Oh, It's On

SOFTWARE PLUS CONNECTIVITY IS THE NEW ONE-TWO PUNCH OF INDUSTRIAL INNOVATION

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A dominant majority of industry decision makers now believe that digital technologies will significantly reshape their organizations and competitive landscape in the next five years.

Indeed, since *Smart Industry* in 2015 began its annual reader survey on sentiment toward the rapidly evolving digital capabilities available to industry, the proportion of readers who believe digital transformation will have a "high" or "critical" impact on their companies has climbed steadily from 45% to 77% (Figure 1). The number of naysayers, on the other hand, who believe it will have little or no impact declined from 23% to a mere 6% in our latest, just completed survey.

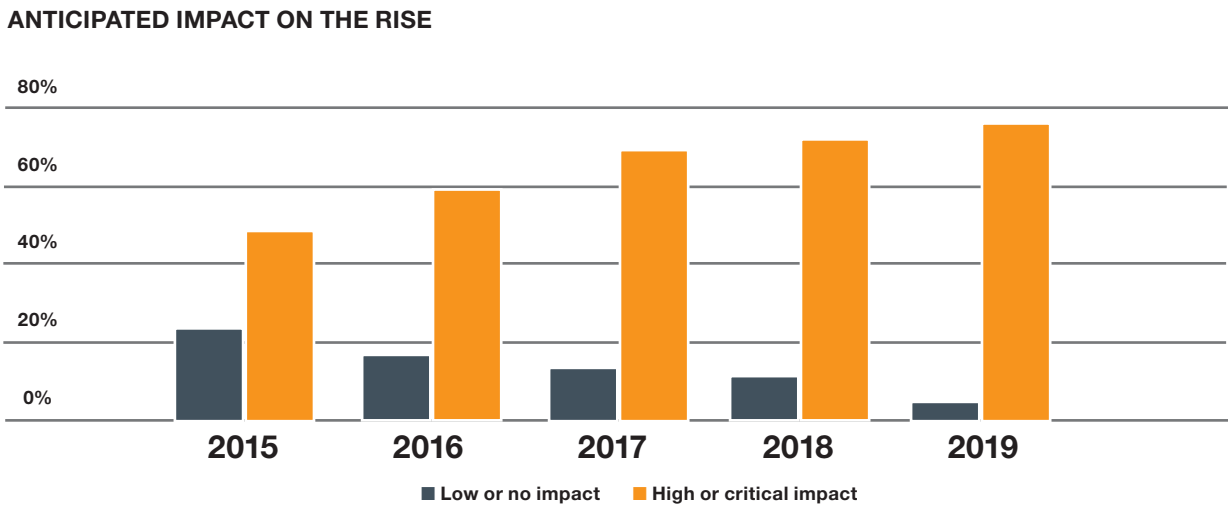

Figure 1. Ever fewer survey respondents believe that their organizations will be unaffected by the latest waves of digital technology. Here, respondents answer the question, "When you consider the drivers of and the opportunities presented by digital transformation, what is your best assessment of its likely impact on your organization in the next five years?"

Meanwhile, activity and investment on the digital front have intensified, with relatively few organizations still in tire-kicking mode. The percentage of survey respondents who say their organizations remain on the sidelines has dwindled to 18% (Figure 2), down from 46% in 2015. Today, the majority (51%) are actively investigating pilot projects and a further third (31%) are actively investing in production-scale applications.

Clearly, industry has bought into the potential of digital technologies to transform the performance of their businesses—and increasingly believes that a well-thought-out digital strategy may make or break the future of their organizations. Our survey indicates that fewer than 5% of organizations have no digital strat-

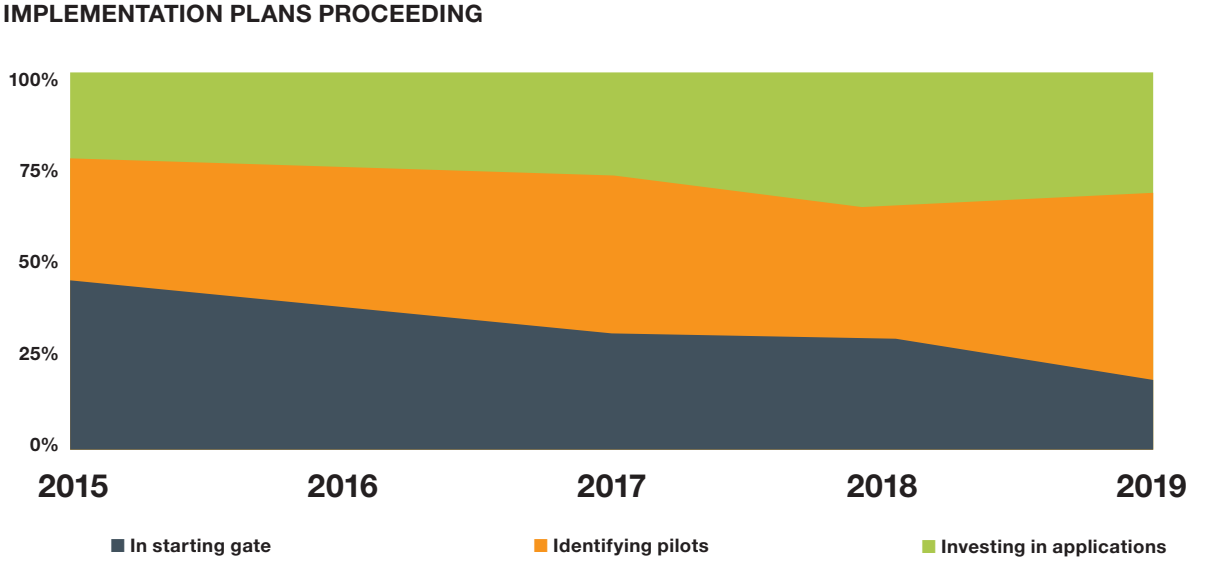

Figure 2. Industry's progress on digital transformation initiatives has steadily advanced over the past four years. Only a stubborn 18% remain on the sidelines, while the remainder have moved on to identify pilots or are actively investing in applications. Percentages shown are of respondents who describe their organizations as "at the starting gate, with focus on learning and exploration," "identifying early applications to pilot," and "have identified applications and are making investments."

DIGITAL STRATEGIES MATURING

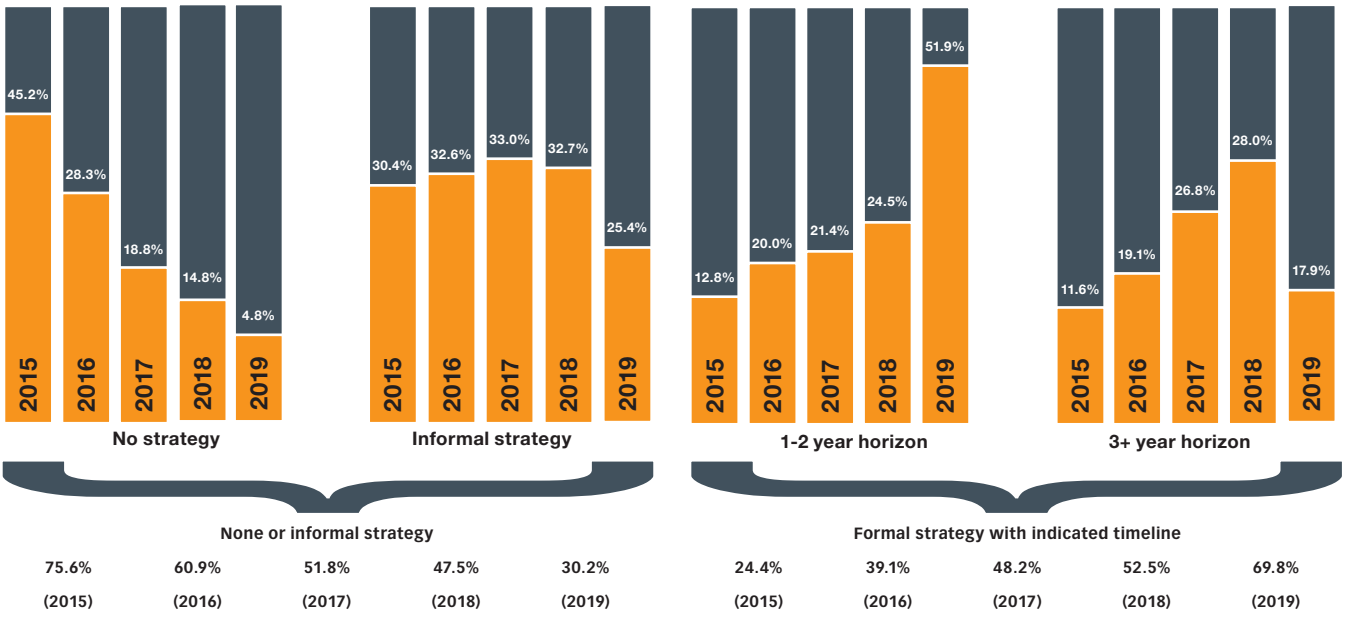

Figure 3. As the number of organizations yet to create even an informal digital transformation strategy dwindles, the majority now have in place formal digital strategies with a time horizon of 1-2 years.

IMPLEMENTATION SPEEDBUMPS

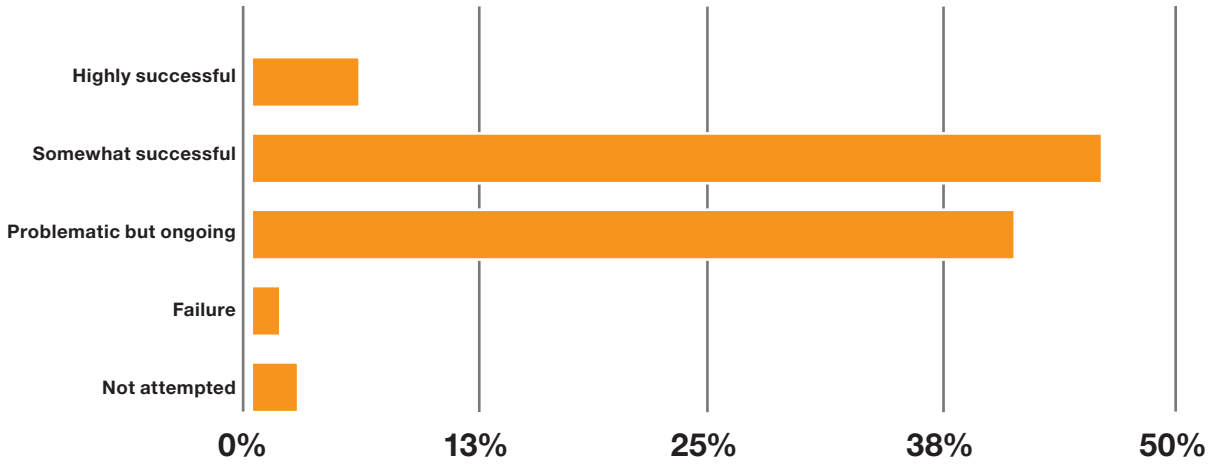

Figure 4. When asked how they would characterize the success of their organization's digital transformation efforts thus far, the collective response was "meh." The large majority is split between "somewhat successful" and "problematic but ongoing."

egyin place, while another 25% have only an informal one. Those numbers are way down, from 45% and 30%, respectively, just five years ago (Figure 3).

Nearly 70% of respondents report having a formal digital strategy in place. Interestingly, most of those survey respondents (52%) now report a short-term strategic focus (1-2 years). The number of organizations with a longer term strategy horizon (3+ years) declined significantly since just last year, from 28% to 18%, perhaps reflecting digital journeys already begun or a newfound appreciation for how quickly things are changing and how difficult it is to see even three years down the road.

FEW UNQUALIFIED SUCCESSES

But it isn't all easy going on the digital front, with the large majority of respondents evenly split between characterizing their digital transformation efforts as "somewhat successful" or "problematic but ongoing" (Figure 4). Only 7% put themselves in the "highly successful" camp, while another 6% have failed or not attempted such projects. While the new generation of digital tools may be more powerful and accessible than they once were, there's work to be done to further ease implementation hurdles—and, of course, address those people and process roadblocks that can sidetrack even the best of intentions and clearest value proposition.

PRODUCTIVITY TOPS LIST OF BENEFITS	2019	2016	4-Year Change
1. Increase productivity	90.1	78.7	11.4
2. Optimize utilization	88.8	82.2	6.6
3. Enhance customer experience	88.3	71.9	16.4
4. Reduce costs	87.6	85.3	2.3
5. Enhance safety	87.0	64.8	22.2
6. Improve sustainability	85.4	64.4	21.0
7. Create new business models/revenue streams	84.1	72.5	11.6

Figure 5. While incremental improvements in productivity, utilization and costs remain top reasons to invest in digital initiatives, enhancing customer experience made the top three for the first time this year. Interestingly, all seven listed benefits has increased in perceived importance over the past five years.

KEY OBSTACLES TO DIGITAL TRANSFORMATION	2019	2015 (Rank	5-Year Change
1. Lack of employee knowledge	39.6	33.9 (3)	+ 5.7
2. Immaturity of standards	38.6	23.2 (8)	+ 15.4
3. Security concerns	38.0	45.2 (1)	- 7.2
4.Lack of senior management knowledge	35.7	33.2 (4)	+ 2.5
5. Senior management commitment	33.1	29.7 (5)	+ 3.4
6. Lack of business-impact understanding	29.3	44.2 (2)	- 14.9
7. General economic uncertainty	24.5	20.6 (9)	+ 3.9
8. Regulations (as for data privacy)	22.6	20 (10)	+ 2.6
9. Workforce skills gap	21.6	28.4 (6)	- 6.8
10. Weakness in technology infrastructure	21.2	24.8 (7)	-3.6

Figure 6. Survey respondents were asked to identify which of the above 10 obstacles were significant obstacles to digital transformation. Lack of employee know-how and security have remained key issues over the years. Immaturity of standards is being acknowledged as a more urgent problem, while business-impact understanding has improved.

TECHNOLOGY UPTAKE	In production use	In test/pilot use	Plan to evaluate	No current plan	
Wireless networks	73.1	14.6	10.3	2.0	MAINSTREAM
Remote monitoring	54.4	31.6	11.4	2.6	
Smartphones/tablets	53.6	30.4	11.6	4.4	
Predictive maintenance	45.2	37.5	13.8	3.5	
Cloud connectivity	53.2	27.1	14.6	5.2	
Data analytics	51.4	27.8	14.9	5.9	
Machine learning/AI	31.1	36.6	23.2	9.1	EARLY ADOPTION
Application virtualization	32.5	34.3	21.8	11.4	
Virtual reality	32.4	32.8	19.1	15.7	
Wearables	26.0	35.8	25.3	12.9	
Additive/3D printing	20.3	40.2	25.5	14.0	
Digital twin	34.7	24.9	26.3	14.2	
Traditional robots	28.8	24.5	25.3	21.4	NICHE/EMERGING
Blockchain	29.8	22.8	21.0	26.3	
Augmented reality	24.8	27.4	28.6	19.1	
Collaborative robots	20.9	24.1	26.7	28.2	
Drones	15.7	21.3	32.7	30.3	

Figure 7. Uptake of the modern digital technologies for the industrial enterprise varies widely—from mainstream technologies that are in production use by the majority of respondents (percentages listed) to emerging/niche technologies that may be in use by fewer organizations—but still rank highly on many respondents' lists to evaluate.

One of the few things that hasn't changed much in the past several years is a primary focus on leveraging digital technology with the goal of incremental performance gains (Figure 5). Increasing productivity, optimizing asset utilization and reducing costs are perennial front-runners—no doubt because the benefits are easy to visualize (and the ROI calculations easy to perform and justify).

But the far less quantitative goal of "enhancing customer experience" nosed into the top three for the first time this year, while awareness of digital transformation's potential to boost safety, sustainability and create new business models/revenue streams has steadily increased over the past five years. Indeed, among these seven options, only six percentage points now separate the most important goal from the least; showing a deepening appreciation for the potential of digital technology to transform all aspects of industrial operations.

When asked to identify obstacles to successful digital transformation within their organizations,

survey respondents placed "lack of employee knowledge" atop the list for a second year in a row (Figure 6). This longstanding issue was joined by oft-cited "security concerns" (although ranked as an obstacle by fewer respondents) as well as "immaturity of standards," which for the first time cracked the top three.

This increase may be due primarily to a newfound appreciation for the importance of standardization, brought about by troublesome implementation efforts. Conversely, with more organizations in command of formal digital strategies, "lack of business-impact understanding" is today seen as much less of an obstacle than it was five years ago.

RESULTS MAY VARY

Finally, in a new question added to this year's survey we asked our readers to identify their organization's experience to date with 17 enabling technologies and use cases closely associated with digital transformation (Figure 7). Four options were given in order to indicate a relative sense of adoption: 1) in production use, 2) in test/pilot use, 3) plan to evaluate or 4) no current plan.

The answers to these questions were then used to roughly cluster these technologies into three groups: Mainstream, Early Adoption and Emerging/Niche.

The Mainstream technologies are those for which the largest number of respondents indicated production or test/pilot use; the Early Adoption technologies are those for which the majority of respondents indicated test/pilot applications or plans to evaluate. Finally, Emerging/Niche technologies are in production use by the fewest organizations—but still rank highly on many respondents' lists to evaluate.

Any way you read the results, it's clear that a remarkable number of new digital technologies have entered the mainstream of late. Even more are currently being evaluated for their production potential. And nearly as many are on the short list for evaluation in the near future.

Don't know about you, but I'm already excited to see how much things will have changed by 2020.

SURVEY METHODOLOGY

First conducted in May, 2015, this year's fifth annual *Digital Transformation: State of the Initiative* survey of industry professionals continues to benchmark the evolving landscape of digital transformation, which we define as the adoption of new manufacturing and business processes made possible by new automation, communications and computing technologies represented by conceptual models such as data analytics, the Industrial Internet of Things (IIoT) and Industry 4.0.

Input for the 2019 edition of the report was gathered in January via an email survey of *Smart Industry* e-newsletter subscribers from across manufacturing, processing and related industries. A total of 662 respondents completed the survey this year, representing a broad swath of industrial concerns as shown in the accompanying chart. Trend analysis is based on responses gathered in the 2018, 2017, 2016 and 2015 editions of the survey. All told, the survey series represents the input of more than 1,800 professionals from across industry.

SURVEY RESPONDENTS BY INDUSTRY

Process manufacturing	31.1
Discrete manufacturing/industrial machine builder	16.9
Engineering/professional services	16.8
Power generation	13.4
Transportation/logistics	8.5
Oil & gas	8
Other	5.3

SURVEY RESPONDENTS BY FUNCTION

Project management & execution	25.3
Production/production planning	14.4
IT & networking	11.2
General/corporate management	10
Product design & development	9.8
Quality assurance	6.2
Logistics/supply chain	5.5
Environmental, health & safety	5.2
Maintenance/reliability	4.8
Sales/marketing	4.1
Finance	3.5