

Industry 4.0: The Role of Mobile

How Mobile Technologies can Dramatically
Improve Manufacturing Operations



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The Move to Industry 4.0

Manufacturing's biggest challenge over the next decade will not be foreign competition — instead, manufacturing organizations will face a dramatic labor shortage in which manufacturers won't be able to fill even half of their open positions. A recent Deloitte manufacturing industry study warns, "The search for skilled talent—ranked as the No. 1 driver of manufacturing competitiveness by global manufacturing executives—appears to be at a critical level."¹ How bad is it? Deloitte says the industry will have 4.6 million jobs to fill between 2018 and 2028, but will likely only be able to fill 2.2 million of them.²

One of Deloitte's recommendations for bridging the skills gap is for companies to increase in-house technical training: "Manufacturers should consider increasing investment in training programs and integrating digital technologies to add relevance, helping employees move ahead on the digital curve."³ In a related report, Capgemini says digitizing manufacturing ("smart factories" and "Industry 4.0") may add up to \$1.5 trillion to the global economy by 2022.⁴

This whitepaper looks into what's holding manufacturers back, why the case for moving to digital is so compelling, and how companies can finally make Industry 4.0 a reality at their organization.

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Supercharge Your Industry 4.0 Pilot

Manufacturers are so intent on getting to Industry 4.0, that more than 60 percent are already well into pilot programs or adoption, the survey said. On average, McKinsey found, manufacturers are piloting eight digital manufacturing solutions, primarily around connectivity, digital intelligence, analytics and flexible automation. Rehana Khanam, a partner at McKinsey & Company, offered six tips to help manufacturers supercharge their Industry 4.0 pilots:⁵

- 1. Focus on business value rather than technology.** Having a detailed business case that balances implementation costs against value-creation potential is important to success, as McKinsey reports, "Sixty one percent of respondents see lack of ROI as a major obstacle when implementing Digital Manufacturing solutions at scale."
- 2. Establish a clear vision and a detailed road map.** 59 percent of respondents to the McKinsey survey said a lack of vision is a significant roadblock to their company's digital transformation.
- 3. Define the technologies, systems and processes that will allow the pilot to scale.** Requirements should be comprehensive (technologically), scalable, integrated with systems and processes), and secure.
- 4. Establish collaborative partnerships.** Include both internally and externally (technology partners and integration partners).
- 5. Drive from the top.** "A senior executive should have overall responsibility for the transformation, and decision-making should be coordinated across plants, geographies and functions."
- 6. Build skills through internal training; new talent acquisition; and collaboration with technology vendors, research and academic institutions.** This builds employee skillsets that foster creativity and innovation.⁶

Mobile: Powering Industry 4.0

We're well into the next industrial revolution, the digital transformation of the manufacturing industry, called Industry 4.0. The revolution is powered by IoT, smart factories, the gathering of tremendous amounts of data, and big-data analytics, among other technologies. At its core, though, Industry 4.0 is powered by mobile. Without mobile tech, Industry 4.0 would be impossible.

Perhaps the most succinct explanation of the importance of mobile in Industry 4.0 comes from Samsung executive Josh Gibson, who in a recent blog post describes the important cloud technologies that are transforming manufacturing and then concludes: "Forward-thinking manufacturing companies are using mobile devices as the platforms through which plant management and workers can access these cloud technologies with ease — and at scale — to create an agile, responsive and truly collaborative environment."⁷

Anurag Lal, CEO and President of Infinite Convergence Solutions, concurs in a recent blog post that vital to Industry 4.0 is how well IoT and mobile work together: "The key to staying competitive in this new era of innovation is the confluence of IoT and mobile. With IoT's ability to combine data generation with connected devices, manufacturers can mine through more data than ever before. By combining that data generation with mobile's ability to provide networks, mobile and IoT will enable increased visibility within the manufacturing market."⁸

Veslabs, which provide solutions for Industry 4.0, visibility into the supply chain, and more, offers a long list of the ways mobile apps are vital to transforming manufacturing, including: asset management, eliminating paper-based systems, better assigning the right number of employees and resources to specific tasks, collaboration and actively measuring the productivity of employees.⁹

The post offers this overall insight into how mobile apps can help digitally transform factories: "Industry 4.0 is characterized by decentralized intelligence. All parties can communicate with one another, with machines, machine with machine, or with higher-level processes... Industrial apps will play an essential role to ensure this type of communication. The reasons are clear: apps are easy to use, cost-effective, and available everywhere in a user-friendly format."

Challenges on the Path to Mobile

The digital transformation of manufacturing, or Industry 4.0, is well underway, and manufacturers have begun reaping its benefits. A recent CapGemini survey of manufacturers found that 76 percent "either have a smart factory initiative that is ongoing or are working on formulating it." Despite, that, "Only 14% of companies are satisfied with their level of smart factory success." That means that plenty of manufacturers are trying to get to Industry 4.0 but face significant roadblocks along the way.¹⁰



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A recent article in The Manufacturer, outlined 4 common pitfalls in Industry 4.0 or digital transformation projects, and offers strategies for avoiding these pitfalls.¹¹


First, it recommends, manufacturers shouldn't bite off more than they can chew. "For many engineers and factory managers, it can sometimes seem as though Industry 4.0 needs to be applied everywhere immediately, and it's easy to fall into the trap of believing that digitalization demands a complete overhaul."

Second, the article encourages manufacturers to ensure that the equipment and communications standards they choose are flexible and can accommodate change. The Manufacturer advises, "Selecting the correct standard at the start of your digital journey is essential...For machines, that means connections which not only meet the standards of today but will also be easily modified in response to future changes."

Next, manufacturers must plan carefully, and make sure that all stakeholders are involved in digital transformation, particularly in deciding what data needs to be collected. The article explains, "By visualizing the data that is being collected, employees can share their expert insights and knowledge to help manufacturers understand what is important to measure – from machine performance through to functions such as logistics and purchasing."

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"Digitizing manufacturing may add up to \$1.5 trillion to the global economy by 2022."

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"Manufacturers should consider increasing investment in training programs and integrating digital technologies to add relevance, helping employees move ahead on the digital curve."

The fourth mistake manufacturers need to avoid is overlooking security. Cyber-attacks are becoming more prevalent, so security needs to be baked into the process every step of the way.

The final pitfall is re-inventing the wheel. Manufacturers should select standard solutions rather than build proprietary ones whenever possible. The article states, "This approach further helps manufacturers maximize the value of Industry 4.0 upgrades over the long term, reducing restrictions on upgrade options in the future."¹²

Starting small – perhaps even digitizing one form at a time or integrating new technologies and approaches into the processes and businesses systems you already have – can help companies begin to reap benefits quickly – think undisruptive disruption. The article explains, "Remember, this is evolution, not revolution. Upgrading to Industry 4.0 in manageable steps not only allows businesses enough time to make well-researched and considered decisions, but also gradually introduces employees to the new technology around them."¹³

Getting Started, Avoiding Pitfalls

Major manufacturers are implementing massive digitization projects that include technologies such as IoT sensors that record and transmit readings, high definition cameras that show the production line, and even augmented reality experiments. There's no doubt that the future of manufacturing is high-tech; however, smaller manufacturing companies with limited resources and budgets can still take more simple, cost effective steps that avoid the aforementioned pitfalls while delivering a truly streamlined and digital production line and warehouse.

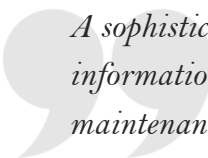
Until now, most data gathered in the field was written down on paper forms and manually input into back-end systems resulting in data entry errors and delayed access to important information. Replacing paper forms with smart mobile apps that capture critical data quickly – by automating the capture of location and time data, etc. Eliminating paper reduces the costs and problems associated with paper forms: printing, scanning, filing, and deciphering scribbles. Capturing new types of data (e.g., images, audio, bar code scans, time and date stamping, digital signatures, etc.) affords the company more accurate operations intelligence. When these mobile apps integrate with existing business systems it makes critical information available immediately to the organization.

Mobile apps are natural expeditors – making everything immediate without the need to

pass through multiple people and steps first. As workers complete a task, s/he can kick off another workflow/activity, such as a non-conformance report, work order, or supply order, at the press of a button.

Mobile apps are already familiar to workers, with most production workers carrying mobile phones on them and using weather apps, mechanic apps, text or email to assist them every day. Mobile apps with embedded business logic and business rules can also go beyond simple data capture and guide workers in best practices. Embedded business logic can help new workers perform like more experienced workers, by having a virtual expert on hand to alert workers to problems, suggest resolutions and ensure that the job is completed properly. A sophisticated mobile app can validate information as its captured, such as the maintenance history of a piece of equipment, ensuring data accuracy and providing the field worker with immediate insights, alerts or next steps, on-the-spot. Embedded business logic can result in less errors and safety issues, and that translates directly to bottom line improvements.

As they take these initial steps towards digital, companies must consider additional data types in their plans. For example, Internet Of Things (IOT) technology sensors can automatically gather data from the shop floor or warehouse. Will your solutions be able to utilize this type of data? The best strategies will allow for flexibility as your organization matures and needs change.

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Build or Buy?

Companies can start with off-the-shelf apps that replace standard manufacturing forms or serve a single purpose, such as a safety inspection or a Gemba walk. No developers are required to build these apps, but these one-off solutions do not allow for deep customization to reflect your unique business processes, or collect your data in the cloud or in an Excel spreadsheet that does not immediately or easily allow other workers or systems to leverage the data in real-time. Additionally, as workers in the field enter data into the app, there's usually no way to validate the information as its captured, conduct custom calculations for the worker, or immediately trigger an alert or workflow in existing business systems. Finally, many of these systems fail when a cell or WIFI signal is unavailable – a very common reality at manufacturing facilities or warehouses.

So what about custom development? You could find a mobile development agency to build you custom app(s), incorporating all the capabilities and scenarios your organizations might need. While custom development offers the most flexibility, it's not always the best route for manufacturers that must decrease costs and

move quickly. Custom development requires back-and-forth requirements gathering, native development time, multiple reviews, production line testing and ongoing updates to incorporate user feedback. This process can quickly eat up valuable time and become cost-prohibitive. Plus, once the firm has built the app(s) for you, you'll need to keep paying them to update the app(s) as your business needs change.

How about building it yourself, or have someone on your team build it? After years of requiring mobile developers to build apps, building business apps yourself is now a reality for a wide range of manufacturers. "Low-code app development" solutions now exist that offer templates for safety inspections, non-conformance reports, Gemba walks, equipment inspections, dispatch and work orders. Even better, these solutions allow a wide range of users to customize each app, and and quickly build new ones to digitize paper forms and other processes. Keep in mind, not all these solutions are sophisticated enough to allow offline operation, integration with your existing systems and rich security -- buyer beware. Manufacturing companies considering low-code development as an option must review important criteria that could dictate success or failure on the production line or in the warehouse.

Finding the Right App Builder for Your Team

Many low-code app builders claim similar capabilities, but manufacturing companies must

consider the conditions that their workers operate in and look for more sophisticated capabilities that solve these unique industry challenges. While every app you build may not require these capabilities, your overall digital approach is more likely to be successful if you select a solution that doesn't leave you hanging if your app must perform common activities, such as conducting calculations, operating offline, or initiating alerts.

When evaluating these solutions, look for solutions that can:

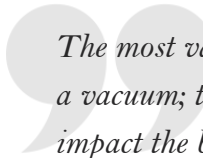
- **Utilize mobile device-specific hardware capabilities.** Products should support the use of: camera, specialized detectors, GPS, or local file system storage - which expands the amount of data an app can handle. These data entry capabilities are impossible to deliver through a browser-only experience. That's where the difference between mobile forms and a mobile business app come into play.
- **Support offline work.** A mobile form isn't truly mobile if it can't work when a user is without a WiFi or cell connection, but an offline mobile app is not good enough. Enterprise-grade mobile apps should be able to automatically synchronize stored information (even large media files) and intelligently handle data conflicts (beyond "last-in wins") when reconnected with the backend system. There should be data persistence when the app is closed or the battery dies, including data not saved to the server. Offline capabilities that only allow you to add records versus reading data from a database for editing or deleting are of limited value.
- **Manage the various rich media types available on mobile devices.** Workers can take pictures, video or record audio notes on their phones and tablets, so your mobile apps should have these capabilities as well. If the user captures images or audio while offline -- think of an insurance claims adjuster working in a tornado-struck area -- the app must be able to save these larger data files without any difficulty. Only a mobile app that can access the device hardware meets this need.
- **Support stylus annotation and digital ink as a data type.** Users on the production line may be doing inspections, taking notes on repairs or editing diagrams. Touch-sensitive drawing experiences are important in all types of manufacturing apps.
- **Run cross-platform.** A good rapid app development platform will produce apps that run natively on tablets, smartphones, and the desktop regardless of operating system or screen size. The software will have careful consideration of how – and how often – an end user will interact with the mobile app on the device.
- **Be location-, time-, and mobile-context-aware.** With powerful mapping in their

B2C apps, workers doing on-site repairs or delivering goods don't want to waste time opening maps to find an address or inputting a time or location into a data file. Solid manufacturing apps should automatically capture important field-level data as part of the experience.

- **Optimize experiences for devices and specific tasks.** This includes capabilities to dynamically produce custom keyboards (such as a digit-only keyboard for numeric entry fields), speech-to-text to speed data entry, and apps that require only one hand or a single finger to operate. Ergonomics can be directly designed into the app.
- **Integrate with existing systems of record and workflows.** The most valuable apps do not operate in a vacuum; they drive daily processes and impact the business in real time. Make sure you're producing apps that tie into the systems and processes that already drive your organization.

These criteria offer a great checklist to keep handy while you're evaluating mobile app development products or form builders. However, in situations where requirements go beyond data capture, this list of 5 advanced requirements should be considered. These capabilities turn a basic data capture app into a powerful business tool that streamlines all types of work in the manufacturing process and drives business in real time. Ask if the product can:

- Scan Bar or QR codes and perform relative look-ups against remote data sources or on-device databases.
- Take advantage of web services.

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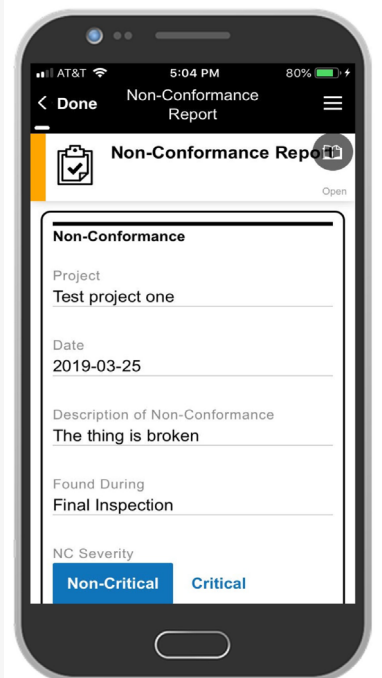
The most valuable apps do not operate in a vacuum; they drive daily processes and impact the business in real time.

- Pre-fill data on a mobile app from a corporate system of record.
- Initiate SMS or emails based on calculation or transformations performed on the collected data.
- Create dynamic and filtered picklists for much faster and more accurate data input.

The last thing you need is to introduce a technology that makes recording data or completing a checklist harder or builds yet another data source that must be rekeyed or manually uploaded into business systems. Think streamlining processes. Look for systems that tie easily into your processes, have user interfaces that are intuitive to your workers and how they get work done, and always work offline.

Conclusion

Manufacturing companies cannot delay going digital any further. New technology innovations have made it possible for manufacturers to go digital without spending millions or disrupting the entire organization. By taking advantage of the mobile devices already carried by workers, and user-friendly low-code app development, companies can begin to quickly capture more varied and accurate field data. With the right solution that can plug into your existing systems painlessly, you could benefit from digital technologies faster than you thought possible.



[Alpha TransForm](#) is an example of a low-code solution with the sophistication required by manufacturing companies. It has the unique ability to rapidly create mobile-optimized forms and field apps that can easily access and integrate with existing databases, company workflows or web services. Apps built with TransForm always work offline – of vital importance for the manufacturing industry where there are large facilities or remote locations without reliable signals.

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Sources:

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