Belden

Beyond bits & bolts:

The multifaceted essence of digital transformation

White paper

By **Michael Maher Farag**

Digital transformation (DT) has been an overriding topic for organizations around the world in recent years. There's a growing consensus that digital transformation is not only real—it's imminent and inevitable. As advanced digitization continues to emerge, companies that cannot cope in this new world will struggle to maintain a competitive edge. Accordingly, it's pivotal for organizations to establish a holistic DT strategy across all business functions so they can secure their future in the digital arena.

In industrial environments, Industry 4.0 is at the heart of this transformation. It's a phase of digitization that disrupts traditional manufacturing by introducing cutting-edge technologies like artificial intelligence (AI), Internet of Things (IoT), robotics and big data analytics into manufacturing processes. The promising benefits of Industry 4.0 are not limited to improved productivity, enhanced quality, asset performance, increased flexibility and reduced costs. It also provides the opportunity to create new business models and revenue streams.

Although there's a growing interest in the application of digitization and Industry 4.0, there's still a lack of guidelines for organizations to follow (especially in the implementation phase) due to its complex and multi-scope nature.

It's important to understand that implementing Industry 4.0 initiatives is not only about adopting the latest technologies, upgrading legacy systems or investing in advanced digital tools. While these steps are vital, other essential aspects must be considered for a successful transformation.

Table of Contents

There is a need for a holistic Industry 4.0 framework that integrates different elements. Many organizations have focused too narrowly on technology implementation without considering broader business model and organizational changes. For manufacturers, this means preparing manufacturing plants to handle these changes.

This whitepaper focuses on developing new insights that will help manufacturers make their Industry 4.0 journey successful by understanding its multifaceted nature. It underscores the importance of addressing leadership, organizational culture, business models and technology adoption as integral components of effective DT implementation.

The Industry Lacks Consensus on Digital Transformation

While digital-transformation execution can be stymied by many things, one of the biggest hurdles is the industry's lack of guidelines, standards or blueprints for plants to follow for successful design and implementation. As a result, manufacturers are moving forward with digital-transformation development but are uncertain about how to do so effectively.

In fact, the industry doesn't even agree on what digital transformation means: There isn't a common definition.

For the purposes of this whitepaper, we define digital transformation as: **"The ongoing process of utilizing digital technologies to transform business operations and create value for customers. Digital transformation aims to drive innovation, improve efficiency and create new business models that enable companies to remain competitive and significant in an increasingly digital world."** (This definition is one originally presented by Gregory Vial, associate professor at HEC Montréal, in The Journal of Strategic Information Systems.)

Beyond the lack of standardized implementation protocols, companies struggle with other obstacles as well: budget restrictions, employees' resistance to change, the temptation of sticking to traditional process and legacy business models, and inflexible organizational structures.

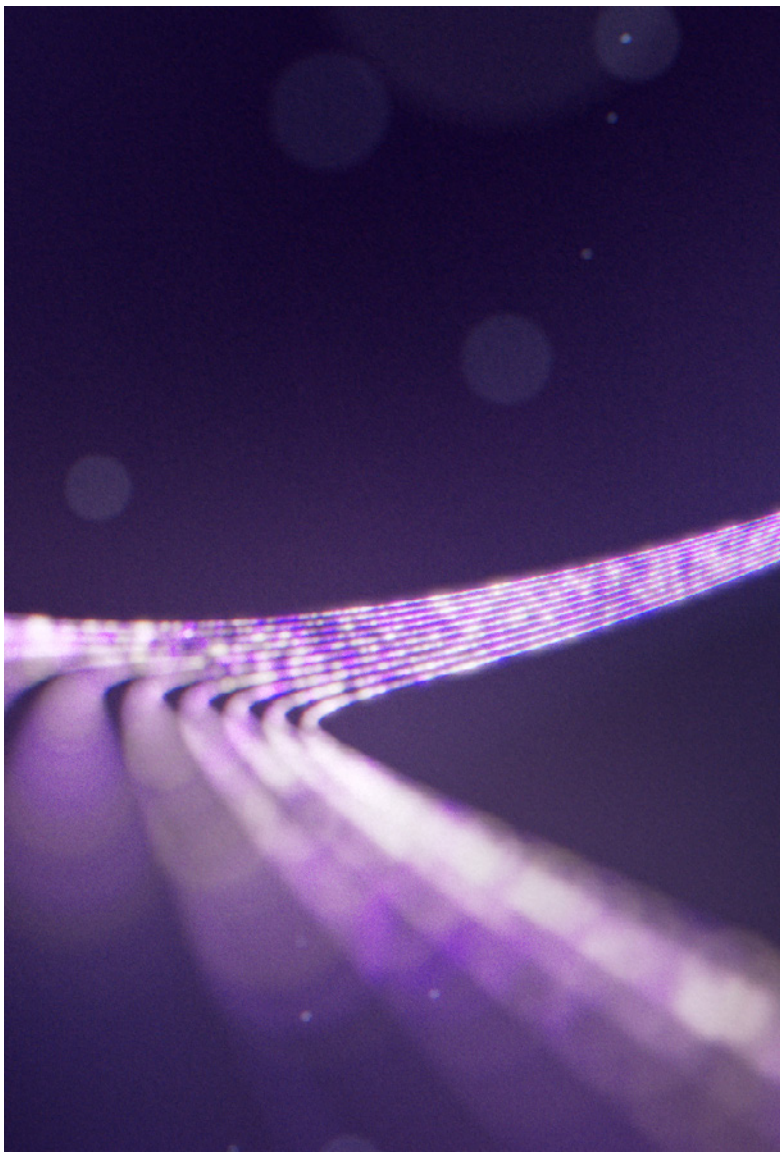
Because of these obstacles, many manufacturers are slow to fully incorporate successful Industry 4.0 initiatives into their operations. For instance, Magesh and Dursun (2021) highlighted that digital transformation intended to increase efficiency has a failure rate of 90%. They suggested five factors to help increase success.

The companies that determine how to take digital transformation from a crawl to a sprint will become industry leaders.

Surveying Leaders About Industry 4.0 Approaches

When planning for Industry 4.0, many manufacturers consider only the technological aspects while overlooking the importance of leadership, adjusting business models and making organizational and cultural changes, which are also critical for successful implementation.

To assess the status of Industry 4.0 initiatives, as well as explore challenges along the journey and identify variables that directly impact implementation success, we surveyed more than 50 manufacturing professionals. Their insights are shared in this whitepaper.



Setting the Scene: The State of Industry 4.0

To gain a baseline understanding of how effectively the manufacturing industry is implementing digital transformation, we asked respondents about the status of Industry 4.0 in their own environments.

Among them, 38% have successfully implemented digital transformation, while another 27% say they've implemented it—but without success.

Approximately 10% of manufacturers have failed so far in their attempts to implement digital-transformation strategies, and another 10% haven't taken any steps toward digital transformation yet. The remaining respondents simply report that their journey is "in progress" or "unknown."

With nearly four in 10 manufacturers reporting feelings of confidence about their digital transformation implementation—which is a higher number than many industry reports indicate, such as the report from Capgemini and a Barriers to Digital Transformation in Manufacturing report from Kristin Vogelsang at WFO—there seems to be potential confusion about what "digital transformation" truly means. This isn't surprising, given that the industry lacks a formal definition or standardized framework for it.

Some respondents may think they've achieved success simply because they applied technology to some of their processes. But is that what successful digital transformation really looks like?

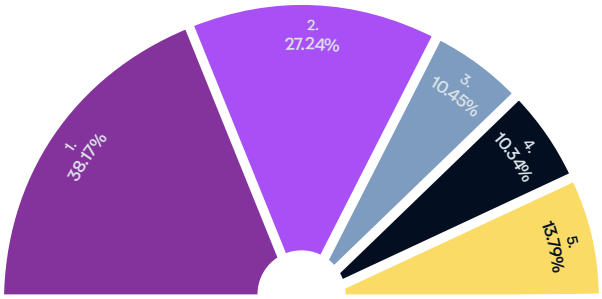
When asked about the challenges associated with digital transformation and Industry 4.0, specific themes emerged among respondents:

1. The organization's lack of learning culture
2. The inability to take risks
3. The need for the right knowledge and resources
4. The lack of effective and thoughtful leadership

These topics were explored in more detail in the survey, which investigated the multifaceted nature of digital transformation involving leadership, organizational culture, business models and technology adoption. Insights are shared below.

Question 2:

What is the status of your company/factory with respect to digital transformation (DT)/Industry 4.0 initiatives?



1. Implemented DT plans in place and it was successful.
2. Implemented DT but it was a failure with no benefits.
3. We developed the plan towards DT but failed to implement it.
4. We did not take any steps towards DT.
5. Other.

Figure 1: Question 2 results

1: Leadership

Leadership is key to digital transformation.

While 55% of companies say they have a well-defined Industry 4.0 strategy from leadership, another 31% have a strategy that isn't well-defined. Approximately 13% lack a strategy or plan for Industry 4.0 initiatives altogether.

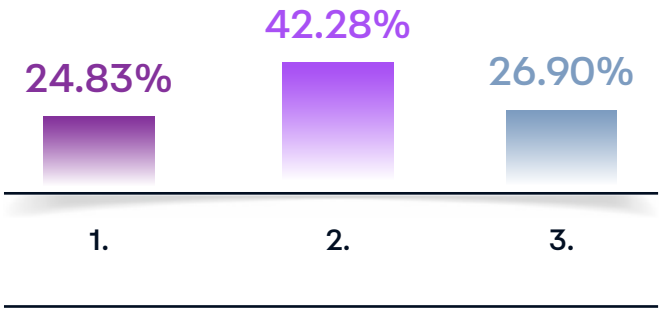
The Role of Collaboration

Part of the leadership equation involves the encouragement of collaboration within the workplace to achieve goals.

Only 25% of manufacturing professionals report high levels of collaboration in their work environments, while 48% indicate average levels and 27% report ineffective promotion of collaboration. This means leadership teams aren't being impactful enough to communicate, engage with and create collaboration among employees, which can harm successful Industry 4.0 implementation.

Q5

How effective is your company's leadership team in communicating its vision and strategy for Industry 4.0 and also in promoting a collaborative environment for impactful DT?



1. Highly effective.

2. Somewhat effective.

3. Ineffective.

Figure 2: Displayed responses of Q4-Q9 from leadership section

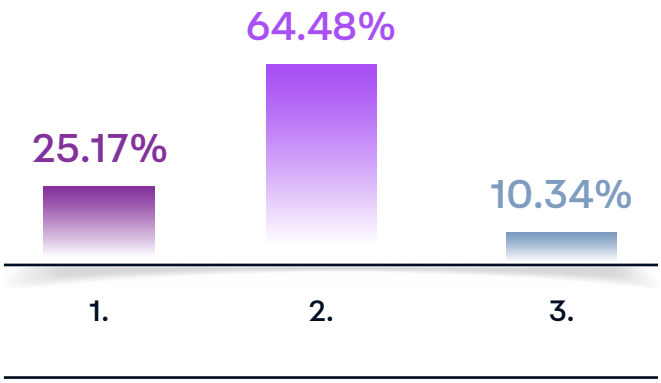
Dedicated Leadership

To gauge how companies approach Industry 4.0 implementation (who's responsible for leading the charge?), we asked respondents about dedicated leaders and departments. Almost 75% of manufacturers lack a leadership team that's focused on driving the implementation of digital transformation.

Among the survey respondents, 76% believe that having a dedicated leader—such as a chief digital officer (CDO)—for these initiatives is essential to achieve effective digital transformation This emphasizes the nature of Industry 4.0 being a cross-functional initiative with a far-reaching scope, with the majority of participants recommending having a dedicated leader who can focus on pursuing the opportunities offered by Industry 4.0.

Q7

Does your company have a dedicated leader or department responsible for leading the implementation of Industry 4.0 initiatives?



1. Yes, a dedicated leader or department is focused on the Digital transformation (DT)/Industry 4.0 initiative.

2. No, it's just part of the overall business or strategy discussions by existing technology team.

3. No, it's not discussed at all in our company.

Figure 3: Displayed responses of Q4-Q9 from leadership section

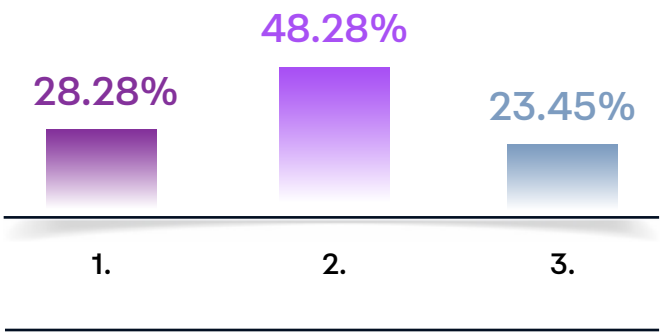
2: Organizational Culture

Culture and mindset are critical to digital transformation and changing the way manufacturing environments work—but changing these two things can be difficult due to the conservative nature of the industry, as well as the major investments required.

Only 30% of respondents believe that their employees are ready for a change to culture and mindsets; 48% don't think their employees are ready for change but are willing to learn. The remaining group (about 23%) believe that their employees resist change due to concerns about job security and uncertainties amid digital transformation.

Q11

Do employees of your company have the mindset to change and the flexibility to adapt to a new modern way of working related to adjustment in business model in the context of digital transformation?



1. Yes, employees have the right mindset to adapt to new changes and modern ways of working.

2. No, employees do not have the right mindset, but they are willing to gain it.

3. No, employees are very resistant to any change. There is a high sense of insecurity with any change, and they think digital transformation will cause them to lose their job.

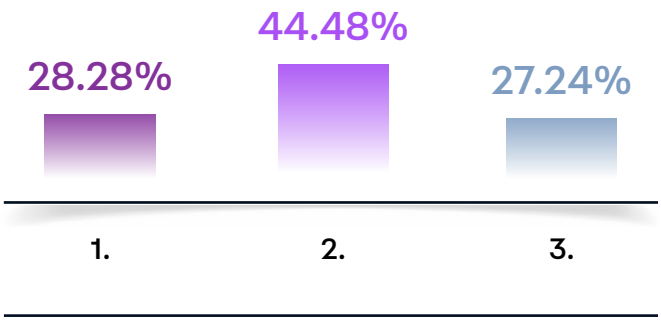
Figure 4: Displayed responses of Q10-Q14 for Organizational Culture section

Risk Management

The uncertainties associated with any innovative direction, such as Industry 4.0, should have a risk management plan in place (Parida et al., 2019). The survey revealed that only 28.8% of companies have an adequate plan, while 44.48% need improvements and 27.24% lack a plan. This gap, possibly due to manufacturers' reluctance to take risks, indicates a need for better risk management strategies in the manufacturing industry.

Q12

How does your company manage the risks associated with innovation and new technology adoption?



1. We have a comprehensive risk management strategy.

2. We have a risk management strategy, but it could be improved.

3. We do not have a risk management strategy.

Figure 5: Displayed responses of Q10-Q14 for Organizational Culture section

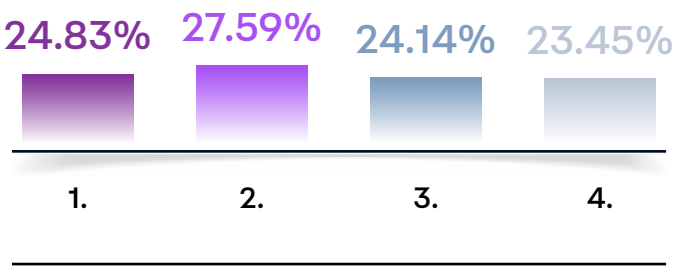
Preparing Teams for Change

When we asked manufacturers how they prepare their teams to use new technologies and tools, the strategies are split almost evenly. Nearly 25% said they provide training for existing employees to help them learn new things, while 28% hire new employees that possess the required skills to use these tools and technologies, 24% rely on self-learning and 23% do nothing.

These results demonstrate the need to improve training options for employees to enhance their learning capabilities and, as a result, promote cultures of learning.

Q14

How is your company preparing employees to work with new technologies and tools introduced through Industry 4.0?



1. We provide training and development programs for employees because they are willing to learn.

2. We hire new employees with the required skills.

3. We rely on self-directed learning.

4. We are not actively preparing employees.

Figure 6: Displayed responses of Q10-Q14 for Organizational Culture section

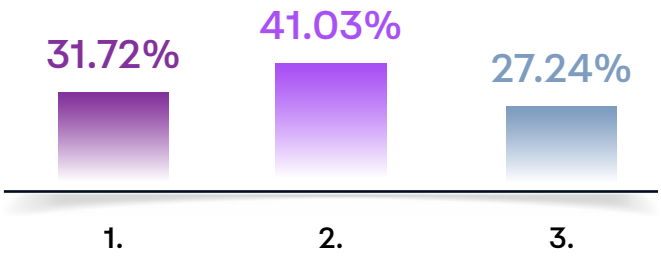
3: Business Models

Business models are another valuable aspect of successful digital transformation. Understanding the connection between the two is essential to leverage the benefits and take advantage of new opportunities. But most manufacturers are not yet prepared to transform their business models to take advantage of these gains.

When it comes to manufacturers' understanding of the impact of digital transformation on business models, only 32% have a clear understanding of the connection between the two. Approximately 27% have an average understanding, and 41% do not realize the relationship between digital-transformation initiatives and business models.

Q15

Does your company have a clear understanding of the impact of digital transformation on its current business model?



1. Yes, we have a clear understanding of the impact.

2. No, we do not have a clear understanding of the impact.

3. Somewhat, we have some understanding but need further clarification.

Figure 7: Displayed results of Q15-Q19 for business model section

Shifting Business Models

To evaluate how companies are responding to the opportunities laid out before them, we asked respondents whether they've adapted their business models to take advantage of the new prospects created by Industry 4.0.

Only 39% have led major shifts in their business models; 44% haven't made any changes, and the remaining 17% have made only small, ineffective changes.

New Revenue Streams

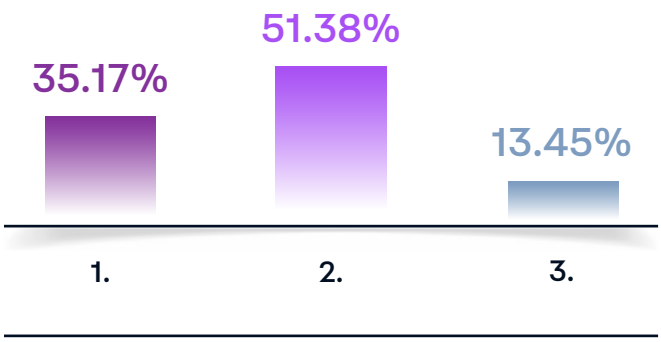
When it comes to Industry 4.0's ability to create new revenue streams, 35% of participants strongly agree that this is possible, while roughly 13% strongly disagree. The majority say they neither agree nor disagree—they're just not sure.

In terms of identifying the potential for new revenue streams, 34% have pursued new business models in order to generate new streams of revenue. Another 42% haven't identified or implemented any new revenue streams, and the remaining 24% have identified some opportunities but haven't taken steps to implement new initiatives.

These results tell us that manufacturers must step out of their comfort zones and get ready to transform business models to enable them to create new paths of value creation in the digital era. This involves embracing digital technology to enhance the efficiency and speed of their business processes.

Q17

Do you agree that adoption of industry 4.0 can create new revenue streams for your company?



1. Strongly agree.

2. Neither agree nor disagree.

3. Strongly disagree.

Figure 8: Displayed results of Q15-Q19 for business model section

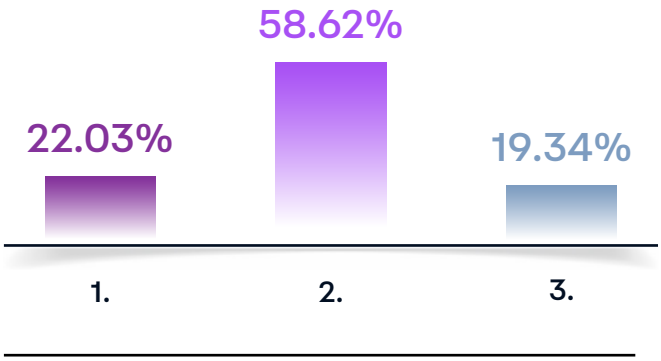
4: Technology

Finally, we asked manufacturing leaders about their technology adoption. It seems that most manufacturers still abide by traditional approaches and haven't taken advantage of everything automation has to offer.

When asked about the level of automation in their current manufacturing processes, 22% of respondents say adoption is high (more than 75% of their processes are automated). The majority (59%) are at a medium level of adoption (between 25% and 75% of their processes are automated), and the rest (19%) are at a low level of adoption (less than 25% of their processes are automated).

Q20

What is the level of automation in your company's manufacturing processes?



1. High (more than 75% of processes are automated)

2. Medium (between 25-75% of processes are automated)

3. Low (less than 25% of processes are automated)

Figure 9: Displayed results of Q20-Q25 for technology section

Technology Adoption Challenges

When adopting Industry 4.0 technologies, manufacturing leaders say they experience challenges in three areas:

1. High costs and uncertainty about ROI
2. Long implementation times
3. Lack of motivation to change and concern about uncertainty and complexity of rolling out new technologies

Preparation to Onboard New Tech

To combat these challenges, 32% of manufacturers rely on assessments to verify the validity of the technologies they select, along with their organization's adoption readiness. Similarly, 35% conduct technology gap analyses to identify areas where Industry 4.0 could be implemented.

The majority (68%) do not use any type of assessment to gauge preparedness. They also neglect to conduct technology gap analyses (66%).

An even smaller percentage (22%) follow a process to test and verify new technologies before implementing them across plants, meaning that 78% of companies do not do this.

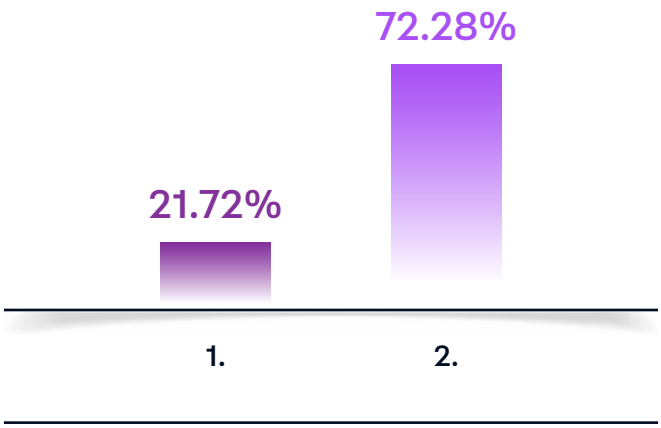
Most manufacturers (75%) also lack the necessary infrastructure to support Industry 4.0 technologies, such as AI, cloud computing and data analytics.

As a result, most manufacturers are not positioned to adopt the real industry 4.0 technologies today.

Even respondents that have the right infrastructure in place don't follow essential practices, such as technology assessments, gap analysis and testing, to adopt new technologies. Why? Because, as illustrated in the challenges identified by the group, manufacturers don't seem to be fully aware of the importance of these practices. They underestimate the potential risks and challenges associated with adopting technology without proper evaluation.

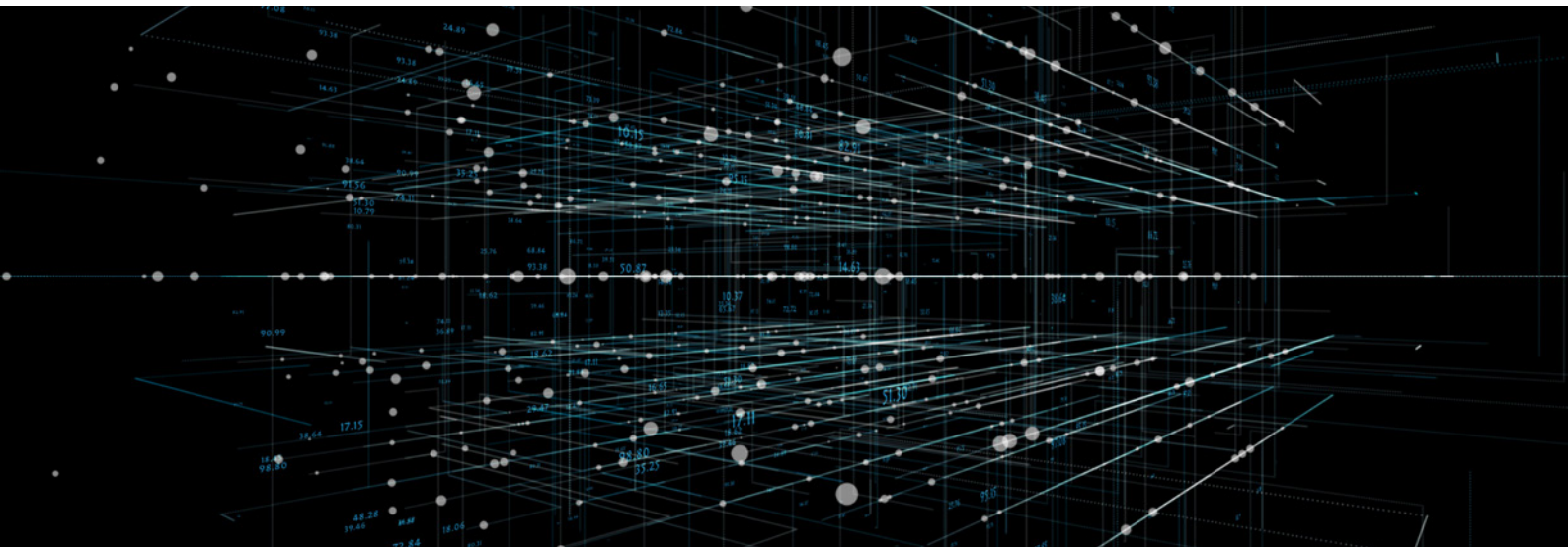
Q25

Does your company have a process for testing and validating new Industry 4.0 technologies before implementing them across the organization?



1. Yes.
2. No.

Figure 10: Displayed results of Q20-Q25 for technology section



Conclusion

While the benefits of Industry 4.0 are clear, successful implementation is not without challenges. Feedback from more than 50 manufacturing leaders highlights some of the biggest obstacles to achieving high success rates.

Effective leadership and organizational culture play fundamental roles in driving Industry 4.0 transformation, along with re-evaluating traditional business models and embracing new approaches.

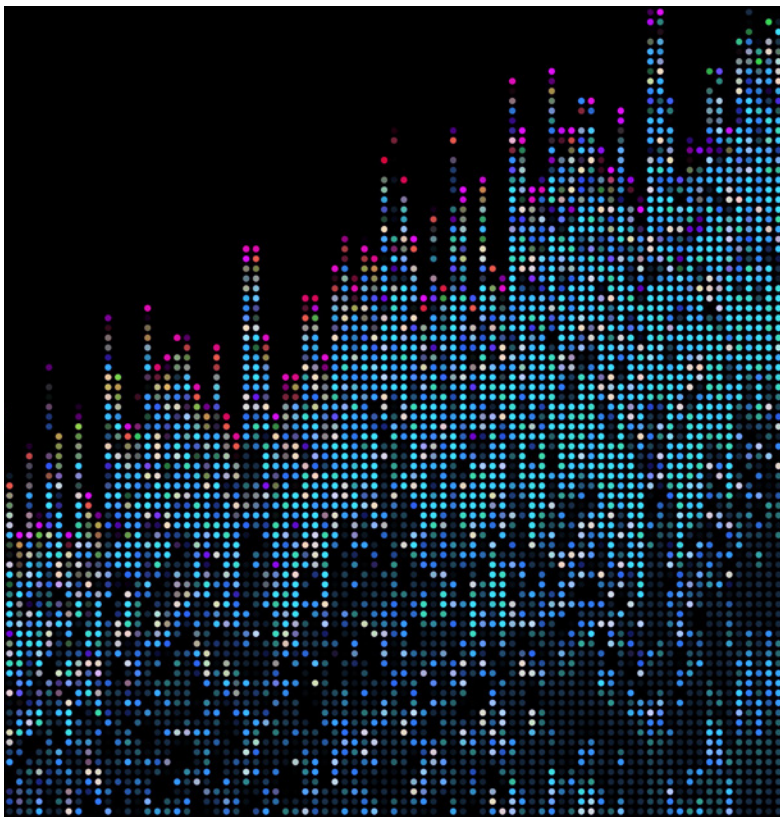
While technology adoption is a critical enabler, selecting and integrating technology must be done only after completing technology assessments, gap analyses and testing before implementation.

By addressing these aspects with the right approach and leveraging the opportunities offered by Industry 4.0, manufacturers can realize increased operational efficiency, improved competitiveness and sustainable growth in the digital era.

Belden works closely with industrial plants to craft a tailored, step-by-step roadmap to lead you along your digitization journey. We do this by:

- Helping you identify your goals
- Conducting assessments and analyses based on what we observe in your environment
- Presenting the findings we uncover from our assessment, explain how to address issues, map out steps to meet your goals and calculate expected ROI after making suggested changes
- Offering recommendations on how and where to get started when you're ready Belden's team of solution consultants, combined with our Customer Innovation Centers, can help you not only take advantage of cutting-edge technology, but also make sure you have the right foundation in place to do so—from getting the right leaders involved to deploying the right infrastructure.

Learn more here



Connect to what's possible.

White paper

About Belden

Belden Inc. delivers complete connection solutions that unlock untold possibilities for our customers, their customers and the world. We advance ideas and technologies that enable a safer, smarter and more prosperous future. Throughout our 120+ year history we have evolved as a company, but our purpose remains – making connections. By connecting people, information and ideas, we make it possible. We are headquartered in St. Louis and have manufacturing capabilities in North America, Europe, Asia and Africa.

For more information, visit us at:
belden.com

follow us on

Belden