

European Nanoelectronics Forum 2008

Working Together to Innovate in Nanoelectronics

The European Nanoelectronics Forum, held in Paris on the 2nd and 3rd of December 2008, attracted more than 300 key players from the micro- and nanoelectronics industry as well as public authorities. It was the first common event organised by MEDEA+/CATRENE, the EUREKA clusters for R&D in micro- and nanoelectronics in collaboration with AENEAS, the Association of R&D actors in nanoelectronics supporting the ENIAC Joint Technology Initiative. Both the CATRENE chairman, Enrico Villa and AENEAS president, Alain Dutheil, emphasised the need for the whole sector to work together in partnership with the public authorities to maintain European mastery of the semiconductor technology that underpins the future development of the Information Society.

"We are standing at a crossroads," declared Emmanuel Gabla, Director of the Information Society Technology Department at the French Ministry for the Economy, Industry and Employment in his opening address "Technology is now more powerful but also more difficult. It requires massive R&D. We have to make choices and build on our strengths. Strong European partnership is essential in order to achieve global leadership. The current financial crisis will make the next period more difficult but marks a return to the real economy. We know the sector's commitment and it can count on the support of the French public authorities."



Emmanuel Gabla, Director at the French Ministry for the Economy, Industry and Employment

Facing up to global challenges

Alain Dutheil, president of AENEAS, reiterated the importance of R&D at a time of crisis. "It is time to move forward and we can come out stronger," he insisted, identifying four challenges:

1. R&D costs in the semiconductor industry, that are much more than other sectors and up tenfold compared to a decade ago;
2. Social evolution in the context of an ageing society and global warming emphasizing the renewed needs in terms of security, transport, entertainment and communications requesting multiple technologies;
3. Technology with the need to combine both More Moore and More than Moore;
4. Strong competition from outside of Europe.



Alain Dutheil, President of AENEAS

"Europe can compete with any part of the world with regard to innovation," said Dutheil. "This needs alliances and partnerships as national players cannot support the R&D costs alone. It also needs the integration of private and public efforts in a move towards greater efficiency. The monitoring efforts in MEDEA+ and CATRENE are good examples of how to develop trust, offering a fully transparent process that is highly flexible."

Dutheil highlighted the close connections between the EU Framework Programme, the ENIAC Joint Undertaking with its strategic research agenda and the more market driven

EUREKA Clusters. He also emphasised the necessary links between other initiatives, such as the embedded systems programmes ITEA2 and ARTEMIS and also EURIPIDES, the microsystem and packaging Eureka cluster. Combining these competences to manage the abovementioned challenges can bring new perspectives and leadership to European industry, already leading in telecommunications and automotive. Europe can produce the ingredients enabling the future applications.

Innovation to meet future needs

Enrico Villa, the MEDEA+/CATRENE chairman echoed the need for co-operation and synergy between the different programmes. "We do not know how long the current crisis will continue," he said. "The market will expand again after it but it will be a different market, so innovation is essential in order to meet future needs".

"Both MEDEA and MEDEA+ helped Europe master and even drive the technologies supporting the information society and I am sure CATRENE will do the same," he said. "Only 20 years ago, we were asking if the European electronics industry could survive at all. JESSI, MEDEA and MEDEA+ helped ensure that not only could the sector survive but that European companies could compete at the highest levels."

Balanced contributions and sustainable success

More than 600 partners from 23 countries participated in MEDEA+, contributing 28,500 person-years to 90 projects out of the 104 initially labelled over 8 years. There was a positive balance between large and small companies – with a 34% SME participation and a significant contribution from universities and research institutes. The programme obtained important successes in communications, automotive electronics and smart card technologies. It also developed the necessary supporting technologies in the form of 45 nm node processes in line with the industry road map, lithography equipment that is now serving 65% of the global market and innovation at material and substrate levels.



Enrico Villa, MEDEA+/CATRENE Chairman

"Three main recommendations were made at the end of phase one of MEDEA+," explained Villa. "We should work more closely with the Framework Programme – this forum is a good indication of that. We needed a strategy – this is demonstrated by the clear vision in the White Book of CATRENE. And we needed to ensure a role for SMEs – shown by the 209 SMEs involved in MEDEA+ overall, around 100 at any given time, every year from 2001 to 2008. In general, EUREKA offers the best framework for co-operative research as its market-driven, bottom-up approach makes it more flexible – reducing time to market and cutting costs."

Key market drivers

Silicon developments drive the automotive industry and the demands of the automotive sector drive the silicon market according to Erich Biermann of Robert Bosch. "Without electronics there would be no more cars," he said. Demand depends on the car model but key drivers include fuel saving and cutting emissions. "Only 15 or 20% of the energy flow in cars is used for traction energy," he pointed out.

Another key demand is accident reduction. Future applications will require more sensors, including long-range radar. Adaptive cruise control is used mainly for comfort now but will be used increasingly for safety – with devices integrating GHz signal handling, analogue processing and digital logic in small-sized packages like a mobile. "The roadmap for the au-

tomotive sector is different than the international technology roadmap for semiconductors as it is essential to ensure robustness – but the slope is the same,” he said.

The semiconductor industry is the driving force for the electronics industry as well as for all technologies dealing with social challenges such as climate change, energy shortage, security issues and health care, according to Prof. Dr Heinz Gerhäuser, Director of the Fraunhofer Institute for Integrated Circuits (IIS). “€1 invested in the semiconductor business generates approximately €3 in semiconductor products and services, €18 in the electronics business and €75 in the electronic services market,” he pointed out.

“It looks like we have lost our leading position in CMOS manufacturing in Europe, but if we play our strengths properly, we can achieve a lot. There is no physical limit to ‘Moore’ for the next 10 or 15 years – but there might be an economical one. Preserving and further developing today’s know-how in the field of leading-edge CMOS is a strategic necessity. But the new leading edge is smart systems. Complete systems solutions, comprising sensors, electronics and actuators, are the way of the future.”

Highly innovative smart systems require heterogeneous integration and functional diversification – More than Moore. Therefore, Europe must master the breadth of areas involved, from simulation and design, as

well as technology, right up to systems level. Smart systems will help to match the social challenges of the near future and may help to overcome the downturn in Europe’s semiconductor business.

However, this will require the development of new user interfaces, alternative technologies such as polymers for ultra low cost applications, new materials for improved reliability, further miniaturisation by 3D-system integration, improved system design capabilities and harmonised standards for seamless communication.

Planning for a mature industry

The semiconductor sector index (SOXX) grew by 260% between 1998 and 2000 versus 42% for the total market index (DJSTOXX600). After this strong growth, the semiconductor sector index is now showing an increase more in line with the total market index, indicating that the sector has reached maturity according to Jérôme Ramel of Exane, BNP Paribas. “Investors are now concerned about sales growth, margins in terms of pricing power, market share and innovation capacity, and capital intensity,” he said. Increasing consumerisation means time to market is becoming critical: a positive point for companies with a lot of intellectual property. “In many cases, consumerisation will accelerate the need for more integration and therefore

the development of system-on-chip devices and platforms with high barriers to entry,” he added. Ramel saw earnings before interest and taxes (EBIT) margins – a function of innovation – as the most important metric for the semiconductor industry, followed by sales growth, also a function of innovation. “A high level of innovation coupled with a flexible manufacturing process should lead to the perfect profile,” he concluded.

Intelligent combination of resources

Energy is the top global issue and increasing energy efficiency is an easy way to address the problem, according to Arunjai Mittal of Infineon Technologies. “One third of global energy consumption is electricity – some 15 million GWh, according to the Energy Information Administration (EIA)” he said. “It is clean, an easy means to transport energy and its demand is likely to double by 2050.” Against the background of increasing scarcity of fossil fuels and the climate change, generation, distribution and consumption of electrical energy require a more intelligent approach.

“Nano-/microelectronics will play a key role in enabling increases in electrical efficiency and hence energy efficiency,” he insisted. Therefore programmes such as CATRENE and ENIAC should encourage energy efficiency enablers and research in new areas such as material

sciences and interconnect technologies.

Silicon-on-insulator (SOI) substrate technology enables about 10% of high value chips, according to Carlos Mazure of Soitec, now the European world leader in SOI. This company capitalised on the work of European research institution CEA-Leti to create a new worldwide market based on manufacturing in Europe and licensing technology to create multiple SOI sources.

“SOI can deliver a 15 to 20% improvement in performance and a 35 to 40% power improvement over bulk silicon,” he said. It enables radio frequency (RF) and SoC integration with a more than ten times improvement in cross talk. In the next decade More Moore will bring greater value to the semiconductor industry – SOI can already deliver More Moore as well as providing a generic material to support Moore’s Law scaling.

Materials are the foundation of the semiconductor industry and SOI offers the engineered substrates required. However, to ensure the next success story it is essential to continue investing in European R&D to enable the solutions required to address energy saving and ‘greener’ products. “The strategic partnership of R&D, industry and public institutions is key to securing European leadership,” concluded Mazure.

Paving the way for European prosperity

“A time of crisis is the right time to define policy,” said Enrico

Villa, closing the Paris event. “It is important to react fast. We have to recover but this requires a joint effort involving industrial policy, common targets/objectives, commitment and execution. Micro-/ nanoelectronics contributes to 10% of the global GDP due to its enabling role for industry and services. It represents 20% of electronic devices but nearly 100% of their performance. The ICT sector is responsible for more than 85% of all patents in Europe.

“The strategic independence of Europe and European industry and services relies on a competitive European semiconductor industry,” pointed out Villa. “However, Europe is losing market share at a time of increasing innovation and electronic product penetration with skyrocketing costs forcing alliances. There is also change in business and manufacturing models with a deverticalisation of the value chain.

“We need to reinforce our global position by leveraging our core competences and competitive advantage,” he added. “We must develop a dedicated policy and support to this sector by developing national programmes that encourage cross-border European co-operation and anticipate shortage of skilled people by new education schemes. As well, we need to ensure multilateral co-operation to leverage on European strengths such as automotive, energy savings/efficiency, health care, wireless communications or power applications. The EUREKA CATRENE

Cluster and the ENIAC JU are the right tools for such co-operation”.

“We have to develop a European innovation policy under the leadership of the European Commission Enterprise DG with nano-/microelectronics at its core for European capabilities in R&D, lead markets and manufacturing. And this should be supported by a competition policy that takes into account the global industrial landscape, including the manufacturing facilities in Europe and associated cooperation clusters”.

A public funding body viewpoint

Thierry Van der Pyl of the European Commission Information Society & Media DG made a case for greater efficiency in a real public-private partnership in the nanoelectronics sector driven by industry. “Things are going wrong, particularly in the semiconductor industry,” he insisted as he asked for a greater synergy between the various European programmes – particularly between CATRENE and ENIAC. “ENIAC should help remove fragmentation of initiatives.” He pointed out that while there is an increasing focus on creating new services rather than products, new services require new products and new business models. “Nanoelectronics and systems are key to enable the EU to have its share of game.”

