Trends Impacting the Semiconductor Industry in the Next Three Years

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Big data, 5G, and artificial intelligence will transform the electronics industry, but have yet to make a major impact in the semiconductor industry.

Arguably, at no point in the history of electronics has so much change happened all at once than right now. Digital transformation, the proliferation of technologies enabling the smart city and smart factory, the advent of artificial intelligence and next-generation big data, the switch to connected and self-driving cars, and the launch of next-generation wireless cellular technology are rapidly transforming life.

These changes are the impetus for trends impacting the semiconductor market currently and will accelerate in the next three years, according to a new survey conducted by IEEE GlobalSpec on behalf of Advanced Energy.

The survey asked more than 480 respondents for their opinions on what technologies will have the greatest influence on the chip industry in the coming years. It found that the next-generation wireless communications standard known as 5G — which is set to succeed the 3G and 4G standards this year — is expected to impact semiconductor vendors the most, with 57 percent of respondents indicating that companies should be focused on that technology.

Among respondents, the second biggest trend that will impact the semiconductor industry in the next three years is artificial intelligence (AI), with forty-nine percent of those surveyed saying it will be a major issue that companies will need to contend with.

Forty-five percent of respondents think the connected car will be the third-biggest trend facing semiconductor companies in the next three years, as OEMs such as Daimler, Continental, Audi, Ford spinoff Visteon and others look to include digital cockpits with gesture recognition and augmented reality displays; integrated infotainment systems with support for voice assistants and Wi-Fi; vehicle-to-vehicle (V2V) communication where cars share information regarding road safety, efficiency, traffic and weather patterns; and facial recognition and other biometric offerings.

Not surprisingly, these three trends are part of what respondents are currently focused on and what impacts their daily work, along with digital transformation, big data, smart factories and smart cities.

Big data is here but not yet fully realized

Big data is primed to be a significant trend in manufacturing, fueled by the Industrial Internet of Things (IIoT). There is tremendous potential value in the structured and unstructured data that a company generates during day-to-day business. It does not matter how much data there is; what matters is how the data is analyzed and leveraged to reduce costs, save time, stimulate new product development and reach smart(er) decisions. According to analytics provider SAS, when combined with analytics, big data allows companies to determine the root cause of failures or defects in real-time, identify buying habits of customers, determine risk factors and detect fraud.

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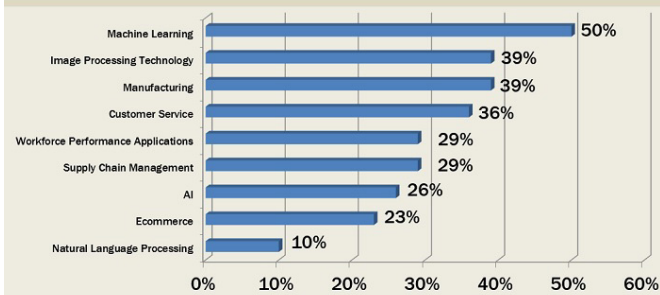

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How Big Data is Used Today

Table 1: The benefits that survey responders see in the implementation of big data in the electronics market. Source: Advanced Energy & IEEE GlobalSpec.
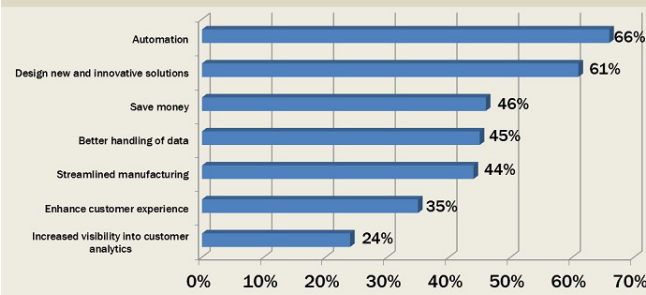
Benefits You Envision Using AI

Table 2: The benefits that survey responders see with AI in the electronics market. Source: Advanced Energy & IEEE GlobalSpec.

However, 70 percent of respondents to the Advanced Energy survey said they are not currently using big data in their job. This may imply that there is still educational and implementation work to do in bringing big data into the smart factory and smart lab.

However, that means there is an opportunity for companies providing analytics and big data to partner with companies not using the technology to incorporate it in future platforms or portfolios in the next three years.

Among those using big data today, respondents said that machine learning is the most-used application (50 percent). Over a third of respondents (39 percent) using big data said they are using machine learning for image processing and manufacturing. This was followed by customer service (36 percent), workforce performance applications and supply chain management (29 percent) and artificial intelligence (26 percent). Other uses include e-commerce and natural language processing.

Those using big data agreed with SAS about the benefits it will bring to companies; 59 percent believe big data will improve the customer experience; 57 percent said process insights will be improved; 51 percent said big data will bring enhanced safety; and 45 percent said the technology will help eliminate risk.

Artificial intelligence is still in the nascent stage
While big data is being used by some for artificial intelligence, the technology is still just getting started. AI promises to permeate all aspects of industrial and consumer electronics.

But according to the Advanced Energy survey, only 26 percent of respondents are using the technology in their day-to-day jobs. This may imply that AI, while common in our day-to-day technology such as smartphones, still has a way to go to make a meaningful impact in the tools workers use in their jobs.

Much like IIoT big data, this shows that the technology has room to grow in the next three years and there will be opportunities to push innovations and technological

advancements into companies that could benefit from AI.
Of the responders using AI right now, machine learning is the top application, with 59 percent. Again, manufacturing and image processing technology are second and third, at 45 percent and 34 percent, respectively. AI is also used for customer service by 28 percent of responders, by 24 percent for natural language processing and by 22 percent for workforce management. Other uses include supply chain management and e-commerce.

The future of AI is important; 66 percent of respondents said that automation will be the biggest benefit as the technology matures. Other benefits include the designing of new and innovative solutions (61 percent), the ability to save money (46 percent), better data handling (45 percent), streamlined manufacturing (44 percent), enhanced customer experiences (35 percent) and a better understanding of customer analytics (24 percent).

These benefits will impact a number of different markets, but will likely impact engineering and manufacturing the most, according to those surveyed. Medical and telecommunications will also benefit heavily from AI, as will education, aerospace, transportation, and energy segments.

However, there are risks with AI. 71 percent of respondents believe that data security is a big concern. Safety was the second highest (38 percent), followed by centralization of information across devices and personal sovereignty (also known as self-ownership), both with 36 percent of respondents noting concern. Another concern is the difficulty with vision and speech recognition and translation in association with AI.

Long-term growth
Respondents also see different factors impacting the semiconductor industry in the long-term. The biggest factor is that R&D investment will continue to be a major need for companies to meet, not just to enable connected cars, 5G, artificial intelligence, big data and the digital transformation, but also what comes next. Of the survey respondents, 45 percent saw R&D as the main attribute to long-term

semiconductor growth, followed by R&D capabilities with 38 percent. Geopolitics (33 percent) – the stability of the world as a whole or how countries interact on trade and information sharing – was also labeled as a factor in long-term growth. Consumer purchasing habits, which always change, were seen by 32 percent of respondents as a major influence on the long-term growth of the chip industry, along with market fluctuations and consumer buying confidence, both at 26 percent.

Conclusion

Technology is always evolving, but more so today than ever before. While 5G, IIoT big data, artificial intelligence, the connected car and digital transformation are all in their infancy, they are poised to have major implications for the future of the semiconductor industry in the next three years.

Most companies are just beginning to implement some of these trends. Given the numerous benefits these technologies offer, they present ample opportunities for those who move swiftly to be a technological innovator and perhaps get a jumpstart on the competition – or risk being left behind.

Appendix A

Major Benefit to Society for Trends Most Focused on Currently

Trend	Percentage
Advanced technology for humanity or future generations	30%
Automation	25%
Enhanced safety	13%
Improved infrastructure	12%
Enhanced customer experience	10%
Eliminating risk	5%
Better health management	5%
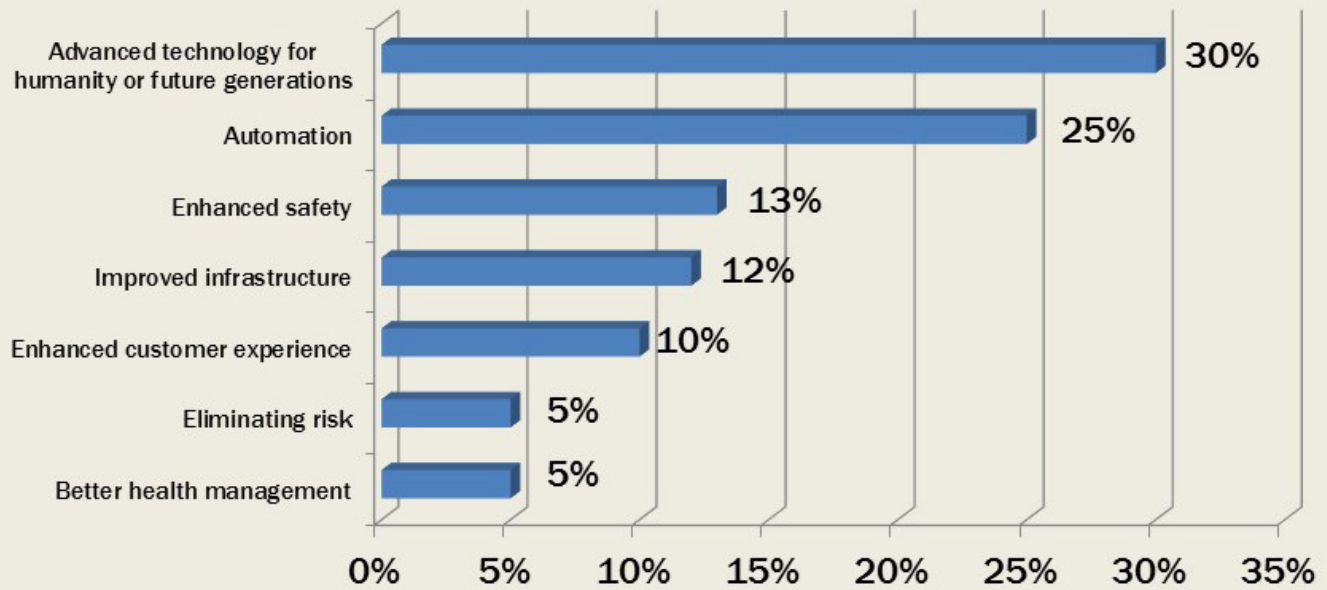
2018 Survey of Semiconductor Industry Trends, base = 483 respondents answering the question.

Value that Big Data Creates for Humankind

| Category	Percentage
Enhanced customer experience	59%
Process insights	57%
Enhanced safety	51%
Eliminating risk	45%
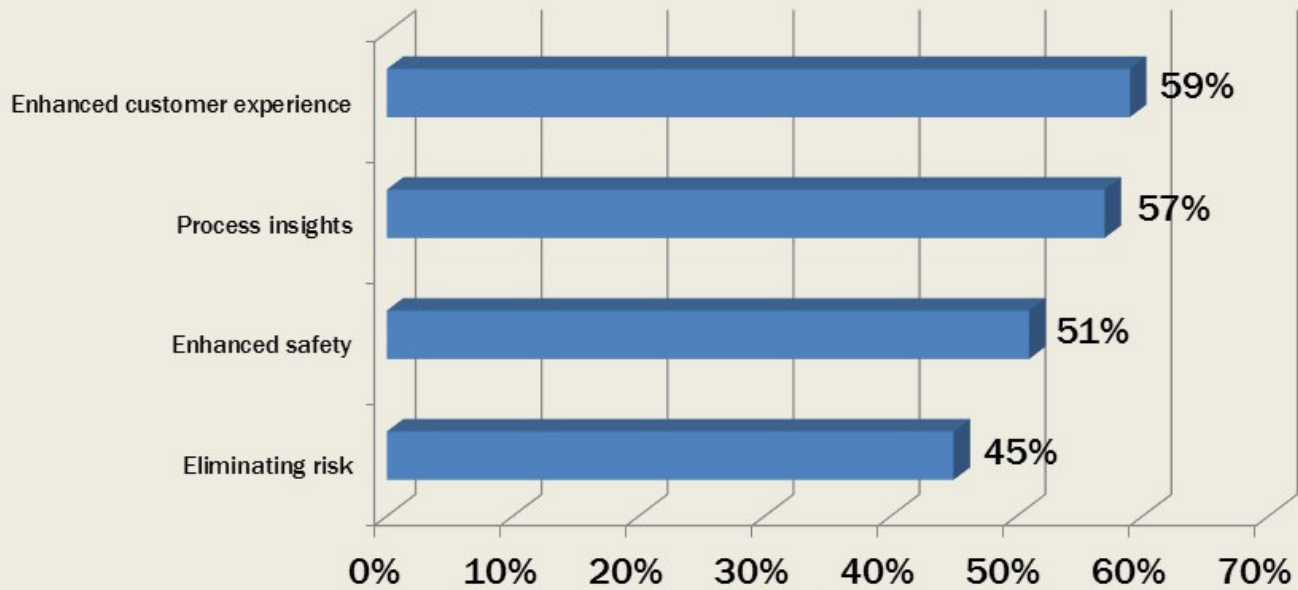
2018 Survey of Semiconductor Industry Trends, base = 142 respondents who indicated they use Big Data and answered this question. Percentages total to more than 100% due to multiple mentions.
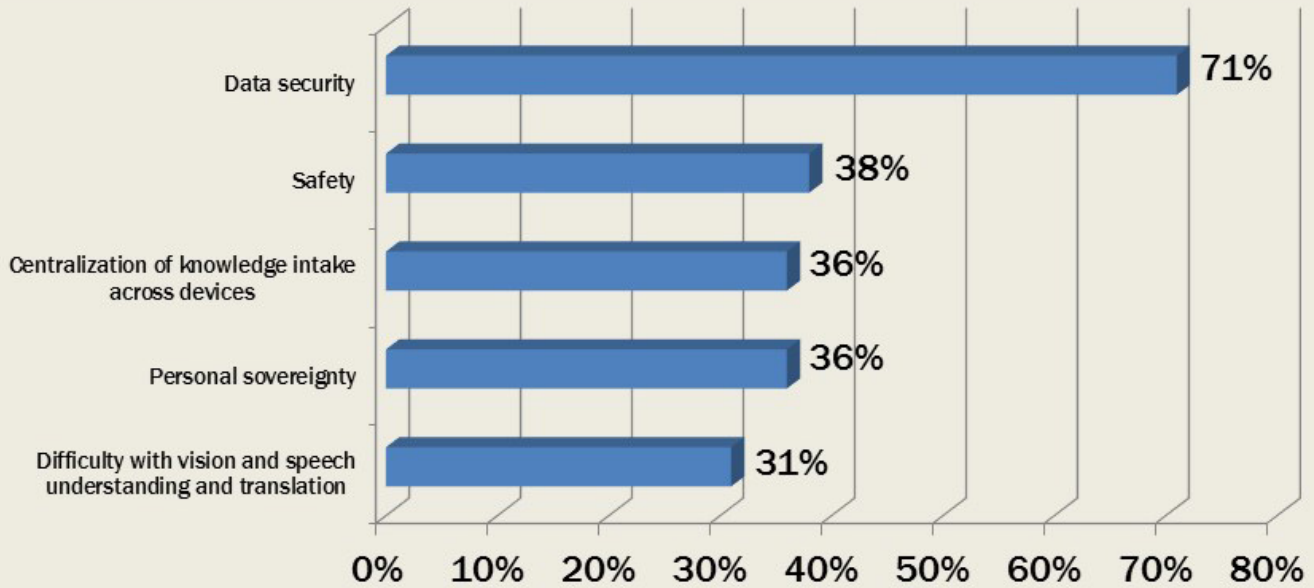
Appendix C

Use AI in Professional Life Day-to-Day

Yes
26%

No
74%
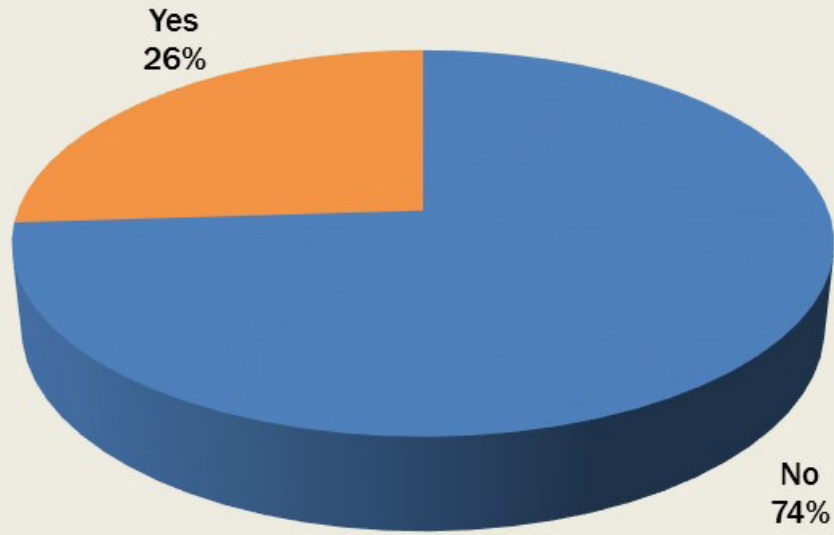
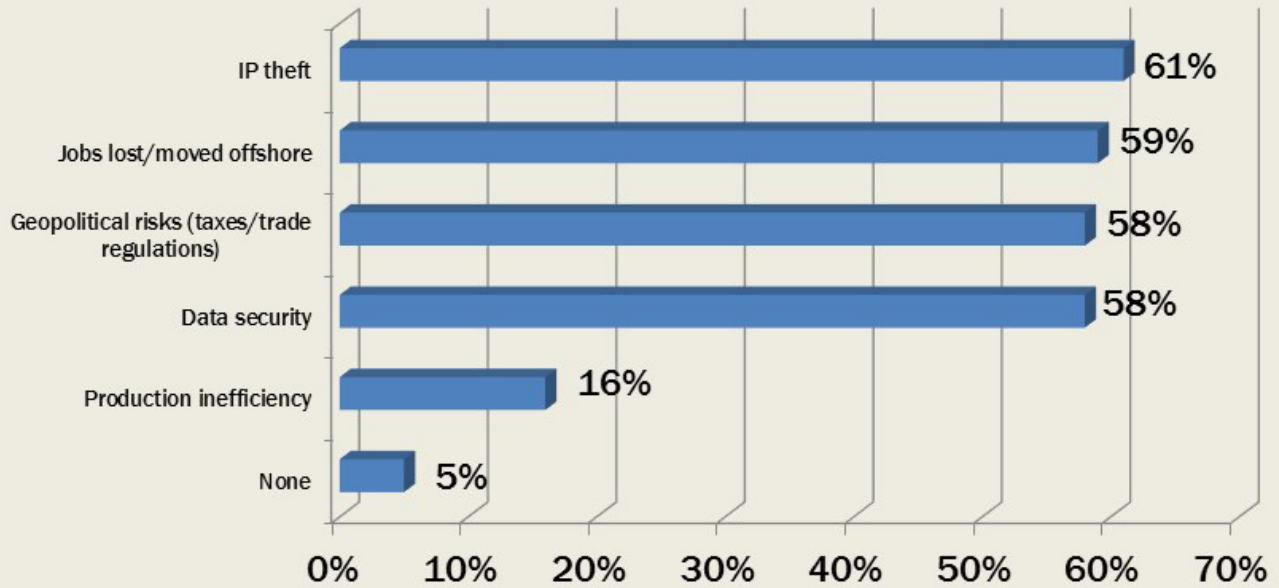2018 Survey of Semiconductor Industry Trends, base = 474 respondents answering the question.

Risks You Envision Using AI

Risk	Percentage
Data security	71%
Safety	38%
Centralization of knowledge intake across devices	36%
Personal sovereignty	36%
Difficulty with vision and speech understanding and translation	31%

2018 Survey of Semiconductor Industry Trends, base = 119 respondents who indicated they use AI and answered this question. Percentages total to more than 100% due to multiple mentions.

Risks of China Entering the Design Market

2018 Survey of Semiconductor Industry Trends, base = 465 respondents answering the question. Percentages total to more than 100% due to multiple mentions.

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