

Digital Innovation Strategies for Future-Ready Manufacturing

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Introduction

Digital innovation has been a key factor in differentiating successful companies from those struggling amid disruption driven by changes in markets, technologies, and customer

demands. However, digital innovation is difficult to implement in manufacturing companies, and the key to success does not always lie in the technologies used but in the strategy behind implementing them. Future-proof manufacturing companies regard digital innovation as a strategic practice.

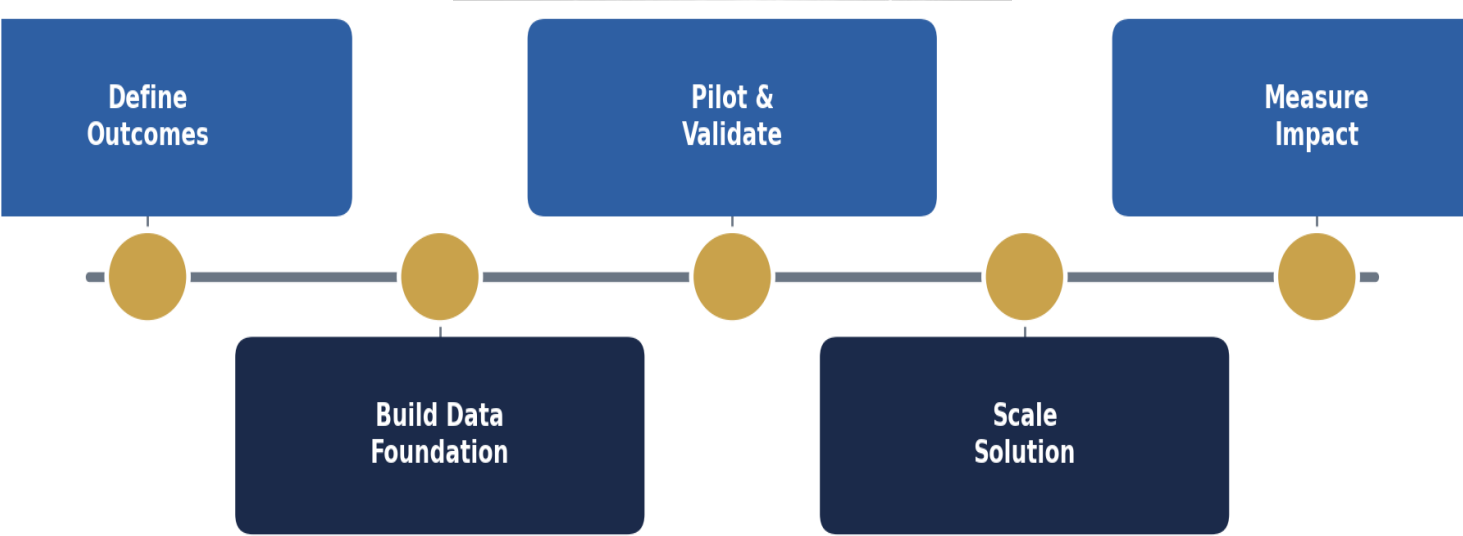


Figure 1: Process overview

This paper focuses on the strategies behind effective digital innovation in manufacturing, including the technology areas critical to success and the capabilities needed to sustain digital transformation over the long term. Figure 1 shows the strategic

path to digital transformation, including the stages of outcome definition, data foundation, solution proofing, scaling, and measurement.

Why Digital Innovation Strategy Matters

However, many organizations have spent a lot of money on innovations like IoT sensors, data analytics, and automation, only to find that their investments bore little fruit, mostly because they lacked an overall strategic plan aligned with defined business objectives. Digital innovation needs not just technology, but a planned approach in which investments are aligned with defined business priorities, the organization builds its own capability through those investments, and it adopts a process-oriented approach to innovation.

Foundational Elements of Digital Innovation Strategy

Starting with Business Outcomes, Not Technology

The best strategies of digital innovations start from a clear definition of what the company wants to achieve with those innovations. In other words, the success starts not from selecting a certain technology but from clearly defining the business goals. It may be related to higher quality, decreased downtime, increased time-to-market, or other things. The technology should always come second and its application should be defined only when the goal of using it is known.

Building a Coherent Data Foundation

Almost every aspect of innovation through digital means in manufacturing is reliant upon having quality data which is easily accessible. This means that manufacturers who wish to implement digital innovation have to first think about building up their data infrastructure, including the sensor network, integration of data, and data governance processes, instead of just working on technologies.

Prioritizing and Sequencing Initiatives

Considering the wide range of possibilities for digital innovation and the limitations of capability and funding for organizations, forward-looking manufacturers create frameworks for prioritizing and sequencing their digital projects, usually those that have both a significant business impact and low implementation complexity, especially in the beginning of the overall digital transformation process.

Designing for Scalability

Those digital innovation programs that are successful as stand-alone projects tend to struggle to replicate success on a larger scale. Successful strategies include considerations around scalability at the onset, taking into account how the successes achieved through pilot programs can be rolled out in additional facilities, lines of products, or geography.



Key Technology Domains for Future-Ready Manufacturing

Advanced Analytics and Artificial Intelligence

Through AI and analytics technologies, companies can leverage the data that has been collected in order to gain insight and drive decision making in a variety of areas such as predictive maintenance and quality, demand forecasting and supply chain management.

Industrial IoT and Connectivity

Connectivity between equipment, products, and facilities in its most comprehensive sense forms the basis of data collection for almost all other digital innovations, giving insights into performance of the production process in real-time.

Cloud and Edge Computing

The combination of cloud computing and edge computing can help create the necessary computational platform for not only factory floor applications but also computationally demanding business intelligence applications at an enterprise level.

Digital Twins

Technology known as digital twin, which expands from single units through production lines to even full plants, allows manufacturing companies to test and optimize their processes

virtually, thus speeding up innovation processes and minimizing risks related to physical modifications to processes.

Cybersecurity

In light of the increasing connectivity and informativeness of manufacturing settings, strong cybersecurity measures will be a necessary factor that drives, rather than hinders, digital innovation to ensure the security and availability of the systems and data relied on by digital endeavors.

Automation and Robotics

As automation systems become increasingly smarter and adaptable, through collaborative robots and autonomous mobile robots, digital innovation can be applied practically to the processes of manufacturing, transforming data into action.

Organizational Capabilities for Sustained Innovation

Cross-Functional Governance

It is imperative that digital innovation be facilitated by collaboration between functions that were traditionally separate from one another, such as operations, IT, engineering, and business management, along with governance mechanisms that would ensure that digital innovation efforts continue to align with business goals and receive appropriate support.



Digital Talent and Skills

Companies that are prepared for the future intentionally develop the digital abilities necessary for their employees, including expertise in data science, software engineering, and even the digital literacy required for workers on the factory floor to thrive in digital manufacturing facilities.

Agile Implementation Approaches

Considering the uncertainties associated with digital innovation, the use of agile implementation strategies by manufacturers has become more effective than conventional, lengthy implementation strategies, due to their reliance on iterative development and feedback throughout the entire implementation process.

Change Management and Culture

Any digital transformation must, by its very nature, bring with it major shifts in existing processes and procedures. Digital innovation on an ongoing basis will therefore need the active consideration of change management, through proper communication and engagement, in order to secure the necessary organizational support.

Partnerships and Ecosystem Engagement

With the fast-changing landscape of technology, not many organizations have the capability to provide everything technologically required internally. Future-oriented

manufacturers are seen developing strategic relationships with technology providers and organizations involved in research and industrial associations to benefit from their expertise.

Measuring Digital Innovation Success

In order to maintain organization’s commitment and improve strategic direction, the organization needs to measure the success of its digital innovation projects based on clear metrics that tie in directly with the expected business results from that strategic direction. Some examples of such metrics could include lower levels of unplanned downtime, higher quality yield on the first pass, shorter time to market, or improved energy/resource efficiency.

Avoiding Common Pitfalls

Manufacturers adopting digital innovation often find themselves plagued by certain common traps. The use of technology without any focus on the alignment with their business goals often leads to huge amounts of money being spent with little tangible value to show for it. Lack of attention to their data capabilities often means that their subsequent analysis and automation efforts fail to produce desired results. Not planning for scalability right from the start often means companies are left with a set of isolated pilots which have little impact beyond themselves. And not focusing on the cultural aspects of digital transformation can often lead to a failure in its implementation.

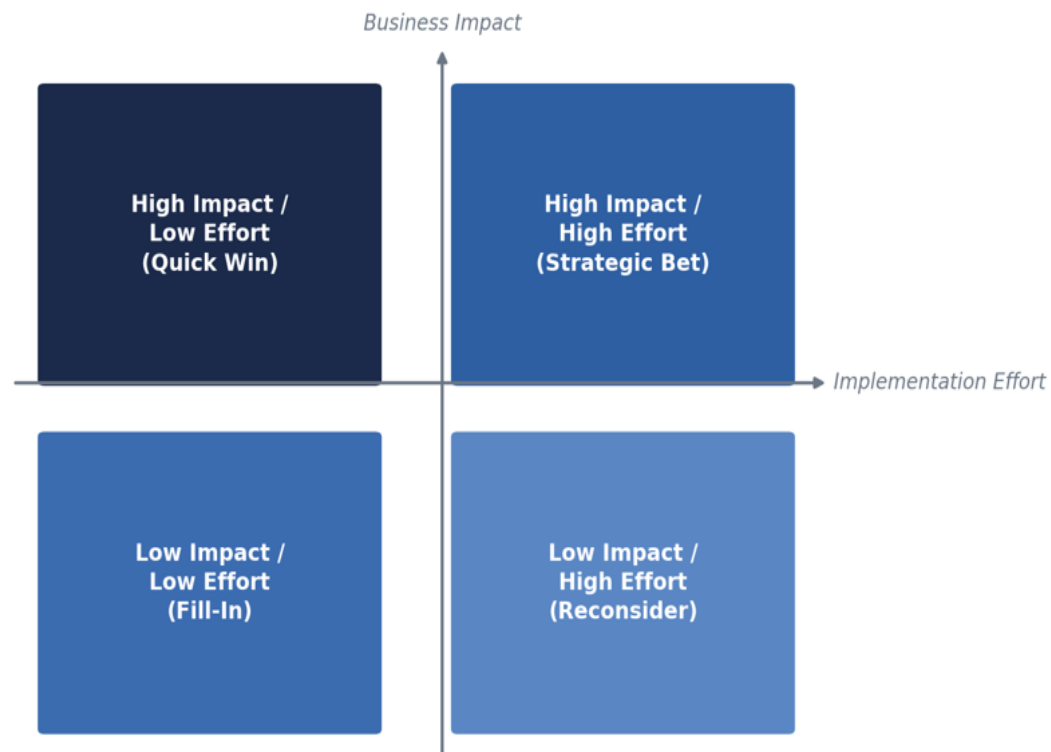


Figure 2: Key framework at a glance

Figure 2 above shows a priority matrix depending on the impact versus effort in relation to initiatives that have been categorized depending on the effect and effort of each initiative.

Conclusion

The development of future-proof manufacturing capability necessitates a proactive approach to digital innovation through which manufacturers must establish business goals, develop a

strong data foundation, carefully prioritize their initiatives, and plan for scale from the get-go. Through making the necessary investments in not just the right technology but also in the capabilities, processes, and culture that enable sustainable digital innovation, manufacturers will be able to confidently deal with technological disruptions while ensuring their operations remain competitive in the increasingly digital world of industrial manufacturing.