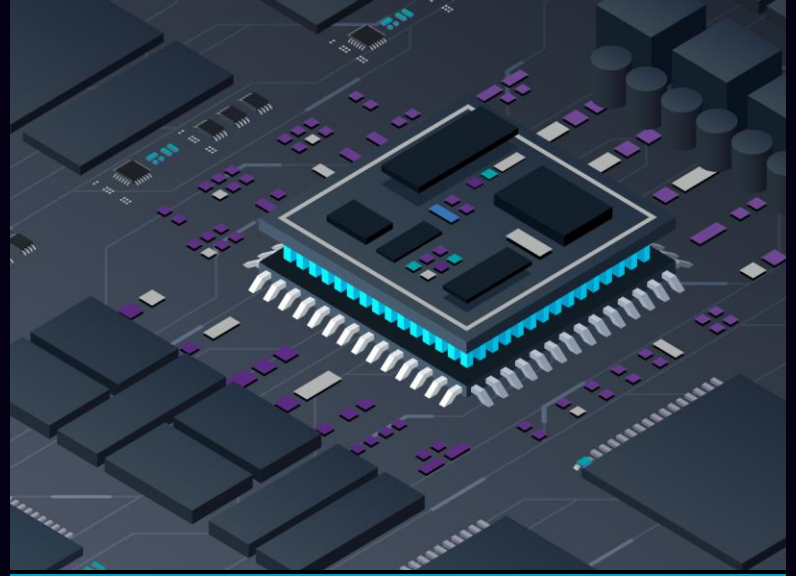


Hardware Talent Supply Trends

01

Global Hardware Talent Supply

- Majority of the hardware semiconductor talent is concentrated in the US and China, and both countries are leaders in advanced semiconductor manufacturing processes with an emphasis on AI chips, 5G, and automotive electronics
- Vietnam has a high growth rate of 4.6% in SE Asia as it is an emerging global production hub with companies such as Amkor Technology, SKC planning to establish chip assembly and packaging, and Integrated Circuits operations
- In EMEA, Germany and Israel are one of the fastest-growing hubs for semiconductor manufacturing and design, respectively. Israel's deep expertise in cybersecurity extends to semiconductor design
- India's semiconductor industry has over 36,000 hardware engineering professionals and is home to top employers including Intel, Qualcomm, Nvidia, Western Digital, and emerging more as a significant player in semiconductor design

Demand vs Supply

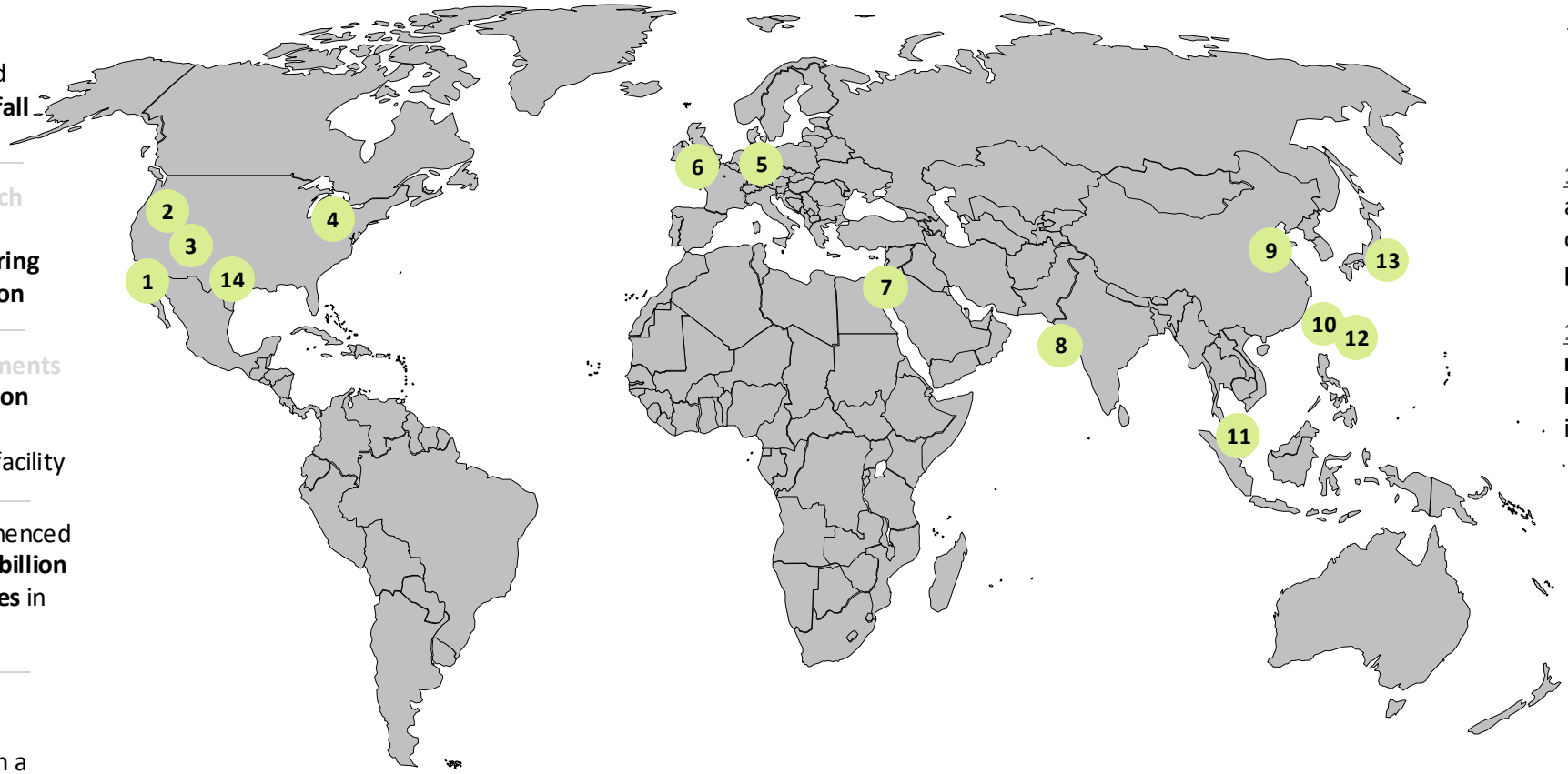
- The global semiconductor industry is facing a severe talent crunch, with an average talent gap of approximately 45- 50%
- The demand-supply gap is growing sharply in Taiwan, Germany, Japan, South Korea due to several reasons such as declining STEM rates, aging workforce, increased competition for talent

Hardware Talent Compensation

- In general, the SoC and hardware design engineering family receives the highest level of compensation out of all hardware job families
- Shanghai, San Francisco, and Beijing have high hardware talent due to vital tech ecosystems, while Penang, Hyderabad, and Bengaluru offer cost advantages for hardware companies

Global Expansion: Semiconductor companies are strategically expanding their global presence to keep up with the increasing demand including setting up new manufacturing facilities, exploring emerging markets, and expanding existing facilities

Semiconductor Hardware Industry Expansion



1. Qualcomm has built a **manufacturing plant in Tijuana**, and it is scheduled to **start operations** in the **fall of 2023**

2. In Jan 2022, Lam Research launched its second semiconductor **manufacturing facility in Sherwood, Oregon**

3. On Feb 15, Texas Instruments Inc. announced an **$11 billion** expansion of its **Lehi, Utah microchip manufacturing** facility

4. In Sept 2022, Intel commenced the construction of **its $20 billion chip manufacturing facilities** in **Licking County, Ohio**

5. Infineon Technologies is constructing a new **Smart Power Fab in Dresden**, with a **$5B+ billion investment**, aiming for **completion by 2026**

6. In Oct 2022, KLA started the construction of a new **research and development (R&D) and manufacturing center** in **Newport, Wales**

7. Intel Corp has plans to establish a new **wafer manufacturing facility** in **Tel Aviv, Israel**, with an investment of **$25 billion**, aiming for **completion by 2027**

8. In Jun 2023, Micron Technology announced an **$825 million** investment in a **Gujarat chip assembly and testing facility**, set to **start operations** by late **2024**

9. NXP launched its **AIoT Application Innovation Center** in North China's **Tianjin** on May 2023

10. In Nov 2022, ASML announced a **NT$950M** wafer optical measurement **R&D project in Taipei**

11. GlobalFoundries is opening a **new center of excellence** in **Penang** with **remote access** to all its global fabs

12. TSMC is constructing a **new factory in Kaohsiung** with the goal of commencing mass production of advanced **2-nanometer chips by 2025**

13. Samsung is investing **$222 million** in a **chip development facility in Yokohama, Japan**, set to be **finished by 2025**

14. Samsung is investing **$17 billion** to build a new **semiconductor manufacturing facility** in Taylor, Texas, to enhance production of **advanced logic semiconductor solutions** across various applications

Source: Draup primarily analyzes its proprietary database of 800M+ Professional profiles, 150M+ Job descriptions, 30K+ skills, and 4,500+ job roles, and compliments it with multiple publicly available career websites, ML annotated research videos, and company websites; Each numerical value displayed on the slide serves as a hyperlink, providing direct access to its corresponding information source

Note: For more information related to center setup, and expansion please refer to [*]

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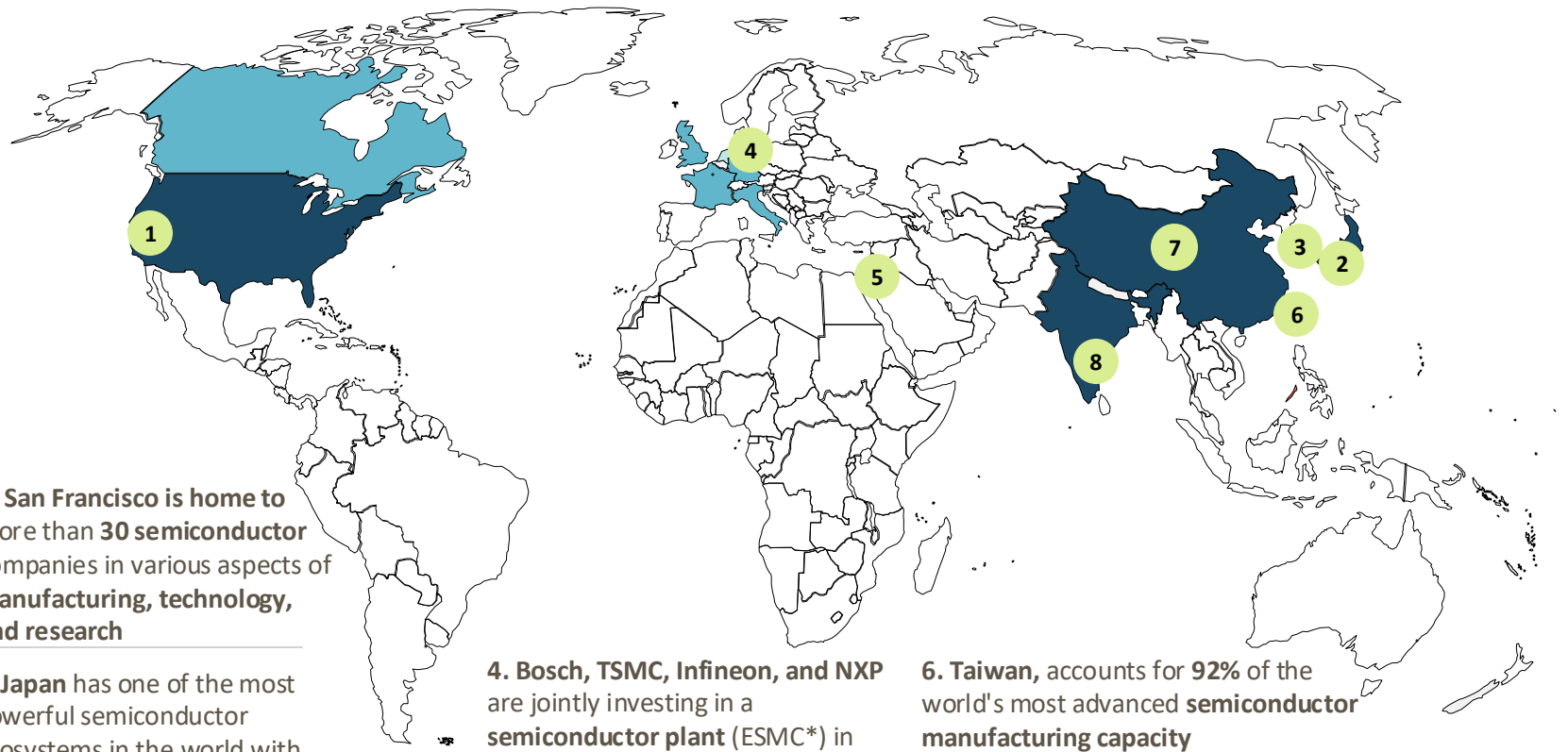
Mature Semiconductor Ecosystem: USA pioneers in innovation, China dominates in manufacturing, while India excels in software and design. To escalate its global footprint, India is aggressively investing in talent and research synergies

Mature Semiconductor Hardware & Software Engineering Talent Landscape



1. San Francisco is home to more than **30 semiconductor** companies in various aspects of **manufacturing, technology, and research**

2. **Japan** has one of the most powerful semiconductor ecosystems in the world with **102 chip-making facilities**, spread across the nation

3. South Korea is home to the two **largest memory chip manufacturers, Samsung and SK Hynix**

4. Bosch, TSMC, Infineon, and NXP are jointly investing in a **semiconductor plant** (ESMC*) in **Dresden, Germany**

5. **Israel**'s semiconductor industry **specializes in R&D and design** and is home to several **fabless semiconductor companies** like **Marvell, Autotalks, and Wiliot**

6. Taiwan, accounts for **92%** of the world's most advanced **semiconductor manufacturing capacity**

7. Semiconductor Manufacturing International Corporation (SMIC) headquartered in **Shanghai** is the **largest contract chip maker** in **China** and ranks **5th** on the global scale

8. Bengaluru is home to a significant number of **VLSI design engineers**

Top Locations	HW Talent	SW Talent
China	146,300	130,400
USA	124,000	168,000
Taiwan	54,000	32,000
Japan	37,800	27,900
India	36,000	57,100
South Korea	27,200	23,000
UK	24,300	38,200
Germany	24,100	33,700
Singapore	16,200	22,200
Israel	15,800	16,900
France	14,900	31,500
Malaysia	12,000	18,200
Italy	10,000	14,100
Canada	9,800	17,600
Netherlands	8,100	17,400

Score in Individual Parameter: High | Medium | Low

Note: The analysis utilizes Draup's actively tracked database of 850Mn+ profiles across 5Mn+ organizations globally. Values have been rounded off. The talent Availability/employed talent is the Overall talent captured in the semiconductor and computer hardware industry. **Growth Rate** are calculated from August 2022 – August 2023. *ESMC stands for The European Semiconductor Manufacturing Company

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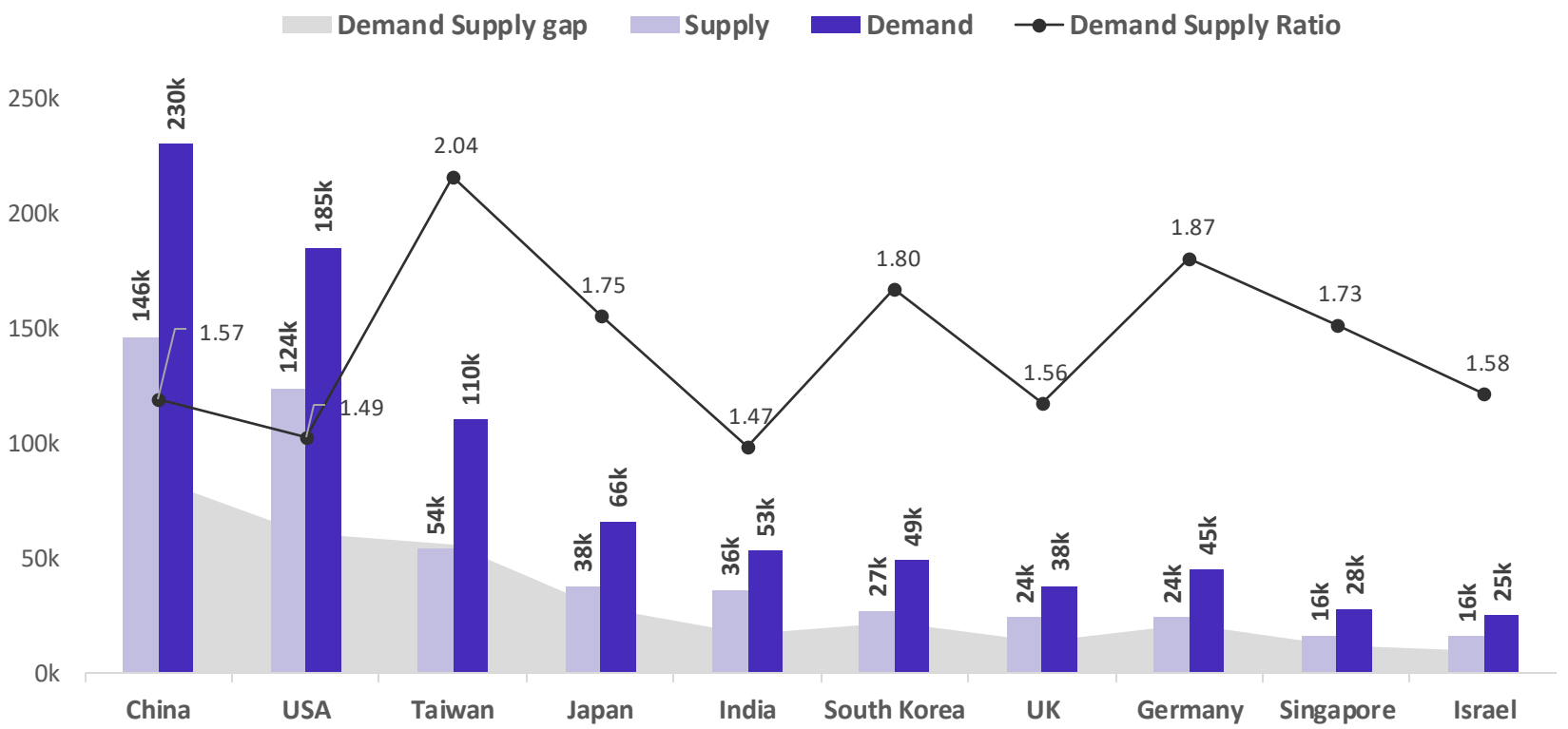
Mature Locations & Hardware Talent - Demand and Supply Ratio : The demand-supply ratio is the highest in Taiwan, Germany, and South Korea whereas India has the lowest ratio indicating a better balance between job demand and the available workforce

Mature Locations: Hardware Talent – Demand Supply Ratio



Insights

The above chart indicates about the **demand-supply gap** in the semiconductor industry across top **10 countries** mentioned; **Taiwan** has **the highest demand-supply gap**, indicating **a strong demand for semiconductor talent**. **China** and the **USA** have substantial demand and supply, while other countries like **Japan, South Korea, and Germany** also demonstrate a significant demand for semiconductor professionals

Core Challenges

- **The declining birthrate in Taiwan** has resulted in a **talent shortage, with AI startups luring top engineers**. **TSMC** faces competition in recruitment from firms such as **Google** and foreign semiconductor companies like **ASML**, known for their superior work-life balance and perks
- **Chinese semiconductor companies** have been actively **luring South Korean semiconductor experts**, offering **competitive salaries** and considering the **establishment of R&D centers in South Korea,** intensifying the competition for talent
- **India's semiconductor industry** struggles with a **talent shortage**, particularly in **skilled chip design engineers**, hindering its growth due to the demand for a specialized workforce
- **Japan's talent shortage** is intensified by **demographic shifts, with an aging population with early retirement age** and **strict immigration policies** posing a dual challenge
- **Chinese semiconductor companies** face challenges in attracting top talent due to **lower compensation and increased workloads**, resulting in only **15% of 2020 IC graduates** choosing this field over other job opportunities

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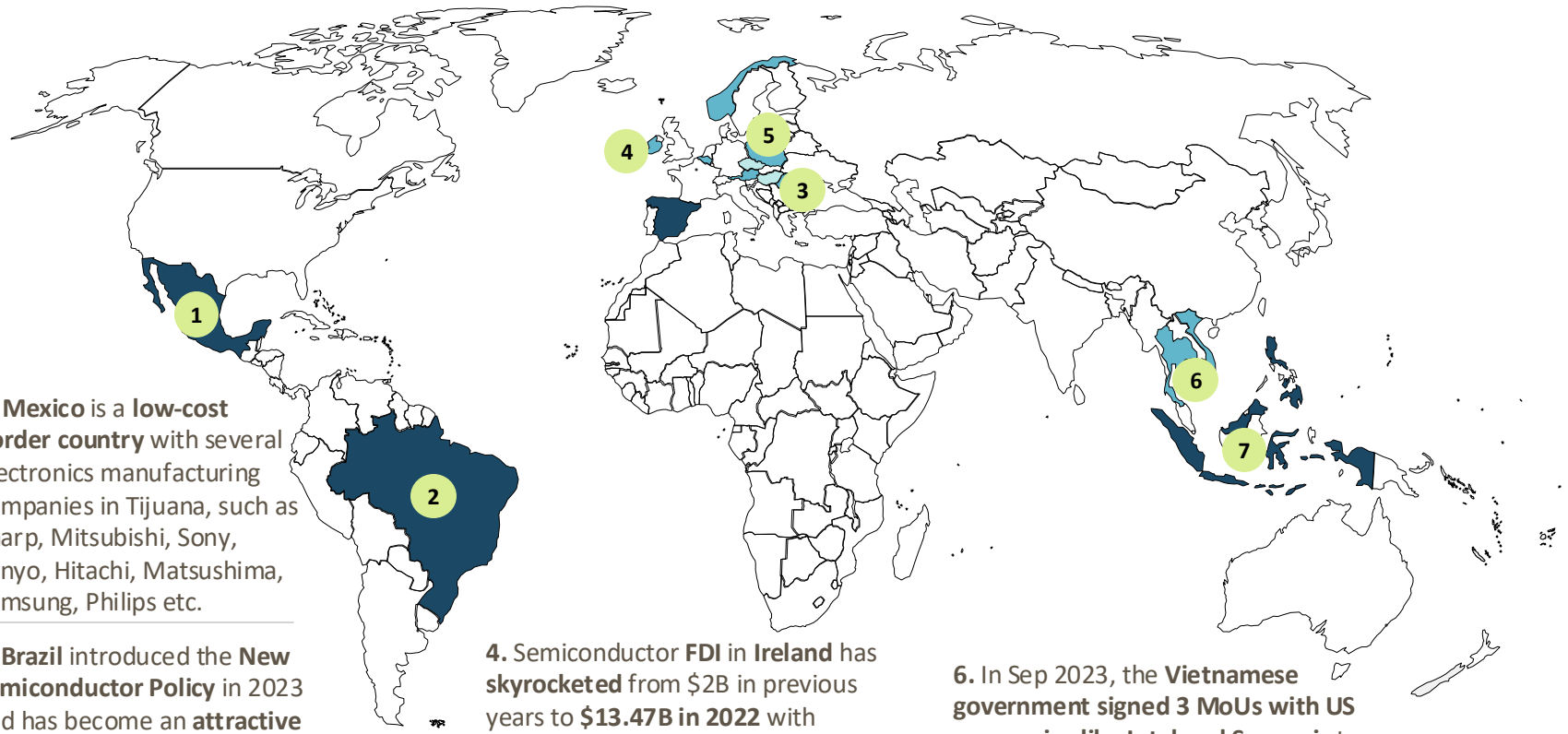
Note: Supply and the demand data is calculated using Draup proprietary ML model which tracks 800M+ profiles. **1. Demand Supply gap** shows the difference between job openings and the number of people looking for those jobs. **2.Demand supply ratio** is defined as the ratio of demand vs supply; a higher demand supply ratio refers to a higher demand of the job role or family in the region and is unfavorable for talent hiring processes

Emerging Semiconductor Ecosystem: Poland, Mexico, Ireland, and the Philippines are emerging as top semiconductor industry destinations, driven by favorable government policies, cost-effective labor, and supply chain risk diversification

Emerging Semiconductor Hardware & Software Engineering Talent Landscape



1. Mexico is a **low-cost border country** with several electronics manufacturing companies in Tijuana, such as Sharp, Mitsubishi, Sony, Sanyo, Hitachi, Matsushima, Samsung, Philips etc.

2. Brazil introduced the **New Semiconductor Policy** in 2023 and has become an **attractive option for manufacturing** to **diversify supply chain risks**

3. **Bosch and NXP Semiconductors** are 2 of **8 companies that** are part of a **EUR 500M** PNRR*-funded program in **Romania** to **boost microelectronics**, emphasizing **chip** and **semiconductor research and production**

4. Semiconductor **FDI** in **Ireland** has **skyrocketed** from $2B in previous years to **$13.47B in 2022** with companies like **AMD and Merck** set to invest in **Cork, Ireland**

5. Poland hosts about **500 semiconductor R&D centers** including those of **Samsung, Amazon, and Intel.** Poland's electronics industry is thriving despite challenges like COVID-19 and the Ukraine conflict

6. In Sep 2023, the **Vietnamese government signed 3 MoUs with US companies like Intel and Synopsis** to bolster their capacity for **chip design** and facilitate **workforce training**

7. Infineon, Tsinghua Unigroup, and Powin are making **investments and expanding their semiconductor operations** in **Batam, Indonesia**

Top Locations	HW Talent	SW Talent
Philippines	15,000	8,300
Brazil	11,000	10,500
Indonesia	8,000	3,800
Spain	7,500	15,800
Mexico	4,900	8,500
Vietnam	4,000	2,100
Romania	3,400	2,500
Ireland	3,000	3,500
Thailand	3,000	1,700
Poland	2,700	3,200
Belgium	2,400	2,100
Austria	1,700	1,800
Norway	1,400	1,300
Hungary	1,200	800
Czech Republic	1,000	1,100

Score in Individual Parameter: High | Medium | Low

Note: The analysis utilizes Draup's actively tracked database of 850Mn+ profiles across 5Mn+ organizations globally. Values have been rounded off. The talent Availability/employed talent is the Overall talent captured in the semiconductor and computer hardware industry. **Growth Rate** are calculated from August 2022 – August 2023. *PNRR stands for National Recovery and Resilience Plan

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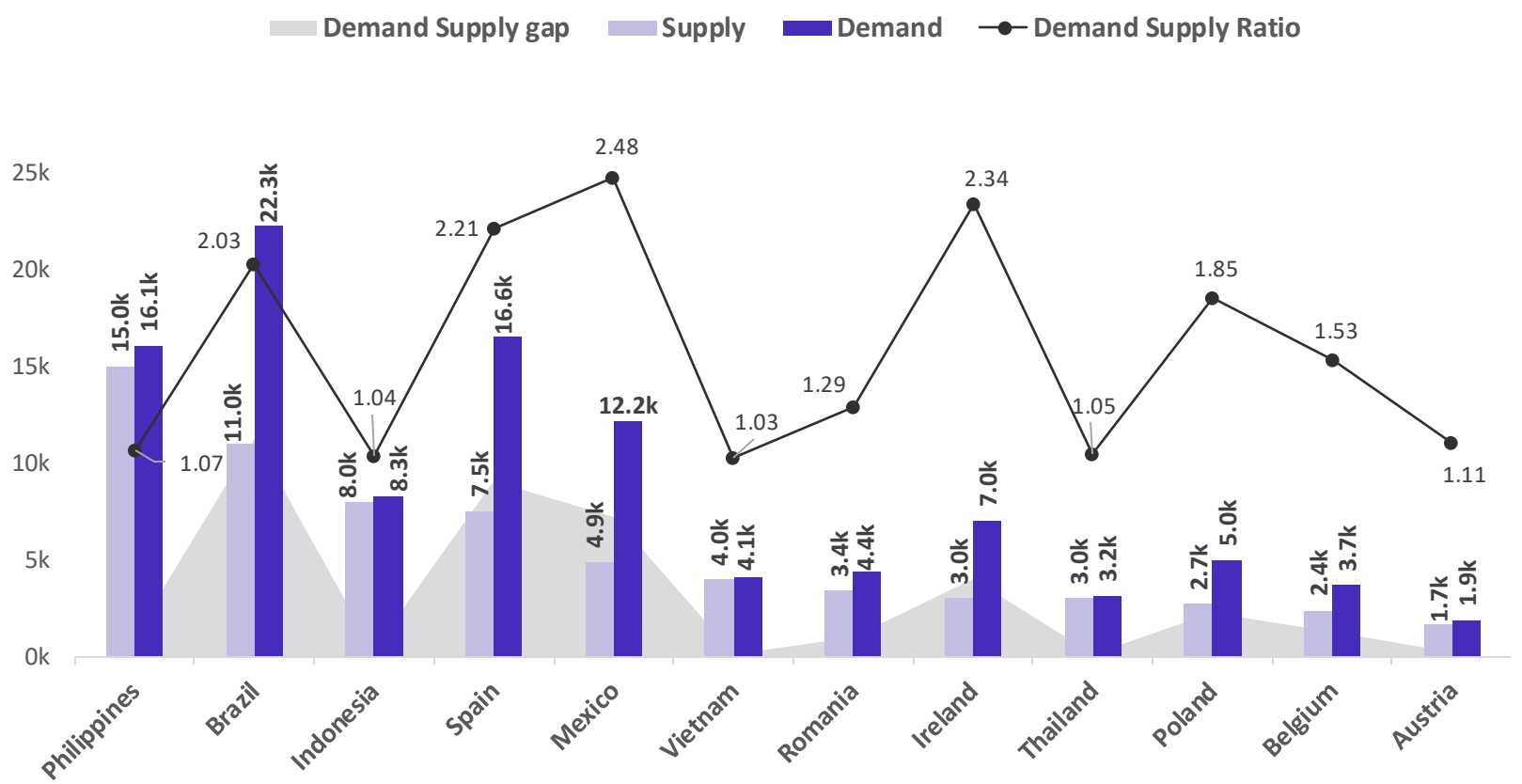
Emerging Locations & Hardware Talent - Demand and Supply Ratio : The demand-supply ratio is the highest in Mexico, Ireland, and Spain whereas Vietnam has the lowest ratio indicating a better balance between job demand and the available workforce

Emerging Locations: Hardware Talent – Demand Supply Ratio



Insights

The above chart indicates about the **demand-supply gap** in the semiconductor industry across **12 hardware talent emerging countries** mentioned; **Brazil, Mexico, Spain, Ireland, Philippines, Belgium, Romania, and Poland** exhibit a higher demand for semiconductor talent, resulting in **higher demand-supply gaps**, with **Brazil** having the most significant gap. Conversely, **Indonesia, Vietnam, Austria and Thailand** have **smaller demand-supply gaps**

Insights

- **Mexico** has emerged as one of the **rapidly expanding destinations** for the semiconductor industry, due to its **close geographic proximity** to the US and an alternative **cost-effective** option **to Asian countries**, even in the face of a **high demand-to-supply ratio**
- **Ireland** hosts prominent semiconductor firms, including **Analog Devices, Maxim Integrated, AMD, Synopsys, Texas Instruments, and Lam Research**, specializing in **chip and IC design**. The most sought-after skills are **Digital ASIC Design, Digital ASIC Verification, and Digital Physical Design**
- **Poland is an emerging eastern European data center hub with the largest tech talent pool in the region & a booming manufacturing industry** which catalyzed major investments, notably **Intel's $4.6 billion commitment** to build a **Semiconductor AT facility in Wroclaw**
- **Brazil** has the **largest pool of technical talent** in Latin America, characterized by **minimal attrition rates** and a robust network of **high-quality universities** consistently producing **top-tier hardware professionals**
- **Vietnam**'s emerging global production hub offers **political stability, cost-effective labor, a skilled workforce**, and high-tech supply chain access. **Amkor Technology, Samsung, and SKC Co.** plan operations in **chip design, assembly, packaging, and integrated circuits**

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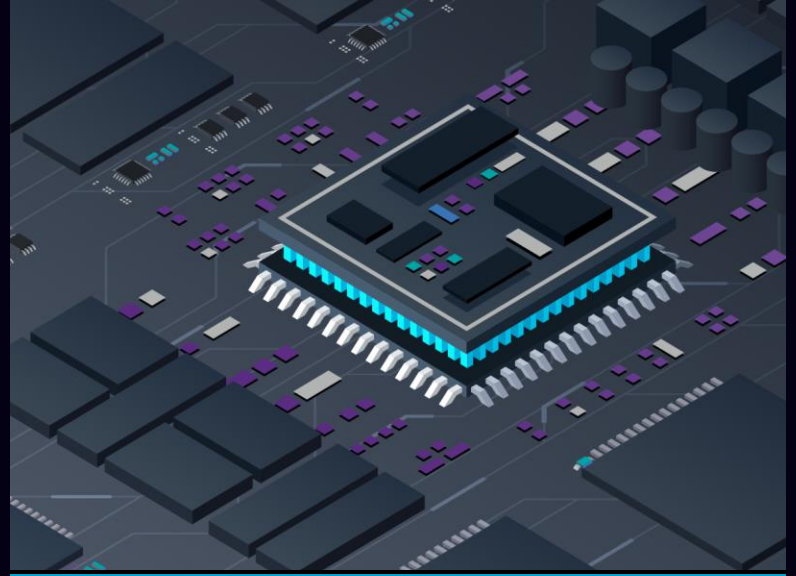
Note: Supply and the demand data is calculated using Draup proprietary ML model which tracks 800M+ profiles. **1. Demand Supply gap** shows the difference between job openings and the number of people looking for those jobs. **2.Demand supply ratio** is defined as the ratio of demand vs supply; a higher demand supply ratio refers to a higher demand of the job role or family in the region and is unfavorable for talent hiring processes



Hardware Talent Demand Trends

02

Hiring Map – Hardware Engineering Job Postings

- Out of the 15 companies that we analyzed, San Francisco had the highest number of job postings. It was also observed that semiconductor companies are expanding their presence to emerging markets in Southeast Asia, including India, Indonesia, Malaysia, the Philippines, Thailand, and Vietnam, to tackle talent shortage

Demand Distribution for Hardware Engineering Roles Across Countries

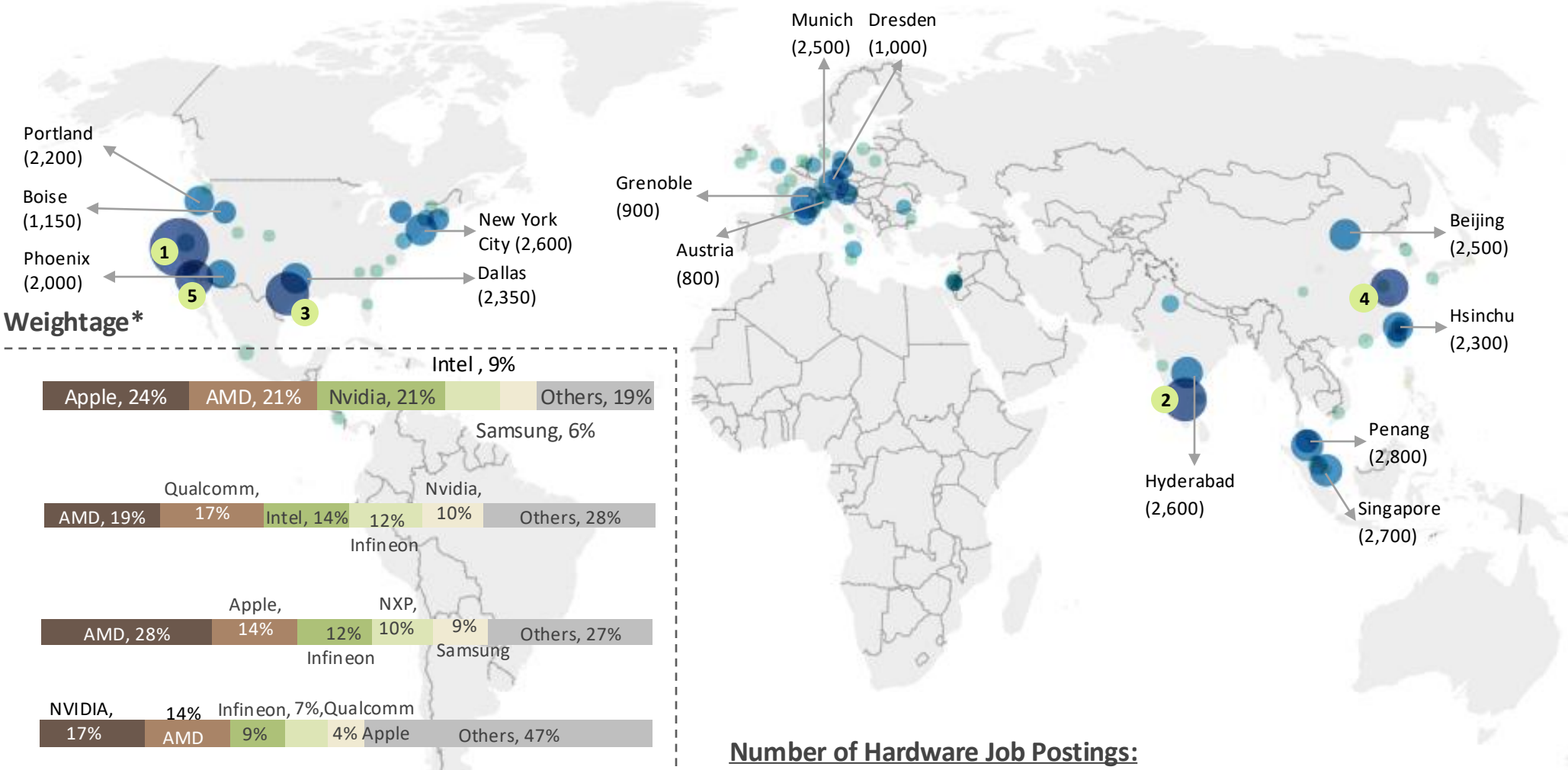
- The United States has the highest demand for talent, accounting for 35-40% of the market. Following closely behind are China, India, and the United Kingdom
- India has a significant share of the global demand for silicon, chip, and ASIC design talent, making it an emerging leader in R&D and semiconductor/hardware design
- The Netherlands' hardware industry has seen a job posting surge thanks to advanced players like ASML, NXP Semiconductors, and STMicroelectronics, establishing a very rare complete semiconductor industry value chain within its borders
- Germany's chip sector is experiencing a surge in investment, with Intel, Wolfspeed, and Infineon building new factories and causing a spike in demand for talent

Global Overview: Demand Intensity across Hardware Engineering Roles

- Occupations with high demand intensity include mostly technical roles at both the engineer and technician levels requiring additional skills related to electronics and design
- The demand for firmware engineers is soaring because many big tech companies are now designing their own hardware to optimize performance and have learned that no matter how good their hardware is, if they fail to invest enough in software or make the product user-friendly, they will fail
- Skilled Hardware Technicians, such as Wafer fab technicians and equipment maintenance technicians, are highly sought after due to the industry's need for hands-on technical experience in cleanrooms and fabs

Hiring Map: Over the past year, San Francisco and Bengaluru have notably taken the lead in hardware job postings globally; Penang, Hyderabad, and Grenoble are the regions experiencing the most significant growth in demand for hardware talent

Hiring Map – Hardware Job Postings



Demand Hotspots & Peer Weightage*

1. **San Francisco Bay Area (8,500 Job Postings)**
   Apple, 24% | AMD, 21% | Nvidia, 21% | Intel , 9% | Samsung, 6% | Others, 19%
2. **Bengaluru Area (5,000 Job Postings)**
   AMD, 19% | Qualcomm, 17% | Intel, 14% | Infineon 12% | Nvidia, 10% | Others, 28%
3. **Greater Austin (4,800 Job Postings)**
   AMD, 28% | Apple, 14% | Infineon 12% | NXP, 10% | Samsung 9% | Others, 27%
4. **Shanghai Area (4,500 Job Postings)**
   NVIDIA, 17% | AMD 14% | Infineon, 9% | Qualcomm 7% | Apple 4% | Others, 47%
5. **Greater San Diego (3,500 Job Postings)**
   Qualcomm, 31% | ASML, 28% | Apple, 27% | TSMC, 5% | Others, 9%

Number of Hardware Job Postings:

< 100 | 101 - 400 | 401 - 900 | 901 - 3,000 | ≥ 3,000

Source: Draup primarily analyzes its proprietary database of 800M+ Professional profiles, 150M+ Job descriptions, 30K+ skills, and 4,500+ job roles, and compliments it with multiple publicly available career websites, ML annotated research videos and company websites.;*The proportions mentioned are based solely on the 15 companies that were analyzed.

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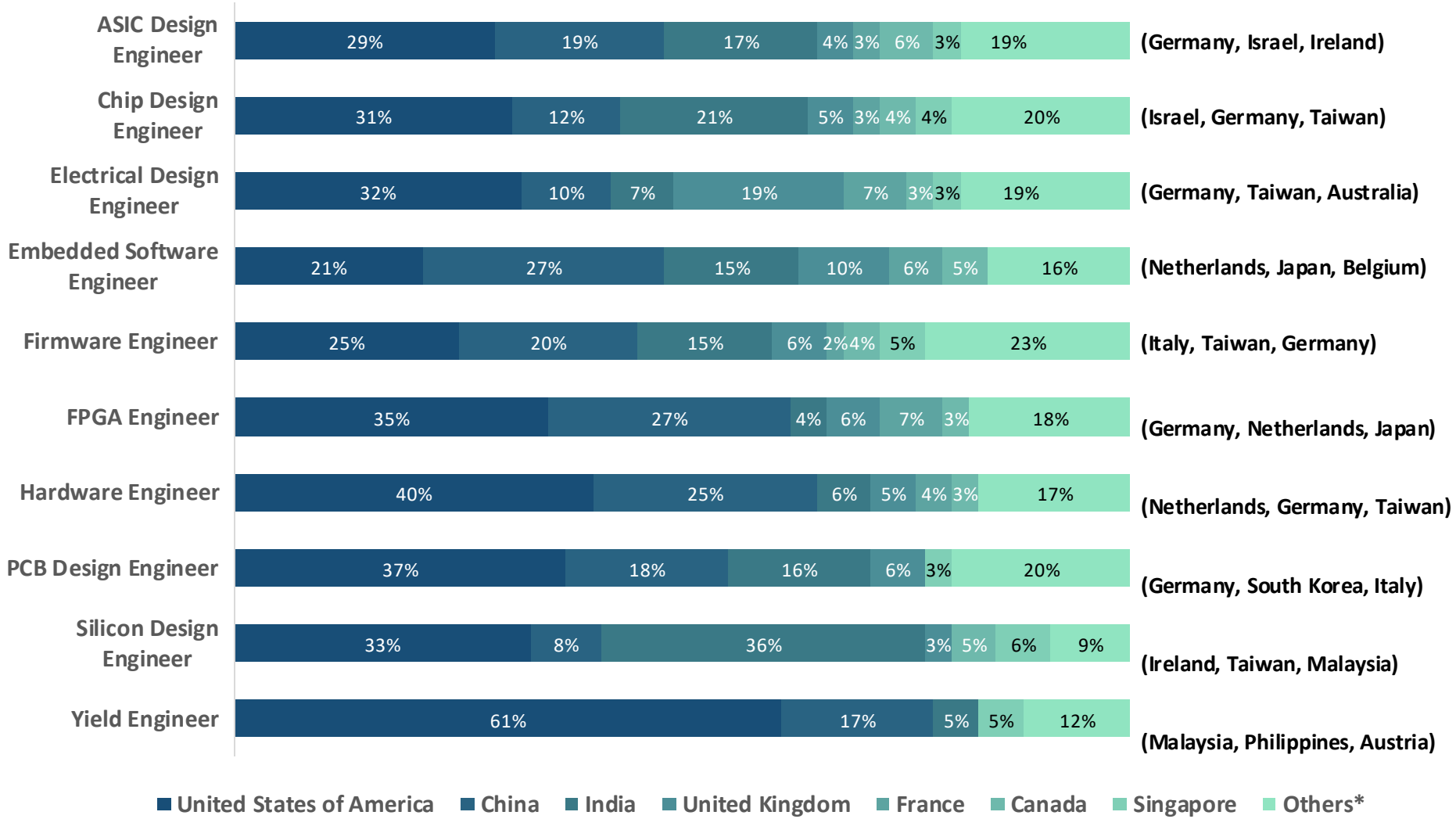
Hardware Talent Demand Distribution: The United States, China, and India rank as the top three places with the greatest need for skilled hardware professionals collectively accounting for more than 70% of the worldwide demand

Demand Distribution for Hardware Engineering Roles Across Countries



Insights

- In addition to the nations indicated in the chart, **Germany, Israel, and Taiwan** also exhibit **significant demand** for hardware professionals
- In **India**, there is a **strong demand** for **silicon design engineers**, highlighting their pivotal role in the country's semiconductor sector
- Along with several semiconductor companies, **Germany** also hosts numerous prominent **electronics companies** like **Bosch and Siemens**, leading to significant and constant **demand for PCB design engineers** in the country
- **Yield Engineers** are in **high demand** in countries like **Malaysia and the Philippines** due to a growing manufacturing environment in the region

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Source: Draup primarily analyzed its proprietary database of 800M+ Professional profiles, and 150M+ Job descriptions and complimented it with multiple publicly available career websites to produce the demand distribution and insights; *The countries enclosed in parentheses indicate the three nations with the greatest demand within the "others" category for theirrespective roles. For more accuracy, demand of hardware engineering roles was analyzed among semiconductor, computer hardware, computer and electronics manufacturing industries

Global Expansion (1/2) : Semiconductor companies are strategically expanding their global presence to keep up with the increasing demand including setting up new manufacturing facilities, exploring emerging markets, and expanding existing facilities

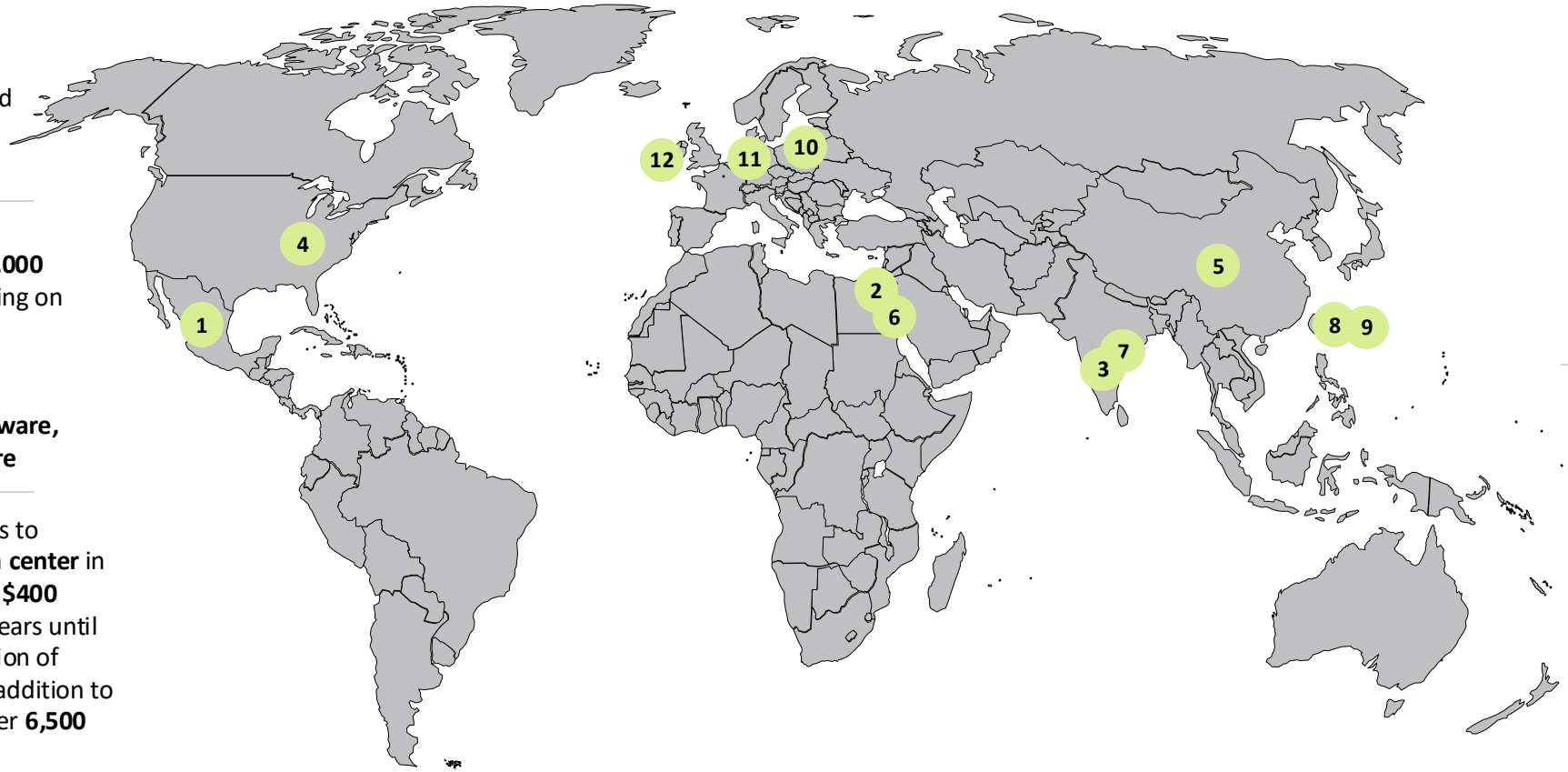
Direct Competitors - Semiconductor Hardware Industry Expansion

1. Qualcomm has built a **manufacturing plant in** Tijuana, and it is scheduled to **start operations** in the **fall of 2023**

2. In May 2022, Nvidia announced plans to **hire 1,000 employees** in Israel**,** focusing on enhancing its Israeli **R&D initiatives encompassing networking, CPU and DPU chip design, software, hardware, and architecture**

3. AMD announced its plans to establish the **largest design center** in Bengaluru, India, investing **$400 million** over the next five years until 2028, resulting in the creation of **3,000 engineering jobs**, in addition to its existing workforce of over **6,500 employees** in the country

4. In Sept 2022, Intel commenced the construction of **its $20 billion chip manufacturing facilities** in Licking County, Ohio



5. AMD forecasts a strong year-end with the launch **of MI300 AI chips to rival Nvidia**, seeing high customer interest and plans for compliance with U.S. export controls for the Chinese market

6. Intel Corp has plans to establish a new **wafer manufacturing facility** in Tel Aviv, Israel, with an investment of **$25 billion**, aiming for **completion by 2027**

7. Qualcomm's new Hyderabad facility is set to provide jobs for **8,700 software professionals,** while **Chennai's** growing operations, including a significant office deal, underscore its importance

8. In 2023, Qualcomm established a **manufacturing engineering and testing center** in Hsinchu, Taiwan that serves as the **largest and most advanced center outside the U.S. headquarters**, focusing on strengthening the semiconductor industry's **supply chain**

9. Nvidia is setting up an **AI research center** in Taiwan, partnering with the **National Taiwan University,** and investing around **$790 million** while **hiring 1,000 employees**

(10 – 12). Intel plans to invest **$4.6 billion** in an **assembly and testing facility** in Wroclaw, Poland, and expand a **semiconductor plant** in Germany with about **$33 billion,** and **commit $17 billion** to a **manufacturing complex** in Ireland

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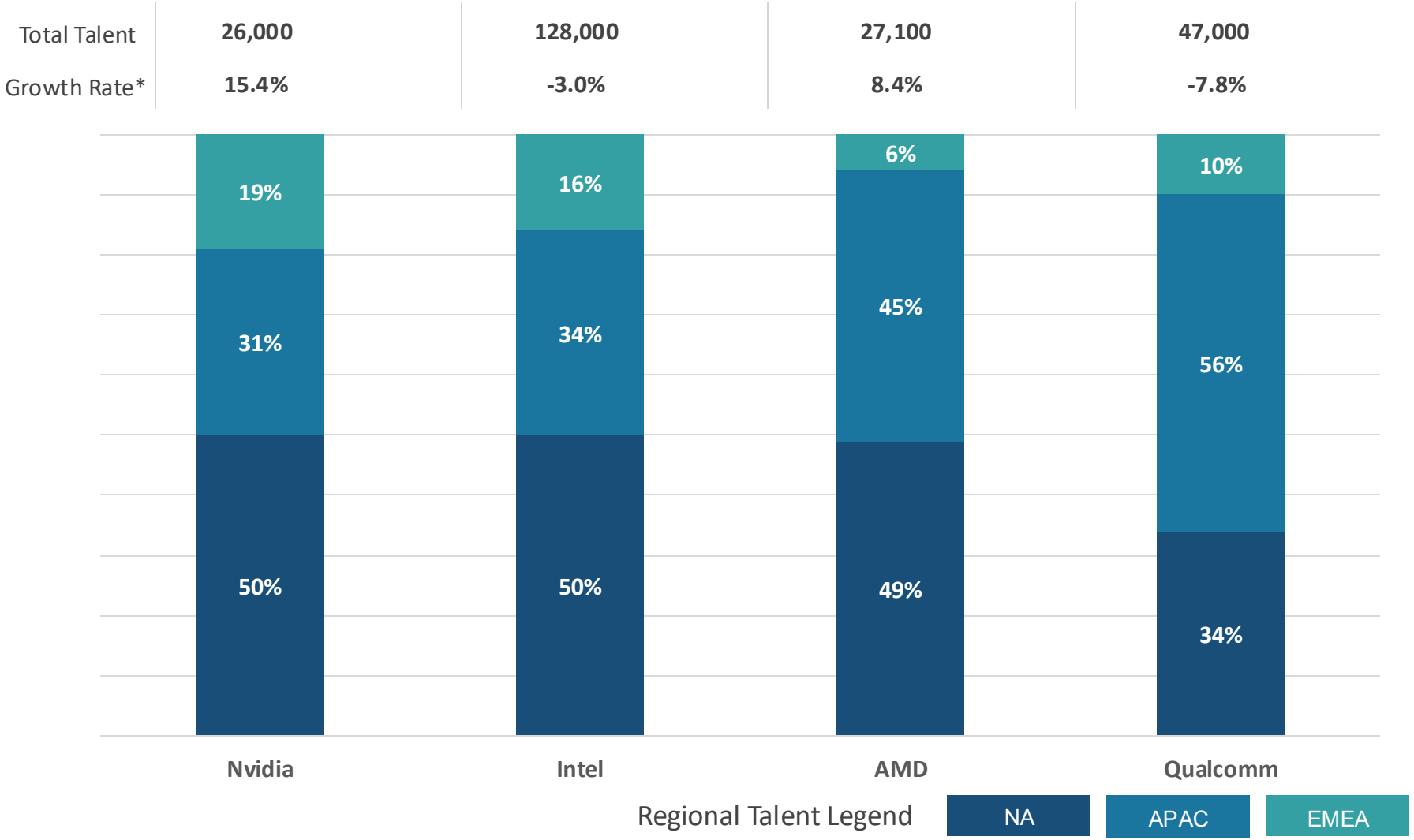
Source: Draup primarily analyzes its proprietary database of 800M+ Professional profiles, 150M+ Job descriptions, 30K+ skills, and 4,500+ job roles, and compliments it with multiple publicly available career websites, ML annotated research videos and company websites; Each numerical value displayed on the slide serves as a hyperlink, providing direct access to its corresponding information source

Regional distribution of global talent across companies : In 2023, Nvidia experienced more than 15% surge in its workforce compared to 2022. Meanwhile, companies like Intel and Qualcomm have negative Growth Rates due to factors like restructuring, market conditions, technological advancements, and strategic shifts

Regional Distribution for Global Talent



APAC

- **Nvidia** intends to create a **joint-managed AI research center** with **National Taiwan University**, employing **1,000 individuals** and committing up to **TWD24.3 billion (US$790 million)** in investment
- **Intel's** strong presence **in Penang, Malaysia**, with over **7,000 employees**, makes it a crucial **manufacturing hub** for the company in the **APAC region**, housing advanced **semiconductor assembly and testing facilities**

NA

- **AMD** has opened **two research and design facilities in New York**, aiming **to generate up to 165 new jobs by the year 2025**

Europe

- In 2022, **Qualcomm** announced to open **6 XR labs throughout Europe**, which will potentially lead to a **higher demand of talent**

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Note: The above insights and projections are curated through various strategic and tactical signals from news articles, journals, Industry reports, and other official organizations. *Growth Rate represents the percentage change in a company's employee count over the last year ; The Total Talent given for the year 2023 are estimated approximations based on the exact reported values from 2022

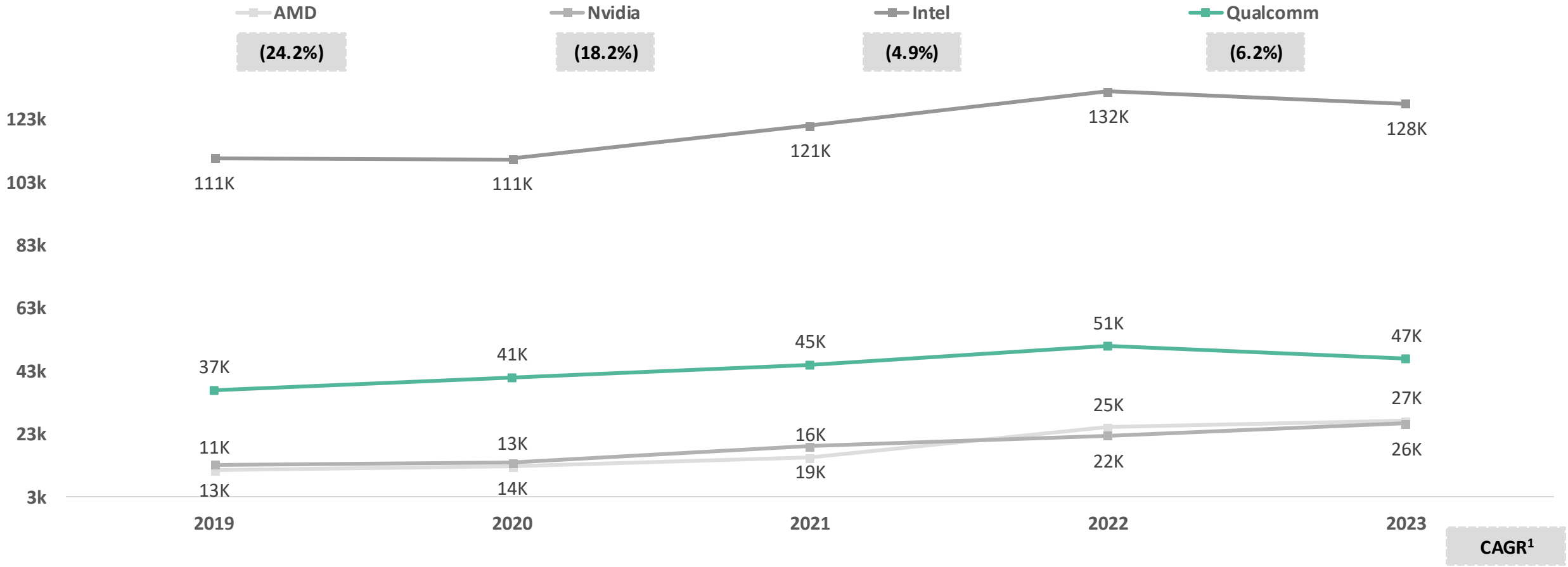
Overall employee count across the globe: The number of employees at AMD, Nvidia, Intel, and Qualcomm has shown steady annual expansion, with AMD having the highest CAGR of 24.2% followed by Nvidia at 18.2%

Total Employee Count

In 2023, **NVIDIA** has **preserved jobs across all headquarters** and simultaneously granted **salary hikes** to its entire staff and in the past year, NVIDIA has also welcomed **600 new employees** in seven distinct **Israeli cities**, including **Yokneam, Tel Aviv, Kiryat Gat,** and others

In October 2022, **Qualcomm** inaugurated its **second-largest campus** in **Hyderabad** with an investment of **$500 million** over 5 years, creating employment for **8,700 professionals**

Intel plans to invest over **$32 billion** in **two advanced microchip fabrication facilities** in **Magdeburg, Germany**, to expand its European growth strategy, with around 30% of the costs subsidized by the government, in response to global efforts **to increase domestic semiconductor production**



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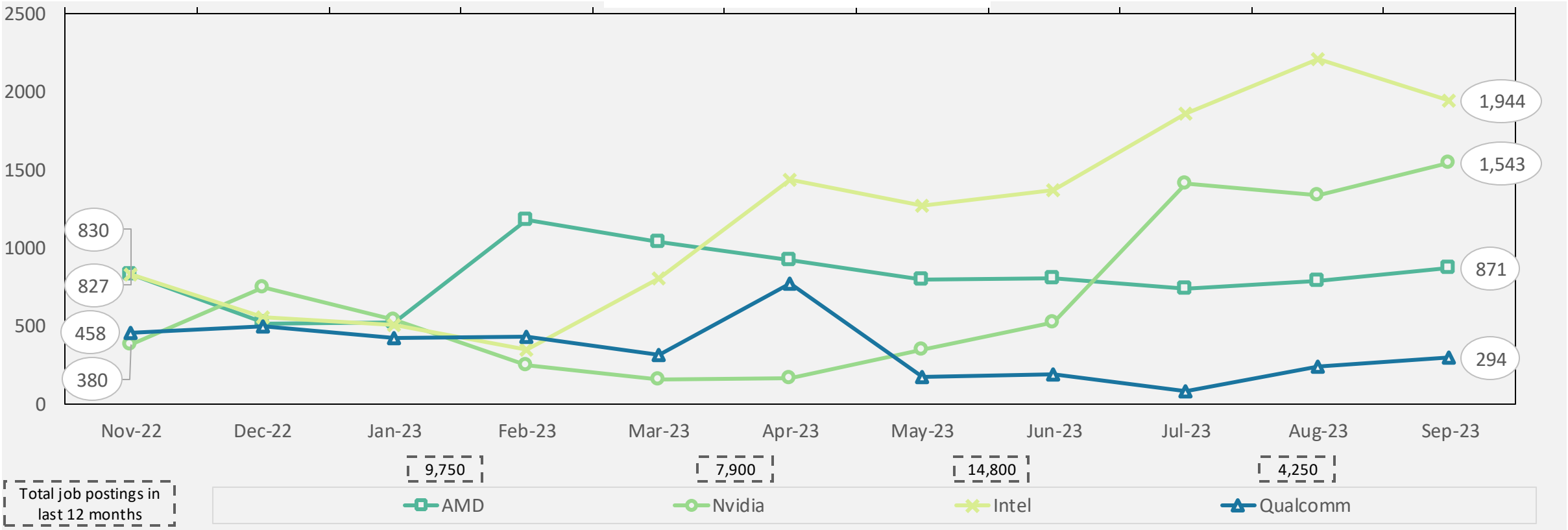
Note: The above insights and projections are curated through various strategic and tactical signals from news articles, journals, Industry reports, and other official organizations. 1. Growth is reported as CAGR for 2020-2023(Q2)

Global Hiring Trends: Nvidia, AMD, and Intel have significantly expanded their workforce in recent years in response to the rising demand for AI and semiconductor technologies and the increased focus on AI-based chips

Global Hiring Trends of Competitors



Insights

Nvidia's leadership in **AI hardware**, driven by **CUDA technology**, has increased their demand for semiconductor expertise, resulting in the hiring of around **8,000 professionals** in the past year

Qualcomm's partnership with **Meta** to enable **on-device AI implementations** is likely to drive demand for technology professionals with expertise in AI and related fields

Intel's Costa Rica office expanded in May 2022, introducing **a Long-Term Retention (LTR) Lab** and **three new Engineering Groups**, leading to the generation of over **300 engineering and technician positions**

Source: Draup primarily analyzes its proprietary database of 800M+ Professional profiles, 150M+ Job descriptions, 30K+ skills and 4,500+ job roles, and compliments it with multiple publicly available career websites, ML annotated research videos and company websites; This data strengthens over 75 ML models and over 12 Psychology models to derive actionable insights, which is also complimented by the analysis carried over by strategic consulting teams within Draup

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Mergers and Acquisitions: In recent years, AMD and Nvidia have been focusing on strengthening their AI and graphics capabilities through acquisitions, while Intel and Qualcomm have prioritized 5G technology and chip development

Recent Acquisitions and Strategy

Qualcomm

- **Autotalks**: In May 2023, Qualcomm acquired **Autotalks** to boost **Snapdragon's automotive safety technology**
- **cellwize**: In Jun 2022, Qualcomm acquired **Cellwize** to **Accelerate 5G Adoption** and Spur Network Infrastructure Innovation
- **Arriver**: In Apr 2022, Qualcomm acquired **Arriver** to provide automakers with **cutting-edge, integrated ADAS* solutions**

intel

- **codeplay**: Intel acquired **Codeplay** in Jun 2022 to enhance its OneAPI parallel programming framework, **bolstering its capabilities in the evolving chip industry**
- **Ananki**: In Apr 2022, Intel acquired **Ananki** to **strengthen its position** in **private 5G networking** and expand its software and services portfolio
- **SiRU INNOVATIONS**: In May 2022, Intel acquired **Siru Innovations** to gain access to key talent and IP in the **development of graphics architecture and software**

AMD

- **nod**: On 10th Oct 2023, AMD announced its acquisition of **Nod.AI** to **enhance its AI capabilities** and **compete more effectively with NVIDIA**
- **Mipsology**: AMD acquired **Mipsology** in Aug 2023 to **strengthen** its **AI inference software capabilities** and enhance its position in the AI landscape
- **XILINX**: AMD's acquisition of **Xilinx** in February 2022 was aimed at expanding and diversifying its leadership computing, **graphics, and adaptive SoC product portfolio**

NVIDIA

- **OMNIML**: Nvidia acquired **OmniML** in Jun 2023 to **strengthen its edge AI capabilities** by leveraging OmniML's expertise in **miniaturizing machine learning models**
- **Excelero**: In Mar 2022, Nvidia acquired **Excelero** to **enhance** its high-performance **computing and AI capabilities** through Excelero's software-defined block storage solutions
- **Bright Computing**: In Jan 2022, Nvidia acquired **Bright Computing** to leverage its **HPC* cluster management software** and strengthen its presence in the enterprise HPC market

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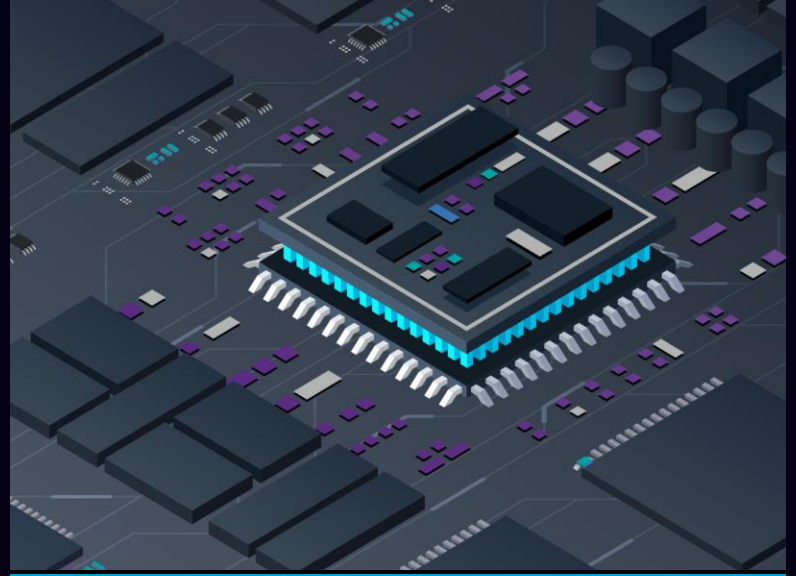
Source: Draup primarily analyzes its proprietary database of 800M+ Professional profiles, 150M+ Job descriptions, 30K+ skills, and 4,500+ job roles, and compliments it with multiple publicly available career websites, ML annotated research videos and company websites; *ADAS stands for Advanced Driver Assistance Systems; * HPC stands for High-Performance Computing



Competitor Analysis

- Samsung Electronics
- Apple
- Intel
- Qualcomm
- STMicroelectronics
- TSMC
- Micron
- Infineon
- Google
- Nvidia
- NXP Semiconductor
- Texas Instruments
- AMD
- GlobalFoundries

03

Talent Supply

- Intel, Samsung Electronics, and Apple employ the largest number of hardware professionals
- AMD and Nvidia stand out as the semiconductor industry's fastest-growing employers with CAGRs of 24% and 18% respectively

Talent Distribution

- Over 80% of the analyzed companies' workforce is situated in the Americas and the APAC regions
- STMicroelectronics and ASML are the dominant players in the EMEA region, employing over 50% of their workforce in this area
- Other companies such as Intel and Nvidia are expanding their presence in EMEA, with Intel investing in $4.6 billion into an assembly and testing facility in Wroclaw, Poland and is also expanding its semiconductor fabrication plant in Magdeburg, Germany

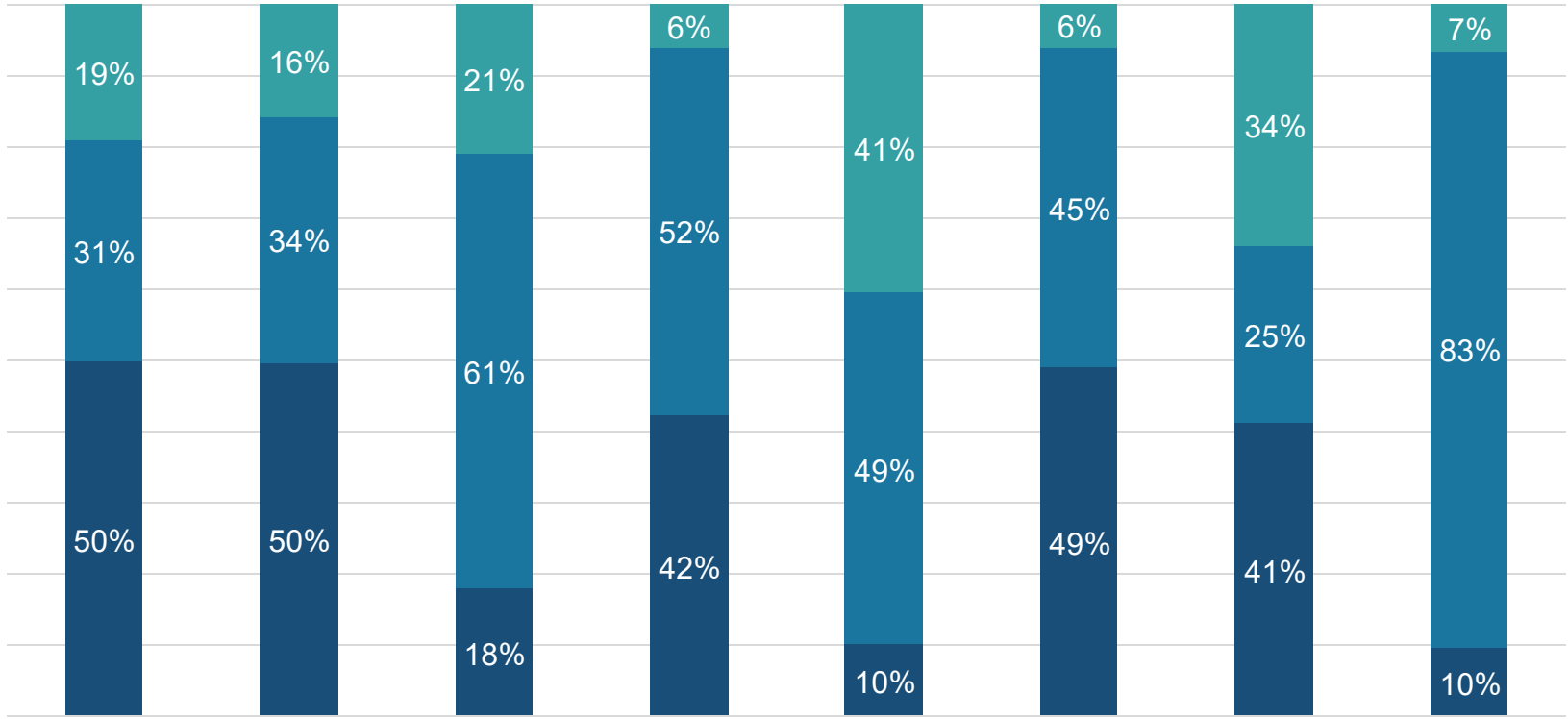
Global Hiring Trends

- Apple, AMD, and Intel had the highest number of hardware-related job postings in the last year
- San Francisco (USA) and Bengaluru (India) are common locations where Intel, AMD, Qualcomm and Nvidia have a significant number of job postings
- The surge in demand for hardware engineers is driven by semiconductor companies entering new industries, increased digitalization, and global supply chain disruptions

Regional distribution of global talent across companies (1/2): In 2023, Nvidia experienced more than 15% surge in its workforce compared to 2022. Meanwhile, big tech giants like Apple managed to sustain a modest 1.6% growth rate and notably refrained from implementing any layoff

Regional Distribution for Global Talent

	Nvidia	Intel	NXP Semiconductors	Texas Instruments	Infineon	AMD	Apple	Samsung Electronics
Total Talent	26,000	128,000	36,000	33,600	58,700	27,100	166,000	271,700
Growth Rate*	15.4%	-3.0%	4.3%	1.8%	4.4%	8.4%	1.2%	0.5%



Regional Talent Legend: AMER | APAC | EMEA

APAC

- **Nvidia** intends to create a **joint-managed AI research center** with **National Taiwan University**, employing **1,000 individuals** and committing up to **TWD24.3 billion (US$790 million)** in investment
- **Intel's** strong presence **in Penang, Malaysia**, with over **7,000 employees**, makes it a crucial **manufacturing hub** for the company in the **APAC region**, housing advanced **semiconductor assembly and testing facilities**

AMER

- **AMD** has opened **two research and design facilities** in **New York**, aiming **to generate up to 165 new jobs by the year 2025**

Europe

- As part of its expansion plans for the **Silicon Design Centre** in **central Munich**, **Apple** is increasing its **investment in Germany** by an additional **1 billion euros** over the **next six years**

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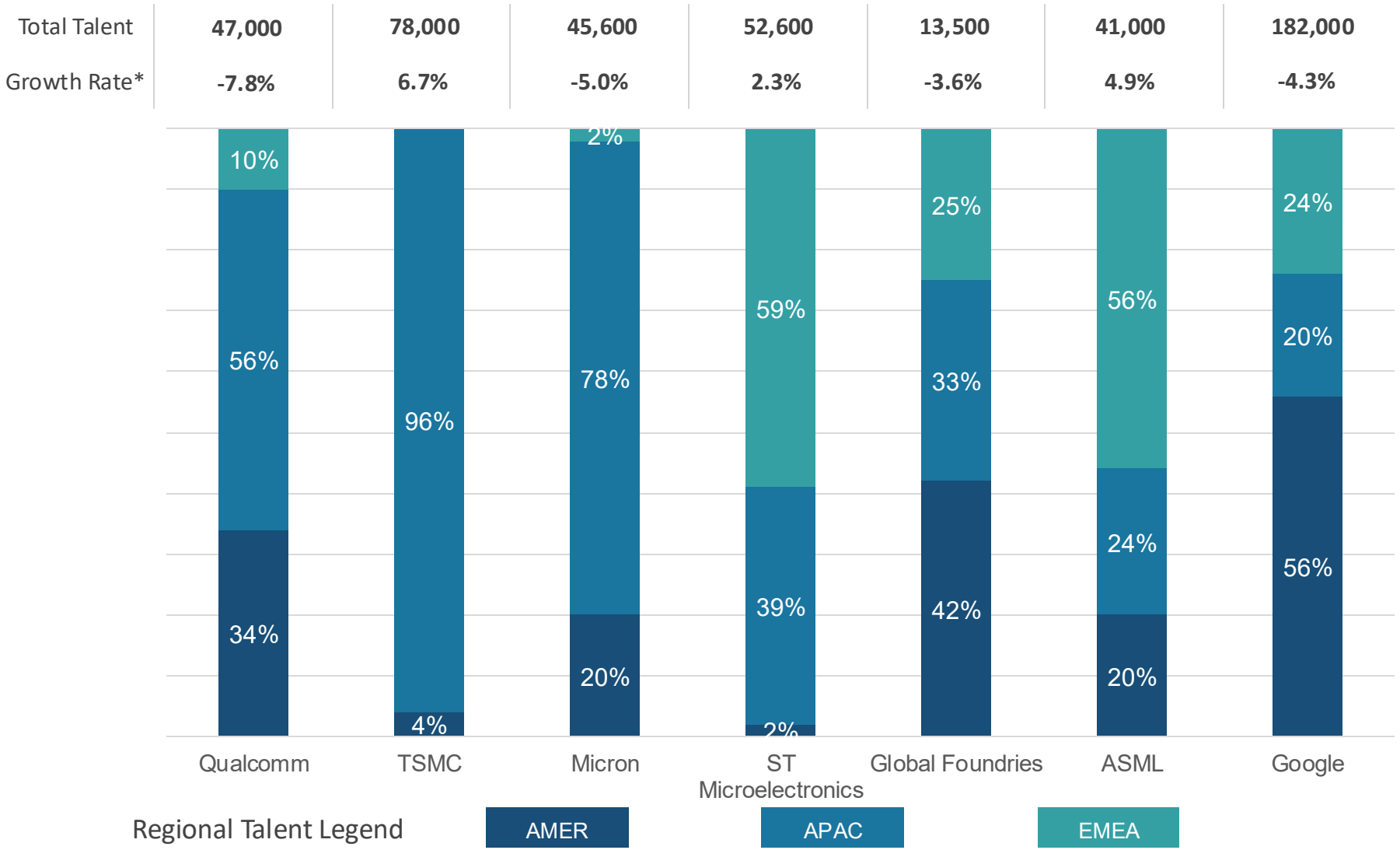
Note: The above insights and projections are curated through various strategic and tactical signals from news articles, journals, Industry reports, and other official organizations. *Growth Rate represents the percentage change in a company's employee count over the last year

Regional distribution of global talent across companies (2/2): In 2023, TSMC experienced a more than 6.7% surge in its workforce compared to 2022. Meanwhile, semiconductor giants like Qualcomm, Micron, and Global Foundries experienced a decline in their overall workforce

Regional Distribution for Global Talent



APAC

- **Micron** is **investing $825M** in setting up an **assembly and test manufacturing** plant for both DRAM and NAND products and creating **20,000 jobs**

AMER

- **Micron** has **invested $40B** in **memory chip manufacturing** with the help of CHIPS and Science Act which will create **40,000 jobs in the US** and bring the US **market share** of memory chip production from **2% to 10%**

Europe

- **STMicroelectronics and Global Foundries** plan to build a **semiconductor factory in France** with an investment of **$6.8B** that has a capacity of producing **620,000 wafers per year**. The new factory would create **1,000 more jobs**
- **TSMC** to build **$11 billion chip manufacturing plant** in Germany with the intention of producing chips for the **automotive industry** by the end of 2027

Note: The above insights and projections are curated through various strategic and tactical signals from news articles, journals, Industry reports, and other official organizations. *Growth Rate represents the percentage change in a company's employee count over the last year

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APAC's Semiconductor Pivot: As China's grip loosens, a new cadre of nations from Singapore to India are seizing the opportunity, leveraging policy support like the 'Chips Act' to build infrastructures and attract significant global investments in the semiconductor value chain

draup

Emerging countries with Semiconductor HW talent and growing ATM* capabilities

Malaysia

- **Malaysia** holds a **strong intellectual property rights system** that helps foster the semiconductor industry and has **strong government policies** in place necessary **for research and development**
- **Malaysia ranks No.2 in the DHL Global Connectedness Index** and its **7 seaports** facilitate the rapid movement of goods making it a **strong supply chain hub**
- **Infineon, Texas Instruments, and Bosch** have collectively invested **more than $8 billion**

Thailand

- **Thailand** recently approved its **investment promotion policy** for the **electronics industry** which aims to benefit **wafer fabrication, IC substrate, IC and IC testing**, and other technology intensive manufacturing
- Thailand government incentives include making **tax breaks, customs duty exemptions, and support for research and development activities** it financially advantageous for semiconductor companies
- **Toshiba, Silicon Craft Technology, and NXP Semiconductors** are the major players in this country

Vietnam

- **Vietnam** is an emerging **global production hub** with several advantages including a **stable political system, low labor costs, abundant human resources,** and easy access to **high-tech supply chains**
- **Amkor Technology, Samsung, and SKC Co.** have plans to establish operations in Vietnam across fields like **chip design, chip assembly and packaging, and Integrated Circuits**

Singapore

- **Singapore specializes** in **wafer fabrication, assembly and testing**. 3 of the 8 largest wafer foundries are present in Singapore
- A vast **ecosystem of suppliers**, a **stable intellectual property** (IP) **system** and a network **of double taxation agreements (DTA)** make Singapore a great location for investments
- **Silicon Box, TSMC, and Soitec** have made **huge investments** in areas of advanced manufacturing and packaging

India

- **Production Linked Incentive** (PLI), **Design Linked Incentive** (DLI), and **Chips to Startup** (C2S) are some of the government schemes launched in India to promote Semiconductor Manufacturing
- India's greatest asset lies in its **vast reservoir of highly educated and talented workforce** and the **government is launching programs** to enhance talent **aligning with industry demands**
- **Micron Technology, AMD, and Foxconn** are some of the companies planning to set up **semiconductor manufacturing** plants in India

Note -*Assembly, Test, and Manufacturing

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Geopolitical Risk in Semiconductor Expansion: US-China tensions amplify trade barriers and supply chain vulnerabilities, adding layers of complexity and risk to global expansion strategies for semiconductor firms

The impact of global tensions is observed in areas of – Hiring Freeze, Increased Layoffs, Reduced R&D Budget, limited product expansion, etc.

Applied Materials	Qualcomm	Lam Research	Marvell	Samsung
Applied Materials, along with KLA Corp. and Lam Research Corp., have stopped shipping high-end offerings to clients in China	Qualcomm has announced a hiring freeze and other cost-cutting efforts along with Micron Technology, TSMC, Intel and others	US Chip Equipment Firm Lam Research starts layoffs in China as result of new regulations announced by US authorities	California-based chip producer Marvell Technology confirmed that it is eliminating some research and development roles in China	Samsung has significantly reduced its workforce in China, by over 70%, because of the US-China Trade War and anti-South Korean sentiments following Terminal High Altitude Area Defense (THAAD) in S. Korea

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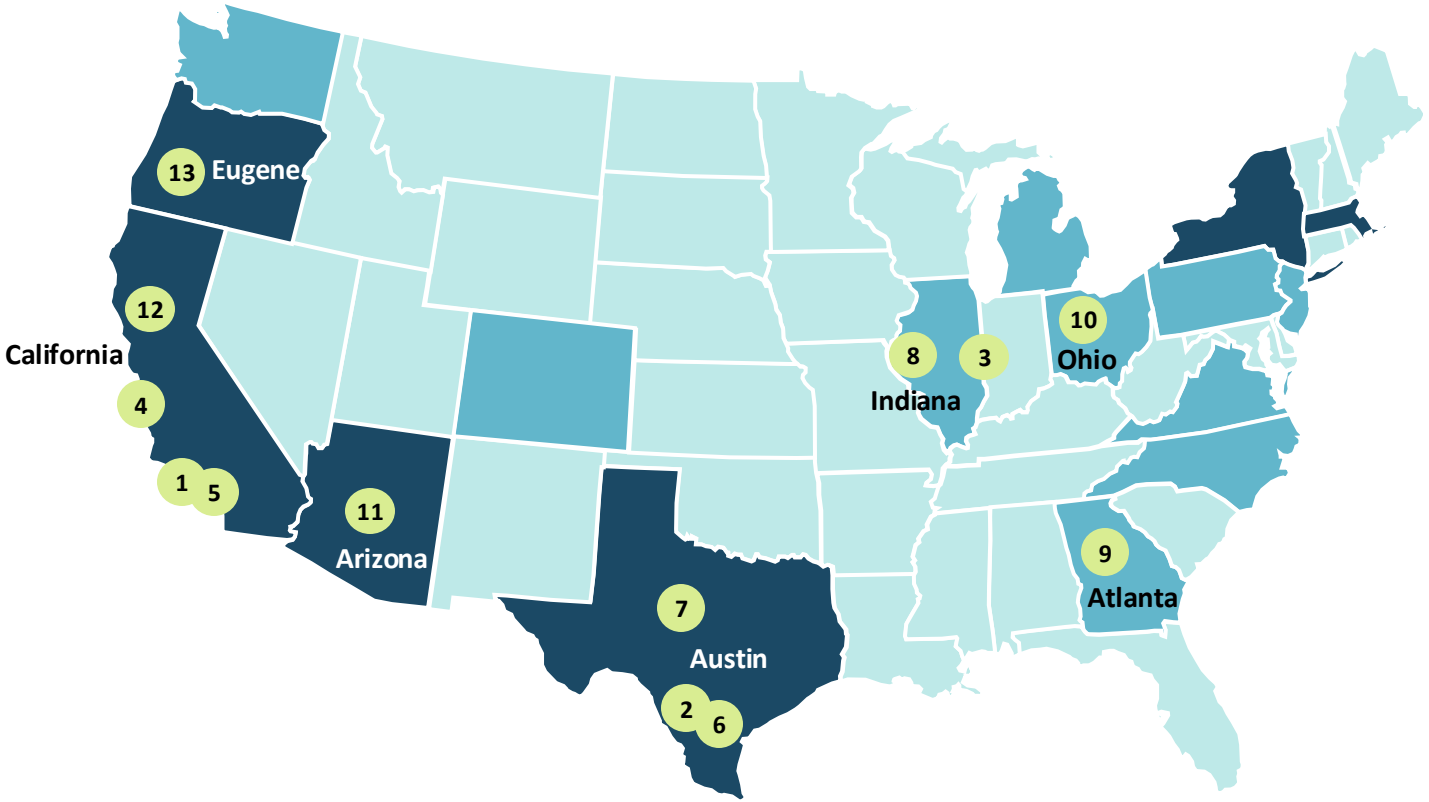
Note: Insights have been extracted from Draup's ML model, which analyses 1000+ custom talent reports, publications, Industry reports, and news articles on a weekly basis

University Partnerships: Semiconductor companies in the US have been actively forming partnerships with universities to advance research, innovation, and workforce development in response to the growing demand for semiconductor technology, with the goal of cultivating a highly skilled workforce

Semiconductor Company – University Partnerships



1. The **MOSIS service** of **USC (University of Southern California) Information Sciences Institute** and **WIN Semiconductors** have collaborated on **III-V compound semiconductor manufacturing**

2. **Texas Instruments** partners with **the University of Texas** at Austin to offer a **three-course series** on Introduction to **Embedded Systems**, **Embedded Systems Design Lab** , and **Real-Time Systems Lab**

3. **Purdue University** extends **TSMC** partnership for **workforce development** and **semiconductor research** until 2031 through CSME

4. **The University of California, Berkeley** is partnering with the **U.S. National Science Foundation** along with **Ericsson, IBM, Intel, and Samsung,** to boost semiconductor technology, manufacturing, and workforce development

5. **The Center for Advanced Research Computing (CARC)** at **University of Southern California** has formed its **first-ever industry partnership** with **Samsung Semiconductor, Inc.** to **test and research new memory and storage solutions**

(6-8). **Samsung** is donating **$5 million** to **multiple U.S. universities**, including **the University of Texas** at Austin, **Texas A&M University**, and **the University of Illinois** Urbana-Champaign, to bolster **STEM education, research, and semiconductor industry workforce development**

9. **The Georgia Institute of Technology** partners with **GlobalFoundries** to **enhance semiconductor research**, offering expanded R&D opportunities and **training programs**

(10–11) **Intel** collaborates with **Ohio State University** and **Arizona State University** to promote **microelectronics industry growth** and **inclusivity** while investing **$20 billion** in Ohio to revitalize U.S. **semiconductor manufacturing**

12. **The Stanford SystemX Alliance**, in partnership with **TSMC** and **industrial firms**, aims to drive **top-tier research and foster Ph.D. graduates**, focusing on enabling **pervasive sensing, computing, and communication with embedded intelligence**

13. **Micron** has teamed up with the **University of Oregon** and 10 other U.S. and Japanese universities for the UPWARDS partnership, focusing on **semiconductor workforce development and research**

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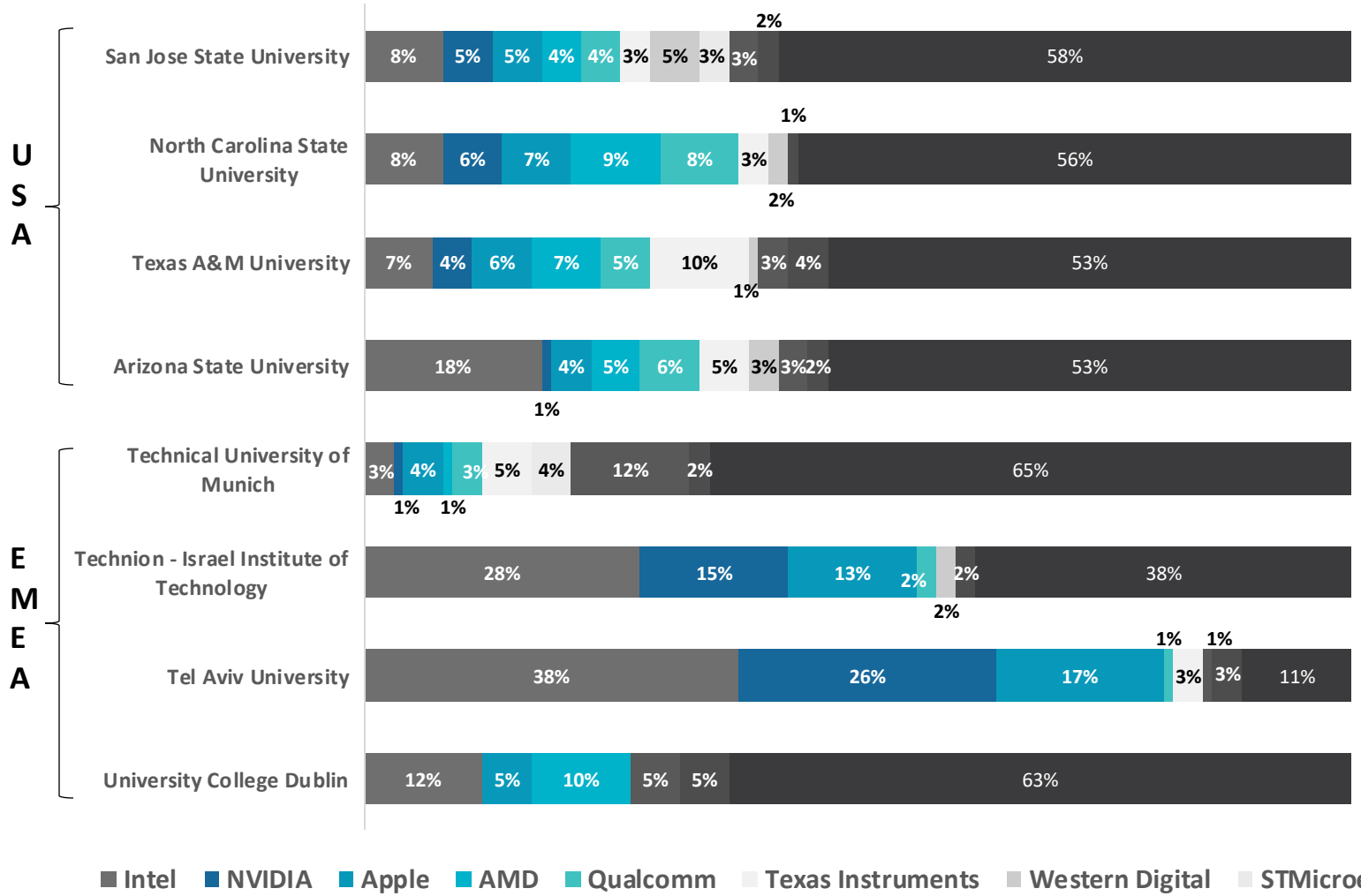
Source: Draup primarily analyzes its proprietary database of 800M+ Professional profiles, 150M+ Job descriptions, 30K+ skills, and 4,500+ job roles, and compliments it with multiple publicly available career websites, ML annotated research videos and company websites; Each numerical value displayed on the slide serves as a hyperlink, providing direct access to its corresponding information source and the numbers on the map indicates the locations of the universities mentioned in the insights

Total number of Relevant Graduates High | Moderate | Low

Companies hiring from top universities across the globe(1/2): Global semiconductor companies are actively hiring talent from top universities worldwide, highlighting the industry's reliance on academic partnerships; Intel hires significantly from Israel

Companies hiring from Top Universities across the Globe



Insights

- **Arizona State University (ASU)** leverage grants from **Intel's** workforce development program to **foster growth** and **enhance the inclusivity of the microelectronics industry**
- **MediaTek**, in partnership with **Texas A&M University**, has successfully **developed its first chip** using **TSMC's leading-edge 3nm technology** reaffirming their commitment to delivering **high-performance, energy-efficient SoCs for worldwide devices**
- **Intel, NVIDIA, Apple, AMD, Qualcomm, Texas Instruments, and Western Digital** are establishing strong hiring ties with top universities in **the United States**

- **Intel Labs,** alongside **the Italian Institute of Technology and the Technical University of Munich,** introduced a new approach to **neural network-based object learning**
- **The Technion - Israel Institute of Technology**, in collaboration with **Intel** establishes a **oneAPI Center of Excellence** to enable **advanced scientific computing** with **CPUs, GPUs, and accelerators,** emphasizing **cross-architecture programming**
- **Intel, NVIDIA, and Apple** are actively recruiting a substantial number of graduates from the leading universities in **the EMEA region**

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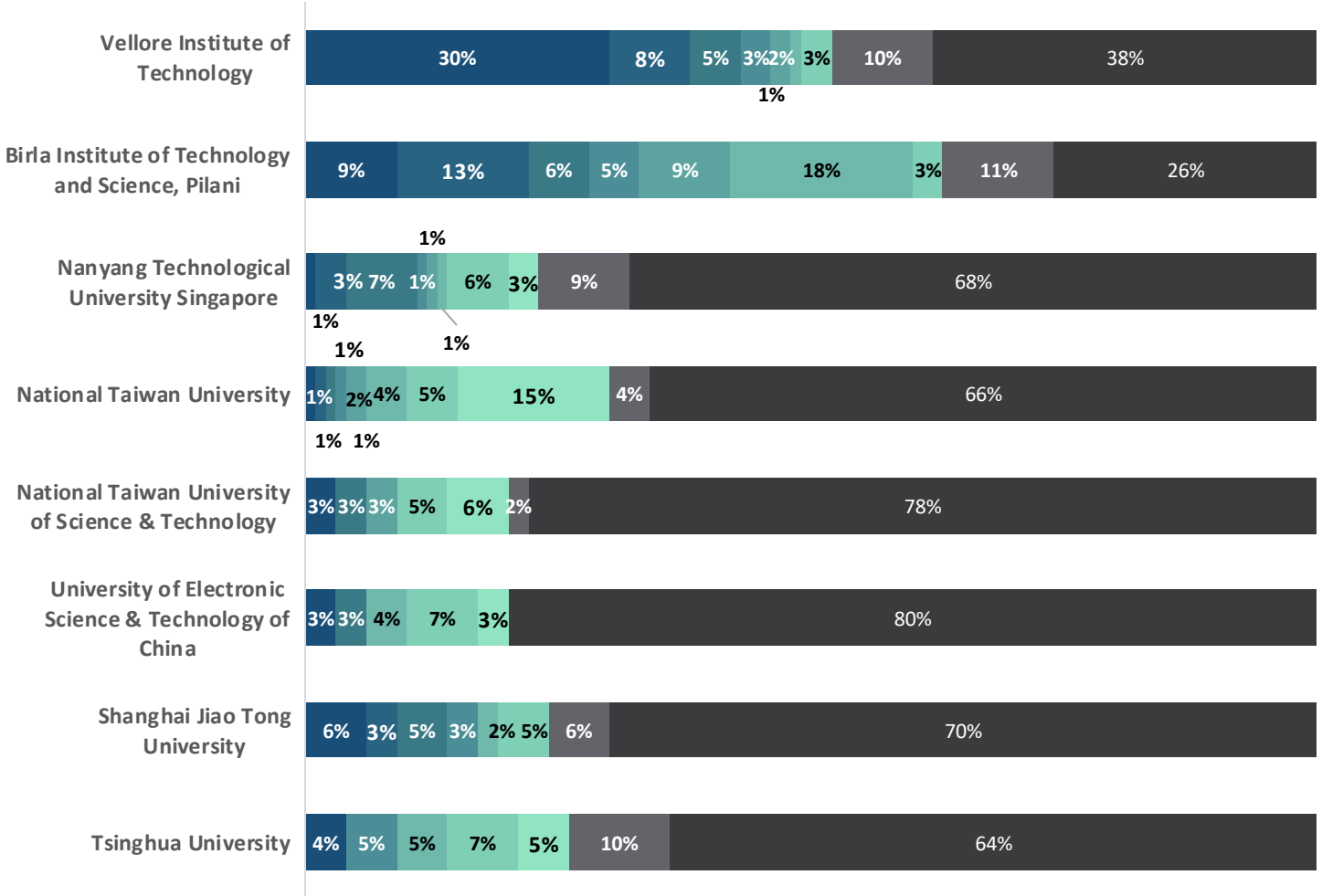
Source: Draup primarily analyzed its proprietary database of 800M+ Professional profiles, and 150M+ Job descriptions and complimented it with multiple publicly available career websites to produce the demand distribution and insights.
NOTE: Others - refers to a comprehensive and diverse array of entities, encompassing not only the well-established and sizable enterprises that have achieved significant prominence and stability but also the smaller and evolving businesses, including startups and ventures at different stages of growth and development

Companies hiring from top universities across the globe(2/2): Top semiconductor companies are sourcing talent from various universities, with Intel notably recruiting from the APAC region; Birla Institute of Technology is the preferred choice for recruiting top talent among major companies

Companies hiring from Top Universities across the Globe



Insights

- **MediaTek** and **National Taiwan University (NTU)** have been collaborating since 2014 and have setup the **MEDIATEK-NTU Advanced Research Center** to **engage and train graduates** on **advanced chip design, wireless communication technologies, and artificial intelligence (AI)**
- **Intel** has established **"Internet of Everything" research center** at **National Taiwan University (NTU),** which acts as a bridge for research collaboration with national as well as global enterprises to deliver practical products and services
- **Vellore Institute of Technology (VIT)** hosts a multitude of **industry-supported laboratories,** such as the Analog System Design Lab, which is backed by **Texas Instruments**
- **Nanyang Technological University Singapore** collaborates with industry leaders like **TSMC, MediaTek Singapore Pte Ltd, and Texas Instruments Singapore Pte Ltd,** to advance research in **Integrated Circuit design and technology**
- **Shanghai Jio Tong University and NVIDIA** have signed **a Memorandum of understanding** on **artificial intelligence calculation and GPU Visualization** for an in-depth study of **high-performance computing**
- **Intel and Qualcomm** are recruiting significantly from top universities in **the APAC region,** while **TSMC** primarily focuses its hiring efforts in **Taiwan and China**

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Source: Draup primarily analyzed its proprietary database of 800M+ Professional profiles, and 150M+ Job descriptions and complimented it with multiple publicly available career websites to produce the demand distribution and insights;
NOTE: Others - refers to a comprehensive and diverse array of entities, encompassing not only the well-established and sizable enterprises that have achieved significant prominence and stability but also the smaller and evolving businesses, including startups and ventures at different stages of growth and development

Skill Clusters of PCB Design Engineer: PCB Design Engineers must be proficient in Systems & Hardware Engineering, Embedded & Electronic Systems, Design Documentation, PCB Design & Layout, and Manufacturing & Process Optimization skills

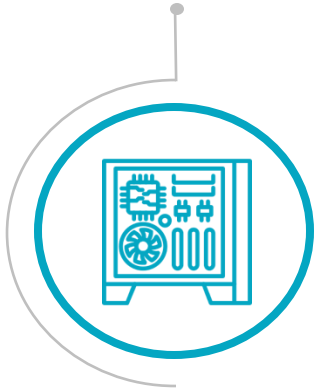
A PCB Design Engineer is responsible for creating and optimizing the layouts and schematics of printed circuit boards (PCBs) used in electronic devices and systems.

Systems & Hardware Engineering

- Hardware Design
- Verilog
- VHSIC Hardware Description Language (VHDL) Design Flow
- Systems Programming
- System Architecture
- Configuration Management
- Electrical Troubleshooting
- System Analysis
- System Integration

Embedded & Electronic Systems

- Controlled Impedance
- Circuit Simulation
- Electronic Circuit Design
- Electronic Design Automation (EDA)
- PCB Fabrication
- Silicon Photonics
- Serial ATA (SATA)
- OrCAD, KiCAD
- ECAD, MCAD
- Netlist
- Altium

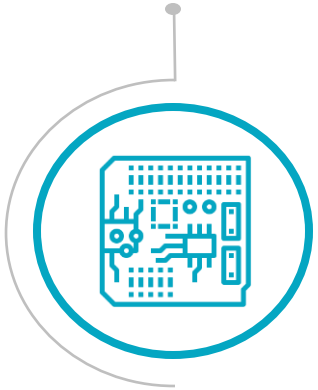


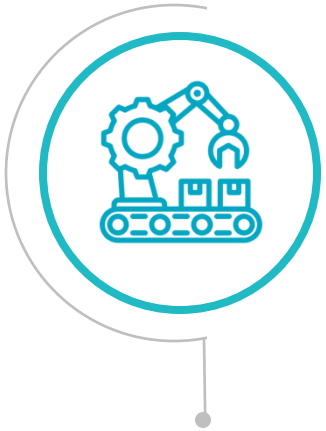
Design Documentation

- Detailed Component Placement
- Constraints Management
- Design Releases
- Electronic PCB Documentation
- SI Constraints
- EMI/RFI Control
- Failed Chipset Count (FCC) Reduction
- IPC Specifications
- Artwork Files
- PCB Compliance
- Cam350

PCB Design & Layout

- Printed Circuit Board (PCB) Design
- PCB Layout
- CAD Layout
- High-Density Interconnect PCB
- PCB Signal Layout
- Multilayer & High-Speed Design
- Circuit Design
- Timing Constraints
- Analog Circuit Design
- Board Layout
- Cadence Allegro





Manufacturing & Process Optimization

- Floor Planning
- PCB Routing
- Design For Manufacturing (DFM)
- Design For Assembly (DFA)
- DFT Constraints
- Thru-Hole
- Back-drilling
- NRC Regulations
- Signal/Trace Integrity
- Post Processing
- Gerber Setting
- Component Placement

Soft Skills

- Strategic Thinking
- Methodical
- Innovation
- Planning
- Creativity
- Learnability
- Adaptability
- Improvisation
- Analytical Thinking

Source: Draup leveraged its proprietary skill library and its database of Job Openings to identify skills required by PCB Design Engineer and classify them based on their function.
Note: Skills listed are not exhaustive and may vary by location

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Reskilling Propensity Analysis – PCB Design Engineer: Layout Engineer, Hardware Test Engineer, and Electronics Technician are the top feeder roles with a high propensity to reskilling to PCB Design Engineer based on Draup's Reskilling Propensity Index (RPI)

Start Roles	RPI	Parameters				
		Path Empirical Data	Compensation Benchmarking	Core Skills Overlap	Soft Skills Overlap	Median Experience
Layout Engineer	7.22					
Hardware Test Engineer	6.42					
Electronics Technician	6.28					
Engineering Operations Technician	6.17					
Service Engineer	5.91					
Verification Engineer	5.82					
Analog Engineer	5.46					
Hardware Quality Engineer	5.44					
Electronic Design Engineer	5.40					
Validation Technician	5.33					

RPI Value — High — Low

Score in Individual Parameter — High — Medium — Low

The list of roles presented above is not exhaustive. Draup can build an exhaustive Reskilling Matrix for multiple roles across all Job Families. Upskilling is analysed when the skills gap is very less, and time required to bridge the skills gap Is less than 6 months and Reskilling is analysed when the skills gap is high, and time required to bridge the skills gap is more than 6 months.

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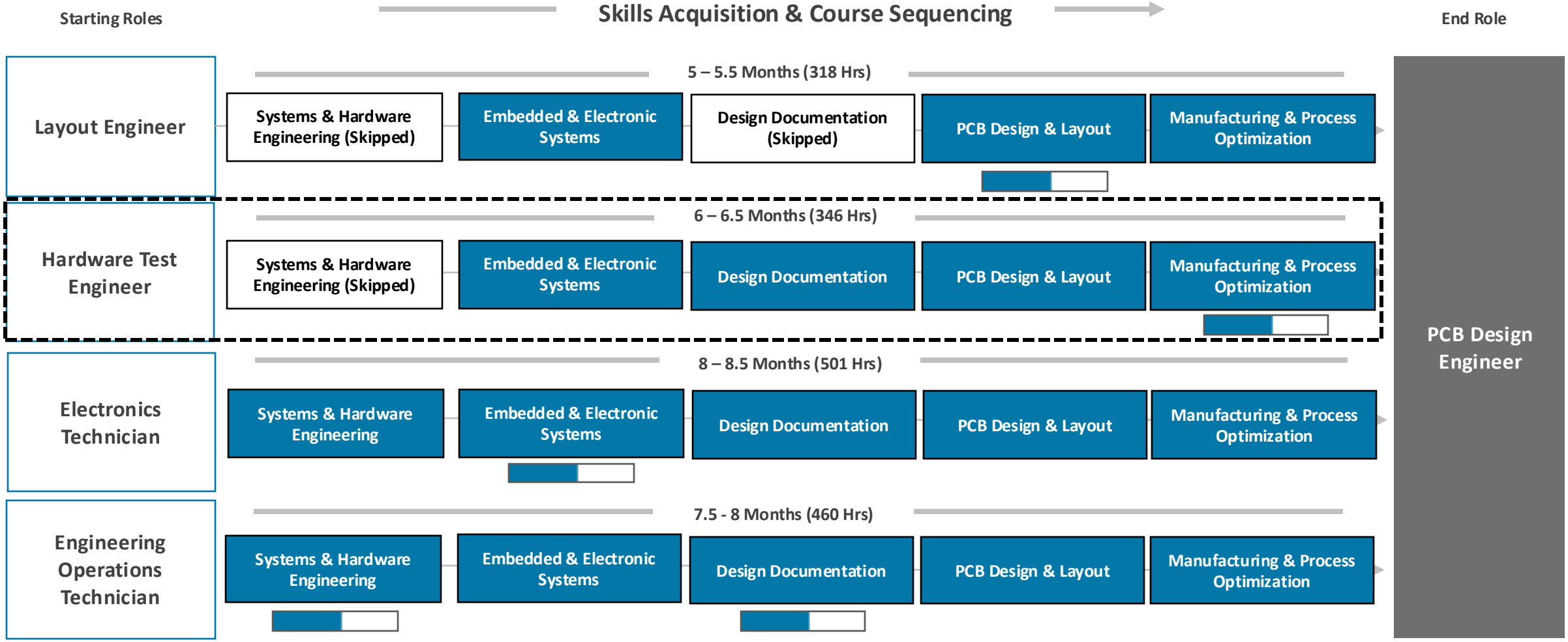
Skill Sequencing: Draup has developed a learning plan with the sequence of skill cluster acquisition to help employees transition into PCB Design Engineer



Source: Draup Tracks 4M+ Career paths across 16M+Data Points from Over 8000 Data Sources
Note: The paths showcased are not exhaustive, the ones mentioned here are the most commonly occurring and plausible paths. Skill level data has been extracted from DRAUP Reskill Navigator. The time durations mentioned are based on preliminary analysis considering 50 hours of dedicated learning per month, subject to change upon deeper analysis

Upskilling Analysis

Skills Partially Skipped

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Learning Journey: Draup has developed a comprehensive 6-month learning journey for Hardware Test Engineer to transition into PCB Design Engineer with beginner level Job Ready Proficiency

- **edx -** UBCx: Silicon Photonics Design, Fabrication and Data Analysis (150 hours)
- **Udemy** – Circuit Design, Simulation, and PCB Fabrication Bundle (17 hours)
- **Udemy** – Design with KiCad (12 hours)
- **Udemy** – Altium Course Learn Altium Designer today (7 hours)
- **Udemy** – Altium Course Learn Altium Designer today (7 hours)

Approximate Timeline: 193 hours

- **Udemy –** PCB101- PCB Design & Manufacturing (15 hours)
- **Udemy –** Practical High-Speed Digital Design (7 hours)
- **Udemy –** Advanced Hardware and PCB Design Masterclass 2022 –EsteemPCB (23 hours)
- **Udemy –** Analog Circuit Design - An Intuitive Approach (6 hours)
- **Udemy –** PCB Design using OrCAD/Allegro from Basics to Expert level (26 hours)
- **Udemy -** Analog Circuit Design - An Intuitive Approach (6 hours)

Approximate Timeline: 83 hours

Embedded & Electronic Systems

Design Documentation

PCB Design & Layout

Manufacturing & Process Optimization

- **Udemy –** Electrical, Electronics, and PCB Design Safety & Compliance (3 hours)
- **Udemy –** Theory of Constraints (TOC) & its Applications -Crash Course (5 hours)
- **Udemy –** Writing Technical Design Document (Real Time Project Based) (3 hours)
- **YouTube –** DFMStream and CAM350 (5 hours)

Approximate Timeline: 16 Hrs

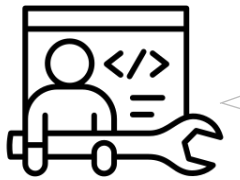
- **Udemy** – Manufacturing process selection and Design for Manufacturing (4 hours)
- **Udemy** – VSD - Signal Integrity (7 Hours)
- **Semi.org** – MEMS Technology Online Course(24 Hours)
- **Semi.org –** SEMI110 A New Approach to Robotics: Designing for Additive Manufacturing (2 hours)
- **Semi.org –** Flexible & Printed Electronics Bundle (6 hours)

Approximate Timeline: 43 Hrs

Total Job Ready Proficiency*: 5.5 – 6 Months (346 hours)

considering 2 hours of dedicated learning/day

Recommended Certification Courses



Hardware Test Engineer

IPC Designer Certification Program-CID (Certified Interconnect Designer-Basic), CID+(Advanced)

Certified Manufacturing Specialist

PCB Design Engineer

Note: Skill-level data has been extracted from Draup's Reskill Navigator. The time durations mentioned are based on preliminary analysis considering 2 hours of dedicated learning per day, subject to change upon deeper analysis. The course selection model considers the following parameters - (i) Rating of the content, (ii) Number of users/enrolments, (iii) Issuing Authority (any user preferences are recorded), (iv) Duration of the content (in case of courses, preference is not given to very short duration content), (v) Individual / Enterprise level costs, and (vi) Skills scope and coverage within the course.

*Completion of courses recommended will provide employees with beginner-level proficiency in the end role.

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