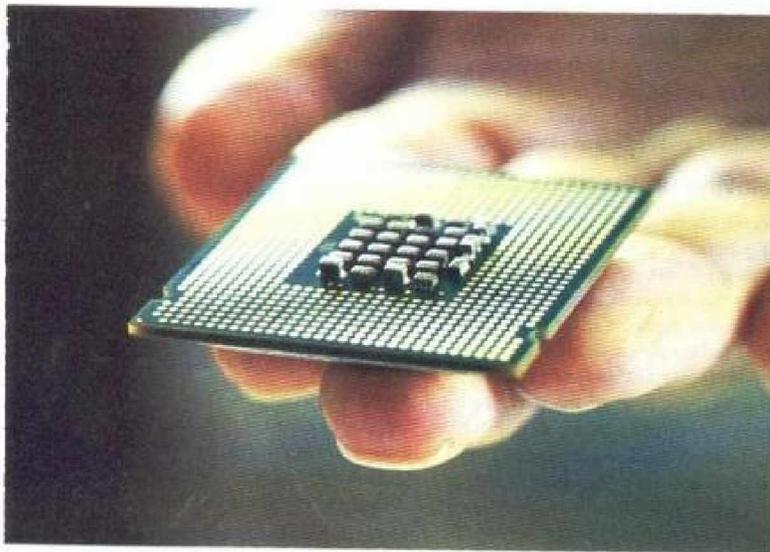


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EMBEDDED SYSTEMS

Can India Move from Implementing to Initiating Products?

Currently, as most users are outside India, they decide what is needed next. In future, though, India can migrate from the role of product implementer to product initiator by focusing on the growing domestic market



■ **UMA BANSAL**

Consumer electronics and telecom companies are starting to recognise the importance of localisation of their products, with India emerging as a big market for these products. Given this, the Indian embedded solution providers are in a unique position where they can add value not only in the development process but also in the

conceptualisation of new and unique products.

Currently, most of our embedded activities pertain to products developed for foreign markets. And most Indian embedded system houses are engaged in sub-system architecture, hardware and software implementation, testing and integration stages of the value chain. India can move up the value chain by conceiving and specifying products (as against service), system architecting, system validation

and making it production-ready in all respects for commercial success.

The embedded ecosystem

The players in the embedded space include system integrators, IC design houses, electronic design automation vendors, board design houses, test houses, software tool providers, and embedded software and application software providers.

Most of the semiconductor manufacturers are involved in VLSI chip design and embedded software development. Indian companies are developing embedded products in consumer, industrial, telecom, automotive, computing and medical space for local as well as export markets.

Transnational global companies like Cisco, Juniper, Honeywell, GE, Bosch, Delphi, Visteon, Continental and many more have set up their embedded development centres in India. In addition, design services companies of India like Wipro, HCL, Satyam, Mindtree, L&T, TCS, Tata Elxsi, KPIT Cummins and many more are doing embedded software and hardware product development in India for global accounts.

India's forte: embedded software

The show stealer so far has, of course, been embedded software development. "Embedded software develop-

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microcontrollers. The MCF5225x, Freescale's latest MCU, was created by the India team in a record time. This MCU is well-suited for a broad range of industrial networking, building/lighting control and medical applications that require high performance and connectivity options (Ethernet and USB).

efnchips did the product design (for a US customer) of a transcode device used for video streaming application. It involved 16-layer board design with around 4000 components including more than eight high-speed processors.

What advantages does India offer?

Nirav Shah, director of marketing, efnchips, says that for embedded systems players, India offers the advantages of large domestic market size, low product development cost, embedded expertise including IP solutions, and established working models locally and globally.

Large Indian companies are moving towards higher-end activities in the embedded value chain with increased expertise in specific domains. They are metamorphosing from labour cost arbitrage to being true contributors to product innovation. A growing phenomenon is that of companies either investing in new design operations in India or significantly expanding their existing facilities. This will contribute to the further expansion of the talent pool and maturation of skill sets in Indian design companies, which will be a true differentiator in the long run.

At the same time, as the pressure mounts on foreign companies to reduce costs of product development, they are increasingly looking for off-shore partners who can provide cost-effective services.

But this is not without challenges

The challenge and opportunity lie in the complexity that is involved in em-

In addition to just developing a block, the local design team should make it a fully packaged, independently usable block.

—Poornima Shenoy, president of India Semiconductor Association (ISA)



bedded design. There is an exponential increase in software complexity. In some areas, the code size is doubling every nine months. More than 70 per cent of the development cost for complex systems such as automotive electronics and communication systems is due to software development and test.

In order to exploit the opportunities, we need to make sure that we have the right resource and skill set levels within the embedded space—such as digital/analogue chip design, embedded software and board design.

There is also the question of how much the local ecosystem has evolved over the years to develop embedded products end-to-end. Indian companies need to provide start-to-finish services. We need to match or exceed the pace of developments that are happening in other countries such as China and Taiwan. High investment costs for R&D need to come down. Inadequate support from government for the capital-intensive semiconductor industry is affecting feeder segments like chip design.

Talent crunch. The fact that large MNCs are setting up manufacturing here is a testament to the fact that the domestic opportunity in India is growing and there will be a huge need for talent in the areas of embedded systems design, development and productisation.

Currently, the embedded space is witnessing a gap between the skill set required and the skill set available. No doubt, India is equipped with the required talent at design implementa-

tion and test levels, but the issue is the number of readily employable engineers, rather than the number of engineers. Institutes have been churning out engineers but they lack industry exposure and are not 'design-aware.' Hence there is a need for training and real-life design exposure before they can become productive.

The industry requires expertise in digital, analogue, software and board design. There has to be a talent transformation from traditional PC applications to embedded designs.

And if we wish to move up the value chain, we don't have the required talent at product specification, architecture and productisation levels as yet.

The Indian embedded system community needs to change its mindset from project focus to product focus. Though this is happening, it is too slow and too little. Additional focus is needed.

Solution to talent crunch

The solution to talent crunch lies in industry and academia collaborations—engineering colleges providing students with hands-on experience. Many engineering colleges are not equipped with tool-kits that the students need to be trained on for joining the industry.

An engineering student in India would require a fair amount of training to reach the level of expertise that his counterpart in the West would reach with six months' training. This is because the engineering course structure is many a time not in line with industry

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needs. A curriculum that has more of a practical orientation in addition to having theoretical perspective is required. There should be more stress on teaching the fundamentals and concepts. And it is necessary to arrange for guest lectures from industry veterans, so that the students could learn some of the best practices.

This is something which is also being recognised by the industry. Several companies have already taken proactive steps to increase the number of VLSI/embedded-trained engineers. Now we do see companies tying up with universities or setting up institutes to equip engineering graduates with the requisite skills.

eInfochips' university programme, *Impetus*, is designed to assist students by building their experience with embedded products, architecture and training materials. Students from engineering colleges are imparted training for four to six weeks.

TI India supports the academia through its University Programme. Termed as the *UniTI*, it stands for 'Universities and TI.' UniTI is the forum in which TI India interacts with universities and interested technical institutions in the role of a facilitator.

An ISA study on the status of semiconductor related research in Indian universities reveals that:

1. The role of government funding is 85-90 per cent of the funding available to university lab research
2. The top seven institutes account for 70 to 75 per cent of the total

A significant trend is the move towards small form-factor designs which can be upgraded with minimal application efforts.

—Nirav Shah, director of marketing, eInfochips



research being undertaken in the academic institutes of the country. These institutes have the faculty and dedicated VLSI labs to support high-quality semiconductor-related research

3. These institutes account for around 61 per cent of research papers published in the field of semiconductors

The study recommends:

1. A public-private partnership (PPP) model involving the government, the industry and the academia to encourage applied semiconductor research

2. Setting up of technology business incubators (TBI). TBIs provide a robust platform for active industry-academia interactions, and help convert potential research ideas into their commercial success

3. Steps to enhance research infrastructure by developing dedicated research centres, enhancing the standard of semiconductor laboratories to match with industry standards and setting up semiconductor-related research centres in special economic zones

4. Performance-based incentives to faculty and research scholars, facilitating involvement of industry executives in academics and creating awareness about job avenues among PhD holders

5. Participation of the industry beyond just providing tools

Road to success

The growth in the next four years for the embedded service industry will be higher in companies offering focused solutions on industry segments like automotive, industrial, portable/wireless and consumer electronics.

The future of embedded software looks bright given the exceeding pressure on the US companies for time-to-market and cost. Indian companies are investing in infrastructure and building domain expertise. IP creation will lead to royalty-based models as well as high-end expertise in specific domains in the embedded software value chain.

Having a local manufacturing ecosystem will also boost this industry with end-to-end product development and rollout happening from India. Companies that have been providing embedded design services will move up the value chain by building reusable components and undertaking complete system development, i.e., all levels of software development. There will be a strong focus on increasing margins and adopting business models which are not linearly dependent on the manpower. ●

The author is a deputy editor at EFY

New applications would be e-passports, smartcard-based rural banking and micro-finance, live-stock identification and identification-based vehicle security.

—Dr N.S. Murthy, director, new business initiatives, NXP Semiconductors

