

EMBEDDED AND VLSI TRAINING IN DEMAND

The \$25-billion global embedded systems market is indicative of the immense opportunity that awaits the training providers in this field

■ SUDESHNA DAS

The widening gap between demand and supply of skilled professionals for embedded systems and very large-scale integration (VLSI) design reinforces the need for industry-specific training to aspirants in this field. Embedded systems are one of the key drivers of R&D offshoring to emerging countries like India and this market is currently pegged at around \$25 billion globally, growing 16 per cent annually. The huge embedded systems and VLSI market is indicative of the opportunity that awaits the training providers in this field.

“The training market is growing at an exponential rate as there are over 130 chip design firms present in India with a turnover of more than \$100 million. The vast pool of talent and growing domestic market have helped the country emerge as an important centre for embedded and VLSI design,” says Vikas Kalra, director-marketing, CETPA.

According to Maaz Jukaku, director, Emtrexe, “The Indian market has just started expanding in terms of usage of embedded/electronic products at consumer levels and it is waiting to revolutionise. The number of embedded product engineers required to do the job is very high.”

“Embedded engineers trained in the latest technologies are always in demand.”

—Thushar V. Nadh, Managing Director, rhydoLABZ

Considering that on an average 20,000 students sign up for embedded system courses in training institutes every year and around 50,000 technical students need help to continue their academic projects, Thushar V. Nadh, managing director, rhydoLABZ, estimates the size of the Indian embedded system and VLSI training market at Rs 1 billion and expects an annual growth rate of 10 to 15 per cent. This estimation is further supported by Vishwanath Raju, director-technical, Vector Embedded Systems. Taking into account the online training and e-learning options as well, Loganathan V., CEO, ISM, puts the embedded and VLSI training business in India at around Rs 2.4 billion.

An overview of the market

The training market can be defined as a component of the entire embedded industry knowledge value-chain. Dr K. Subbarangaiah, professor and director, Veda IIT, identifies the demand-generating components of this value chain as ‘product design and design serv-

ices companies→SoC engineering and platform solution providers→Fabs and EMS providers→testing and packaging companies→consumer market.’

Training institutes and universities lie on the supply end. So Sahim Baker, director, Grey Technolab, expands the value chain as ‘vendor training service provider/training industry→technology aspirant→employer.’ Raju adds a middle component of government and industry associations that provide suitable environment for the training industry to grow.

The nature of training itself can be a parameter for classification. In such a case, it is worth considering Loganathan’s simple approach: corporate trainings on specific skills, academic projects related orientation trainings, public-domain direct training, online training and e-learning-based training.

The topics of interest in embedded systems training are programming languages, microcontroller-based application development, application development for preconfigured embedded platforms, RTOS-based application development, embedded Linux development, digital signal processing, and device driver and FPGA-based embedded system development.

“The VLSI training market broadly consists of VLSI front-end design (which includes hardware design and modeling using HDLs) and design

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verification (using standard verification methodologies and languages). FPGA designs for a range of market segments are being widely adopted as the system platform for the last few years. The VLSI back-end design includes physical design of the silicon chip and physical verification. The system-/board-level design is a niche area of the training market,” explains Wikneswaran Pillai, director, Sandeepani School of VLSI System Design.

Growth drivers

The Indian business climate is conducive to service providers and VLSI and embedded system training is, in fact, a kind of service industry. As a result, this field may be considered as a forte for the Indian players. Pillai explains, “India being a preferred destination for design outsourcing by most companies, training this workforce forms an important part. Also, with India having a huge local market, there are many small and medium companies that have design houses. Graduate passouts from engineering colleges are not ready to execute real industry projects and need initial and ongoing training to ensure productivity.” Ease of starting operations and affordable training costs for students are some of the other competitive advantages.

According to NASSCOM, the VLSI and embedded industry would employ 750,000 professionals by 2015 with

about 680,000 for embedded systems, 75,000 for VLSI design and the remaining 10,000 in manufacturing. A good number of firms will set up shops in India, which, in turn, will increase the requirement of professionals with the requisite skillsets. The training providers can bridge this gap between the industry requirements and professionals.

The training market grows faster during the economic downturn than in normal circumstances. According to Baker, the reflections of the recent economic slowdown are showing up in the form of cost and infrastructure cuts

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—Wikneswaran Pillai, Director, Sandeepani School of VLSI System Design

among the industries. Big players, for example, are opting for trained professionals against freshers. This scenario is naturally in favour of the training industry. Moreover, even the experienced professionals look upon training institutes to keep abreast of the latest technologies and tools.

Devendra Khari, CEO, DKOP, indicates that 40-50 per cent of people working in this sector need to be re-trained. VLSI/embedded training institutes can address part of this need through corporate training.

“India can address the overseas market as well, but this could be offset to some extent by travel and communications cost. By leveraging the Web and other long-distance methods, these costs can be contained,” suggests Khari.

The training institute should also take advantage of the high-tech nature of the field. “In embedded system, the technology changes very fast. Every day each company develops new technologies and products. Embedded engineers trained in the latest technologies are always in demand. Training institutes can play a critical role here,” says Nadh.

“For addressing the demand for qualified manpower, a well drawn out and constantly updated training methodology is a must. The stakes placed by the companies in view of our skilled labour and lesser development costs thus are largely dependent

on the quality assured by our training centres,” explains Baker.

Dr Subbarangaiah feels the need for a win-win interaction amongst semiconductor, product and services companies, government, academia, venture capital providers and industry bodies in developing the ecosystem.

Business strategies

Contrary to general perception of the ‘admission→training→placements’ model, most industry players prefer to follow unique strategies to ensure sustainability. “We don’t limit our operations to training alone, but our R&D and training related activities go hand in hand and the students can benefit a lot from that. They could well achieve a hands-on experience together with our experienced development staff and in a way become aware of the shift in standards from that of a classroom to that of a workbench,” says Baker. Everest

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Infocom follows a similar model with product division Emblitz and training and development division Eilabz.

Dr Subbarangaiyah informs that they follow a teaching-company model with university and industry participation, which is similar to the time-proven teaching-hospital model in medical education. Academic and industry-proven practices go hand in hand. Experienced professionals share their knowledge and expertise as a trainer. Thus a professional executes a dual role. This model has helped during the incubation of quite a few companies with quick ramp-up of teams.

'Short-term' and 'high-frequency' are the buzzwords for revenue generation. For example, currently, Sand-

Institutes should try to increase their reach by upgrading to virtual classroom based programmes.

—Vishwanath Raju, Director-Technical, Vector Embedded Systems

enough to customise their training duration according to the need of the hour. Naveen Kumar, managing director, Emtech Foundation, informs, "We are focused on both skill development (short-term) and career-building programmes (long-term) for engineers in embedded systems."

Diversification is another key to success in this field. "In January this

courses in embedded system and VLSI, including a three-month micro-controller-based course, six-month postgraduate diploma in embedded systems, six-month course in VLSI and system design, three-month course in digital signal processing, and courses in robotics and RTOS. This variety in duration and subject helps to cater to the customers in a better way."

The business strategies may vary from organisation to organisation but the preferred target customers remain the same for all of them. "Engineering students are the most important for us followed by working professionals and corporate clients, respectively," informs Col. N.C. Pande, head, EFY TechCenter.

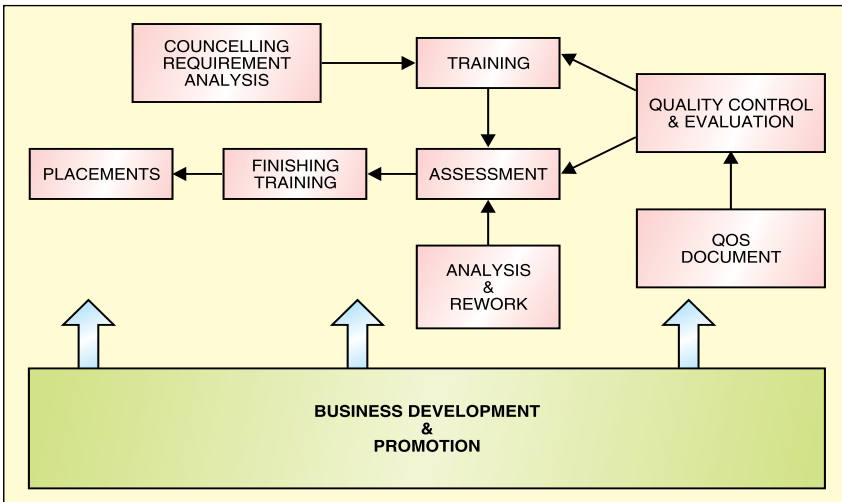
Kalra explains, "We follow a business model which is cost-effective for budding engineers. As far as expectation for 2010 is concerned, there is good potential in the training market for the players who are dedicated to providing quality education on competitive prices."

Organisations are even ready to offer something extra to reach and retain their preferred customer base. "We conduct workshops to generate awareness among budding engineers about the latest emerging trends and the scope in the fields of VLSI and embedded systems," says Sandeep Sreedharan, managing director, Emera Infotech.

Pillai informs, "We have initiated a unique programme under which we offer selective free training to the faculty of engineering colleges in India at their premises. We also guide them to improve their academic standards."

Moving up the value chain

The training industry in India is looked upon more or less as a middleman



Block diagram of the proposed generic business model

eepani School of VLSI System Design has two courses of 10-week duration, one for VLSI and the other embedded. Each of these courses is conducted once a quarter to reach greater number of trainees. Both the courses are intermediate in nature.

Other players too are flexible

year, we had 15 companies for campus placement. The number is likely to go up with the market picking up in areas like telecom applications, automotive embedded systems, industrial automation, chip designing and product-based R&D," says Raju.

Nadh says, "We provide many

Updation of curriculum in accordance with the fast changing demands of the industries is the key to survival.

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Our R&D and training related activities go hand in hand and the students can benefit a lot from that.

—Shahim Baker, Director (Operation), Grey Technolabs

trying to bridge the gap between the industry and academia. The role of the academic institution ceases soon after the course ends.

“We see a brighter scope of moving up the value chain where institutions with strong domain expertise can take up innovation/technology incubation programme in collaboration with the industry. This is more feasible at the training institutes’ end as they have better touch with the academia and act as an interface with the industry,” says Raju.

Moreover, the industry is crippled with an unorganised market structure, lack of investments, geographical bounds, lack of trained manpower and costs required for constant technological upgradation. If colleges tie up with training institutes, it would be beneficial for the students to groom themselves as an embedded engineer taking infrastructural help from the college and training help from the training institute.

Raju suggests, “It would be wise if institutes try to increase their reach by upgrading to virtual classroom based programmes with trained lab coordinators. This has to be done professionally and on a long-term basis with support staff being trained in parallel.”

Training centres need to become equipped with updated tools and software. “The availability of open source resources (such as Linux and Eclipse) is

a great benefit for the academia to leverage the huge knowledge base of the user community and to impart high-end training at a lower cost,” says Pillai.

A parallel market of immense interest is the other Asian countries. “Owing to the affordability, there is an existing flow of students/professionals from south Asia to Chennai. So this potential market can be taken to a higher level

We choose trainers from the experienced workforce involved in our product development centre.

—Maaz Jukaku, Director, Emtrexe

with global audience,” says Raju.

“Due to the lack of sufficient number of qualified trainers, the Indian institutes are at a basic level in the value chain. The different value-addition stages can be identified as entry level (covering undergraduate courses), intermediate level (presently achieved by training institutes with generic topics in a focused domain), advanced level (to be achieved by the training institutes with specialised in-depth topics on par with the industrial activity),” says Pillai.

Organisations like Emertxe prefer to move up the value chain by training people more and more hands-on, ena-

bling them to engage more on practical level. Jukaku feels, “The trainers need to be re-trained. Moreover, they must be better compensated, thereby raising the quality of people employed. Currently, we choose trainers from the experienced workforce involved in our product development centre.”

Jatinder Singh, CEO, TICO, says that updation of the curriculum in accordance with the fast changing demands of the industries is the key to survival. He puts emphasis on code optimisation, hardware design of mixed-signal products, finding best resources and environments for cost-effective product solutions, and time-to-market implementation in product design.

Kalra lists out quality training, proper infrastructure, students’ awareness about latest tools, focus on practical aspects of the technologies and industry partnership as the key elements for upward movement in the value chain.

Emerging trends

The training providers are shifting towards an online mode of training to avail the benefits of cost reduction and better accessibility.

From the perspective of training topics, the key areas are different verification methodologies like platform-based verification, layered test bench, low-power design methodologies, mobile and handheld device technologies, open verification methodology (OVM) for SoCs, and design and verification using System Verilog.

“A trend is emerging to have a common language for both design as well as verification so as to reduce the overall time to develop an IP. System Verilog is emerging as the favourite

ARM preprocessors and open source embedded software tools such as Linux, Android and AVX will be the sought-after topics of training courses in the future.

—Parswanath, Managing Director, Eilabz

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among them all,” informs Sreedharan.

“We can expect the decline of VHDL and the rise of the use of Verilog; more indigenous product design and product marketing by Indian companies for the Indian and overseas markets and more start-up activity in the product and software-as-a-service space and training industry will also evolve accordingly,” explains Khari.

“Companies are increasingly looking for professionals with hands-on experience in digital application-specific integrated circuit (ASIC) design, physical design, mixed-signal IC design, Verilog, VHDL or VHSIC, VLSI design, circuit design and simulations, microcontrollers, digital PCB design and routing,” says Kalra.

According to Parswanath, managing director, Eilabz, “ARM preprocessors and open source embedded software tools such as Linux, Android and AVX will be the sought after topics of training courses in the future.”

Partnering for success

While preparing growth strategies, both established and new training providers should remember partnership with the industry. Most of the successful market players maintain a multidimensional relationship with the industry. Utilisation of vendors as the customer of the finished products is a common practice.

Subbarangaiah says, “VEDA IIT consortium is an ideal example of the

partnership model. It consists of VLSI and embedded companies like AMD, Soctronics and Incube Solutions on the industry front, JNTU and AP State Council of Higher Education on the academic front and VEDA IIT on the institute front for conducting the PG degree programmes (MS in VLSI engineering) as per industry needs with active industry participation and also as per university norms and academic standards. This model is time-tested for more than a decade with 100 per cent recruitment history.”

“Our training programmes and activities are now collaborated with major companies in the field. We have had strategic tie-ups and partnerships with several leading players in the industry, such as Intel and Singapore-based Rhobhatah Robotic Solutions. We are also receiving enough support from leading microcontroller manufacturers like Microchip,” says Baker.

“We are the connecting partners of ARM. We also provide project training to final-year B.Tech, M.Tech, MCA and MSc students and continue R&D in power electronics and microcontroller-based embedded system design and development using ARM infrastructure,” informs Parswanath.

“University alliance programmes from companies like Cadence, Texas Instruments and Philips help in providing tools/training to institutions at subsidised rates and encourage the much required innovation and R&D in

Suggestions for betterment

1. Industry-academia partnership
2. Investment into R&D programmes
3. Initiatives to attract students/professionals from overseas
4. Closer collaboration with colleges
5. Better reach through virtual classrooms
6. Focus on embedded hardware
7. Focus on quality, meeting industry expectations and innovation
8. Building up domain knowledge
9. Knowledge management
10. Quick scale-up
11. Adopting effective methodology of training
12. Building brand recognition
13. Collaboration with the government and venture capital providers

this fast-emerging multi-disciplinary domain. More such programmes are yet to come,” says Raju.

Jukaku prefers to work with universities for revamping the curriculum, teacher training and certification programmes, allying with top-notch universities from India and abroad, and allying with top-notch hirers to provide targeted training.

Eureka, the innovation and technology incubation programme at Vector, is one such initiative in this direction. While the industry supports to incubate viable ideas from students and takes on board promising candidates for internships/R&D activities, the training institutes often try to make a profit out of this collaboration. For example, as the embedded products or electronic components are hardly available in the Indian market, these have started online trading of embedded products at affordable rates. In the process, they have business tie-ups with international companies.

Moving forward, all organisations across the segment should try for government-level partnership. “We have collaborated with the ministry of MSME, government of India, to avail all the facilities allotted for the SME segment,” says Kalra. ●

The author is a consultant—editorial, industry & academia interface at EFY

Engineering students are the most important for us followed by working professionals and corporate clients.”

—Col. N.C. Pande, Head, EFY TechCenter