

The logo for GLG, consisting of the letters 'GLG' in a bold, white, sans-serif font. The background of the entire page is a dark blue with glowing yellow and red circuit traces and nodes, creating a high-tech, digital atmosphere. Four yellow L-shaped corner brackets are positioned at the corners of the page, framing the central content area.

GLG

JULY 2024

INSIDE THE SEMICONDUCTOR INDUSTRY

Key Trends and Expert Insights

By a subject-matter expert and GLG Network Member



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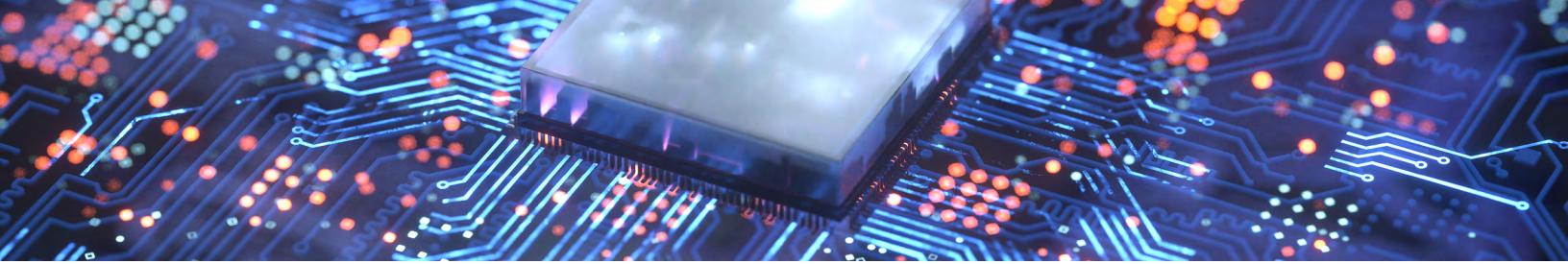
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EXECUTIVE SUMMARY

The increasing performance requirements of hyperscale data centers, rising demand for support of AI workloads on a range of devices, and accelerating interest in processing at the edge are driving new opportunities and increasing challenges for the semiconductor industry. This survey of semiconductor leaders reveals trends that will power future demand for semiconductor design and fabrication as well as make new capabilities available to the device and equipment manufacturers that are the primary consumers of semiconductors.

Findings from the survey point to a future of greater specialization of the semiconductor industry, as purpose-built chips are increasingly deployed to optimize performance for highly specific workloads and industry applications. Software ecosystems are expected to play an even more important role in simplifying the developer experience across an increasingly fragmented hardware landscape.

While the semiconductor supply chain has recovered substantially since the pandemic, changing global conditions, greater emphasis on sustainability, and increasing domestic investment in manufacturing capacity continue to impact the strategic choices available to semiconductor companies. Facing long product cycles and high costs of new product development, firms in this space will want to carefully assess these trends and conduct their own follow-on research to confidently identify the most promising market opportunities.

The survey revealed that:

74%

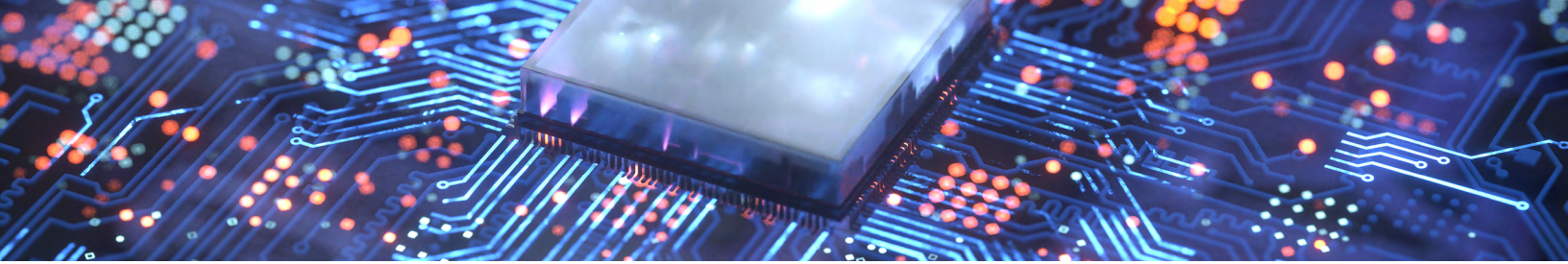
of respondents believe that accelerating AI at the edge is one of the top three growth markets for semiconductors

65%

of respondents expect that AI-specific chips will overtake GPUs as accelerators of AI workloads within four to seven years

90%

of respondents view an open-source software ecosystem as important to the market opportunity for a semiconductor product line



ABOUT THE RESEARCH

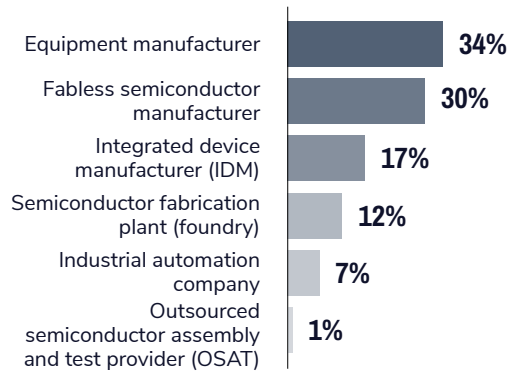
From May 23 - June 3, 2024, GLG conducted an online survey of 101 senior leaders in the United States and Canada with influence over sales, go-to-market planning, or strategy for a semiconductor firm or equipment manufacturer to capture their perspectives on key areas of opportunity and concern.

The study revealed that most respondents:

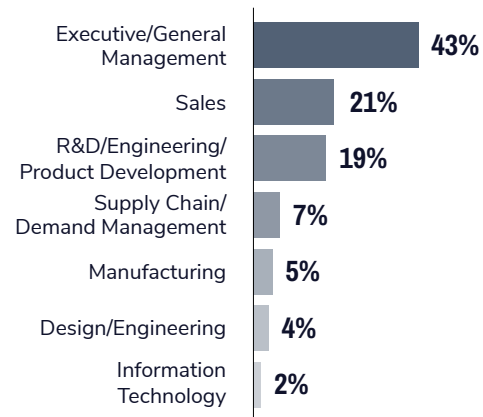
- View AI as a significant driver of semiconductor opportunity
- Expect increasing specialization and verticalization of semiconductors as demand for optimization around specific workloads and usage scenarios increases
- Believe that domestic investments in semiconductor capacity have had a positive impact on the competitiveness and innovation of semiconductor firms

The figures below indicate respondents' roles and the distribution of their companies by annual revenue and industry.

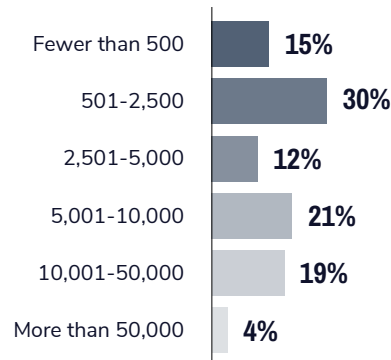
Primary Industry



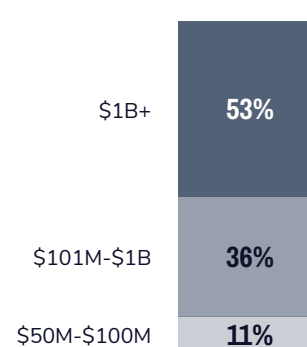
Job Function

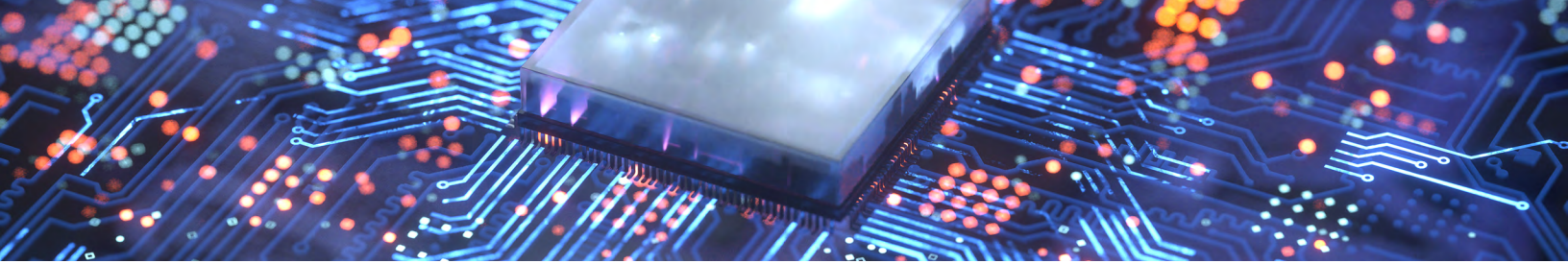


Company Size



Revenue





SURVEY INSIGHTS

90%

of respondents rank AI workloads as a top growth area for the industry

AI workloads will drive demand.

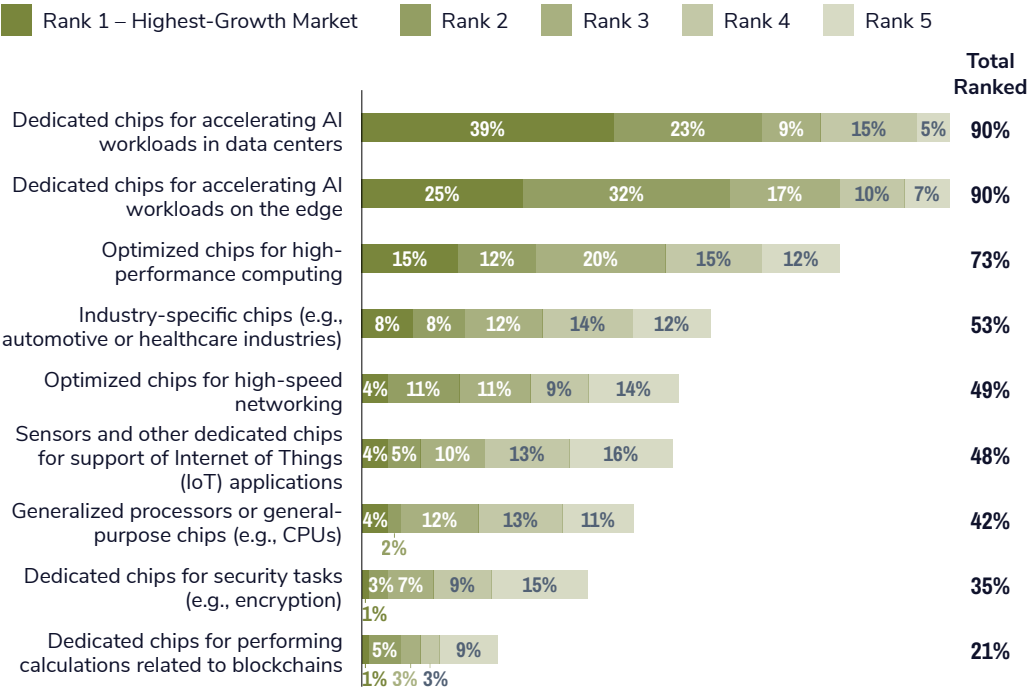
Respondents expect AI workloads to be an increasingly important source of demand for semiconductors, with 90% of respondents ranking AI workloads as one of the industry's top growth areas. Respondents also indicate that those workloads are likely to run both within data

centers and at the edge, so firms planning to pursue AI opportunities should consider investing in product lines that address both the high-performance and scale demands of data centers and the low power consumption required for edge devices. A majority of respondents also indicated that industry-specific chips, such as those used in control systems in the industrial or automotive industries or in devices in the life sciences and healthcare sectors, will be an important driver of semiconductor market growth.

Taking a more detailed look at the nature of AI workloads that need to be supported, 72% of respondents identified data processing and movement in support of AI workloads as one of the top three industry opportunities, and 65% of respondents similarly highlighted inferencing used to support large language models (LLMs). A majority (52%) also identified video processing and media encoding as a key opportunity.

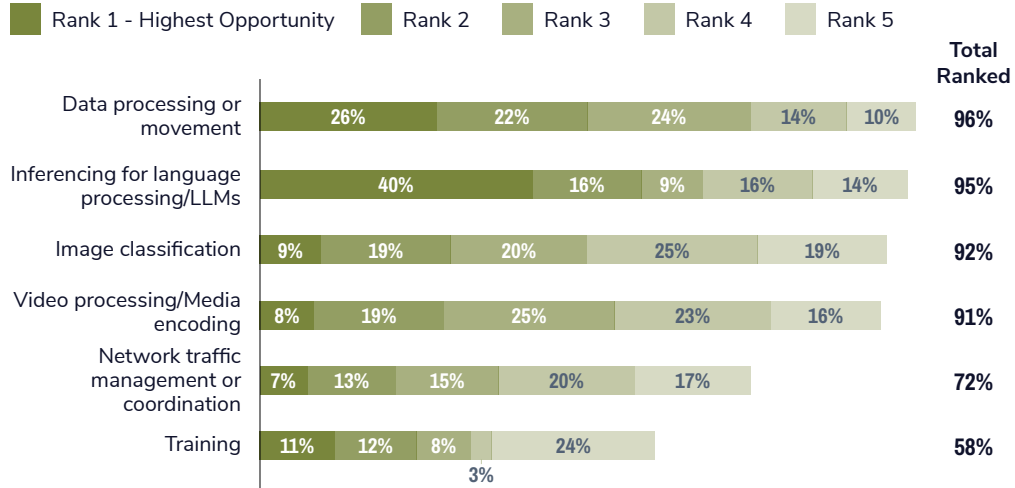
Expected Growth Market of Semiconductor Companies

% Among Total Respondents, Sorted Descending by Total Ranked



Opportunity for Chips for Accelerating AI Workloads

% Among Total Respondents, Sorted Descending by Total Ranked



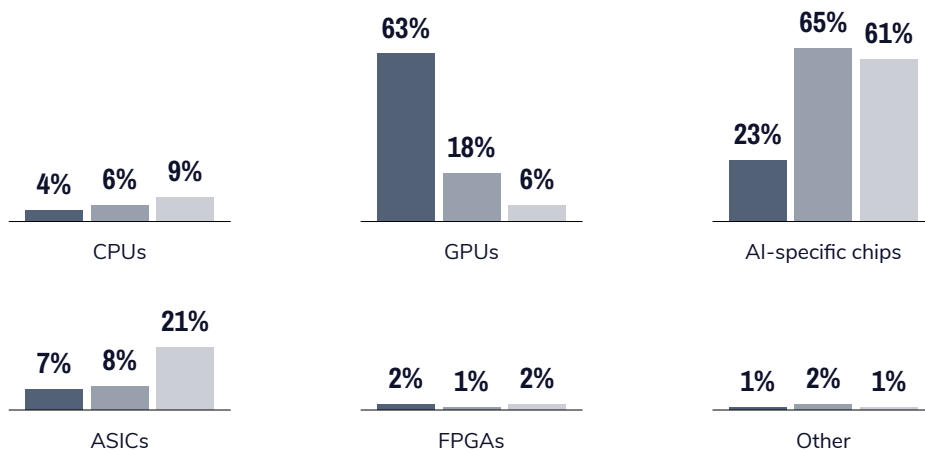
GPU gives way to AI-specific chips.

When asked to project how demand for different types of chips would evolve over time, respondents indicated that while GPUs will be the primary means of accelerating AI workloads in the near term, within four to seven years that role would likely shift to AI-specific chips such as NPUs. Sixty-five percent of respondents indicated that these AI-specific chips would be running the majority of AI workloads in that time frame, while only 18% of respondents believed that GPUs would retain their current significance. It is projected that a variety of AI-specific chips will become available to meet a range of requirements for different operating environments, such as low-power AI accelerators for mobile devices and highly performant chips optimized to run large language models as a service in the cloud.

Anticipated Chip Use in Future

% Among Total Respondents

■ Near future (1-3 years) ■ Medium term (4-7 years) ■ Long term (more than 8 years)



63%

of respondents believe that semiconductors embedded in devices, vehicles, and industrial equipment will drive the majority of semiconductor opportunity within four to seven years

From data centers to devices.

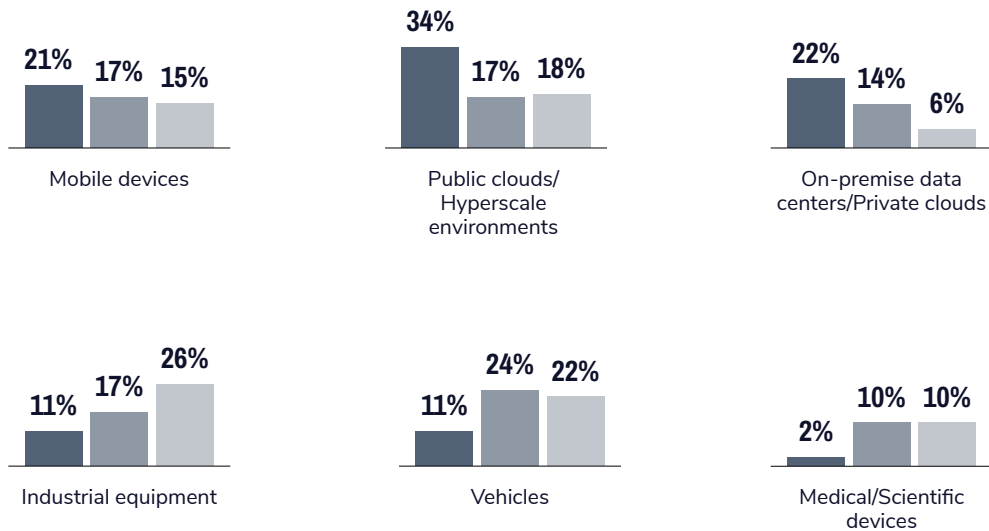
Respondents to the survey also expect a shift over time in which operating environments consume the most semiconductors. While 56% of respondents believe that data centers, both those that support public clouds and those managed on-premise or in support of private clouds, are the primary semiconductor opportunity over the next three years, in the four-to-seven-year horizon these respondents expect that situation to shift, with 63% of

respondents anticipating that semiconductors embedded in mobile devices, vehicles, and industrial equipment will drive the majority of industry opportunity.

Devices or Platforms Anticipated to Drive Demand for Chips in Future

% Among Total Respondents

■ Near future (1-3 years) ■ Medium term (4-7 years) ■ Long term (more than 8 years)

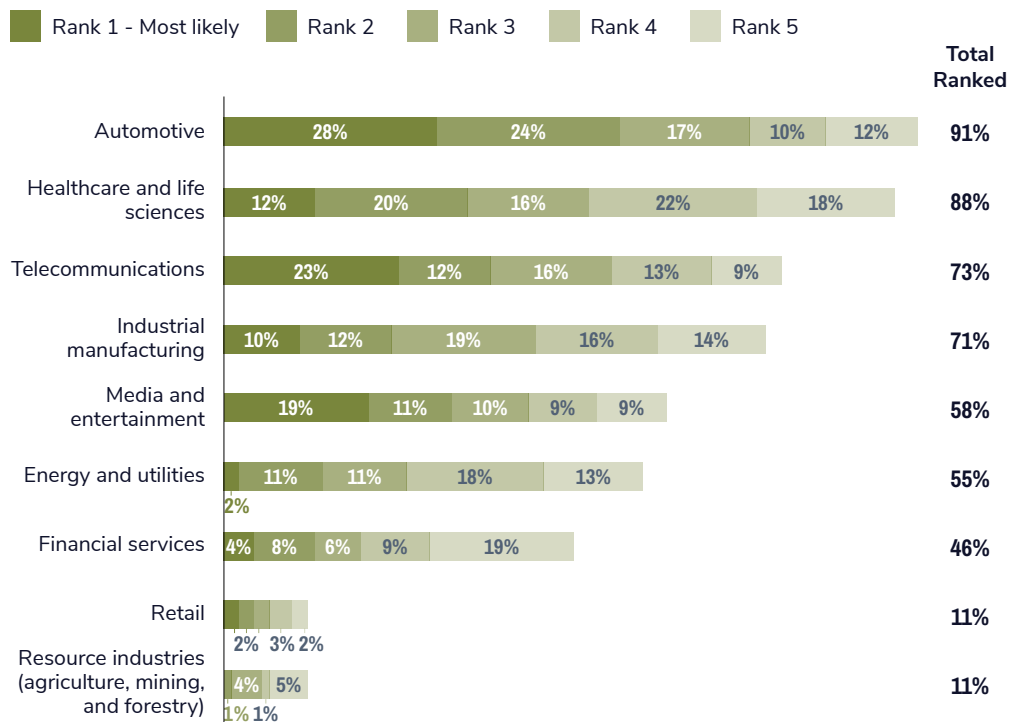


Verticalization is key to growth.

Just as AI workloads are expected to be supported with increasingly specialized and purpose-built chips, respondents indicated that the demands of specific industries will push semiconductor manufacturers to find purpose-built, verticalized solutions for their needs. Respondents suggest that the largest business opportunities for semiconductor manufacturers are likely to come from addressing the unique needs of the automotive, telecommunications, and healthcare/life sciences segments, with 69% placing the automotive industry in their top three opportunities, 51% indicating telecommunications, and 48% indicating healthcare and life sciences. All three industries share demand for chips that can support local processing with limited tolerance for latency and constraints around power consumption, suggesting that raw performance may become less important over time than the ability to process events in real time across distributed devices.

Industries Expected to Drive Opportunity

% Among Total Respondents, Sorted Descending by Total Ranked

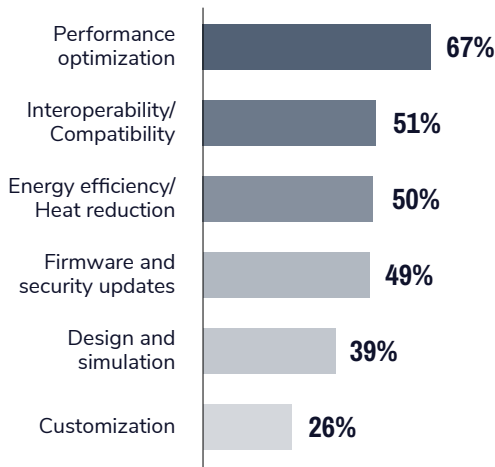


Software makes hardware more valuable.

Increasing specialization of hardware platforms to support specific workload profiles and industry applications will make it more difficult for developers to optimize their software for each particular chip. By investing in the open-source software ecosystem, semiconductor manufacturers can make it easier for developers to share optimizations and build more generalized frameworks that enable applications to make the best use of specific hardware configurations. Ninety percent of respondents to the survey indicated that the health of the open-source software ecosystem around a particular chip was important to the market opportunity for that chip. In particular, respondents believed that open-source software made it easier for developers to obtain performance benefits, improve interoperability, increase energy efficiency, and maintain security when working with a particular chip.

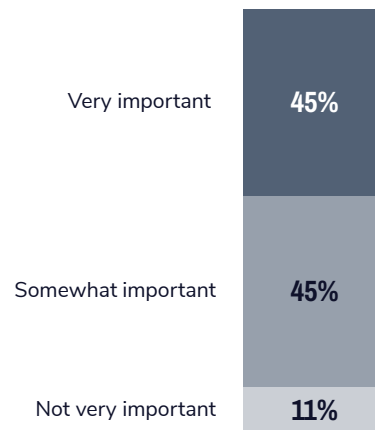
Benefits of Thriving Software Ecosystem

% Among Total Respondents, Sorted Descending



Importance of Open-Source Software Ecosystem

% Among Total Respondents



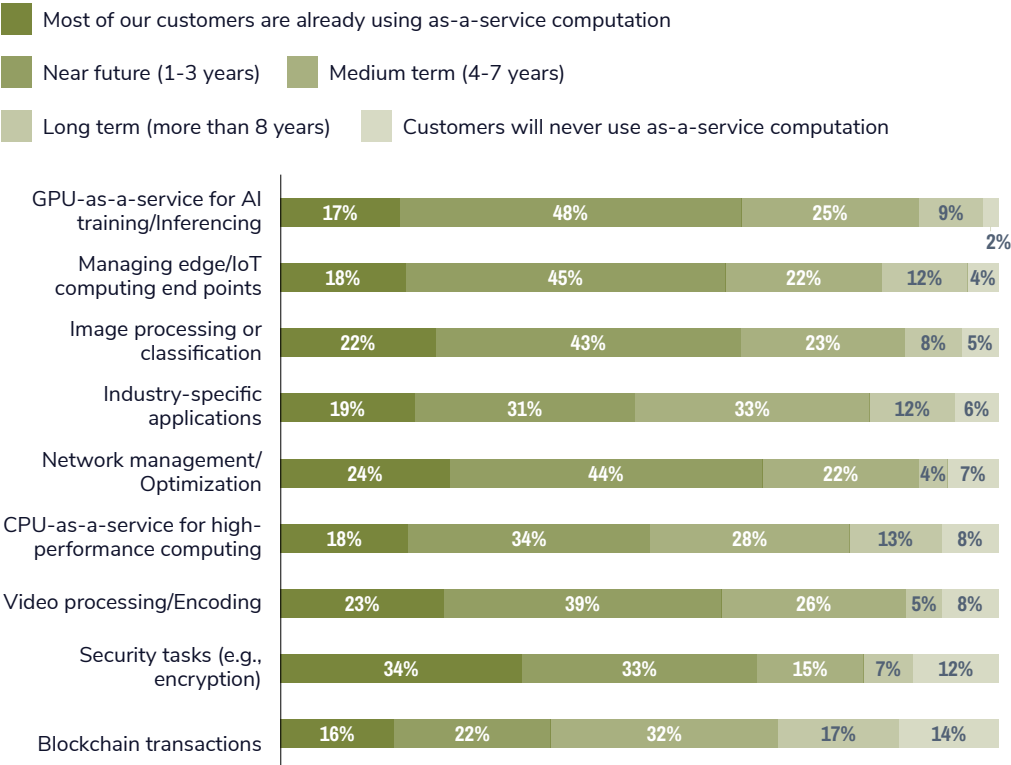
As-a-service models expand opportunity.

While purpose-built chips will enable optimization of workloads for the best combination of performance, cost, and power consumption, the proliferation of hardware options will increase the complexity of managing those workloads and maintaining environments to support them. As with the shift to cloud for generalized compute and storage workloads, companies will look to as-a-service models to manage increasingly more specialized workloads on their behalf, and more specifically they will look to providers that offer dedicated hardware optimized for their particular needs, rather than depending on general-purpose cloud environments. Respondents to the survey believe that in the near term (within three years), a majority of companies will shift to running key workloads in dedicated as-a-service environments; for example, 65% of respondents believe that a significant portion of AI training and inferencing

workloads will be run in dedicated GPU-as-a-service environments within three years. These new dedicated managed service environments will become increasingly important customers for semiconductor manufacturers, driving demand and scale for specific types of workload- or application-specific chips.

Anticipated Customers Shifting by Alternative to Public Cloud Computing Approach

% Among Total Respondents, Sorted Ascending by 'Customers will never use'



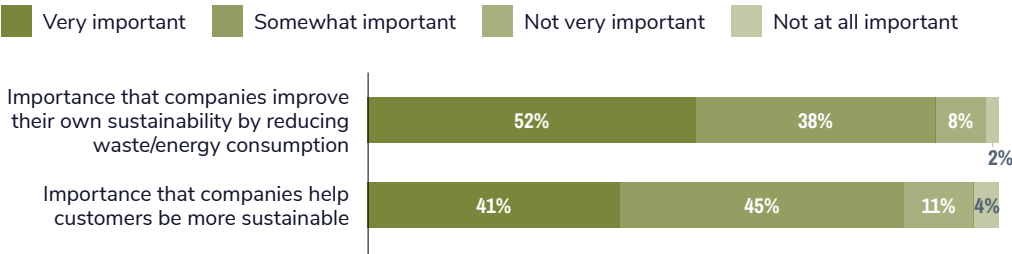
Sustainability actions speak louder than words.

As market demand for sustainable computing increases, and more pressure is put on the industry to manage waste and reduce power and water consumption, semiconductor manufacturers must take action to improve their sustainability; 90% of respondents to the survey indicated that it was important for manufacturers to improve their own sustainability, and 86% suggested that this responsibility extends to helping end customers become more sustainable as well. The increased awareness around sustainability also means that manufacturers must make the market aware of their investments in sustainability. When asked to identify one key strategy for engaging the market around sustainability issues, the largest portion of respondents (39%) suggested that semiconductor manufacturers were best served by developing their own reputation

for sustainable practices rather than marketing sustainability directly to customers. By taking actions to manage their own environmental footprints and scrutinizing their supply chains, firms can model sustainable practices and build positive perception in the marketplace that can translate into greater demand for their products.

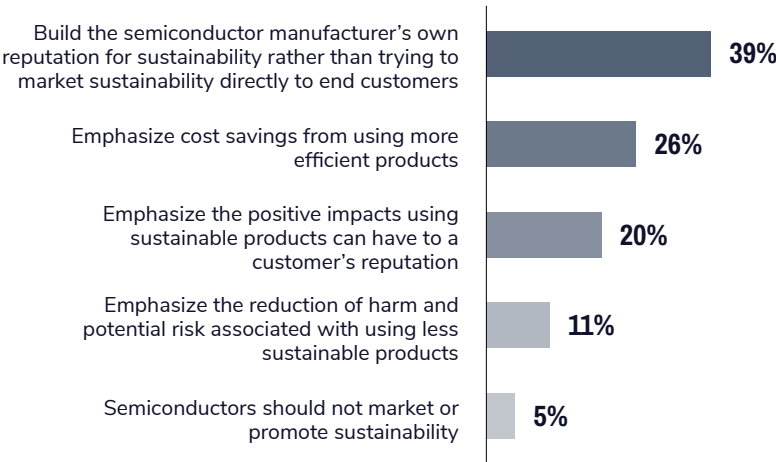
Importance of Companies Improving Sustainability

% Among Total Respondents



Preferred Primary Strategy of Companies to Communicate Value of Sustainability to End Customers

% Among Total Respondents, Sorted Descending



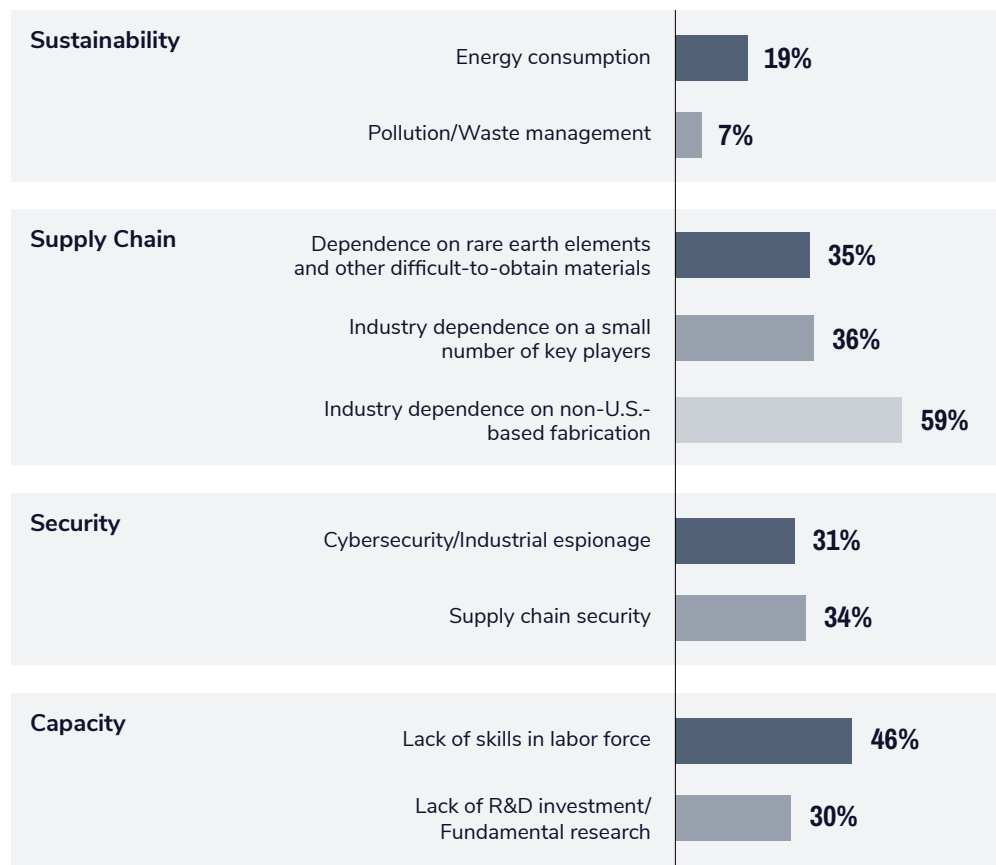
Domestic investments in supply chain capacity are expected to have a positive impact.

When asked to identify the most urgent risks to the semiconductor industry, 59% of respondents (largely U.S.-based) identified dependence on non-U.S.-based fabrication as a key concern, acknowledging both the high concentration of OSAT (outsourced semiconductor assembly and test) providers in Asia and the potential for geopolitical tensions or seismic activity to disrupt foundry operations in Taiwan, while 46%

highlighted the lack of relevant skills in the labor force. Seventy-three percent of respondents said they expected the U S CHIPS Act to impact the health of the domestic semiconductor industry, with 53% of those respondents indicating the act would improve competitiveness with non-U.S.-based firms, 51% suggesting that it would help accelerate innovation and development of new technologies, and 35% expecting that it would increase the availability of skilled labor. When considering the state of the semiconductor supply chain, 58% of respondents indicated that they were more confident about their ability to obtain raw materials since the beginning of the pandemic, but 79% indicated that they still had concerns about availability of these materials over the next three years.

Most Urgent Semiconductor Industry Problems

% Among Total Respondents

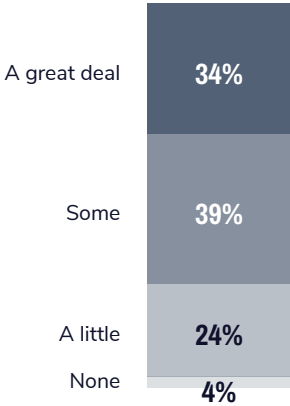


Other (5%)

- Packing
- Actual machines that make the semiconductor. China has invested hard in the global supply
- Labor costs
- All OSATs in Asia
- Political decisions, such as tariffs, impacting supply chains and availability

Expected Impact of CHIPS Act on Semiconductor Industry

% Among Total Respondents



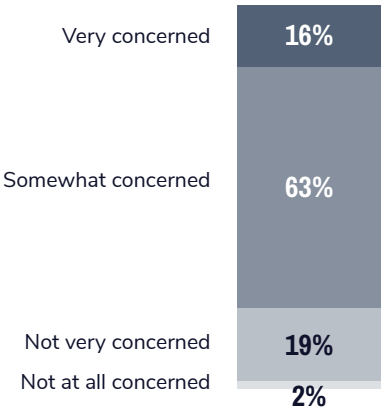
Contribution of CHIPS Act on Health of Semiconductor Industry

% Among Respondents Concerned with Availability, Sorted Descending



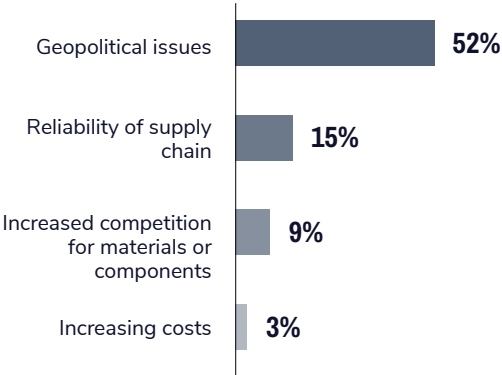
Concern with Raw Material Availability in Next Three Years

% Among Total Respondents



Primary Concern

% Among Respondents Concerned with Availability, Sorted Descending





CONCLUSION

GLG's survey of semiconductor industry leaders highlights a number of trends that will shape investment and go-to-market opportunity for the industry over the next few years:

- AI will continue as a major focus of investment, with specialized chips for accelerating AI workloads, especially those that run on the edge or in devices outside of cloud data centers, gaining importance over more generalized GPUs and CPUs
- Verticalization will be an increasingly important theme for the industry as increasing requirements from automotive, telecommunications, and media companies drive demand for specialized platforms
- Over time, the impacts of domestic investments in semiconductor capacity will change the global competitive landscape and enable innovation to support evolving market demand

As semiconductor companies weigh the high costs of developing new products and consider the risks associated with long product development cycles, observing these trends and investigating more thoroughly how they apply to a firm's specific situation will help ensure that companies pursue the opportunities most likely to yield positive results.

Interested in the full survey results? [Get in touch with GLG.](#)



The survey and interview research and analysis contained in this document has been conducted by a consultant engaged by GLG through Gerson Lehrman Group's network of independent consultants and subject-matter experts ("Network Members"). Network Member survey respondents and interviewees were compensated for their participation in the research. All information is as of May 23 - June 3, 2024, is for informational purposes, and does not constitute legal, accounting, tax, investment, or other professional advice. No representations or warranties (express or implied) are made regarding this document. Neither GLG nor any Network Member shall have any liability whatsoever in connection with the use of this document.