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Semiconductor Startup Market Review

Semico Research and Consulting Group

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Introduction

The semiconductor industry is recognized as the foundation for many of the next must-have electronic devices whether their destination is the factory or in consumers' hands. Much of that innovation is fueled by the new chips developed by startups. This has never been more true than in today's world of connected electronic devices. The advent of IoT, AI and 5G has opened the door for a new generation of startups that are creating disruptive technologies that will transform the industry.

In the not so distant past, semiconductor startup funding fell out of favor. This occurred after the 2000 dot-com bubble when money had poured into startups that included the term "server" in their business plan. During the next ten years, the semiconductor market began to show signs of a 'mature' market, i.e. consolidation, increasing costs, and complex technology challenges. Venture capital (VC) funds looked elsewhere for promising returns.

Funding slowly started to flow back into semiconductor startups as IoT became the new buzzword, and a wide variety of new applications began to emerge. IoT did not always require the most advanced technologies, and there were many outlets for innovation. More recently, more functionality - including AI - is migrating to edge devices. IoT, AI and other applications are demanding new processing capabilities.

This report takes a look at semiconductor hardware startups that are addressing processing requirements. The aim of this report is to provide more context regarding the semiconductor startup landscape.

The first section includes information from Semico's extensive company database and consists of startups from the past five years. We also address trends that are affecting the overall market; lastly, Semico provides our observations regarding some of the challenges of starting a semiconductor company today.

An appendix is included at the end to provide a description of Semico's methodology, primarily the definition of those companies included and excluded from this analysis.

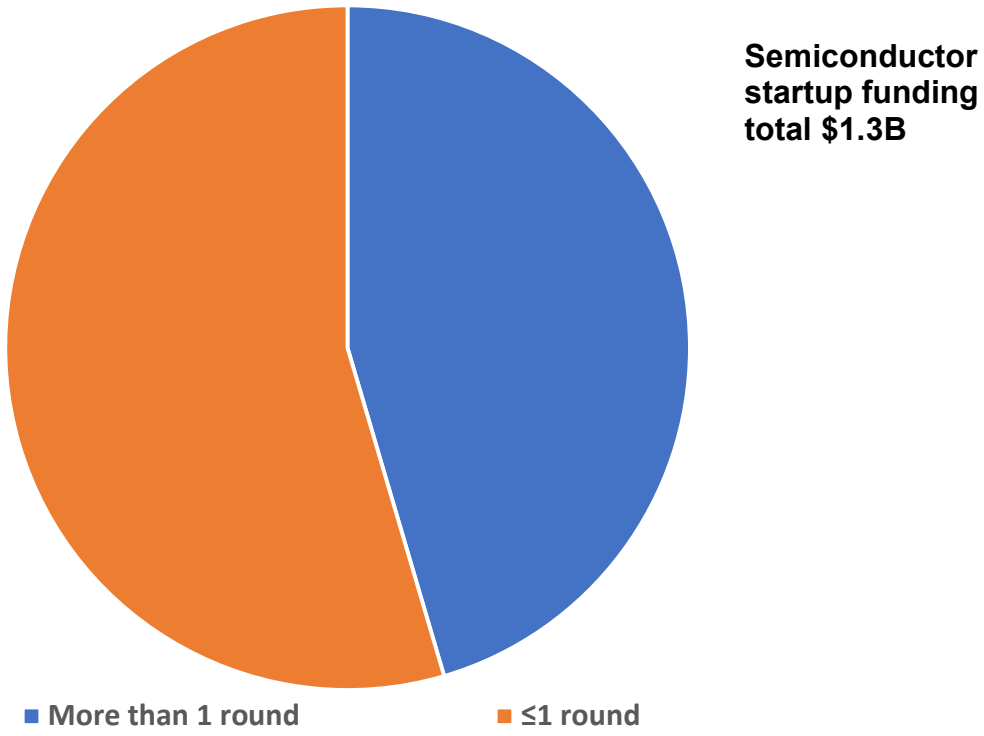
This research is sponsored by Arm, but the analysis and opinions are those of Semico Research and Consulting.

Semiconductor Startup Market

Overview

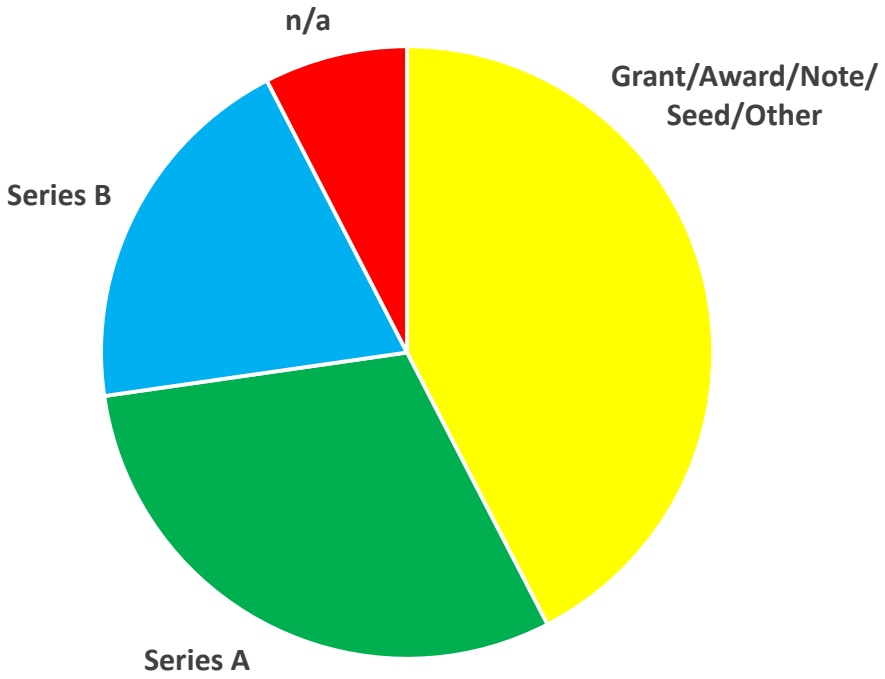
Over the last 5 years, semiconductor chip startups with less than $100 million in funding raised a total of $1.3 billion. The graph below puts the companies into two groups: those firms that secured one or less rounds versus more than 1 round of funding. Specifically, 45% of startups received more than 1 round of funding, while 55% of the startups received either one round or none. The timeframe covered for this chart is from first quarter 2015 through first quarter 2020.

Figure 1. Semiconductor Startup Funding



Source: Semico Research Corp.

Figure 2. Startups by Latest Funding Round

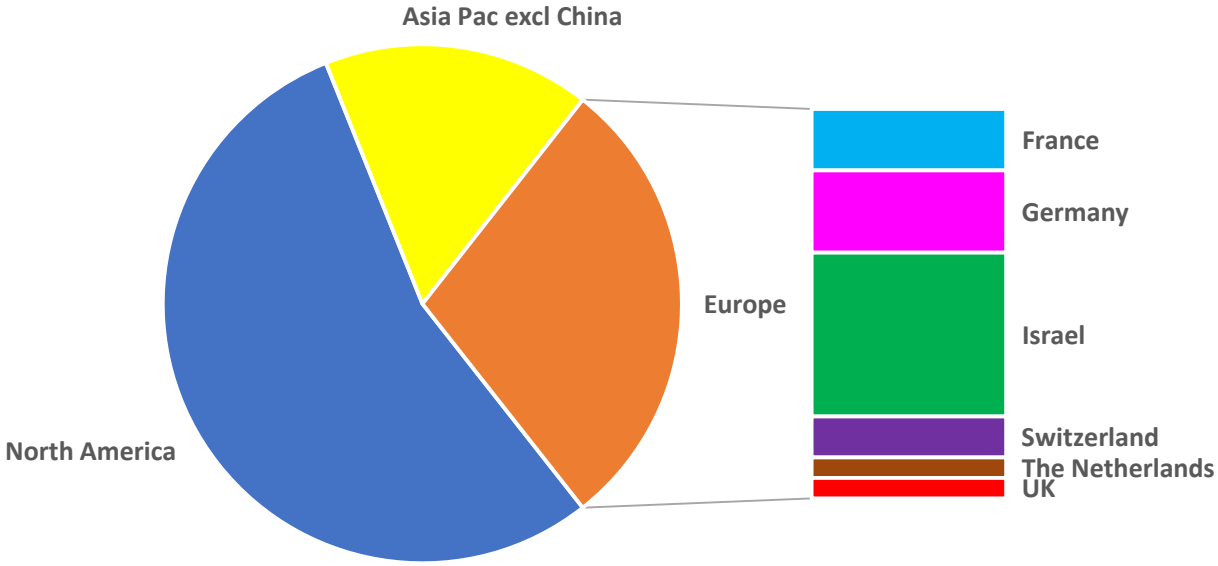


Source: Semico Research Corp.

Taking a closer look at startup funding by latest funding round, we see that almost a third of the startups have achieved series A funding, and another 20% have secured Series B funding. Forty-two percent of the startups have raised funds from either grants, awards, notes, seed or other sources. The remainder of the startup companies, 8%, have unidentified sources of funding. This is a result of firms being in stealth mode or having chosen to conceal their source of funding.

Startups by Region

Figure 3. Startups by Region



Source: Semico Research Corp.

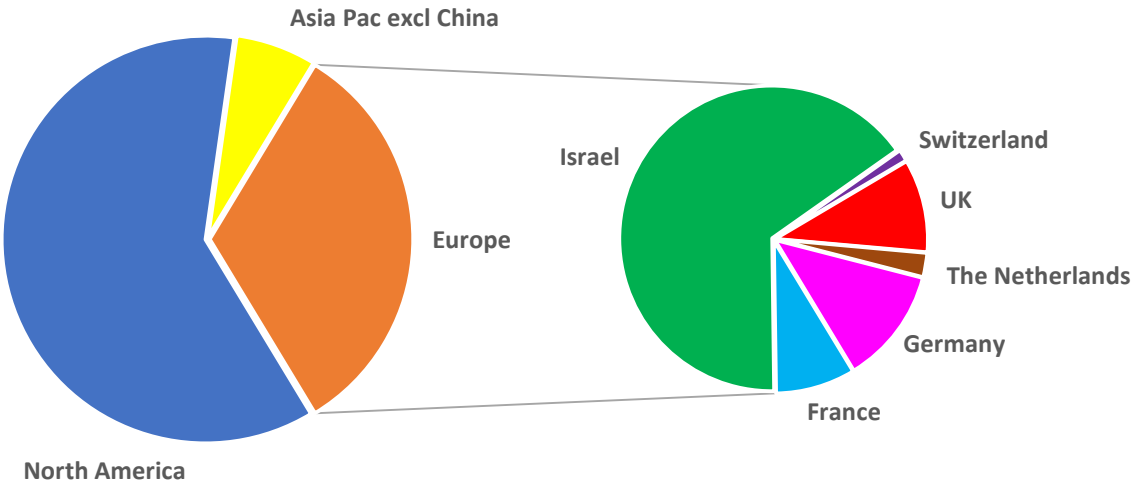
In our database, Semico also tracks startups by regional headquarter location. The Americas region leads in the number of startup companies with 55% based in North America. European-based firms account for 29% of the startups, and 17% of the firms are located in the Asia Pacific region excluding firms in China, which were not included in this report. It is interesting to note that Israel ranks second worldwide, just behind the U.S.

To provide additional insight, the chart above breaks out European-based firms by country. For the purpose of this report, Israel in included in the European region. Israel has spawned the most firms in the European region. Germany, France, and Switzerland are ranked second, third and fourth after Israel.

Although number of startups provides an indication of activity, the amount of funding provides a view of investors' expectations. Semico sorted the database to provide a view of funding by region. Startups headquartered in North America raised 61% of the total funding over the 2015-1Q20 timeframe. European-headquartered startups raised 33% of the total, and startups headquartered in Asia Pac raised only 6%. It should once again be noted that startups based in China were not included in this analysis.

The chart below also shows the funding level for European firms by country. Israel accounts for the vast majority of the funding in Europe followed by Germany, then the UK, and France.

Figure 4. Funding by Headquarter Location



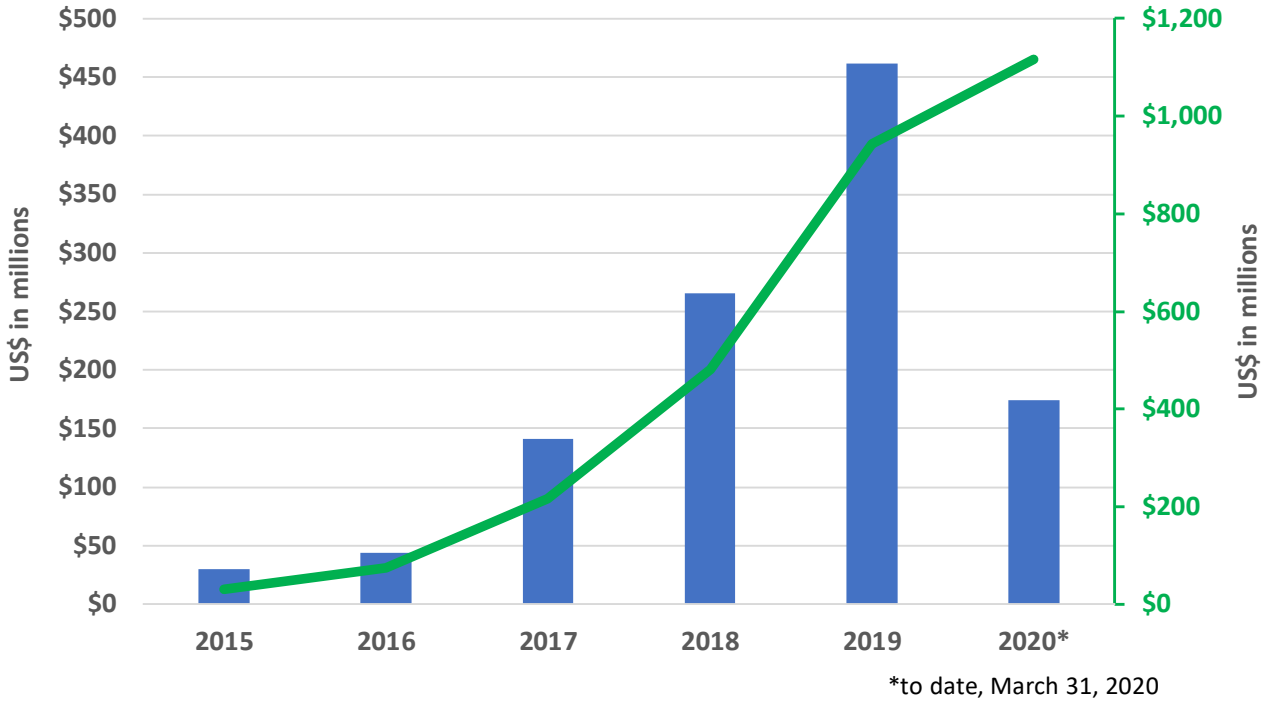
Source: Semico Research Corp.

Semico also calculated the average funding to date per company by region. North America and Europe both average approximately $22 million while the Asia Pacific region only averages $8.5 million.

Startup Funding Over Time

Between 2015 and Q1 2020, startups identified with $100 million or less in funding had amassed a total of $1.3 billion. Over the past five years, investments in semiconductor startups have increased. Figure 5 depicts total funding by year (blue bars) and the cumulative funding over the past five years shown with the green line. It is interesting to note that the funding grew 190% in 2017 and has steadily increased since then. The 2020 funding represents funding through the first quarter of the year.

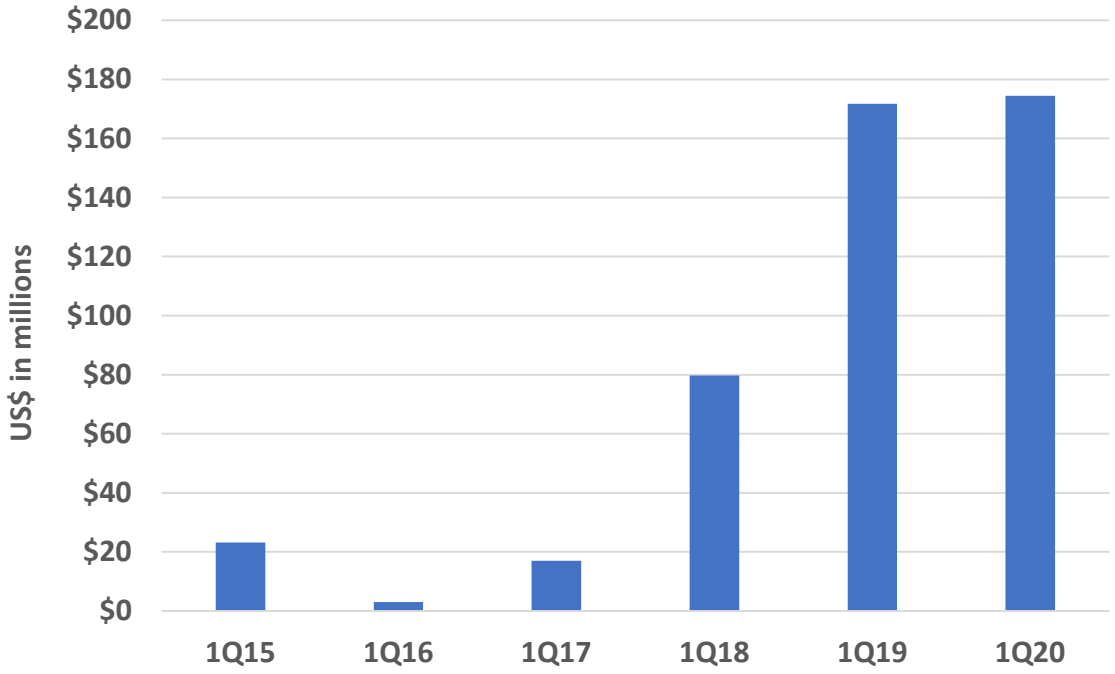
Figure 5. Funding by Year



Source: Semico Research Corp.

In order to compare 2020's potential performance with previous years, Figure 6 provides a comparison of the funding activity in Q1 of the previous five years. Funding appears to be more significant in the first quarter over the past three years as shown in the chart below. First quarter 2018 showed a dramatic increase in semiconductor funding compared to the first quarters in the prior three years. The first quarter 2019 funding was up over 115% compared to Q1 2018. Q1 2020 funding increased 2% over Q1 2019. This would typically point to a relatively good year for 2020 funding; however, with the spread of the COVID-19 pandemic and a worldwide recession on the horizon, we are cautiously optimistic that funding will continue for the balance of the year.

Figure 6. 1st Quarter Funding Comparison



Source: Semico Research Corp.

Funding by Application

Over the past fifteen years, semiconductor startups accessed funding by riding the wave of new applications that were in vogue at the time. These waves included:

- Servers
- Wireless products using varying standards
- Networking
- IoT

In the past 5 years, the industry buzzword that's attracting venture capital attention is artificial intelligence. AI is finding its way into not only cloud applications and data centers but edge devices such as self-driving/electric vehicles, consumer products, retail establishments and telecom. Industrial IoT (IIoT), specifically factory floor automation, is another popular application for AI because it improves efficiency, process control, quality and product reliability. The return on investment from IIoT is quantifiable.

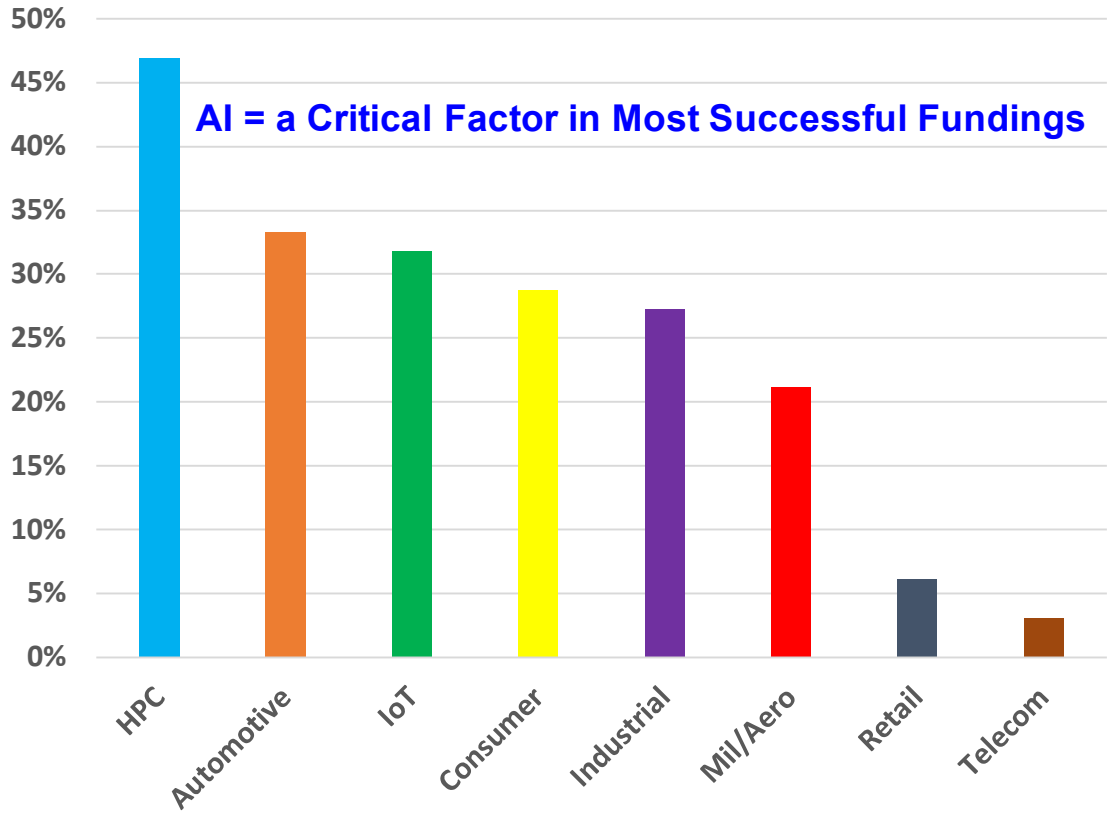
The chart below shows the percent of startups targeting each application. There is some overlap as many companies target more than one application.

HPC (high performance computing) is being targeted by 47% of the startups we identified. Thirty-three percent of firms are targeting automotive, and close

behind is IoT where 32% of the startups are participating. Consumer applications are being targeted by 29% of the companies while 21% of the startups have a Military/Aerospace focus. Retail and Telecommunications are not a big focus for startups with less than 10% of the companies picking these areas as a target market.

For a description of each application, see the Appendix.

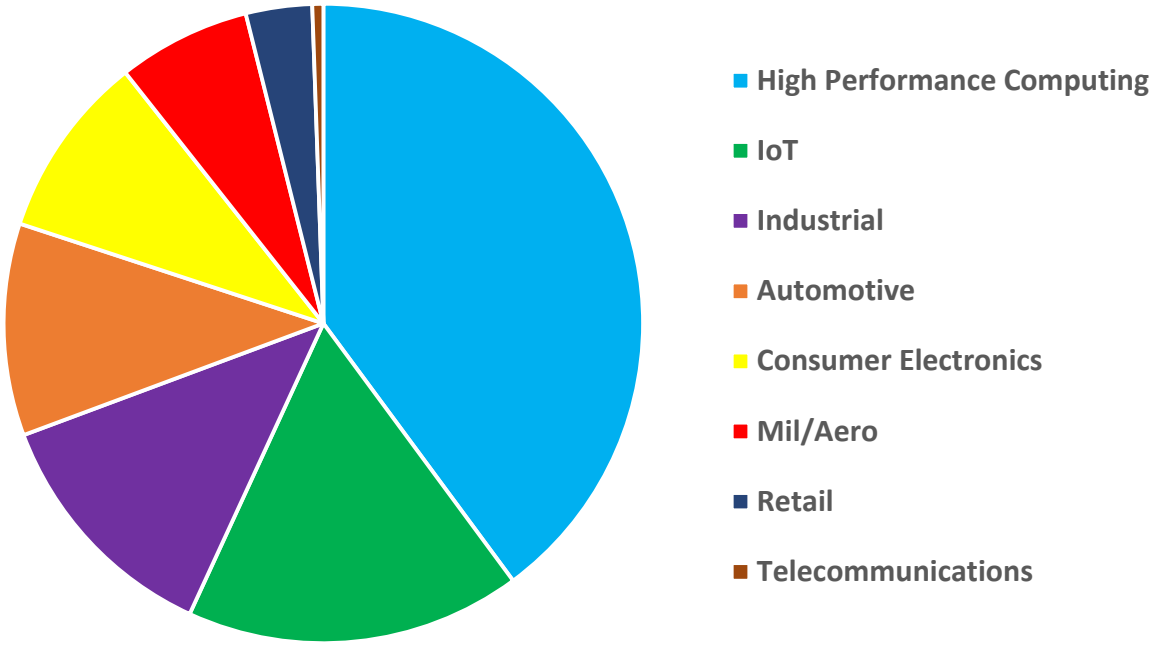
Figure 7. Startups by Application



Source: Semico Research Corp.

Taking another look at startups by application, the following pie chart breaks out startup applications by funding. It shows that HPC (high-performance computing) attracted the largest amount of funding at 40% of the pie. The second-largest funding amount went to IoT at 17% and Industrial came in third at 12%.

Figure 8. Startup Funding by Application



Source: Semico Research Corp.

There are a number of themes running through the group of startups examined for this report. One is the use of new technologies to address continued advancements to develop new markets. A sector attracting a lot of attention from startups and VCs is IoT. The IoT market is still in a high-growth stage as products are diverse in order to satisfy a broad spectrum of new applications. This market is ripe for startups because for the most part there is no dominant market leader. In addition, new opportunities continue to emerge especially when adding AI at the edge. Innovators are creating solutions to address the changing environment and new ways to connect with consumers. Some examples are:

- Home health care
- Telemedicine
- Home connected diagnostic equipment
- Home networking
- Fitness and wearables
- Smart home

The automotive market is another area that continues to introduce semiconductor solutions for new applications in the area of infotainment, mobile hotspots, vehicle electrification, safety systems, and instrumentation. Startups bring innovation and disruptive designs to this market. The automotive market is,

however, more challenging for startups due to the highly structured supply chain that requires a significant review and qualification process for products addressing safety, electrification and ADAS.

Semico Research Observations

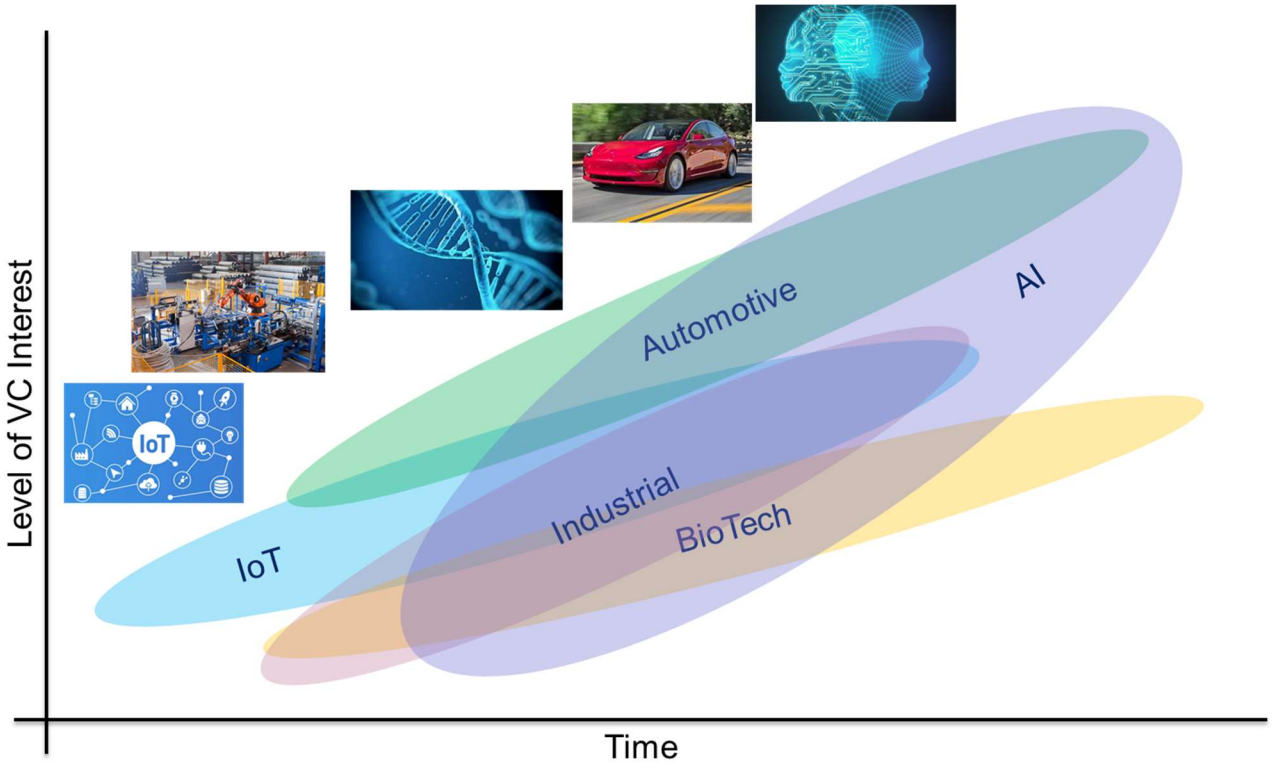
The Attraction of AI

As previously mentioned, funding for semiconductor startups went out of favor after the 2000 dot-com bubble burst. But venture capital dollars began to flow again when new products began to emerge in the IoT and biotech arenas. The figure below is a stylized representation of the various markets that have piqued VC interest.

The X-axis represents time, and the Y-axis depicts funding interest from VCs. Today, AI is a hot topic and attracts funding for both learning and inference applications. All four of the application markets generate funding interest particularly if AI features are also implemented into the startup's designs.

AI will continue to draw attention as data collection increases, algorithms are improved and new applications are introduced. Semico believes the market for AI will continue to attract funding as new applications are introduced.

Figure 9. Innovative Applications Attracting VC Funding



Source: Semico Research Corp.

Startup Funding Trends

Looking at the overall capital market, the amount of dollars allocated for Series A funding has grown over time. According to TechCrunch, in 2010, Series A funding averaged $4.9 million across all industries. By 2017, the average had grown to $12.1 million indicating that the cost to fund a startup was increasing. Startups in the semiconductor industry require even more capital. Semico data indicates that over the last five years the average Series A round of funding for a semiconductor startup averaged $20 million.

Investment Timing

Startups typically seek several rounds of funding starting with seed money, then moving to Series A and Series B. For the overall startup market, the timeline between funding rounds is approximately 2 years. Thus, a typical timeframe from seed to Series A and then to Series B can be 4 years. Most startup companies must raise enough funds to operate for at least two years. Semiconductor startups do not seem to fall into such a well-defined pattern as the overall startup market.

In 2015, the Economist published a study that showed the average age of a technology company that goes public had grown from only four years in 1999 to 11 years. (To fly, to fall, to fly again, 2015)

The two-year timeframe between seed to Series A seems reasonable for a new semiconductor company, as chip design can take 24 months to get from conception to shuttle run. However, for many semiconductor startups, the founders themselves classify their companies in startup mode on average for 3 - 11 years, much longer than most general industry startups. This broader timeframe is not totally surprising as semiconductor startups face a number of challenges in today market.

Semiconductor Startup Challenges

On an ongoing basis, Semico conducts interviews with companies developing new products. In addition, we have conducted a number of surveys which include gathering information from startups. As a result of this data collection, Semico has observed several challenges that are common among semiconductor chip startups today.

Semiconductor product designers are dealing with increasing complexity in SoC designs. The challenge is especially significant for startups as they have a limited number of design staff. Startups must weigh the benefits of an advanced manufacturing process with the increased cost and design complexity. Most startups are faced with a wide range of customer and market requirements which could be satisfied by a number of different solutions. Startups must deal with

customer requirements and market demands at the same time that they secure a foundry partner.

After years of operating as fully integrated companies, the semiconductor industry slowly shed many of the key operating functions that used to be conducted inhouse. One of the most visible changes was the development of the fabless business model. In the 1990s, semiconductor startups could no longer afford to build their own manufacturing plants. Today, startups must deal with the selection of a foundry which includes process technology offerings, capacity availability and cost considerations. One of the challenges for a startup is securing the right foundry partner at the right price. The cost of tapeouts, custom processes or advanced processes can be overwhelming.

Semiconductor design services such as Electronic Design Automation (EDA) are also becoming expensive. EDA tools are particularly critical to startups, and the ability of the EDA tools to address new designs, affordably is always under scrutiny.

Due to the disaggregation of the semiconductor supply chain, startups rely heavily on a strong ecosystem to enable quicker and more robust product development at more cost-efficient levels. Startups typically cannot afford a design failure or any delay in time to market. Missing a market window could mean success or failure of the initial product. As a result, companies need to have the correct balance of design cost, chip complexity and time to market in order to capture design wins and develop product revenue.

Appendix

Startup Data and Analysis: Methodology

The data for this analysis comes from Semico's company databases. There were a number of filters used to sort the companies that were included in the startup analysis. Below is a listing of the most prominent variables used to sort the information.

1. Timeframe: Semiconductor startups that launched between 1Q15 and 1Q20.
2. Total funding: Received less than or equal to US$100 million in funding to date.
3. Type of semiconductor company:
    a. Only semiconductor chip startups – not software or IP companies.
    b. Products focused on logic processors, not memory, display drivers, sensors, MEMS, RF, power management, discretes or optoelectronics.
4. Companies based in China were excluded from the report.

Definitions of Applications

High Performance Computing: AI, cloud AI, inference, machine learning, computing, HPC, data center

Automotive: exterior and interior vision and detection, analysis of driving conditions, improved user interface, hybrid LiDAR, Deep Learning-powered computer vision, in-vehicle scene understanding

Industrial: asset tracking, agriculture, robots, healthcare, beacons, robotics, energy nodes, locationing, drug development, patient care (diagnostics, reduce time to treatment), medical research modeling, accelerated DNA sequencing for genomic medicine

Consumer: wearables, smart toys, VR/AR, smartphones, video upscaling

Mil/Aero: defense, small satellites, aerospace, drones

IoT: building automation, surveillance, security, smart home, smart buildings, smart cities, finance, edge AI

Retail: electronic shelf labeling and sensing, automated replenishment, connected consumer goods, interactive scanners

Telecom: 5G infrastructure, optimizing 5G data service delivery, networking

Bibliography

To fly, to fall, to fly again. (2015, July 25). *The Economist*, pp. 17-20.