Why India needs a lot more talent that can craft chips

Semicon MNCs are starving startups and academia of talent with big paycheques

Shilpa Phadnis & Sujit John | TNN

V Ramgopal Rao, director at Indian Institute of Technology (IIT), Delhi, is involved in two startups. One is trying to make an explosive detection kit on a chip. The other is building sensors for agricultural applications. Both these require VLSI (very large-scale integration) talent. VLSI is the process of creating an integrated circuit (IC) by combining millions of transistors onto a single chip. Different applications often require different kinds of chips. Off-the-shelf chips may not be good enough, or may be too expensive. Rao is trying to bring down the cost by creating unique chip designs.

But VLSI talent is too expensive in India. "I cannot afford my own PhD students," Rao said at the Times Techies Webinar last week. The students' salary as soon as they graduate, Rao said, is almost half of his. "In five years they would be earning much more than what I would be making. So just imagine the condition of startups. They have a huge requirement of VLSI implementation and they have nowhere to go," he said.

India produces excellent chip design talent. But most of them are either overseas, or in the India R&D centres of the global semiconductor companies, the likes of Intel, Qualcomm, Samsung, Western Digital and Huawei. The kind of salaries these companies pay, the kind of lab facilities they offer, the startups cannot hope to match.

Neither can Indian academia. What academia can pay is a fraction of what industry pays. "Even in established IITs like Delhi, Bombay, we are short of VLSI faculty. At IIT Delhi, we could recruit 10 people tomorrow in the electrical engineering department if they are available. All 23 IITs together, it could be 500 faculty," Rao said.

So, even as chips are becoming core to everything around us – VLSI, as Rao said, is at the heart of today's technology revolution – India is in this peculiar bind where it finds it difficult to produce the VLSI talent it needs. "Data from the ministry of electronics & IT suggests we have a requirement currently of some 500,000 (VLSI) people, and what we have is half of that," Rao said.

Satya Gupta, president of the VLSI Society of India, and former chairman of the India Electronics & Semiconductor Association (IESA), said the government's newest SMDP (Special Manpower Development Program), focused on incentivising moves from chips to system design, provides substantial funding to academic institutions. The programme provides some 70 odd institutes with the tools needed for chip design, provides training on those tools, organises faculty workshops. He believes if the funds are utilised well, it can go a long way towards improving VLSI talent supply.

Rao was sceptical. He said while a student may be able to design a chip, the crucial element is the ability to implement it on silicon and test it. "Many tier-2 institutions cannot afford the silicon chip implementation cost. It costs Rs 2-3 lakh to get a chip fabricated (from a foundry outside the country). And when it comes back, even the testing facilities are not there except in some premier IITs," he said.

Rao urged the large semiconductor companies to share their resources to help academia implement their designs. He also said that India's traditional Bachelor's programme of electronics & communication should be changed to an electronics & VLSI programme. "Students will then have many more job opportunities," he said.

Preet Yadav, member of the VLSI Society of India, agreed on the need to revisit curriculums. "We need to create space for the advanced topics in the curriculums by shifting the basics to the 10th and +2 level. The advanced topics can come in the four years of the BTech curriculum," he said.

Yadav and Gupta also underlined the importance of industry professionals being involved in teaching a part of the curriculum to ensure students are ready for industry when they graduate, and to bring in new thought processes. Gupta noted that some institutions have started the concept of `professors of practice', under which professionals come to teach.

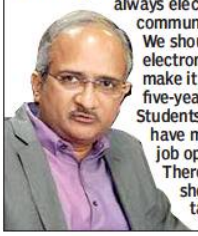
Rao said that while `professors of practice' is good in theory, the reality is that good industry professionals are under tremendous pressure to meet their design deadlines at work. He suggested looking at faculty appointments jointly by academia and industry. "Can we come up with a 50:50 arrangement? The faculty member can be shared between industry and academia, the person gets decent salaries and bridges the gap between industry and academia," he said.

The consensus was that good VLSI education must become as ubiquitous as IT education. The latter has made India a global IT powerhouse.

VLSI IS AT THE HEART OF TODAY'S TECHNOLOGY REVOLUTION

V Ramgopal Rao | DIRECTOR, INDIAN INSTITUTE OF TECHNOLOGY (IIT), DELHI

- Silicon is fast replacing steel everywhere. There is disruption happening in every industry because of this. Who would have thought just ten years ago that Apple alone will sell 30% more watches today than all the Swiss watch companies combined. Tesla is now giving a tough fight to all the traditional car makers. VLSI is at the heart of this revolution. India has a huge opportunity to become a major player in this space if we play our cards well.
- In India, the Bachelor's programme is always electronics & communication. We should make it electronics & VLSI, make it a dual degree, five-year programme. Students will then have many more job opportunities. There's a huge shortage of VLSI talent now.



Satya Gupta | PRESIDENT, VLSI SOCIETY OF INDIA, AND FORMER CHAIRMAN, IESA

- There was a time when good talent from premier institutes were going to e-commerce. I think the tide is turning, they are going once again to core jobs. Good jobs are available, and cutting edge work is happening.
- I want to make a commitment here. Those of us who have been in this industry a long time and are kind of retired, we will contribute to bringing industry knowledge to academic institutions. On curriculum, let's make a commitment here that in the next one year, academia and industry together will work to create an electronics & VLSI programme. Let's start that dialogue in two weeks.

Preet Yadav | MEMBER, VLSI SOCIETY OF INDIA

Semiconductor technology is changing very fast. We need to revisit our curriculums. We need to create space for the advanced topics in the curriculums by shifting the basics to the 10th and +2 level. The advanced topics can come in the four years of the BTech curriculum. We need to start involving experts from industry to deliver advanced topics to students, to bridge the practical skill gap.