50th DAC Global Forum

VLSI design in Argentina:

Driving a sustainable electronic industry

J. Agustín Rodríguez, Pedro M. Julián
Instituto de Investigaciones en Ingeniería Eléctrica
UNS-CONICET
Bahía Blanca, Argentina
jrodriguez@uns.edu.ar

I. Introduction

It is well known that developed countries strongly rely on their high tech engineering capabilities. Technology in general, but referring to electronic systems in this context, drives continuously growing economic sectors, generates good quality employment and conforms a strategic resource.

The participation of Argentina in this industry has always been marginal. A comprehensive treatment of this situation is out of the scope of this essay, but the high tech sector followed almost the same course than the overall industrialization process of the country. Briefly, Argentine economy has historically been based in primary activities. On the contrary, even though the industrial sector experienced different stages of expansion, many factors like complex social processes, interruptions to the democratic order and bad economic policies, became obstacles with sensible negative impact on the consolidation of a competitive industry.

Despite these difficulties, the Argentine electronic industry found its way to successfully develop and it currently agglomerates around 750 companies mainly focused on automotive and industrial electronics, computer equipment and medical instrumentation [1]. The special trade zone located in Tierra del Fuego Province, also impulses the installation of consumer electronics assembling firms which have shown a significant increase in their production reaching, for example 2 million high definition TVs and 11 million cellphones in 2011.

Nevertheless, recent international trading statistics show that the ratio between imports and exports for the high tech sector is close to 30 (15 % more than in 2006) [2]. In 2011, imports reached 8000 million U$D, totaling an increase of 70 % in 5 years, while exports were close to 300 million U$D, being almost constant since 2006. This unbalance in the electronic industry international trade generates a fair concern for policy makers and has been addressed by protective policies and by several financial and stimulus programs for the sector.

With an evident need to increase the productivity and competitiveness, VLSI technology, with its growing presence in the country, came into the scene as a feasible alternative to enhance the value chain of the electronics business and as a driver of innovation. The possibility to envision a strategic plan like this, comes as a consequence of a decade of shift in national policies that gave significant support to science and technology and more importantly, of a solid foundation in terms of human resources enabled by a strong and prestigious public education system that coined several generations of electronic, computer system and software engineers.

II. Government Programs

The current relevance assigned to science and technology &T) is in accordance with the Law of Science, Technology and Innovation (No. 25.467) promulgated in 2001.

The creation of the Ministry of Science, Technology and Productive Innovation (MINCyT) in 2007, upgrading the existing Secretary of Science and Technology, was a significant step in the appreciation of the role of S&T. Since then, policies pursing to position Argentina in the high-value added segment of the global economy have been under execution. Narrowing the gap between technology actors and productive and service sectors has been one of the clear objectives. Also, in the perspectives stated by MINCyT, the applied micro-electronics was defined as a priority area.

Within MINCyT, the National Agency for Science and Technology Promotion (ANPCyT) implements the FONCyT, FONTAR, FONSOFT and FONARSEC nationwide programs for funding S&T research and development. Each of them targets different kind of projects to generate new scientific knowledge, technology or innovations, carried out by researchers, entrepreneurs, and public or private institutions. ANPCyT funds come from the national treasure and from international financial entities. The loan 7599-AR form the International Bank for Reconstruction and Development and 1728/0C-AR from the Inter American Development Bank adds up to a total of 430 M U$D destined to these programs.

In particular, FONCYT has financed specific programs in the microelectronics area oriented to produce PhDs, and to produce collaboration between universities, public institutions

Capital	Buenos Aires
Language	Spanish (official)
Area Total	2.780.400 km^{2}
Population (2012 estimate)	40,500,000
Currency	Argentine Peso ($ - ARS)
Time zone	(UTC -3)
Internet TLD	.ar

and private companies. More recently, FONARSEC has financed consortia for the development of technological clusters. Tecnopólis del Sur is a consortium located in Bahía Blanca, based on the capacities of Universidad Nacional del Sur, the National Institute of Industrial Technology (INTI), the Trade Free Zone Area of Bahía Blanca and Coronel Rosales, the Industrial Union of Bahía Blanca, and private companies, with the long term objective of setting up a scientific and technological park in the electronics area. Another consortium was setup composed by the National University of Tucumán and INTI, for the development of LED devices and electronics.

III. MICROELECTRONICS COMMUNITY

Microelectronic technology adoption in Argentina has been growing since the late eighties. In the present there is an active community composed by several universities, public institutions and a modest but still relevant private sector that collaborate towards the consolidation of this high tech sector.

There are more than 10 national universities currently incorporating different topics central to microelectronics in their curricula, including undergraduate and postgraduate courses in device physics, digital, mixed signal and analog design, RTL design, FPGA based design, logic and physical synthesis, processing architectures, verification and embedded systems. There are also relevant proven design capabilities coming from research and development projects that involve successful silicon implementations of different kinds and complexities. Also, through the mentioned S&T financial programs, microelectronic laboratories at universities have been upgraded with the acquisition of modern design, testing and characterization infrastructure.

Academia has been strongly supported by different international agreements. The MOSIS service played a fundamental role providing access to sub-micron integrated circuit fabrication and different EDA providers (mainly Synopsys and Mentor Graphics) allowed the access to industry design tools through their university programs.

The public institutions are led by INTI. Created in 1957, it is involved in the development and transfer of technology to the industrial sectors, and in quality assurance of processes, produced goods and services to be compliant with national and international regulations. It also helps the articulation between academia and industry. The Micro-technology and Micro-systems Laboratory at INTI counts with VLSI design capabilities as well as with professionals and equipment for micro fabrication, packaging, characterization and testing. Its photo-lithography and thin film deposition resources have been focused in the development of micro-electro-mechanical systems.

Other non-profit organizations like the Argentine Nano-technology Foundation and business associations like CADIEEL, have a very relevant role accompanying the high tech community with consulting activities, financial support, prospective studies, technical training and conferences support**.**

The private actors, represented by companies whose core business is microelectronics, has two fundamental exponents. In the fist place, Allegro Microsystems located in Buenos Aires, running a design house for sensor IC design. In the second place, Clariphy Argentina located in Cordoba and running another design house for digital design with application to optical fiber signal processing. Both firms are representative success stories. A third representative company is INVAP, located in San Carlos de Bariloche, whose core business is high tech engineering in the fields of scientific nuclear reactors and satellite fabrication.

Special mention deserves the Argentine School of Microelectronics, Technology and Applications (EAMTA), an annual conference which has been promoting the research and development in VLSI, the adoption of the technology and the interaction between the different domestic and international actors involved in chip design. Every year since 2006 an annual meeting has been held in different cities around the country with more than 100 students taking initial and advances courses in layout, synthesis and analog/digital design. The conference proceedings are available through the IEEE Xplore digital library.

An important milestone is the recent creation of the INTI Center of Micro and Nanoelectronics of the Bicentennial (CMNB) with four facilities in the cities of Bahía Blanca, Buenos Aires, Chascomús and Tierra del Fuego with approximately 70 young talents dedicated to the design of integrated circuits, with a focus on products relevant to the national economy. On the other hand the economic group Corporacion America has launched the company Unitec Blue, which will inaugurate a 250 million dollar for RFID backend smartcards in June 4, and has announced a second phase that will include a foundry to supply microchips in the range between 350nm and 90nm.

IV. A ROAD TO SUSTAINABILITY

The envisioned strategy to expand and consolidate the electronic industry is based on the incorporation of high value added activities, like the design of integrated circuits, in the high-tech segment of the productive chain.

For this purpose several main objectives were defined under a Strategic Area Project that proposed: (1) to strengthen the research and development groups that perform tasks within this area, both in infrastructure and human resources; (2) to establish a critical mass of designers, who work as a driver of the activity; and (3) to generate a local network where companies, universities and professional interact.

Much has been done in these directions and there are human and technical resources to address Argentine electronic industry ASIC design demands as well as to outsource design for foreign companies. Still, sustainability needs the establishment of a profitable business which would in turn require sounder efficiency, international integration and competitiveness.

These kind of requirements are sometimes overwhelming challenges for developing countries, but addressing them through serious and responsible long term policies and taking advantage of past experience in project development, can lead to valuable human, social and institutional growth.

V. REFERENCES

[1] Luciano J. Cianci, “El papel de la industria electrónica en el proceso de desarrollo argentino”, Universidad de Buenos Aires, 2011.

[2] “Fichas sectoriales: Estructura y evolución 1991 – 2011”, Ministry of Industry, 2012.