DIGITAL OUTLOOK

INDUSTRIAL MANUFACTURING INDUSTRY

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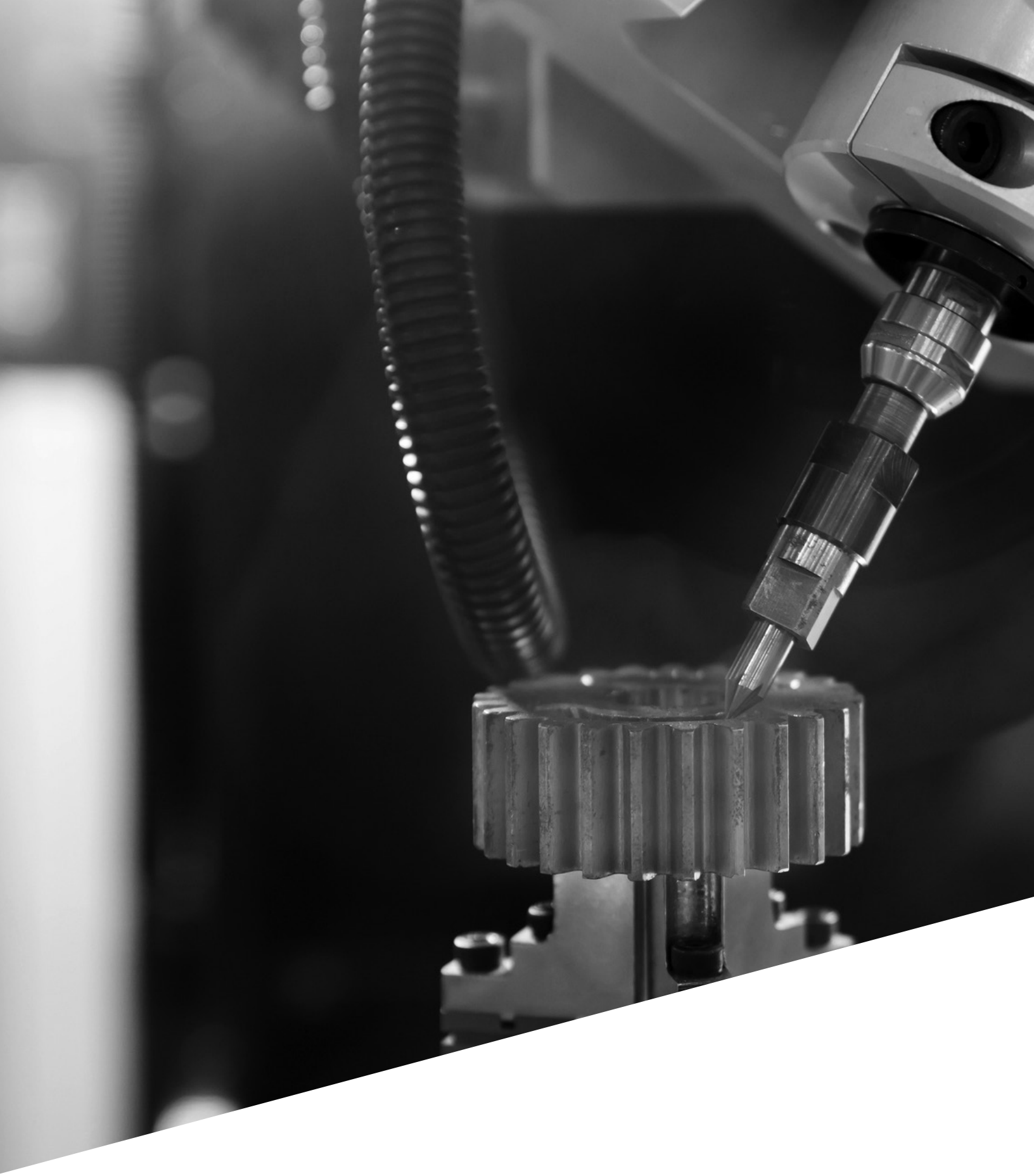

INTRODUCTION

Any opinion on the future of manufacturing can be summarized in two words –Industry 4.0, the fourth industrial revolution powered by digital technologies such as the Internet of Things (IoT), artificial intelligence (AI), and smart manufacturing. A leading provider of research and intelligence about the information technology (IT) and telecommunications sectors has declared that in two years' time, digital platforms will support up to 30 percent of revenue of 60 percent of the manufacturers worldwide. Every commentary on the future of manufacturing talks of only one thing – its transformation impelled by digital trends, such as 3D printing, robotic automation, cognitive computing, industry clouds, smart supply chains, and of course, the Industrial Internet of Things (IIoT). The already blurry lines between operational technology and IT will be all but erased as the two integrate even more tightly.

So the question of what lies ahead for the industrial manufacturing sector this year is not one of what, but of how, how much, and how fast.

As the technology partner of several large manufacturing organizations around the world, we wanted to find out some of these answers for ourselves. Hence late last year, Infosys commissioned a survey of 1,000 senior decision makers from business and IT, from large organizations (with 1,000 employees or more and annual revenue of at least US$500 million) in nine industries, including 115 respondents from the industrial manufacturing industry to hear their views on the digital technology trends that would make the greatest impact on their business through the next three years.

While identifying the key digital technology trends was the most important objective of the study, it was not the only one. The survey also sought to understand which digital technologies were in use within manufacturing organizations and the broad purpose for which they had been deployed – improve existing operations, solve new problems, or create new opportunities. Another objective of the research was to ascertain how ready these companies were to take advantage of the favorable digital technology trends of 2018 and beyond.

Finally, the study reviewed these findings against current and immediate investments in digital technologies to understand where the industrial manufacturing industry was putting its resources.

The research findings were supplemented with our own perspective on the manufacturing sector and anecdotes about the happenings in the industry to produce this short but incisive report.

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EXECUTIVE SUMMARY

- According to the industrial manufacturing companies surveyed, better cyber security (68 percent), using AI and automation in the back office (45 percent), and supplying directly to consumers through e-commerce (45 percent) are the most commonly reported trends for the next three years which will make a positive impact on their organization.
- Cyber security (73 percent), big data analytics (65 percent), enterprise cloud (61 percent), and AI (54 percent) are the four digital technologies being utilized the most by manufacturing companies today.
- Industrial manufacturing enterprises plan to invest in digital technologies in the coming 12 months. IIoT (71 percent), 3D printing of spare parts (68 percent), AI/OCR (optical character recognition) for vendor and staff contract management (67 percent), and cyber security (67 percent) have already received investments from most companies who consider them a trend for the coming three years.
- A majority of respondents said that their organization could improve both existing skills and technologies in preparation for implementing the top trends of 2018 and beyond; budget was not a big problem.

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TOP INDUSTRIAL MANUFACTURING TRENDS FOR THE NEXT THREE YEARS

1 CYBER SECURITY

2 AI AND AUTOMATION

3 E-COMMERCE

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A diverse set of digital trends, from the use of blockchain for improving supply chain traceability and transparency to creating digital twins for enhancing efficiency in maintenance operations, entered the conversation. When asked to name the trends with the greatest positive impact on the organization in the next three years, the respondents mentioned the following (only those named by 30 percent or more are listed below, and not showing the three most commonly chosen):

a. Leveraging the IIoT to sensor enable the production floor to build smart factories where it is possible to predict and prevent machine failure.

b. 3D printing of spare parts. Detailed conversations with some respondents suggested that some organizations may already be using 3D printing but for samples rather than spare parts. Others were still testing and assessing feasibility but believed there would be a "big benefit for sales".

c. Using blockchain technology to improve traceability and transparency of the supply chain.

d. Investing in predictive technologies to improve after sales service. For instance, manufacturers are using past data on equipment failure to build machine learning models to predict future incidents with a high degree of accuracy.

e. Investments in the use of advanced materials, such as carbon fiber, in engineering.

f. Creating digital twins for improving maintenance efficiency. Using sensors and cloud technology, it is possible to build a digital twin of a physical environment where manufacturers can visualize the entire life cycle of a product, feed its data into an analytics platform to identify points of failure, and then use that insight to improve design and production processes.

g. Deliver products as services through an opex model. A manufacturer of heavy equipment, for say, a power plant, would rarely have the opportunity to interact with the customer after delivering the order. But thanks to the IIoT, it can now supply the same equipment "as a service" and can collect data from the connected equipment to repair faults remotely, conduct predictive maintenance, and send software updates over the air. This allows it to keep up a continual engagement with the customer as well as open up new revenue streams.

h. Using AI and OCR to manage staff and vendor contracts.

On average, each respondent from the industrial manufacturing sector had five trends in their list of what would make a significant positive impact on their organization in the next three years. Of these, the three trends receiving most mentions – cited by 68, 45, and 45 percent of the respondents, respectively, as making a positive impact on the business – suggest that the industry is both cognizant of the opportunities of digital technology as well as the challenges it brings.

Better cyber security was voted the most important digital technology trend for the next three years, receiving a mention from 68 percent of the respondents. This is absolutely expected, considering that as factories become more connected both inside and outside, they expose themselves more to cyber security risks.

Using AI and automation in the manufacturing back office and leveraging the e-commerce channel to reach parts to consumers directly, without the interference of middlemen, were in joint second place, each cited by 45 percent of the manufacturing respondents.

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Which of the following trends will have the most positive impact on your organization within the next three years?

Cyber security	**68%**
AI and automation for the manufacturing back office	**45%**
e-Commerce to reach parts to consumers directly	**45%**
Industrial Internet of Things to predict and prevent machine failure	**44%**
3D printing of spare parts	**40%**
Blockchain for better supply chain traceability and transparency	**37%**
Investment in predictive technologies for after-sales service efficiency	**36%**
Investment in use of advanced material in engineering	**36%**
Digital twins for better maintenance efficiency	**33%**
Drive to deliver products as services made possible by Internet of Things	**33%**
AI and use of optical character recognition for people (staff), contract management, or vendor contract management	**31%**
Participate in ecosystem of services where maintenance data can be shared with other players in the value chain	**14%**
Don't know	**1%**
Average number of trends that will have a positive impact on respondents' organizations within the next three years	**5**

Let us discuss these top three most commonly reported trends in more detail.

1 Better cyber security to safeguard manufacturing systems, data, and installations in Industry 4.0

The manufacturing industry was among the top five targets of cyber attack last year. Hackers, seeing that manufacturing companies lag others in cyber security awareness and protection, are readily exploiting this weakness.

In its 2017 mid-year report on the state of global cyber security, a global leader in IT and networking observed that 28 percent of the manufacturers lost an average 14 percent of revenue due to a cyber attack in the last 12 months. The world over, manufacturers are now piling up security solutions – 63 percent use six or more – to protect their organizations against a security breach.

The importance of cyber security for the modern manufacturing organization with abundant cyber-physical systems cannot be overstated. An attack can cause a lot more than loss of revenue, customers, industrial secrets, and reputation, including environmental damage and loss of life. A grim example is the June 2017 cyber attack in Ukraine, which caused computers monitoring radiation at the old Chernobyl nuclear plant to stop functioning. Hopefully, industrial manufacturers who, as the survey shows, do acknowledge the need for better cyber security, will act upon that conviction in the next three years.

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2 AI, robots and automation to run the manufacturing backend

Robots on the shop floor is hardly breaking news. But recent advances in technologies, such as machine learning and visual recognition, have opened up never before use cases for AI and automation – on the shop floor, within the supply chain, and inside the back office. A leading consulting firm estimates worldwide spending on robotics to touch US$67 billion by 2025 of which more than US$24 billion will belong to the industrial sector, as manufacturers use robots to improve accuracy, efficiency, consistency, and productivity beyond human levels, and to improve worker health and safety by deploying these machines to work in hazardous conditions.

Dramatic evolution in AI capabilities means robots and robotic software can take on more complex tasks in the manufacturing back office, from ledger management and supply chain operations to ERP automation, while chatbots and smart assistants man the customer service desk. In the not too distant future, factory managers in need of information from the shop floor will simply ask a chatbot to gather it for them.

3 e-Commerce to supply to customers directly

The e-commerce shopping experience is the gold standard for consumers. So why not for the customers of industrial manufacturing companies? When surveyed, two out of three customers of B2B products and services complained that their experiences here were not as good as the consumption experience on Amazon and other e-commerce sites. Slightly more than 60 percent desired the self-service option.

Clearly, the respondents to our survey were agreeing that it was time to give customers what they were asking for, when they included e-commerce in their list of top trends. The sales process in industrial manufacturing has started to change, with lengthy, costly physical interactions – with distributors, sales representatives, and other intermediaries – being replaced by an automated ordering process and online purchasing. Web and mobile channels provide a smooth, omnichannel experience to consumers as they fulfill diverse needs for information, spare parts, and services in one place. The manufacturers also gain by way of satisfied customers, greater reach and revenue, and higher efficiencies.

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DIGITAL TECHNOLOGIES THAT INDUSTRIAL MANUFACTURING COMPANIES USE – CYBER SECURITY, BIG DATA ANALYTICS, ENTERPRISE CLOUD, AND AI

Industrial manufacturing enterprises utilize about six digital technologies on average. The most deployed technologies in the industry are cyber security, big data analytics, enterprise cloud, and AI, in use at 73, 65, 61, and 54 percent of the organizations, respectively.

Which of the following digital technologies does your organization currently utilize?

Cyber security	73%
Big data analytics	65%
Enterprise cloud	61%
AI (machine learning, deep learning, natural language processing, natural language generation, and visual recognition)	54%
ERP and enterprise application implementation/modernization	49%
3D printing	44%
Internet of Things	43%
Business process management solutions	40%
APIs	34%
Enterprise service management solutions	33%
Blockchain	30%
Dev-ops and agile	30%
Mainframe modernization	16%

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For the industrial manufacturers participating in the survey, the most important purpose of implementing all these technologies was to improve existing business operations, but a substantial number were also looking to solve new business problems and create new opportunities (the last was especially true of enterprise cloud and AI).

When the following areas of digital technologies and solutions were implemented within your organization, was it to improve existing business operations, solve new kinds of business problems, or create new opportunities?

	Improve existing business operations	Solve new business problems	Create new opportunities	Don't know	None of these
3D printing	71%	31%	47%	-	-
AI (machine learning, deep learning, natural language processing, natural language generation, and visual recognition)	60%	58%	40%	-	-
APIs	72%	54%	49%	-	-
Big data analytics	64%	52%	33%	-	-
Blockchain	41%	62%	50%	-	-
Business process management solutions	61%	48%	57%	-	-
Cyber security	61%	52%	29%	-	1%
Dev-ops and agile	54%	60%	51%	3%	-
Enterprise cloud	60%	54%	44%	-	-
Enterprise service management solutions	79%	50%	50%	-	-
ERP and enterprise application implementation/modernization	66%	61%	38%	-	2%
Internet of Things	60%	62%	50%	-	2%
Mainframe modernization	56%	61%	56%	-	6%

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WHERE INDUSTRIAL MANUFACTURING ENTERPRISES ARE INVESTING – SLIGHTLY MORE IN EMERGING DIGITAL TECHNOLOGIES

While industrial manufacturing enterprises plan to invest in digital technologies in the coming 12 months, it is more important that they invest right than invest big. So where are they putting their money? Are companies investing in disruptive technologies to bring totally new possibilities to life, or only in tried and tested solutions that keep the business running?

More importantly, are the investments aligned with the trends deemed most significant in 2018 and beyond? To understand this, the survey asked the respondents whether they were investigating or investing in the top three trends they had named as having the most impact on their organization in the next three years. Here are the findings.

Industrial manufacturers, who believe that at least one trend will have a positive impact, were investing in the top three trends for the next three years, but they were investing a bit more in other trends. Where these trends were expected to have a positive impact, most enterprises were investing in them; the IIoT (71 percent), 3D printing of spare parts (68 percent), and AI and OCR for managing vendor and staff contracts (67 percent). 67 percent of the respondents said their organization was investing in cyber security, while 59 percent and 53 percent of the respondents said the same for e-commerce and AI and automation for the back office, respectively. The likely reason for this pecking order is that industrial manufacturing companies may have already invested in the last three areas, which are fairly mature, and are now turning their attention to emerging trends and technologies, such as 3D printing and the IIoT.

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Is your organization investing in or investigating any of the top trends?

	Investing in this trend	Planning on investing in this trend	Investigating this trend	Not investing in, planning on investing in or investigating this trend
Industrial Internet of Things to predict and prevent machine failure	71%	19%	10%	-
3D printing of spare parts	68%	26%	6%	-
AI and use of optical character recognition for people (staff), contract management, or vendor contract management	67%	26%	7%	-
Cyber security	67%	28%	5%	-
e-Commerce to reach parts to consumers directly	59%	26%	12%	3%
Digital twins for better maintenance efficiency	55%	40%	5%	-
Investment in use of advanced material in engineering	55%	35%	10%	-
AI and automation for the manufacturing back office	53%	41%	6%	-
Drive to deliver products as services made possible by Internet of Things	50%	35%	15%	-
Investment in predictive technologies for after-sales service efficiency	50%	50%	-	-
Participate in ecosystem of services where maintenance data can be shared with other players in the value chain	50%	25%	25%	-
Blockchain for better supply chain traceability and transparency	30%	57%	13%	-

Industrial manufacturing respondents, who expect at least one trend to have a positive impact on their organization, answered the question, "Which of the following technologies or solutions will your organization use in order to realize the promise of all of these trends?" by naming AI (65 percent) ahead of big data analytics (55 percent) and cyber security (54 percent).

But overall, how equipped are they to implement these trends? When the survey asked the respondents if they had what it took to implement their top trends, a big majority said they possibly needed to improve their technologies (91 percent) and their skills further (82 percent). Only 42 percent cited lack of funds as a barrier to implementation.

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IN CONCLUSION

For industrial manufacturing organizations, which began their journey to digitalization several years ago, 2017 marked one more year of walking the path. In 2018, the industry will continue its march to Industry 4.0, helped along by top trends – cyber security to protect the organization, AI and automation to improve the back office, and e-commerce to enhance customer experience. Manufacturers are investing not only in these trends, but also in others that are yet to mature, indicating that they have their sights trained firmly on the future.

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