving pharmaceuticals, medical devices, food, and biotechnology. The FDA sets rules in the U.S., and Europe follows the EU MDR. Asia often uses GxP. Each region has its process and paperwork.

A single MES setup will not meet all these needs, and attempting to implement a single system across all sites can lead to delays, audits, or legal issues.

The fix is to design the MES with flexibility for local rules. Each plant should comply with the laws of its region while still utilizing the central system. Build in local validation steps and tools to track compliance. This keeps the rollout on track and avoids costly issues later.

2.1.3 Language and Cultural Barriers

Many teams overlook the importance of language in MES rollouts. Operators and engineers must understand what they see on the screen. If the interface uses a second language, mistakes can happen. People may avoid the system or misuse it.

This is not just about menus and labels. Training, guides, and support must also be in the local language. Clear words build trust and reduce errors.

The best plan is to localize the MES fully. This means modifying the interface, help tools, and training to align with each site's language. This makes users more confident and the system more useful.

2.1.4 Infrastructure Gaps

Not all plants have the same tech setup. Some may lack strong networks, up-to-date hardware, or cloud support. These gaps can delay or block an MES rollout.

A one-size-fits-all approach will not work here. Sites need to be checked before rollout begins. If this step can be skipped, problems will arise later and slow everything down.

Begin by thoroughly reviewing each plant's technical specifications. Look at servers, network strength, and cloud access. Then pick the setup that fits. Some sites may require on-premises systems, while others can utilize the cloud. A mix of both often works best.

2.1.5 Change Management

People often resist new systems, primarily when corporate interests drive the change. This is even more pronounced in global rollouts, where cultural differences are prevalent.

Local teams may feel left out or worry that the changes will not fit their work. If they perceive the MES as a "top-down" initiative, they may not cooperate with it or utilize it fully.

The most effective way to address this issue is to engage local leaders from the outset. Pick champions from each site who can guide the rollout and build trust. Train teams using the right examples and terms that are relevant to their region. Show how the new system helps them, not just the company. This builds buy-in and keeps the rollout on track.

2.1.6 Governance and Rollout

Rolling out MES in phases is more effective than implementing it all at once. It allows time to learn, adjust, and resolve issues before moving to the following site or, in some cases, piloting other lines.

However, without apparent oversight, things fall apart. Some sites may move ahead without guidance. Others may lag or ignore key steps. This leads to uneven results and confusion.

To avoid this, set up a global program office. It should guide the full rollout. Select local or regional leads who are familiar with the teams and can promptly address questions or concerns.

2.1.7 Integration with Local Plant Systems

Many plants still utilize outdated systems, such as ERP, SCADA, and LIMS. These systems often do not work well with new MES platforms (For example, SAP DM Cloud System). Each site may have a different setup, which makes the rollout more challenging.

If the MES fails to communicate with existing systems, then delays and errors can appear. Manual workarounds require time and introduce additional risk.

The best approach is to select an MES with built-in connectors and robust APIs. This allows it to integrate with various systems without requiring extensive coding. Flexible platforms reduce setup time and help keep the project on schedule. Therefore, a prior study would be helpful in this regard.

Figure 1 Illustrates the Global MES Key challenges and resolution approach.

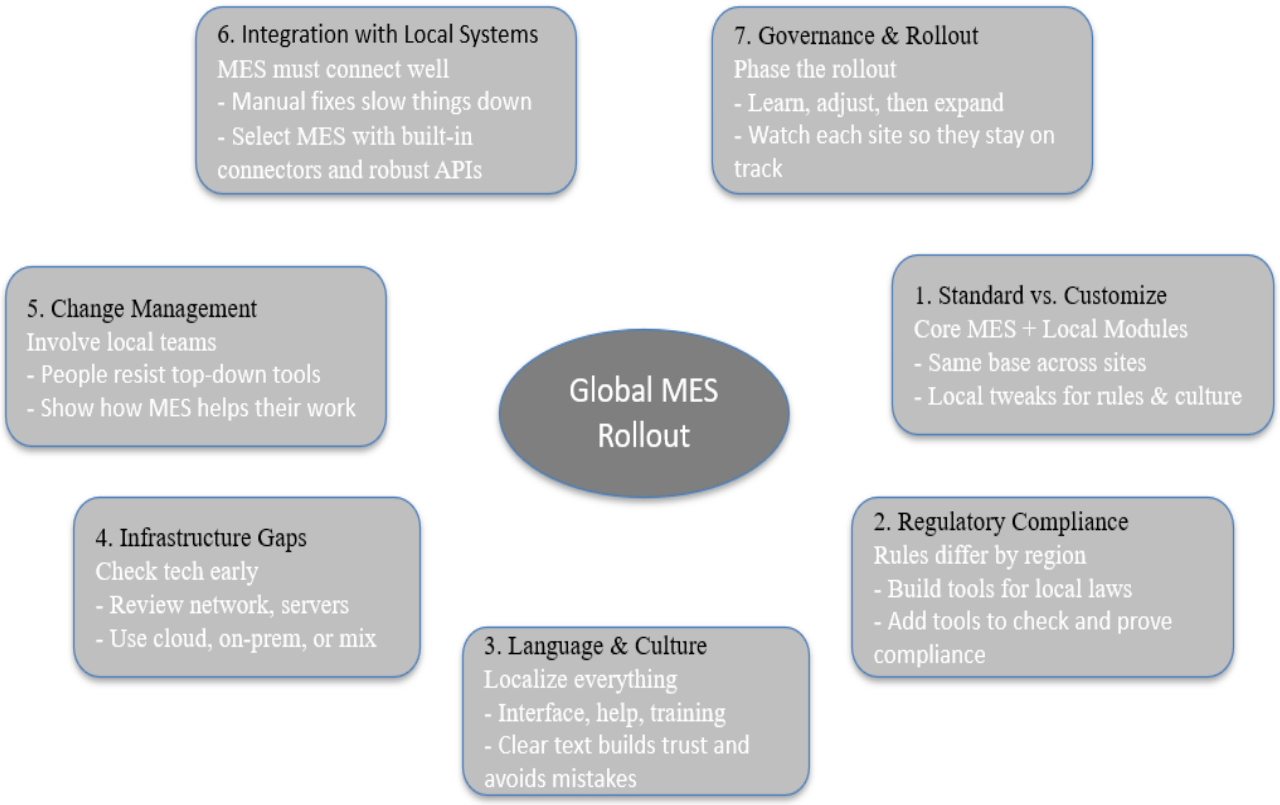

Figure 1. Key Challenges in Global MES Rollouts

2.2 Contradiction or Limitations in Past Work

Past research on global MES rollout has gaps. Many studies fail to align with real-world needs, particularly in large, multi-country settings. Some focus only on single sites or small companies. Others ignore how different industries use MES in unique ways. One-size-fits-all methods won't work. Rapid technological advancements and evolving company needs necessitate updated, flexible rollout strategies. Technology has also changed fast. Older studies may not reflect today's cloud setups, API tools, or security needs. These differences cause mixed results. What works for one site might not fit for other sites, this shows the need for updated, flexible strategies that cater to both global scale and local demands.

2.2.1 Standardization vs. Localization

Findings from industries like pharma often focus too much on rules and compliance. In contrast, the manufacturing sector may emphasize speed and agility. Using lessons from one field in another can cause mistakes.

2.2.2 Industry Bias

Findings from industries like pharma often focus too much on rules and compliance. In contrast, the manufacturing sector may emphasize speed and agility. Using lessons from one field in another can cause mistakes.

2.2.3 Cultural Blind Spots

Many rollout models treat MES as just a technical job. They overlook the influence of culture, language, and local customs on the adoption process. Change management is often an afterthought.

2.2.4 IT Readiness Assumptions

Some models assume all sites have modern networks and systems. That is not true. Older plants and sites in emerging markets often lack

the tech needed. Vendors do not always plan for this gap.

2.2.5 Rollout Timing

Some say "big bang"[3] rollouts work best to enforce standards. Others favor phased rollouts to reduce risk. Few studies explain when to use each method or how to mix them.

2.2.6 No Long-Term View

Most research stops after the rollout begins. There is little data on long-term results, upgrades, or ROI over several years.

2.2.7 Vendor Bias

Many studies originate from major MES vendors, such as Siemens, Rockwell, or SAP. They focus on their tools. This creates bias and overlooks open platforms or vendor-neutral options.

Overall, the research lacks balance. It needs better coverage of cultural aspects, technological gaps, and rollout options. It should also include more neutral, long-term studies.

2.3 Gap Statement

Current studies show mixed views on central control versus local management. This creates confusion for companies on how to organize MES rollouts globally. Many reports focus solely on a single industry, such as the pharmaceutical or automotive sectors. This limits the usefulness of advice for other sectors with different needs. Human factors, such as staff resistance and training needs, receive little attention. Infrastructure issues, such as varying IT setups, are often overlooked as well. There is no clear way to measure success over time. Most research focuses on short-term results, rather than how systems perform years later.

New challenges, such as incorporating AI, addressing cybersecurity risks, and complying with sustainability regulations, remain largely unaddressed. A flexible, all-in-one framework is needed. This should help companies balance these issues and adapt to future demands.

3. Methodology

This study utilizes numerical data to compare MES rollouts across global sites. It gathers data from regions, industries, and deployment styles. The goal is to find patterns and key differences in strategies and results. It measures facts like KPIs, system uptime, cost, rollout time, and user adoption rates. It does not focus on stories or case studies. The study compares MES implementations by region, such as Asia, Europe, and North America. It examines various industries, including the chemical, pharmaceutical, heavy engineering, discrete, and non-discrete sectors. It also compares rollout methods, including phased and big-bang approaches. Finally, it reviews multiple MES vendors and integration styles.

3.1 Audience or Sample

The study focuses on MES stakeholders involved in global rollout projects. These include IT leaders, manufacturing engineers, plant managers, MES project managers, and system integrators. All participants come from multinational companies working across various regions. They provide valuable insights into strategy, challenges, performance, and user adoption across various rollout settings. The study includes hands-on experts from both plant and corporate roles across global sites and industries. This mix offers real-world insights into the challenges and successes of MES rollouts. Participants come from multiple global sites. This covers differences in culture, technology, and regulations that affect MES rollouts. The sample includes companies from the chemical, automotive, electronics, and industrial engineering industries. This adds variety to the study, facilitating comparisons of MES practices across sectors.

Overall, the study gathers diverse perspectives to understand how MES rollouts succeed or face challenges worldwide.

3.2 Data Collection

This study shows a mixed-methods approach to gather data from multiple perspectives on the global rollout of MES. Quantitative data came from project documents and performance reports. At the same time, structured talks with key leaders and semi-structured interviews with shop floor workers gave insights into the people, technology, and culture behind MES adoption. This multi-source method allowed a clear, evidence-based comparison across locations, industries, and roles.

3.2.1 Collection of Implementation Outcome Data

Quantitative data was collected from several MES projects to measure rollout success. Key metrics included time to go-live, budget tracking, integration rates, user adoption, system downtime, and quality or production KPIs before and after implementation. Data came from internal project reports, KPI dashboards, post-implementation reviews, and input from MES leads or IT teams.

3.2.2 Stakeholder Discussions

Structured talks were held with MES project managers, IT and OT managers, global manufacturing leaders, select MES vendors, and business analysts. These discussions focused on strategic planning, lessons learned, key challenges, and governance or standardization models.

3.2.3 Interactions with Shop Floor Personnel

Semi-structured views exchanged during implementation and thereafter were conducted with line operators, supervisors, maintenance engineers, and quality or test control staff. The goal was to understand user experience, training feedback, usability, process changes, and barriers to effective MES use.

Combining metrics, stakeholder views, and shop floor input enabled the study to draw strong, multi-level insights into global MES rollout strategies and their actual effects.

3.3 Analysis

The analysis identified themes related to rollout mechanisms, including planning, execution, and managing change. It highlighted key success factors, including user adoption, system stability, and alignment across sites. It also highlighted what helps MES systems last in the long term. Coding was done by hand and checked repeatedly to keep themes clear and detailed.

4. Results

The study involved thematic analysis to spot key factors that affect global MES rollout success. This method helped to reveal common patterns in stakeholder experiences and challenges during implementation. It also showed how people viewed system effectiveness over time.

4.1 Key Quantitative Result: Global MES Rollout

On average, global MES rollouts were completed in approximately 8 months, spanning more than two production sites, and achieved a user adoption rate of 78%. As observed in **Table 1**, how values are captured against each measure.

Table 1: Global MES Rollout Duration

Measure	Value
Average Rollout Duration (Multiple sites, Geos, lines)	8.2 months
Average Number of Sites (Including Lines)	2.4 lines(sites)
User Adoption Rate	78%

4.2 Sustainability Indicators (6 Months Post-Rollout)

On average, global MES rollouts were completed within an average rollout time of 8 months, achieving 95% usage post-go-live and an 88% reduction in manual processes, resulting in a 91% improvement in data traceability. However, post-rollout adjustments are still needed due to several other factors. The data in **Table 2** provide a comprehensive breakdown of the sustainability factor.

Table 2: Global MES Sustainability Indicator

Sustainability Indicator	Reporting Percentage
Continued MES Usage	95%
Reduction in Manual Processes	88%
Improved Data Traceability	91%
Need for Post-Rollout Adjustments	23%

4.3 Success Rate by Rollout Approach

On average, global MES rollouts have a better success rate when implemented using a phased strategy compared to a big-bang approach. Quality insights can be found on **Table 3**.

Table 3: Global MES Rollout Strategy VS. Duration

Rollout Strategy	Projects Meeting KPIs	Avg. Duration (Months)
Phased	83%	8.2
Big Bang	71%	6.1

5. Discussion

Phased rollouts had better results but took more time. Big bang rollouts were faster but had lower KPI success. Most rollouts were completed within 8–9 months, demonstrating that global MES deployment is feasible within a short timeframe when managed effectively. On average, each rollout covered more than two sites. This suggests an enterprise-wide approach, rather than just pilot programs. User adoption averaged 78%. This is strong, but 22% of users may not fully use the system. This gap highlights the need to improve by implementing training, a more effective change support system, and enhancing system usability to address the 60% of sites that require tuning after go-live. Approximately 20% of the participants needed further adjustments to the system. These fixes are regular and manageable. The results suggest global MES rollouts can be quick, scalable, and sustainable with the proper planning. Project leads can use the 8-month average and 78% adoption rate as planning targets. These benchmarks support budgeting and team planning, as well as setting leadership expectations. The data also reveals new questions: What makes adoption easier or harder? Which rollout style works best in which setting? How can we measure long-term gains and ROI?

5.1 Limitations

The findings offer valuable insights into the timing, scope, and user adoption of MES rollouts, but they also have limitations. The sample size may be small and focused on a few industries, which limits the broad applicability of the results. Most data may originate from specific regions, potentially missing local rollout issues in other areas. Companies define MES differently, so success or timing may not mean the same output across sites. Additionally, external events, such as COVID-19 or supply chain issues, were not considered. Finally, the data shows a single point in time and does not track how systems perform over time.

5.2 Future Research

Future research should examine how MES systems perform during pilot and over time after rollout. Studies can also compare strategies across industries and regions. Cultural factors that affect system use should be explored. As MES integrates with AI [6], ERP, and IoT, there is a strong reason to examine how it fits into large-scale digital transformation.

6. Conclusion

This study found that global MES rollouts typically took 8 months to complete and often involved more than two sites (including the pilot phase, which includes realization). This indicates that companies are striving for standardized systems across their locations. Approximately 78% of users adopted the system; however, some gaps remain in training and support. Rollout success varied by region and industry due to local rules and company culture. In fields like pharma and food, strict regulations added extra pressure. After going live, most systems remained stable but required adjustments. These findings help manufacturers see what to expect when rolling out MES across sites. They demonstrate that effective planning enables large-scale rollouts to be possible. The study also highlights the need for improved support after launch and a greater

focus on the needs of individuals and local communities. It opens the door to future research on how MES systems evolve and endure over time, as well as their integration into broader shifts in global manufacturing.

References

[1] Beric, D., Havzi, S., Lolic, T., Simeunovic, N., & Stefanovic, D. (2020, March). Development of the MES software and Integration with an existing ERP Software in Industrial Enterprise. In 2020 19th International symposium Infoteh-Jahorina (infoteh) (pp. 1-6). IEEE.

[2] Klaus, H., Rosemann, M., & Gable, G. G. (2000). What is ERP?. Information systems frontiers, 2, 141-162.

[3] Daneels, A., & Salter, W. (1999). What is SCADA?.

[4] Robey, D., & Rodriguez-Diaz, A. (1989). The organizational and cultural context of systems implementation: Case experience from Latin America. Information & Management, 17(4), 229-239.

[5] Heleen, B. (2022). Smart Manufacturing with SAP Cloud and AI Automation.

[6] Campbell, L. (2020). Leveraging AI to Optimize MES and ERP Systems for Improved Accuracy and Efficiency in Manufacturing.