ANEXO II

PRESENTACIONES

Allegro® MicroSystems, Inc.

High-Performance Power ICs and Hall-Effect Sensors

Allegro Microsystems Argentina S.A.

¿Quiénes Somos?

- Centro de Desarrollo de Productos en Argentina para Allegro Microsystems Inc.
- Establecido en Ciudad de Buenos Aires (Saavedra) desde 2001.
- Allegro Microsystems Inc es lider en el mercado en producción de Sensores Integrado Inteligentes de Campo Magnetico (Efecto Hall), Motor drivers y Power management.

Recursos Humanos y algo más

- Humanos:
  - 29 Ingenieros: (UBA, UNS, ITBA, UTN)
    - Diseño Analógico (9)
    - Diseño Digital (4)
    - Diseño Físico (layout) (12)
    - Evaluation Engineering (4)

- Herramientas: (Soft and Hardware)
  - Full Cadence suite
    - (Simulation, analog/dig Mixed mode, Layout/Synth)
  - Laboratorio de microelectrónica
    - (microprobers, laser cutter, environmental chamber, etc).

¿Qué Hacemos?

- Diseño integral de Sensores Hall integrados en tecnologías CMOS y BiCMOS.
  - Desarrollo de Factibilidad.
  - Diseño/simulación analógica y digital (schematics / rtl coding).
  - Diseño físico (sintesis y analog layout).
  - Generación de máscaras (Tape out)
  - Mediciones de Testing (wafer level – microprobing, Package level).

- Mercados principales:
  - Automotriz - Altamente especializado en Múltiples aplicaciones.
    - Gear Tooth Sensors (Transmision, ABS, CAM, steering, breaking)
    - Linear position (gas pedal, valve position)
    - Position (magnetic switches)
    - Angular Position (rotary, steering column, etc).
  - Consumer (cell phones, laptops)
  - Industrial

Areas de Especialización

- Profundo conocimiento de requerimientos de calidad automotriz.
  - EMC / ESD.
  - Amplios márgenes de Temperatura. (-40C to 150C).
  - Altos márgenes de Calidad (< 1ppm).
  - On chip self test and Diagnostic circuits.
- Especialización en dispositivos:
  - Sensores integrados de efecto Hall.
  - Técnicas de reduccion de ruido y offset.
  - Dispositivos de alta tension (+/-60v).
  - Memorias no volátiles (Eeprom, Poly Fuses, Fuse/Antifuse)

Productos principales

- Más de 50 productos 100% desarrollados en Argentina.
- Arquitectura líder en sensores Hall desde (1996) – Chopping Technology.
  - US Patent 5621319 (Bilotti et al)
- Sensor Linear de más bajo ruido y offset en el mercado mundial.
  - US Patent 7425821
- Sensitivity Auto Calibration Mode.
- Lowest Noise PWM output Linear device.
- 21 US patents. (+7 pending).

Productos principales

Trabajos conjuntos con entidades internacionales para la transferencia de nuevas tecnologias de la academia a la industria.

- EPFL (Lausanne, Suiza)
  - Circular Vertical Hall development.
- Frauhaufer Intitute (Duisburg, Germany)
  - Eeprom technology implementation. (Automotive graded).
- CEA (Comisión de Energía Atómica, Grenoble, Francia)
  - GMR technology implementation.

Desafíos Mirando hacia el futuro

- Poder seguir aumentando la calidad y adaptarse a los cada vez más rápidos cambios tecnologicos.
- Incrementar los márgenes en productos a través de innovacion tecnologica e implementacion de soluciones a medida.
- Superar los desafíos de competitividad y productividad disminuyendo los tiempos de desarrollo.
- Poder desarrollar aplicaciones y negocios para el mercado automotriz local

EXPERIENCIA SYNOPSYS SANTIAGO - CHILE

ENTRE NOSOTROS

Victor Grimblatt
R&D Group Director
Marzo 2012

WHY CHILE?

PRESENTED TO CORPORATE STAFF IN OCTOBER 2005

- Country stability
- Competitive cost compared to other offshore locations
- Very low turnover
- First mover advantage
- Excellent level of professional in electronics and computer science
- Excellent knowledge and experience in Software Engineering
- IC design courses at University of Chile
- Open the door to the rising Latin American market
- Engineers with excellent English level

FIRST TASKS

- Create a company
- Find and open an office
- Find projects
- Find and hire engineers
- Get Chilean government subsidies

HUMAN RESOURCES

- 16 employees in 2006
- 46 employees rigth now + 2 reqs

KEYS TO SUCCESS

- Implement a ramp up process which allowed employees to be fully productive in 3 months
- Use of productivity as main measure of success (vs. cost objective). Our productivity is around 90% of US productivity at a cost around 40% of US
- Control cost while providing an excellent development environment to engineers
- Planned, focused growth in close agreement with sponsoring BUS
- Meet commitments and schedules as a way to create confidence in Chilean developers
- Work closely with universities through the Synopsys University Program and internship program to create a candidate pipeline
- Keep local focus avoiding overhead.

ELECTRONICS and IT
Semiconductor Industry
A Regional View

OUTLINE

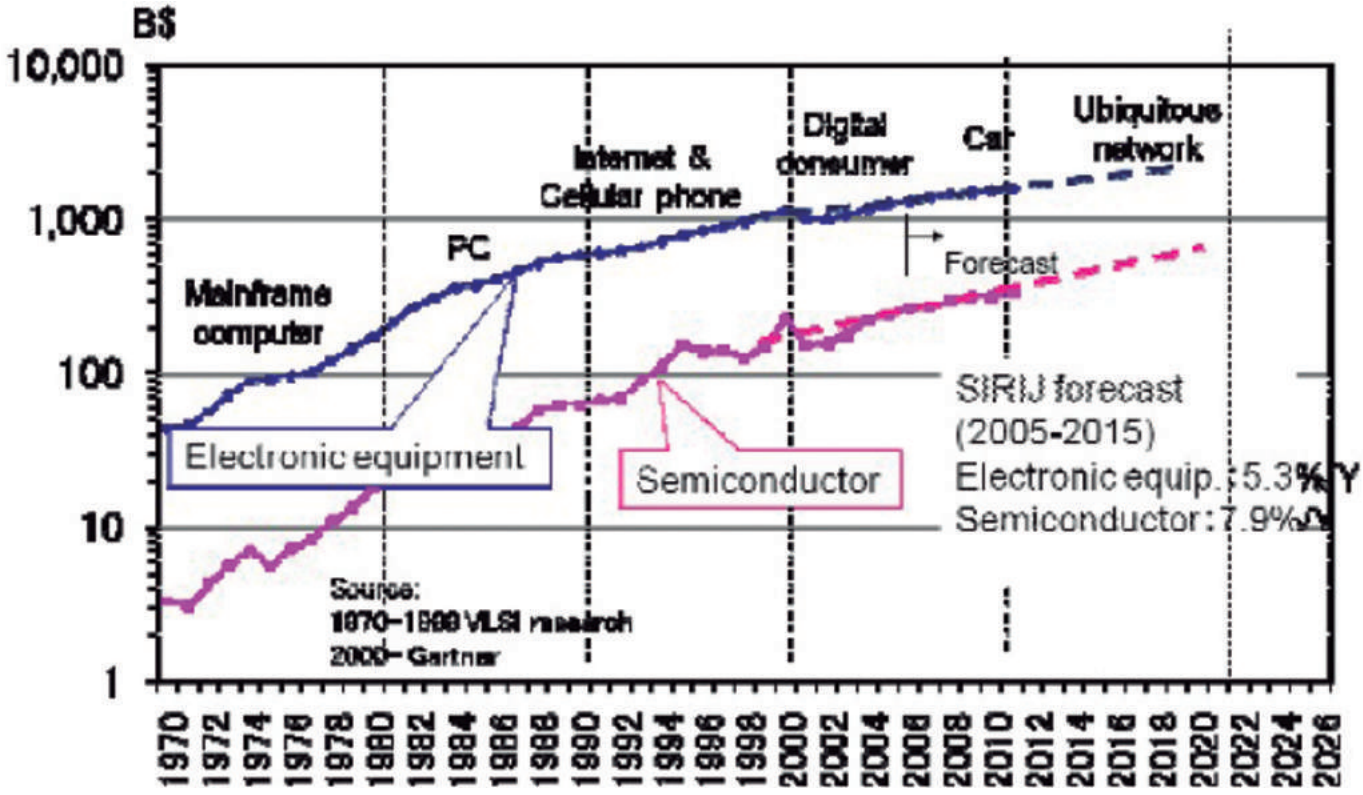
- *The global electronics industry*
- *Overview of the sector in Brazil*
- *Microelectronics: Opportunities in Design*
- *Scenario of local (Brazilian) incentives*
- *Conclusions*

Sergio Bampi, Ph.D.
Univ. Federal do Rio Grande do Sul
bampi@inf.ufrgs.br

ELECTRONICS INDUSTRY - WORLD PRODUCTION

	Produção de eletrônicos (US $ mi) 1992	Produção de eletrônicos (US $ mi) 2005	Participação % na produção mundial eletrônicos 1992	Participação % na produção mundial de eletrônicos 2005	Cresc. Médio anual 92/05
Brasil 1	12.527	27.957	1,9	2,3	6,4
Brasil -Informatics	4.169	10.039	0,6	0,8	7,0
Estados recentemente industrializados 2	69.861	193.469	10,8	15,6	8,2
Four asian countries 3	21.810	94.963	3,4	7,7	12,0
China	13.126	250.471	2,0	20,2	25,5
East Asia	104.797	538.903	16,2	43,5	13,4
United States	173.609	221.360	26,9	17,9	1,9
European Union – 15	139.413	172.224	21,6	13,9	1,6
Japan	177.890	177.845	27,6	14,4	0,0
Other countries	37.442	100.605	5,8	8,1	7,9
World Market	645.678	1.238.894	100,0	100,0	5,1
World industrial production (US bi)	24.242,05	44.880,77			4,9

EVOLUTION OF THE GLOBAL MARKET FOR SYSTEMS AND SEMICONDUCTORS



SEMICONDUCTOR COMPONENTS

- *2005-2015: 7,9% a.a projected growth*
- *Semi: More than 1/6 of the Global Electronics industry:*
- *Electronics goods: US$ 1,9 Trillion / year*
- *2011: Semicon Components industry (US$303Bi): 16% of the world electronics production*
- *Growing share & KEY to:*
  - *Diferentiate & inovate in electronics*
  - *Tecnological convergence:*
    - *INFORMATICS*
    - *TELECOM.*
    - *ENTRETENIMENTO*

SEMICONDUCTOR & ELECTRONICS

Forecast Feb, 2012	4Quarter 2011	2011	2012 (F)
IC Sales ($ Bi)	60.6	252.4	262.2
Y over Year (%)		(+1.5%)	(+3.9%)
Capacity Util. (%)	83.4 %	88.3 %	87.0 %
IC Units (Billion un.)	46.7	193.8	206.8
Electronics ($B)	US$ 472.2 B	US$ 1,835	US$ 1,938
Semi Equipmt ($B)	10.1	50.5	45.6

WORLD – ELECTRONICS INDUSTRY GROWTH

- *Global electronics industry grows at a rate higher than the average worldwide industrial growth:*
  - *1992-2005: 5,1 % per year*
  - *2005-2015 : 5,3 % per year*
- *World semiconductor industry grows at a faster rate than the average of the world*
- *electronics industry*
  - *7.9% per year: estimate for 2005-2015 period*
  - *Previous decades: grew at about 14% per year*
- *Trend:*
  - *Higher value added to the electronic components*
  - *"Componentization" of the systems*

WORLD – ELECTRONICS INNOVATION OPPORTUNITIES for LA

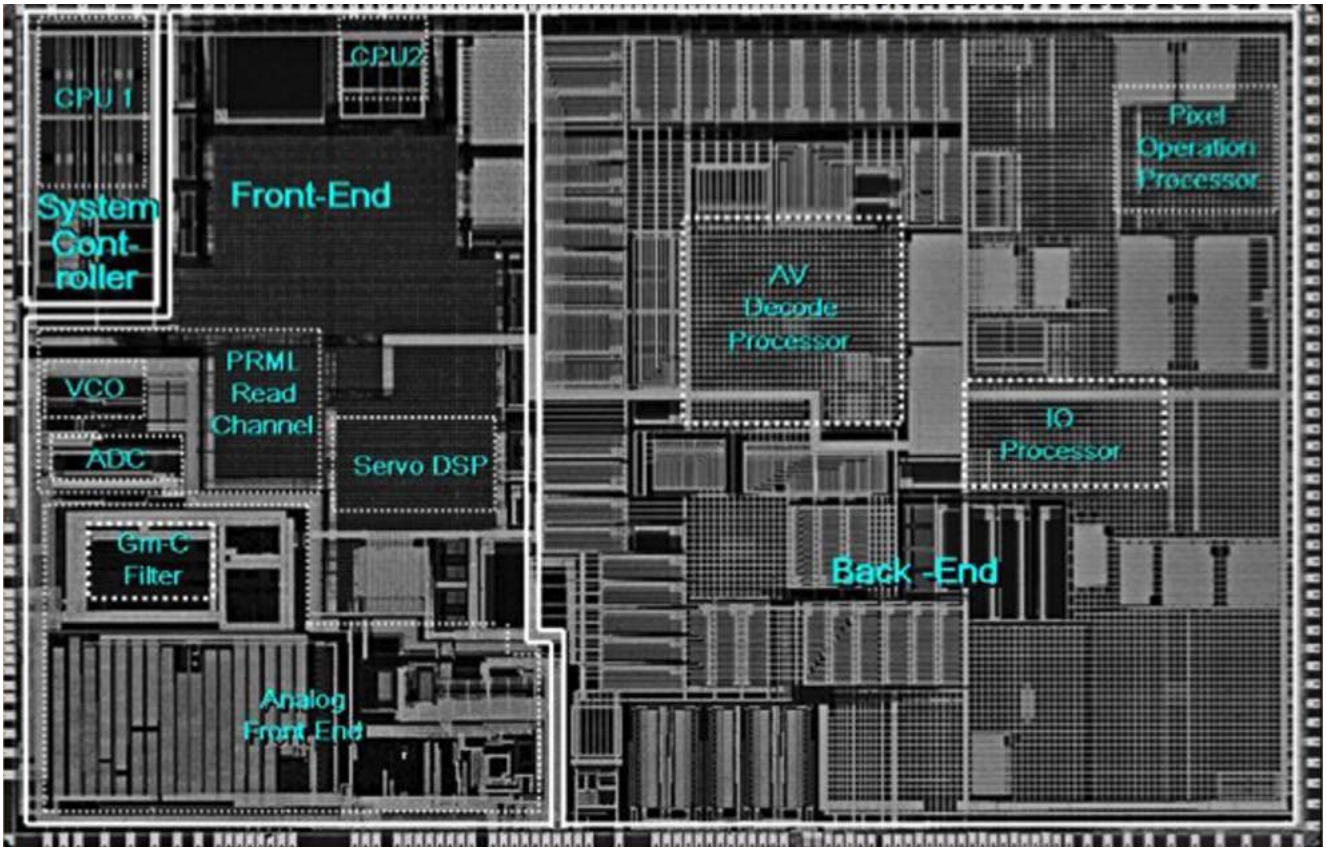
- *Public transportation, Local Agro-Chains*
- *Energy network (smart), metering, services to customers*
- *Universal access, connectivity, interoperability*
- *Wireless sensors in public services*
- *Ambient energy harvesting*
- *Ecological monitoring & control*
  - *Electronics in Bio-environments*

GLOBAL ELECTRONICS INDUSTRYTRENDS: SYSTEM-ON-CHIP ERA

- *Manufacturing ⟶ Moves towards SE Asia*
- *Integrated circuit Design is strategic for the electronics*
- *High-risk market:*
  - *Product life cycle: extremely short and getting shorter*
  - *Design cost (Non-Recurring Engineering – NRE - costs) are considerable*
  - *Systems-on-chip (SoC):*
    - *Growing complexity*
    - *High Costs (Risks)*
    - *Engineering teams and product teams are GLOBAL*
    - *"Drivers" of growth are also GLOBAL products*
- *Symptoms of the Systems-on-chip Era:*
- *Manufacturing alliances /foundring for key components*
- *Engineering teams: NRE costs at US$ 10´s to 100´s Millions*

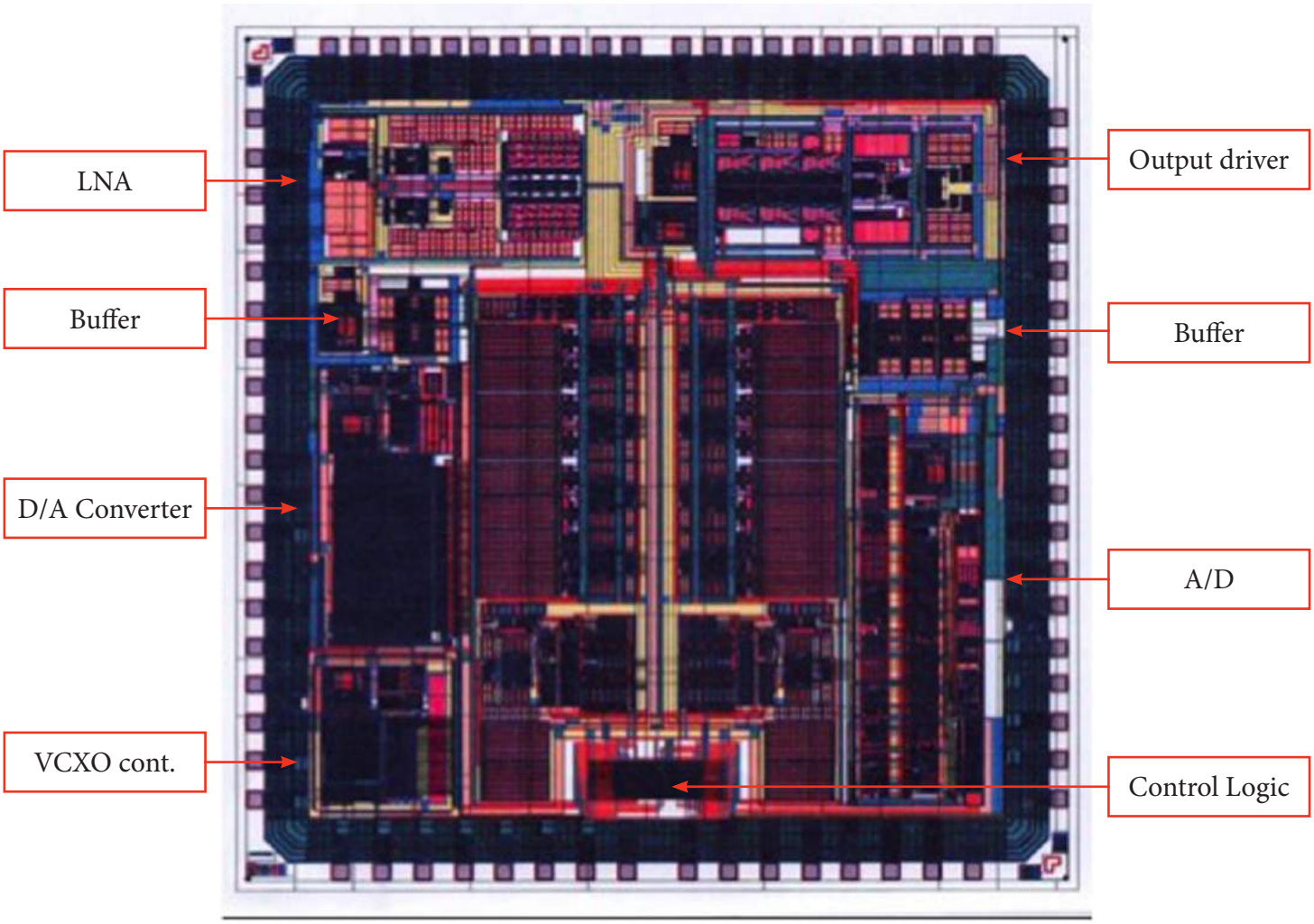
SYSTEM-ON-CHIP – EXAMPLE ASSP: IC FOR DVD

SoC: 06 processors, controllers, analog modules, etc
0.13 um CMOS - 20 Milion transistors



ISSCC 2003, K Okamoto et., al.

ANALOG/DIGITAL IC: ADSL MODEM FRONTEND



Source: A. Matzuzawa
Matsushita, Japan

A GENERAL VIEW OF THE SEMICONDUCTOR INDUSTRY

SEGMENTATION OF THE NANO- AND MICROELECTRONICS INDUSTRY

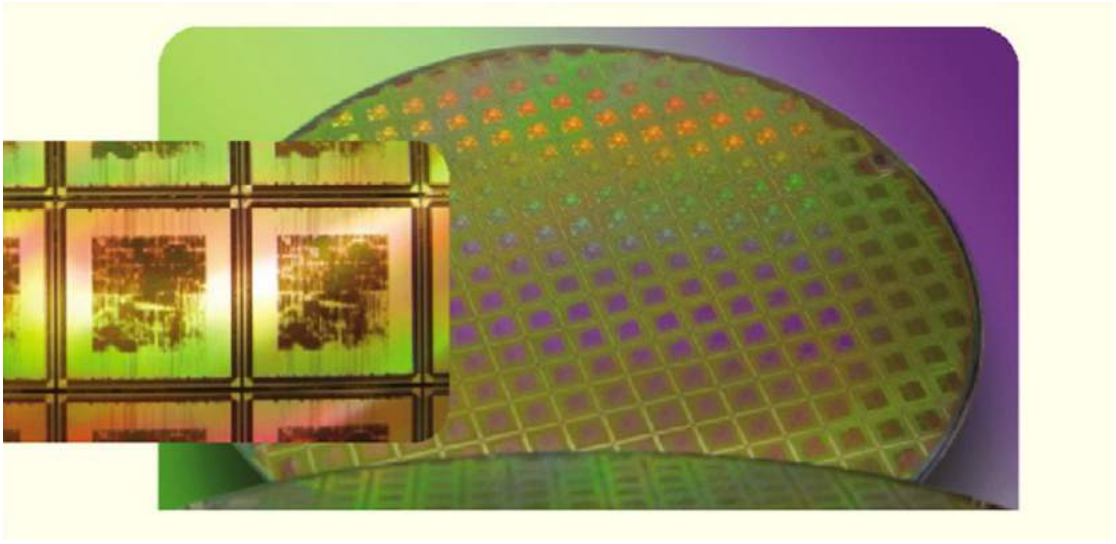
- ***Electronic Systems Design and MEMs Design***
- ***Integrated Circuits Design (Design Houses /Co.)***

- ***WAFER FABRICATION (at Foundries –IDM or pure play)***
- ***Component Packaging / Test (Back-End)***

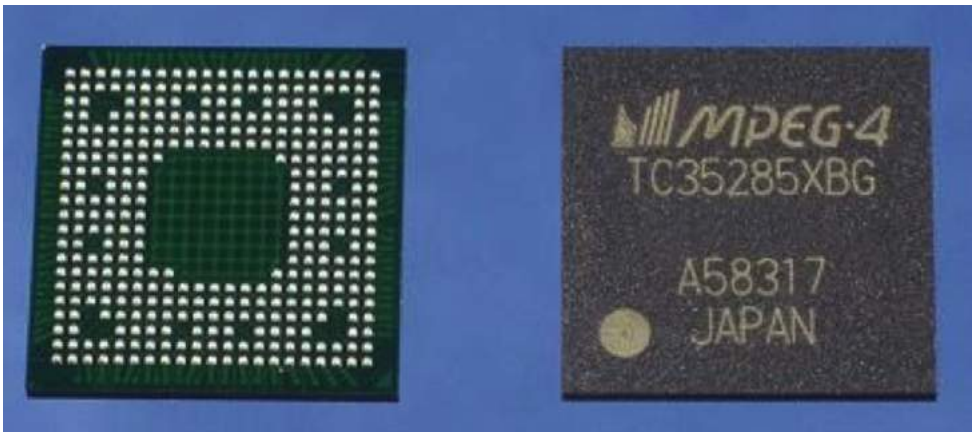
- ***Distribution / sales / application support***

WAFER – THE UNIT-PRODUCT DURING THE FABRICATION

WAFERS AT THE END OF FABRICATION LINE

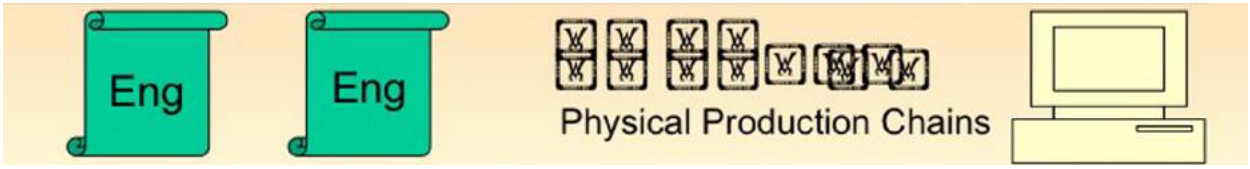


POST-PACKAGING – NEXT STAGES
AUTOMATED ELECTRICAL TEST (ATE) (BACK-END)



GLOBAL DIAGNOSTICS OF EE

- *Extreme Spatial Fragmentation of the Electronics Production*
- *High Value-Added at the Beginning (DESIGN) and End of the production Chain*
- *Producers not necessarily capture the Value*
- *Electronics is part of the ICT infrastructure*



MICROELECTRONICS INDUSTRY ECO-SYSTEM

Suppliers to The IC Chain

EDA
- Serviços habilitadores e capacitadores

Equipamentos
- Protocolos
- Padrões industriais
- Novas Tecnologias de fabricação

Materia prima
- Wafer
- Gases
- Químicos

IC PRODUCTION-VALUE CHAIN

1 System design	2 Chip design	3 Wafer Fabrication	4 Package & test	5 Services to customers
• IDM • Fabless • OEM	• IDM • Fabless • Design House • SIP	• IDM • Dedicated Foundry	• IDM • ATS	• IDM • Fabless

ICs Buyers
- OEM
- CEM
- Distributors
- ODM

INFRASTRUCTURE

Conhe-cimento	Serviços Públicos	Logística
• Universidades • Centros de P&D	• Energia • Água • Comunicações	• Infra-estrutura de transportes • Provedores logísticos

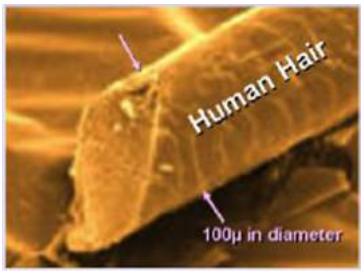
Mercado de CI por aplicação

US$ 230 bilhões (2005)

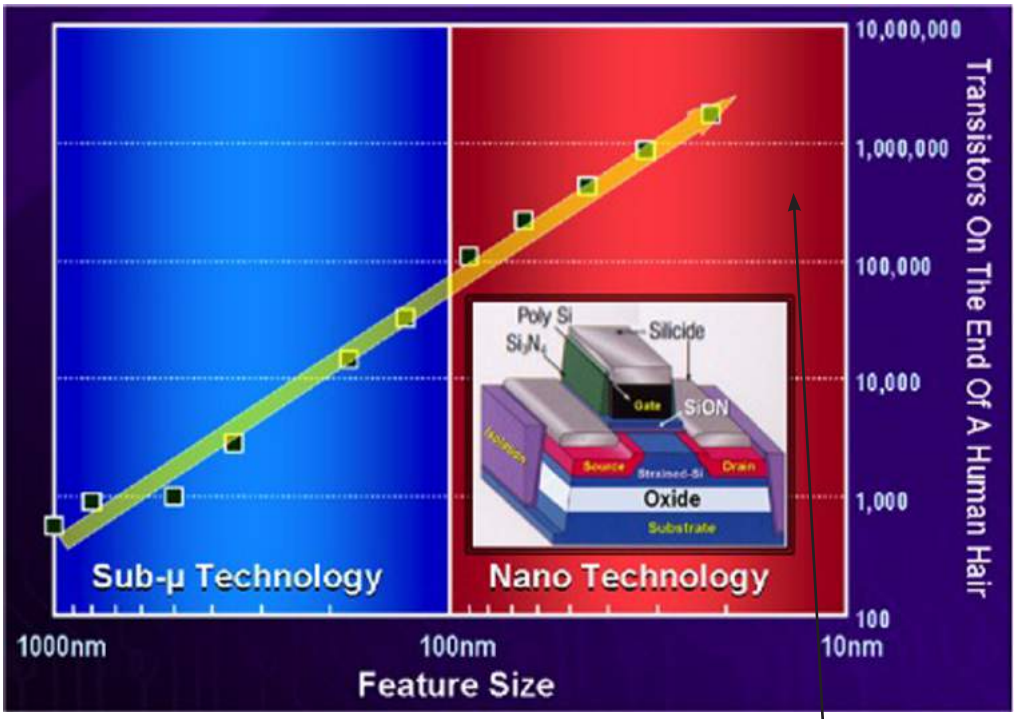
Fonte: BNDES Studies

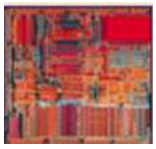
NANOCMOS: A REAL WORLD COMPARISON

1989	2004	2014



1 µ = 1000 nm
1 cm = 10000 µ





- ***Equivalent to 486DX MPU***
- ***6 million metal contacts***
- ***60 cm of metal wiring***

A SYSTEM { on chip — SOC; in a Package — SIP

- ***Cost*** *and* ***engineering*** *choice*
- *SoC – System-on-chip has at least two of:*
  - *Digital CMOS as baseline*
  - *One or more CPUs*
  - *Analog circuit block*
  - *RF module*
  - *Flash memory or embedded RAM*
  - *Sensor*
- *In a SiP: same above + add still:*
  - *MEM, package, connectors, actuators, opto-components, optical fibers*

WHY FOCUS ON MICROELECTRONICS AND NANOELECTRONICS?

ENABLERS OF KEY MARKETS

- *Digitalization of life*
- *Connectivity everywhere*
- *New Medias and new ways of communicating*

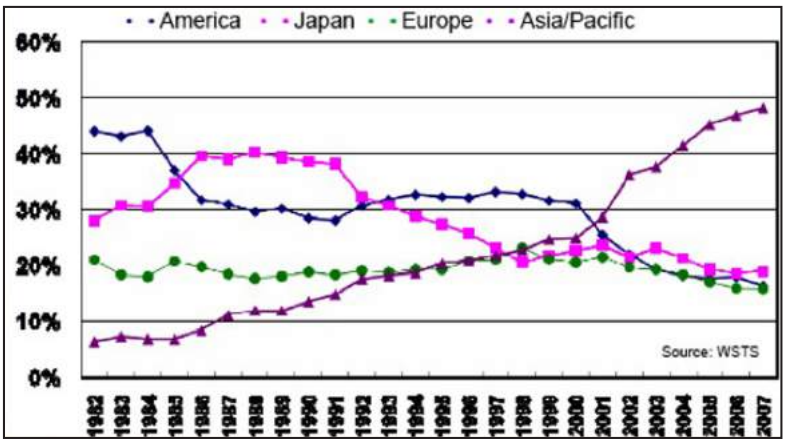
- *More than Moore (scaling in 2-D) opportunities*

SUMMARY: UNDERSTAND THE GLOBAL ELECTRONICS INDUSTRY

- *Highly segmented industry – worldly organized*
- *Enormous productivity gains by specializing in the global value chain*
  - *High value added by:*
    - *Integration in silicon (system-chip)*
    - *Key Functionalities built-in the component*
    - *Software/hardware integrated / embedded*
- *Current market system-drivers:*
  - *Consumer electronics and wireless communication*
- *Future market system-drivers:*
  - *Ubiquitous computing, always-on, everywhere connected*
  - *Transport: safety and energy efficiency*

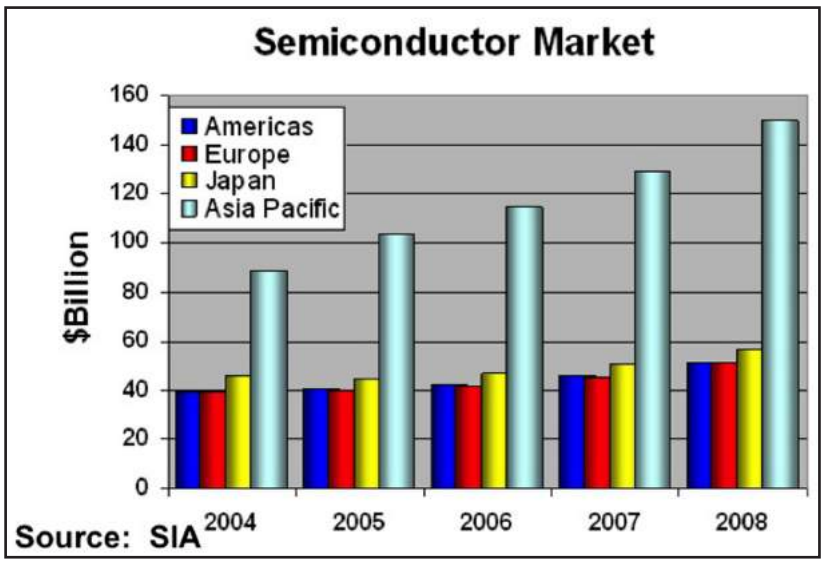
WORLD SEMICONDUCTOR MARKET TRENDS

SEMICONDUCTOR WORLD PRODUCTION MARKET SHARE BY REGION

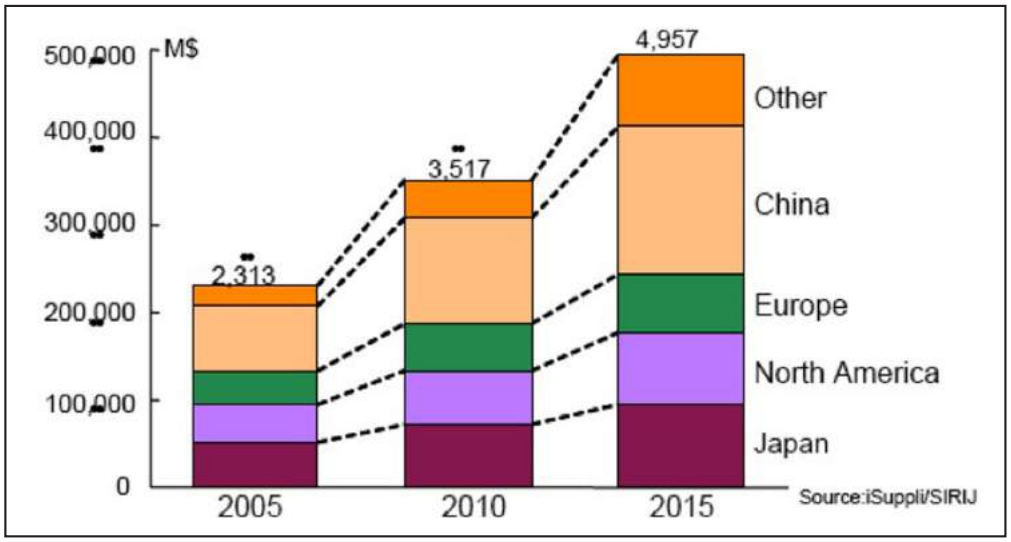


SE Ásia: concentrated the growth after 2000

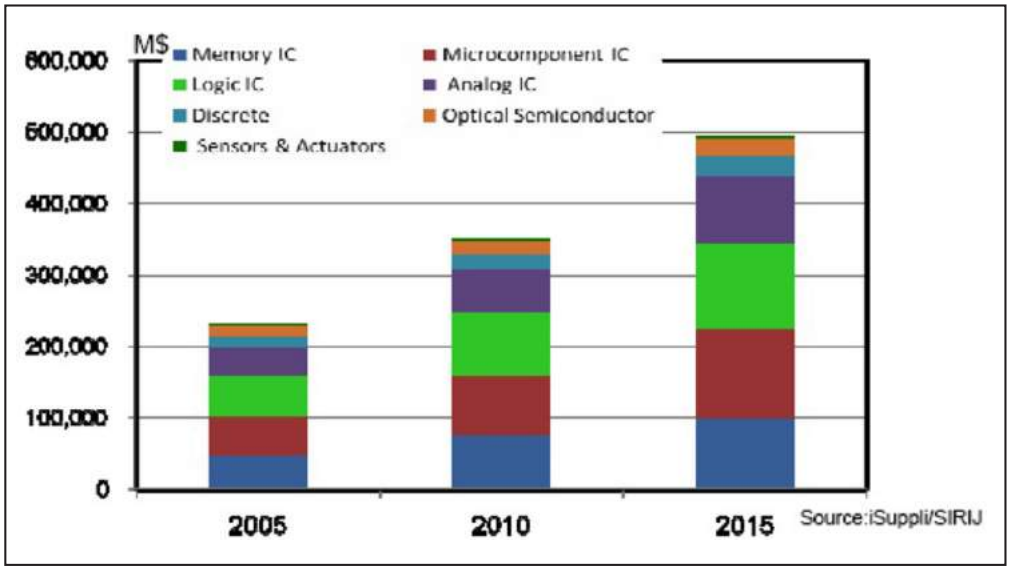
SEMICONDUCTOR MARKET TREND BY REGION



MARKET SHARE BY REGIONCONSUMPTION OF SEMICONDUCTOR COMPONENTS



SEMICONDUCTOR INDUSTRYBY PRODUCT FAMILY (PRODUCTS ARE DIVERSE)



INDÚSTRIA DE COMPONENTESTENDÊNCIA DE CRESCIMENTO POR PRODUTO

Component/type	**Growth % a.a. (05-15)**	**Leaders /Conc.**
Flash memory	14	Samsung, Toshiba, Micron **High Mkt Concentration**
Microprocessor	10	Intel, AMD, Texas **High Mkt Concentration**
ASSP Digital	10	Fabless: Qualcomm, Broadcom, Xilinx, Altera **Averagem Mkt Shares**
Analog/mixed signal	10	Texas, AD, etc. **Low concentration**

Source: SIA of Japan

MERCOSUR SITUATION

- *Largely an importer of electronics (100% of ICs, for example)*
  - *Brasil/Argentina have an assembly industry*
- *Negligible components production:*
  - *Semiconductors*
  - *Non-CRT displays (LCDs, Plasmas, FEPs)*
- *Lack of a local production chain*
- *Few isolated producers:*
  - *Action Item: Spur "DESIGN Activity"*
- *Is Latin America in the investment map of the electronics industry?*
- *Difficult – except as an assembly platform*
  - *Reality in Brasil, Mexico, Argentina, Costa Rica*
- *There are examples of Engineering / High-value activities:*
  - *Guadalajara, Campinas, Sao Paulo, Porto Alegre, Buenos Aires, Montevideo*
  - *Companies in IC Design in Mercosur: Freescale, Motorola, Ceitec, Allegro, small startups (Nangate-BR, XP design, Nanowattics-UY)*
  - *Embedded software: many more*
- *Few local producers:*
- *Example: CCC in Montevideo, Industrial Automation in Brazil*

ROADMAP TO SPUR INVESTMENTS IN THE REGION (LATIN AMERICA)

- *Understand the value chain in electronics*
- *Which are the actors in each ring of the chain ?*

- *In which sector to spur investments?*
  - *Innovation*
  - *Systems and components design*
  - *Embedded Systems Software*
    - *Hardware-dependent software*
- *Local engineering in LA is key*

COMPANIES SEGMENTATIONCONSIDER THE LANDSCAPE OF THE VALUE CHAIN

SEGMENTO	TIPO DE EMPREENDI-MENTO	Características / Mercado	Investimentos
Design Houses	DH1 - Vinculada / Verticalizada	Vinculadas a uma única empresa de semicondutores (com ou sem fabricação própria).	Relativamente pequeno (de US$ 1 a 5 milhões), concentrado em software, treinamento e estações de trabalho.
	DH2 - Integradoras independentes	Licencia ou contrata IP ou serviços de DH3.	
	DH3 - Prestadoras Independentes	Fornecedoras de módulos de IP e de embedded software segundo especificações das DH1 ou DH2.	
Foundries	Nível 1	Prototipagem de pequenas séries. Produção de CMOS em baixa escala	De US$ 40 a 100 milhões
	Nível 2	Produção em volume. Litografia "trailing edge". Fornece para segmentos especializados: componentes automotivos, memórias flash, sensores, telecom, RF e sistemas micro-eletro-mecânicos	Cerca de US$ 400 milhões

	Nível 3	Mega-fábricas produzindo em grande volume (microprocessadores e memórias principalmente).	De US$ 1 a 2 bilhões
Back-end	Verticalizada	Integradas a empresas fabricantes de semicondutores	De US$ 20 a 200 Milhões
	Independente	Atendem a foundries independents. Atuam no encapsulamento, testes ou ambos.	

UNDER THOSE TENDENCIES OF A GLOBAL INDUSTRY

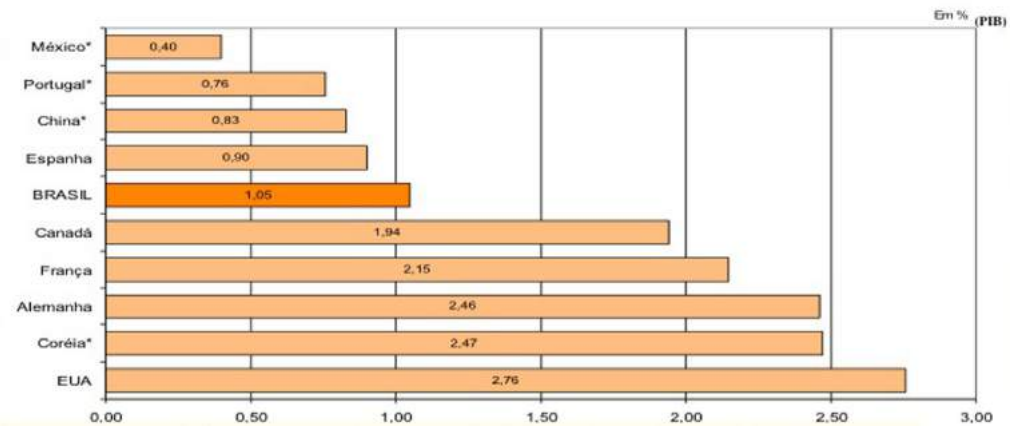
Action Items for IEEE Promotion of LA industry in ICT:

1. ***Promote Highly Talented Engineering Education in Systems and Components Design Leading Universities ← → Global Leading Companies***
2. ***Incentives & Attractive Pulls for R&D Location in Latin America***

These 2 actions insert also local companies and startups in the rapid innovation chain for ICTs and EE.

SAMSUNG NOKIA CONNECTING PEOPLE Itautec EPSON ERICSSON SIEMENS FLEXTRONICS TOSHIBA ALCATEL DELL Panasonic MOTOROLA hp SONY UNISYS NORTEL

UNDER THOSE TENDENCIES OF A GLOBAL INDUSTRY



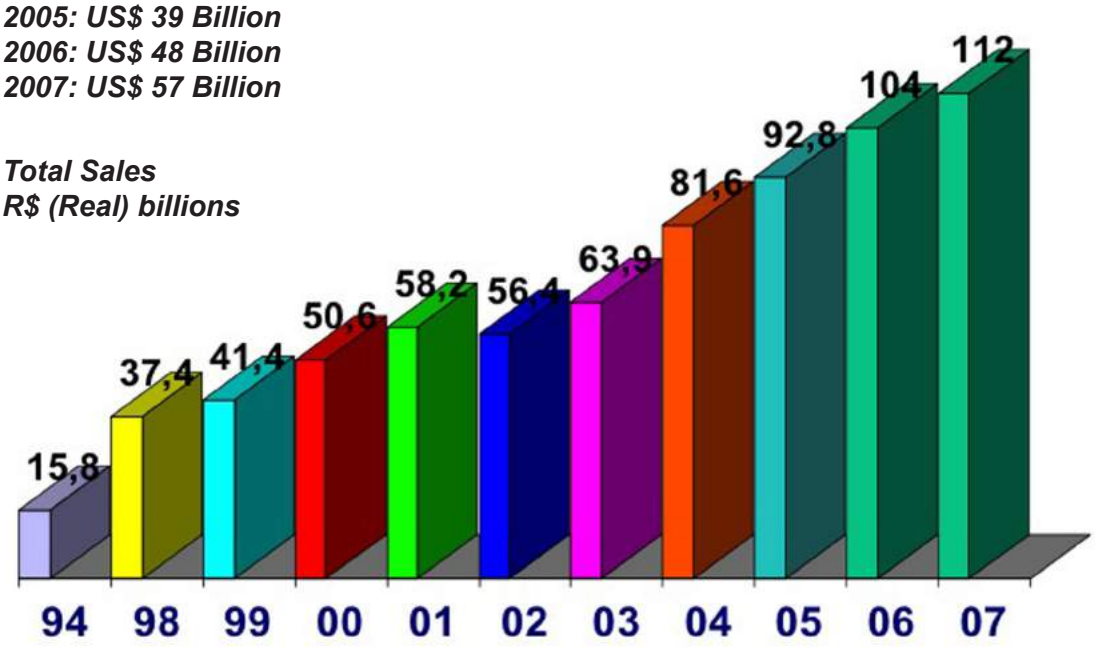
Fontes: OECD, MSTI database, November 2001, e MCT: Coordenação de Estatística e Indicadores.
Nota: (*) Refere-se a 1999.

ELECTRONICS INDUSTRY IN BRAZIL
AN OVERVIEW

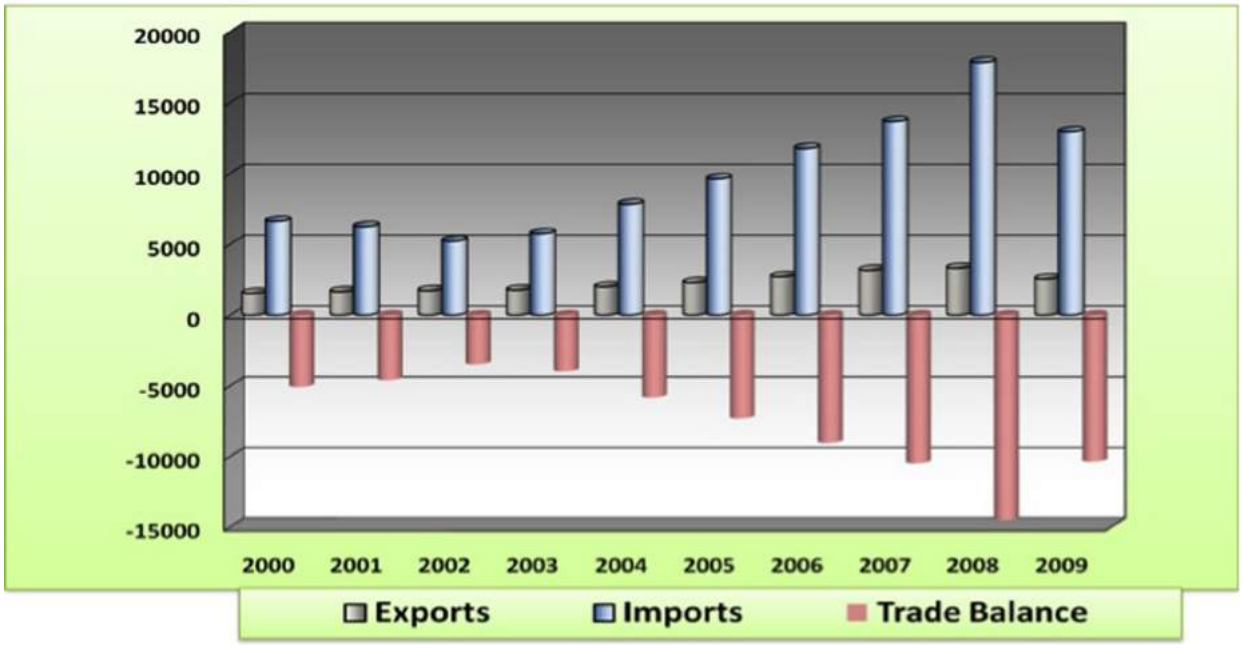
BRAZILIAN ELECTRONICS & ELECTRICAL INDUSTRY (YEAR INCOME)

2005: US$ 39 Billion
2006: US$ 48 Billion
2007: US$ 57 Billion

Total Sales
R$ (Real) billions



COMPONENTS TRADE BALANCE OF BRAZIL US$ MILLION – FOB



ELECTRONICS INDUSTRY INDICATORS

INDICADORES	1999	2000	2001	2002	2003	2004	2005	2006
FATURAMENTO (R$ bilhões)	41,4	50,6	58,2	56,4	63,9	81,6	92,8	104,1
FATURAMENTO (US$ bilhões)	22,9	27,9	24,7	19,3	20,8	27,9	38,1	47,8
NÚMERO DE EMPREGADOS (em mil)	134,2	139,9	131,2	123,3	122,6	132,9	133,1	142,9
EXPORTAÇÕES (US$ milhões) (1)	3.173	4.423	4.732	4.415	4.771	5.344	7.767	8.955
IMPORTAÇÕES (US$ milhões) (1)	9.865	11.887	13.489	10.294	10.048	12.667	15.135	18.684
SALDO DA BALANÇA COMERCIAL (US$ milhões) (1)	(6.692)	(7.464)	(8.757)	(5.879)	(5.277)	(7.323)	(7.368)	(9.729)
FLUXO DE COMÉRCIO (US$ milhões) (2)	13.039	16.310	18.220	14.710	14.819	18.011	22.902	27.639
FATURAMENTO/EMPREGADO (US$ mil)	170,7	199,1	188,5	156,2	169,9	209,9	286,6	334,6
EXPORTAÇÕES/FATURAMENTO (%)	13,9	15,9	19,2	22,9	22,9	19,2	20,4	18,7
EXPORTAÇÕES/TOTAL EXPORTAÇÕES DO PAÍS (%) (1)	6.6	8,0	8,1	7,3	6,5	5,5	6,6	6,5
IMPORTAÇÕES/TOTAL IMPORTAÇÕES DO PAÍS (%) (1)	20,0	21,3	24,3	21,8	20,8	20,2	20,6	20,4
FATURAMENTO/PIB (%) (1) (3)	4.3	4.6	4.9	4.2	4.1	4.6	4.8	5.0

(1) Série revisada; (2) Exportações + Importações; (3) PIB a preços correntes.
Fontes: IBGE, BACEN e SECEX.

2007
111,7

156

5,8
19.9%

2005-2007 ELECTRONICS PRODUCTIONUS$ 57 BILLION PER YEAR (2007)

Electronics, Electrical Goods Production	2005 R$ (Bi)	2006 R$ (Bi)	2007# R$ (Bi)	Gr(%) ´07/´06
Industrial Automation	2.33	2.7	3.1	14
Components (Electro/Electronics)	8.65	9.4	10,15	8
Industrial Equipt – Capital goods	11.8	13.3	15.5	17
Power – Gen. – Transm. – Distrib.	6.5	9.2	10.6	16
Informatics – IT goods	24.4	29.4	31.4	7
Materials for electrical installations	6.39	6.75	7.65	13
Telecom Equipment	16.4	16.7	17.5	4
Household electrical/electronics	16.2	16.5	15.8	-5
Audio Video	10	12	Eletros	

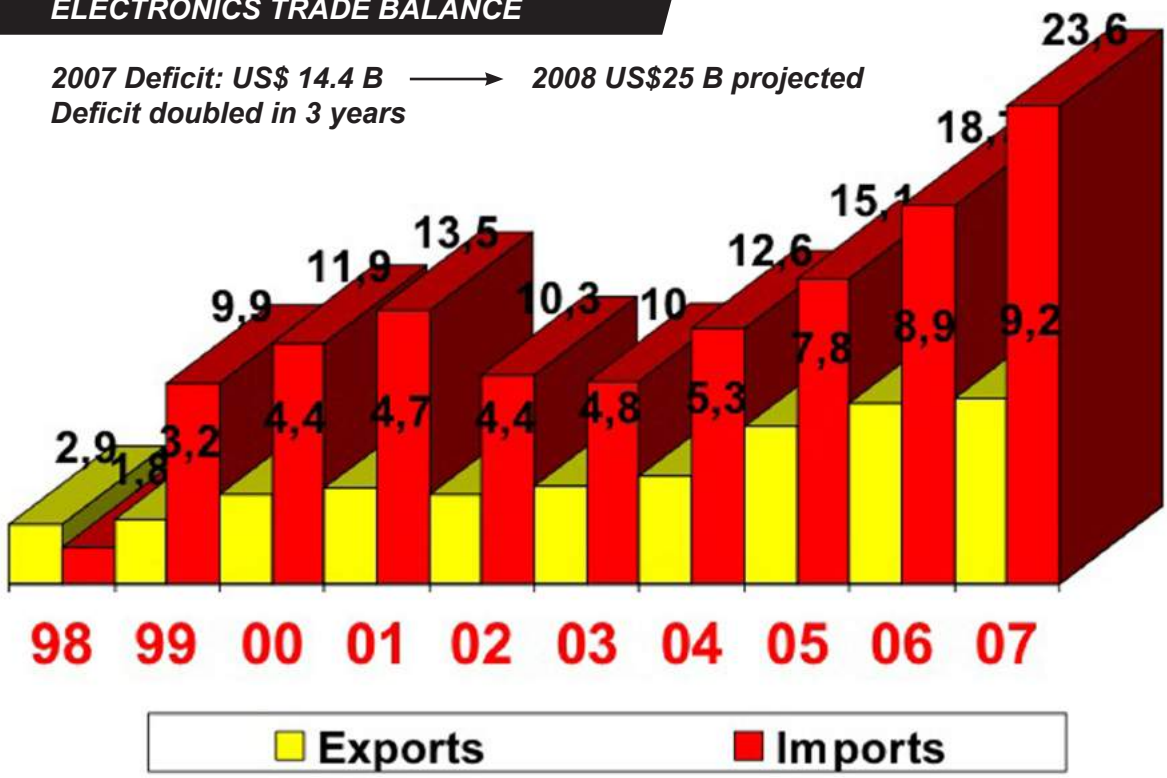
ELECTRONICS MANUFACTURINGOUTPUT

Industrial Base: 3,200 Companies in Electrical manufacturing

- ***4% of world Computer Production***
  - ***~ 10.6 million (2007)***
  - ***~ 8 million (2006)***
- ***World: 300M***
- ***TV sets (CRT, etc) – 10 million (2007)***
- ***Mobile Phones – ~ 130 million subscr. (Jun 08)***
  - ***Cellular phones assby: 66 million in 2007***
  - ***Hand set Exports: US$2.8 billion (2006)***

ELECTRONICS TRADE BALANCE

2007 Deficit: US$ 14.4 B ⟶ 2008 US$25 B projected
Deficit doubled in 3 years



FEW FACTS ON BRAZILELECTRONICS TRADE IN 2007

2007 data

- *Accounts for 20% of all Brazilian imports*
- *Trade flow 2007: US$ 33 Bi*
- *US$ 24.0 Bi Imports + US$9.3 Bi Exports*

- *US$ 24.0 Bi imports:*
  - *61% from SE Asia*
  - *27% of all imports: from China (US$ 6.4 Bi)*
  - *32% of all imports: from EU + USA*

Asia

- ***Brazil Exports 2007:***
  - ***Celular phones:*** ***US$ 2.1 Bi***
  - ***Hermetic Compressors:*** ***US$ 704 mi***
  - ***Automotive electronics:*** ***US$ 716 mi***
  - ***Heavy industrial components:*** ***US$ 886 mi***
- ***Brazil Imports 2007:***
  - ***Semiconductors:*** ***US$ 3.42 bi***
  - ***Telecom components:*** ***US$ 2.65 bi***
  - ***IT subassemblies, components:*** ***US$ 3.10 bi***
- ***RECENT TRENDS:***
  - ***Imports of fully assembled growing faster than intermediary goods (e.g.: chips, components)***
- ***SE Asia dominance:***
  - ***US$ 14.4 Bi, or 61 % of all imports***
  - ***US$ 0.3 Bi of exports***
- ***IP (Intelectual Property) ← → TRADE***

ELECTRONICS / ELECTRICAL MANUFACTURING IN BRAZIL

7 States with >100 companies

	Aut. Com.	Fab. e mont. de comp.	Fab. Equip. perif.	Fab. Compon passivos	GDT	Fab. Mat. Eletn.bas.	Fab. Equip. transm	Fab. Teleq	Fab. Apar. recept	Inst. Med.	Aut. Indust	Total CE
RO	0	0	3	2	0	0	0	0	2	0	0	7
AC	0	0	0	0	1	0	1	0	0	0	0	2
AM	5	11	**13**	5	2	**38**	4	11	**21**	0	2	112
RR	0	0	0	0	0	0	0	1	0	0	0	1
PA	2	3	1	1	3	0	2	0	0	1	1	14
AP	0	0	1	0	0	0	0	1	0	0	0	2
TO	0	1	1	1	1	0	0	0	0	0	0	4
MA	0	0	1	2	0	0	1	2	0	0	1	7
PI	0	1	1	1	0	0	4	0	0	0	1	8
CE	3	3	1	1	7	5	4	2	2	1	3	32
RN	0	0	0	0	1	0	0	1	1	2	1	6
PB	0	1	3	2	1	2	2	1	1	0	0	13
PE	2	1	2	4	8	11	2	3	2	1	4	40
AL	1	1	0	0	1	0	0	1	0	0	0	4
SE	0	1	0	0	3	0	0	1	0	0	0	5
BA	2	42	13	1	5	9	3	1	5	1	1	83
MG	6	14	30	**27**	**34**	**71**	11	28	20	11	12	**264**
ES	1	2	1	3	7	3	3	1	1	0	3	25
RJ	7	9	**18**	11	**28**	**34**	16	15	11	14	13	176
SP	41	72	**161**	160	157	**464**	73	86	113	125	**171**	**1623**
PR	9	6	22	19	**33**	**53**	13	7	**28**	4	24	218
SC	3	3	11	15	**21**	**26**	4	8	9	10	**21**	131
RS	4	12	27	39	**53**	**97**	12	12	21	19	**45**	**341**
MS	0	1	0	0	2	2	1	0	0	0	0	6
MT	2	1	0	10	1	1	1	0	2	1	0	19
GO	2	0	2	16	3	7	3	0	1	0	1	35
DF	1	4	5	0	2	2	0	1	0	0	1	16
Total	91	189	**317**	**320**	**374**	**825**	160	183	240	190	**305**	**3194**

Fonte: RAIS (2003)/MTE

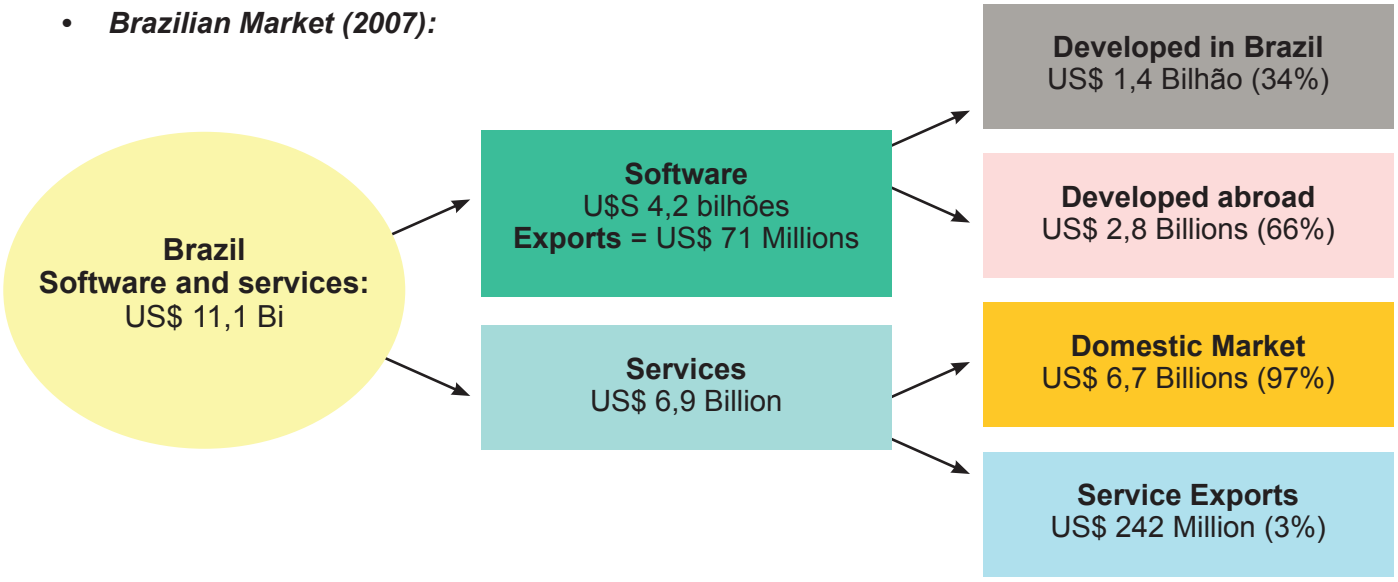
BRAZILIAN MARKET
SOFTWARE AND IT SERVICES

- ***2007 World IT market ⟶ US$ 1,3 trillion***

Hardware 42%	Software 20%	ITC Services 38%

  - ***Latin American IT market in 2007 ⟶ US$ 47,7 Bi***
  - ***Main: Brazil US$ 20,7 Bi***
    Mexico US$ 11,3 Bi

- ***Brazilian Market (2007):***



Source: ABES/IDC (2008)

POLICY MAKING INSTRUMENTS

- ***Example: More than 60% of components used in Brazil are to assemble TICs goods.***
- ***Programa Nacional de Microeletrônica 2002-10***
  - ***Result of a study by experts***
  - ***Discussion with companies and academia***
  - ***Sociedad Brasileira de Microeletrônica***

NATIONAL PROGRAM FOR MICROELECTRONICSOBJECTIVES

- ***General:***
  - ***Support to systemic innovation for the industry.***
  - ***Coordinated within the Industrial and Technology Policy of the Brazilian Government.***
- ***Specific goals:***
  - ***Enhance activities in Design (Systems and ICs, then others)***
  - ***Establish CEITEC Center as a nucleus for commercial activity, then attract new players.***
  - ***Fiscal incentives:***
    - ***Law 11484 – Incentives to Support the Semiconductor and displays industries***
- ***Accelerate commercial activites in micro and nano-based industries***

POLICY MAKING: PRIORITY AREAS

- ***Software***
- ***Semiconductors***
- ***Capital intensive goods***
- ***Biotech – Pharmaceuticals***
- ***Forward looking initiatives in:***
- ***Nanotech & Renewable resources***

SEMICONDUCTOR INDUSTRY

PNM BRAZIL (National Microelectronics Plan)
Semiconductor Industry in Brazil
Institutions for Education & Research
IC Brazil Program

PNM – SUPPORTING RATIONALE

- ***Broad Objectives of the Action Plan***
  - ***Promote electronics industry***
    - ***Competitiveness & Research & Development***
    - ***Support Innovation in the Design Engineering of electronics (complete systems)***
    - ***Key: Design of Systems by the local industry***
  - ***Rationale: demand for component innovation comes from innovative systems and innovative services***
- ***Commercial deficit worries economists***
- ***Lack of local inovative design is a more strategic shortcoming***
  - ***components and subassemblies***
    - ***systems ← → components***

SEMICONDUCTOR INDUSTRY FEDERAL SUPPORT

- ***Support for Scholarships & Training - PhD/Master/Experts in Design and Process***
- ***Investment for semiconductor plant (CEITEC) and Design Centers***
- ***Support to industrial IC projects***
- ***Infrastructure support for Research Centers/Labs/Design Centers***

POLÍTICA DE DESARROLLO PRODUCTIVO - TICS

Sub-programas específicos na PDP

Software e Serviços TI Estratégia	**Microeletrônica** Estratégia
Mostradores de Informação (Displays) Estratégia	**Infra-estrutura para Inclusão Digital** Estratégia: Ampliação do Acesso
Adensamento da Cadeia Produtiva do Complexo Eletrônico Estratégia	

MICROELETRÔNICA

ESTRATÉGIA: FOCALIZAÇÃO E CONQUISTA DE MERCADOS

Objetivo: ampliar produção local e exportações de componentes microeletrônicos

Situação atual

Déficit de US$ 11,45 bilhões na balança comercial do complexo eletrônico em 2007: componentes eletrônicos (US$ 5,5 bilhões), principalmente semicondutores (US$ 3,25 bilhões)

Metas 2010

1. **Implantar 2 empresas de fabricação de Circuitos Integrados (ou MEMS), envolvendo a etapa de front-end**
2. **Elevar o número de Design Houses do programa CI Brasil de 7 para 15 e fortalecer a sua atuação**

Desafios

- **Implantar empresas brasileiras de projeto eletrônico Foco: Design Houses e ASICS**
- **Converter Brasil em plataforma de exportação para grandes players Internacionais. Foco: CI padronizados e foundries**

Gestão

MCT
MDIC

INSTRUMENTOS ATUAIS: MICROELETRÔNICA

Desafios

Implantar empresas brasileiras de projeto eletrônico Foco: Design Houses e ASICS

Instrumentos

BNDES
Apoio à Inovação
Financiamento
Capitalização

FINEP
Subvenção
Crédito
Capital de Risco

Lei de Inovação (10.973/04)
Incentivos Fiscais à inovação

Lei do Bem (11.196/05)
Incentivos Fiscais à inovação

Lei 11.484/07 (PADIS)
Incentivos Fiscais à produção local de semicondutores

Lei de Informática (11.077/04)
Incentivos fiscais

CNPq
Bolsas RHAE

INPI
Gestão da Propriedade Intelectual

MCT
SIBRATEC
Institutos do Milênio

ABDI
Articulação

SEBRAE
Proimpe

SENAI
Formação e Treinamento

Desafios	Instrumentos		
Converter o Brasil em plataforma de exportação	**Lei 11.484/07 (PADIS)** Medida de incentivo para semicondutores	**BNDES** Financiamento à Exportação Capitalização	**PROEX**
	APEX/MRE Promoção Comercial	**MDIC/BNDES/ABDI** Atração de investimentos estrangeiros	**ABDI** Articulação **SUFRAMA:** Apoio à exportação

Gestão Integrada

MICROELETRÔNICA: INICIATIVAS

Iniciativas	Medidas e recursos	Responsabilidade
Apoio financeiro e capitalização	Financiamento e capitalização a empresas, SPEs, consórcios e joint-ventures para viabilizar investimentos no setor	BNDES
	Estruturação de Fundos de Investimento em Participações (FIPs) e Fundos de Investimento em Direitos Creditórios (FIDCs)	BNDES Mercado de Capitais
Promoção do investimento em inovação	Grupo de trabalho: Lei do Bem Objetivo: reduzir a incerteza jurídica quanto à aplicabilidade dos incentivos à inovação tecnológica previstos na Lei do Bem (11.196/05), regulamentados pelo Decreto 5.798/2006. Prazo: 4 meses	MF MCT MDIC ABDI
Desoneração tributária	Aperfeiçoamento do PADIS Eliminação de restrição de acesso aos incentivos do Programa na aquisição de máquinas e equipamentos usados	MF
Centros tecnológicos	CEITEC: Infra-estrutura fabril: concluída Início da produção de circuitos integrados: até julho de 2009 Fortalecimento do Programa CI Brasil e modernização dos centros de P&D (incluindo tecnologia de processos)	MCT BNDES FINEP ABDI

Iniciativas	Medidas e recursos	Responsabilidade
Capacitação e Treinamento	Programa de capacitação de especialistas em projetos de CI e processos de manufatura de semicondutores	MCT MEC Sistema S MTE
Apoio às PMEs (Design Houses)	Estruturação, fortalecimento e capitalização de Fundos de Empresas Emergentes (FEEs) e Fundos de Venture Capital	BNDES Mercado de Capitais
	Desenvolvimento e capitalização de incubadoras e parques tecnológicos, articulados com universidades e centros de pesquisa	MCT/FINEP BNDES FINEP
Atração de Investimentos Estrangeiros	Programa estratégico para atração de Investimentos Estrangeiros em Microeletrônica: • identificação de investidores potenciais • organização de missões de fomento para divulgação do mercado brasileiro e dos instrumentos de apoio existentes • apoio à estruturação de operações de investimento direto em microeletrônica (incluindo joint-ventures)	MDIC MCT BNDES ABDI MRE APEX

MICROELETRÔNICA/SEMICONDUTORES

CENÁRIO POSSÍVEL (2012)

- *Investimentos no médio prazo concentrados em projeto (design de componentes) e em back-end (packaging)*
- *Elementos do cenário:*
  - *Programa PADIS em vigor: incentivos fiscais*
  - *Programa CI-Brasil: formação de engenheiros de projeto:*
    - *Investimento federal de R$ 60milhões (2008-2010)*
- *Investimentos anunciados:*
  - *Back-End:*
    - *Smart-cards. Empresa Symetrix*
    - *Memória flash. Empresa asiática*
    - *Encapsulamento de diodos LEDs (low-end). Vision*
- *Expansão da área de projeto de componentes complexos (semicondutores)*
- *Indicadores*
  - *05 a 10 novos empreendimentos em back-end*
    - *Investimento médio: US$ 20Mi /empresa*
  - *Base de "design industrial"*
  - *1500 projetistas empregados no Brasil*
    - *Atual: 350 empregados (Freescale + 07 Design Houses)*

Porte total: *US$ 400 Mi (back-end)*
U$$ 150 Mi/ano design

INVESTIMENTOS PROPICIADOS PELA MUDANÇA ESTRUTURAL/TECNOLÓGICA

- ***DESIGN: investimento em capital-light:***
  - ***Startups em 3 níveis:***
    - ***DH1: IDM integrada verticalmente***
    - ***DH2: Integrator; platform owner***
    - ***DH3: empresa provedora independente de IPs e fornecedora de serviços de "design"***
- ***Empresas de IPs focando em software embarcado.***
  - ***Questão metodológica: IT service X Sistema de HW***
  - ***OPORTUNIDADES novas de investimento***

INVESTIMENTOS ESTRATÉGICOS

- ***Instituições de R&D focando em pesquisa industrial, suporte e desenvolvimento pioneiro ligado à indústria eletrônica.***
  - ***Exemplos: ITRI / Taiwan - ETRI / S. Korea***
    - ***Sematech (USA), IMEC (Bélgica), SELETE (Japão) / Indústria Semicondutores***
    - ***No passado, papel do CPqD /Brasil***
- ***Centros de P&D industrial como entidades privadas de interesse público, com forte financiamento estatal***

CONCLUSIONS

- ***Industrial Policy for IT and EE is in place in Brazil***
- ***Instruments***
  - ***Fiscal and credit incentives***
  - ***Federal level support for company R&D***
- ***IC BRAZIL and PNM Program***
- ***Distortion in the Innovation system in Brazil***
  - ***R&D in companies is limited***
  - ***Need for more interaction – companies – world class institutes and universities***
  - ***More enterprise R&D***
- ***Region Mercosur has to add new actors in the scenario***
  - ***VC capital, incubators, Innovative companies, etc***

MICRO OR NANO ? TWO KILLER APPLICATION EXAMPLES

- ***In-VIVO Instrumentation:***
  - ***MICRO is as important as NANO***
  - ***MEMS or NEMS: it's the application !***
- ***Ad hoc sensor networks***
  - ***ambient intelligence***
  - ***smart silicon "dust"***
  - ***Tag on everything***

LOCAL COMPONENTS INDUSTRY

Brazil Semiconductor Imports: US$ 3.5 Billion

excludes gray imports & components in subassemblies, parts, etc.

Local production of electric "components": US$ 5.2 Billion

includes compressor, assembled parts, subsystems, automative electronics, passives

PNM – KEY POINT

The business success depends on entering the engineering value chain
Electronics inovation implies co-evolution of both:
SYSTEMS ← → COMPONENTS

Define First:
Services, standards
Hardware platform

Then Components
Embedded Software + Chips

RESEARCH SCENARIO IN MICROELECTRONICS

- ***300 Professionals working on R&D and teaching simultaneously in Brazilian Institutions***
- ***100 Master´s and 40 Ph.D. per year***
- ***Basic silicon microfabrication on a research scale: 4 public Universities***
  - ***2: São Paulo State: UNICAMP, USP***
  - ***2: Federal: UFRGS,UFPe***

RESEARCH SCENARIO

- ***CENPRA – federal R&D Center - Mask fabrication by direct write ; basic packaging ; displays.***
- ***INPE e LNLS – Sensors; space devices and advanced characterization.***
- ***CEITEC – a public company with focus on IC design and wafer fabrication (CMOS initially)***
- ***CEITEC - a company wholy owned by the federal government***

INITIATIVES UNDER INDUSTRIAL P

1. ***IC- Brazil Program***
2. ***Support to University Program***
3. ***Round of financing through FINEP federal agency and SEPIN of the Ministry of Science and Technology***
4. ***Agency for Industrial Promotion linked to the President´s Agenda and Ministry of Industry and Foreign Trade***

IC BRAZIL PROGRAM

MAIN OBJECTIVES

- *Explore opportunities in the IC design business chain, in close association with the Higher Learning and R&D Institutions*
- *Focus the ITC policymaking (Law 8248, 1991) in the semiconductor component: foster activities with smaller investment barriers.*
- *Target IC design and federally funded projects with value added for the local electronics industry*
- *Attract major players to establish design and EDA engineering in Brazil in the future*
- *Promover atividades e projetos que agreguem valor a diferentes setores econômicos, inclusive Complexo Eletrônico*

TYPES OF SUPPORT

- *Companies as start-ups in 3 levels:*
  - *DH1 : IDM vertically integrated*
  - *DH2 : Integrator; platform owner*
  - *DH3 : independent IP and design service providers*
- *Companies focusing on embedded software*
- *R&D Institutions focusing on support and development linked to the electronics industry*
- *Higher Learning and Research Institutes*

CLIENTS PROSPECTED WITHIN BRAZIL

- *Opportunities in Competitive Industries doing production in Brazil*
  - *Transportation and automotive*
  - *Agri-business*
  - *Capital goods*
  - *Instrumentation, medical*
  - *Power Systems*

STRATEGIC AREAS – SEMICONDUCTORS

DESIGN HOUSE PROGRAM

- *Objective: Created 5 DH Centers in 2005*
  - *Increase to 15 companies in 2010*
- *Participants: CENPRA at Campinas, LSITec in São Paulo, CEITEC in Porto Alegre, CESAR in Recife and CT-PIM Manaus Free Trade Zone*
- *Infrastructure: Workstations, SW and HR*
- *Initial focus areas: Automation, HDTV, RFID, telecom.*

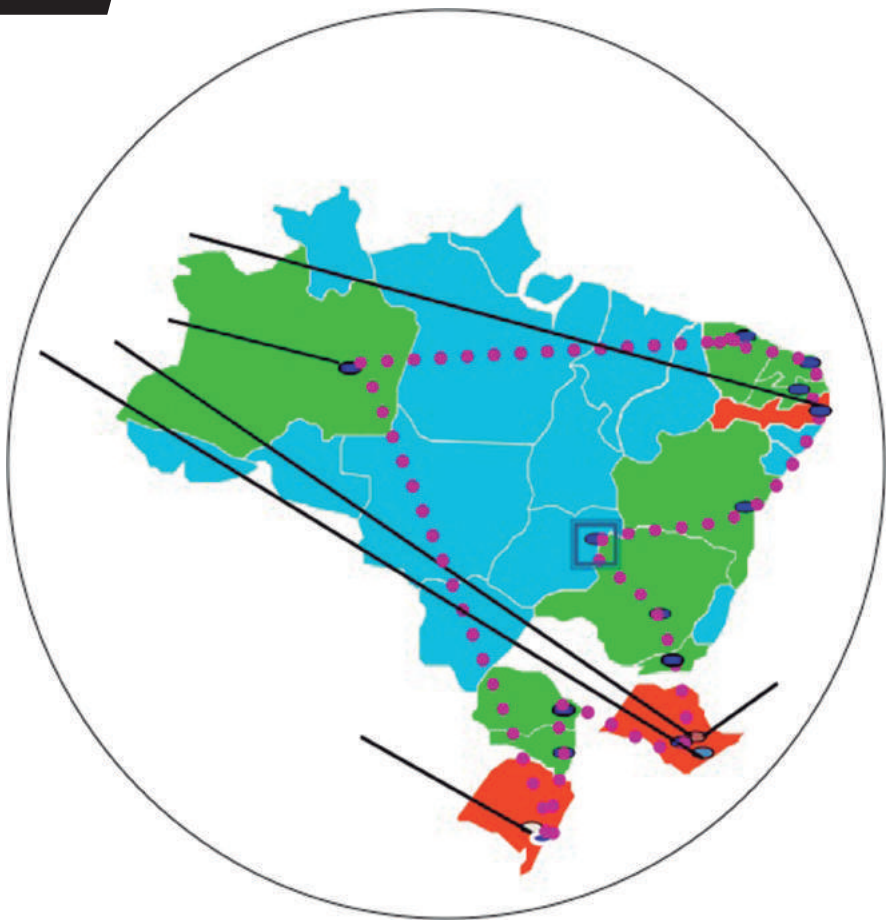
DESIGN CENTERS

CEITEC
Design & CMOS microfab
NSCAD-UFRGS: HR and support to CAD and Training

CENPRA
Displays & Training

Broadband Network
HR & Design Houses

● **Start up companies**
Embedded software
Brazil-IP



IC BRAZIL & NATIONAL PLAN FOR DESIGN

ACTION ITEMS COMPLETED

- ***Approval at Ministry level. Multi-year funding.***
- ***CEITEC : microfabrication center built***
  - ***Activate its fab tools (underway, 2008-09)***
- ***Call for Proposal by Federal Agency towards R&D Institutions***
- ***Scholarships/Traineeships for Top Engineering***
- ***Federal subsidy for Engineering salaries***

MERCADO BRASILEIRO DESOFTWARE E SERVIÇOS DE TIINFORMÁTICA:

1,23% DO PIB BRASILEIRO

SOFTWARE E SERVIÇOS TI

ESTRATÉGIAS: FOCALIZAÇÃO, CONQUISTA DE MERCADOS, DIFERENCIAÇÃO

Objetivo: posicionar o Brasil como produtor e exportador relevante de software e serviços de TI no cenário mundial

SITUAÇÃO ATUAL

- *Exportações limitadas: US$ 800 milhões (exportações mundiais: US$ 36 bilhões)*
- *Mercado doméstico: US$ 9 bilhões, crescendo a 15% a.a.*
- *Baixa participação de empresas brasileiras de tecnologia nacional no mercado interno*
- *Oferta fragmentada, com grande número de PMEs*
- *Janela de oportunidade para conquista de parcela mais significativa do mercado offshore*

Metas

1. *Exportações: US$ 3,5 bilhões em 2010*
2. *100.000 novos empregos formais até 2010*
3. *Serviços TI: consolidação de 2 grupos ou empresas de tecnologia nacional com faturamento superior a R$ 1 bilhão*

- *Ampliar a inserção internacional*
- *Incrementar o investimento em capacitação tecnológica*
- *Fortalecer as empresas brasileiras de tecnologia nacional e apoiar a consolidação empresarial*
- *Consolidar e fortalecer a marca "Brazil IT"*

“The IC-Brazil Program and Related Activities”

Sergio Bampi (UFRGS)
& J. Swart (Unicamp)

Federal Univ. of Rio Grande do Sul
State University of Campinas – UNICAMP
BRAZIL

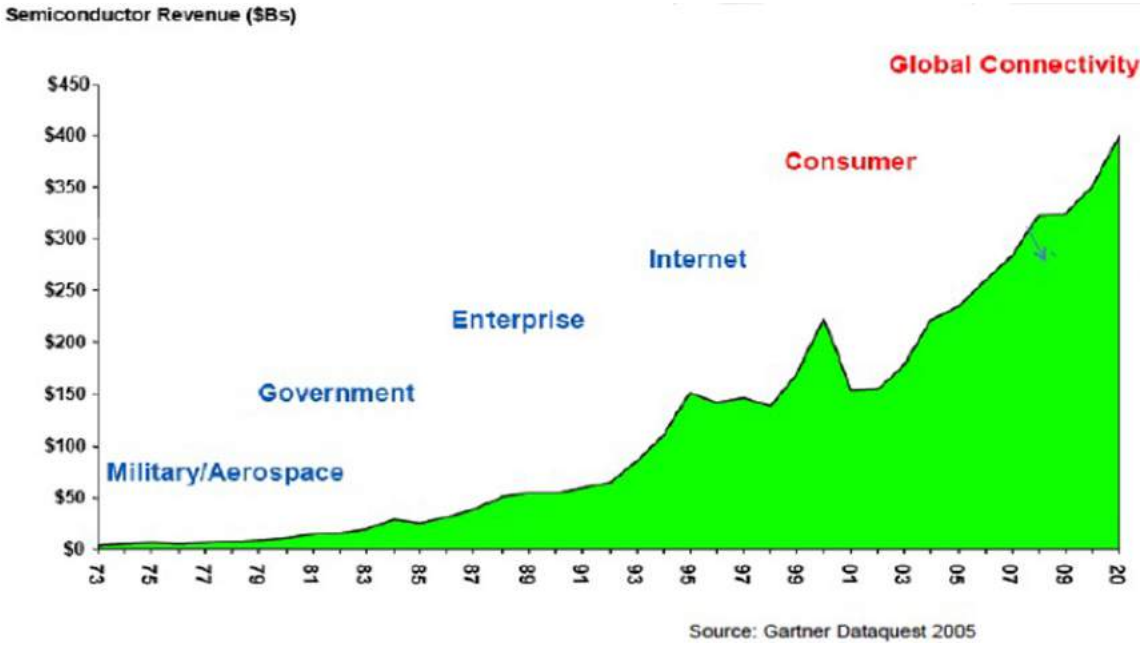
Outline

1. Introduction
2. IC-Brazil Program
3. Related Activities
4. University Programs
5. NAMITEC Research Network
6. Summary

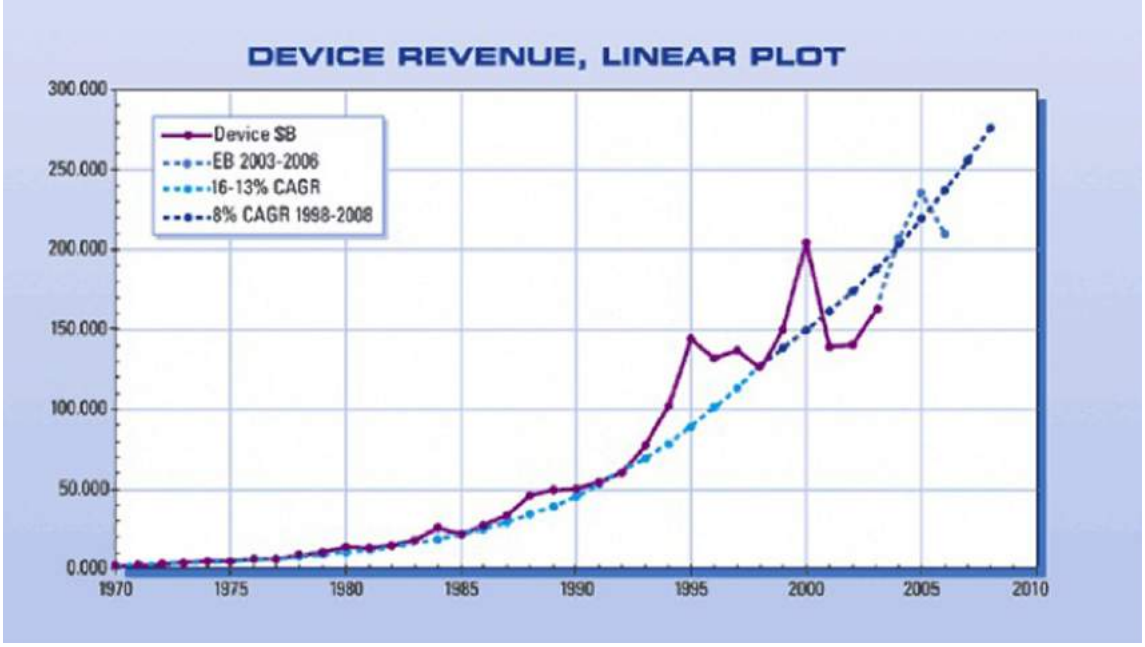
1. Introduction

- Innovation
  - Is key for economical and business success
  - Requires specific components or ICs
- Examples of innovation based on semiconductors
  - > 1950 – Military, aerospace, radio, analog communications
  - 60 – Calculator, 3rd gen. computer IBM360
  - 70 – Microprocessor, microcontroler
  - 80 – PC, electronic games, DSP
  - 90 – Celular, digital camara, internet, DPD
  - 00 – Digital & 3D TV, MP3, SmarthPhones, Ultra-books, Tablets
  - 202x – Health & Energy - Innovation by Electronics

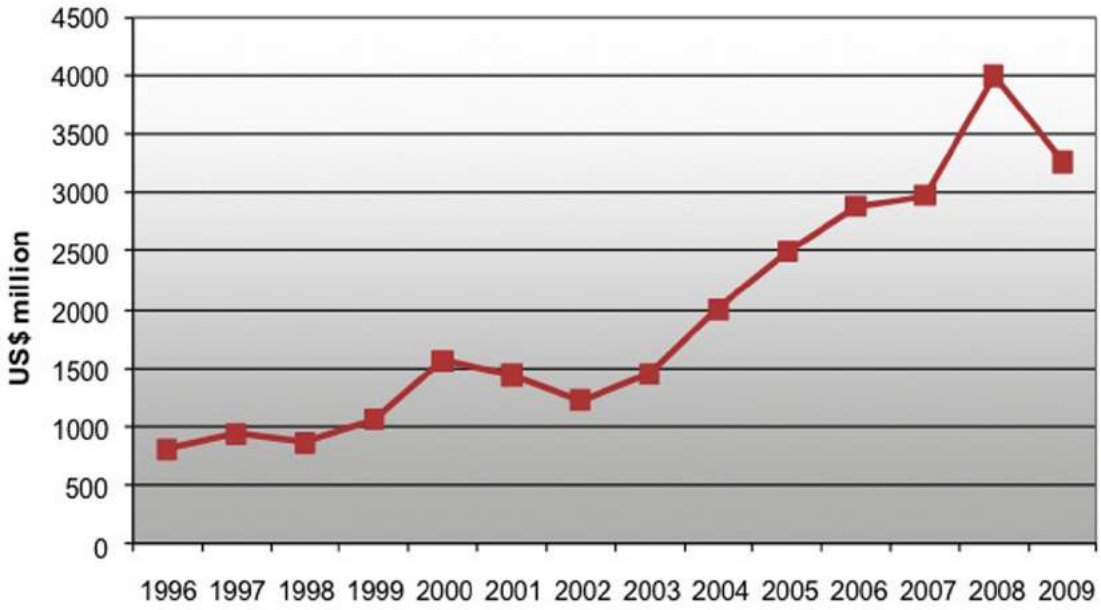
Drivers for the Semiconductor Industry

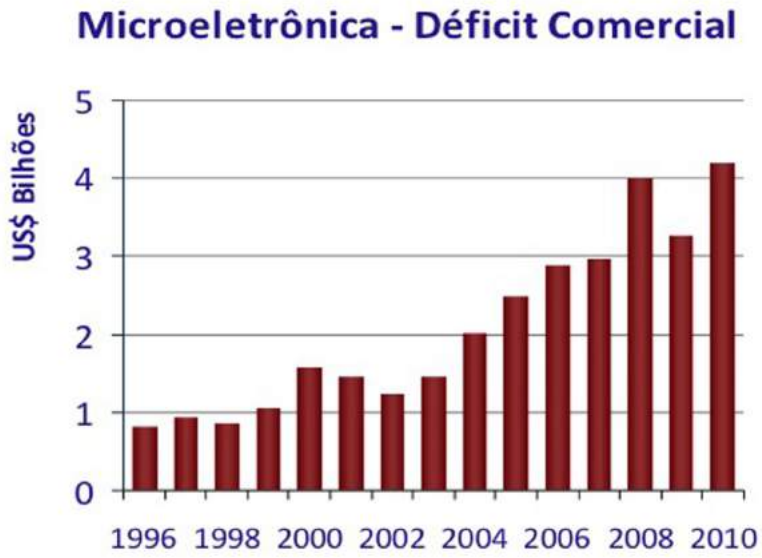


Global Semiconductor Market (forecast)

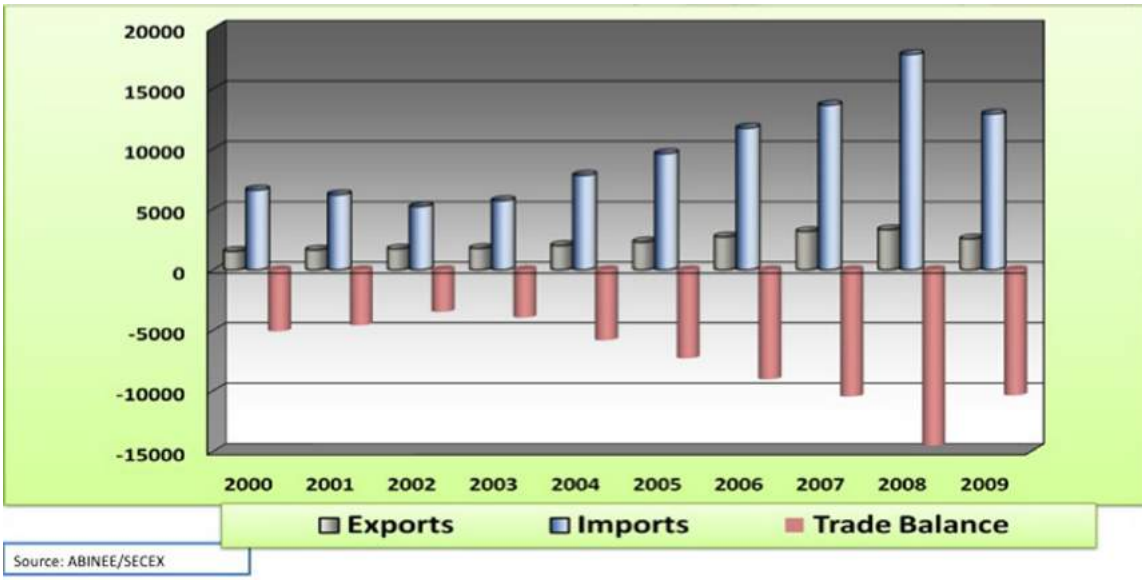


Brazil - Electronic components: IC imports





Components Trade Balance of Brazil US$ million – FOB



Commercial trade balance by type of components (US$ millions)

Valores Correntes (R$ milhões)	2003	2004	2005	2006	2007	2008
Componentes para informática	878,7	1.170,1	1597,8	2.177,5	3.088,5	4.052,6
Semicondutores	1.742,9	2.397,5	5.904,2	3.332,5	3.423,3	4.040,5
Componentes para telecomunicações	812,5	1.285,1	1.744,8	2.420,3	2.649,4	3.978,9
Instrumentos de medida	510,8	665,4	592,6	796,5	975,3	1.280,1
Eletrônica embarcada	454,3	546,4	648,3	657,1	884,6	1.261,1
Componentes para equipamentos industriais	414,7	497	9	498,4	620,3	627,1
Telefones celulares	86,8	166,7	231,3	282,1	374,6	797,0
Aparelhos eletromédicos	73,9	70,0	89,5	377,4	480,5	607,7
Componentes passivos	257,4	342,8	372,1	488,5	494,1	599,0
Máquinas para processamento de dados	221,7	304,6	358,6	409,5	431,6	598,3

General Tendencies and Challenges

- New products and applications
- Cloud computing
- Convergences of functions: notebook or smartphone?
- Mobility and easy to use
- Universal access, connectivity, interoperability
- Wireless sensor network
- Ambient energy harvesting
- Ecological correctness

Importance of Microelectronics

- Present in practically all areas
- Semicondutors:
- Key for product inovation
- Sucess of Modern Industries
- Latin America: all IC's are imported
- Negative trade balance
- Foreign dependency: requirement of export licences for local products with incorporated IC's
- Difficulties to import components for strategic programs like satellite development
- AUTONOMY

Brazil – a summary

- Brazil was active since the beginning:
  - 60's – Philco – diodes and transistors.
  - 70's – RCA/Philco, sold to SID microelectronics in the 80's.
  - Many back-end industries: Philips, TI, Fairchild, Itaucom
- 90's – opening of the borders and globalization
- 00's – Increasing trade balance deficit; economical studies performed by ministries and BNDES lead to:
  - Policy of incentives to attract investments and perform R&D in Brazil: Lei de informática, Lei do Bem (Inovation), PDP, PADIS, subvenção econômica, financiamentos BNDES

Semicon Industries in Brazil - 2010

- AEGIS – power devices
- SEMIKRON – power devices
- SMART – back-end for memories
- Hana Micron & Teikon = HT Micron – back-end for memories
- CROMATEK – back-end for LED's
- Tecnometal Energia Solar - photovoltaics
- FREESCALE – design center

2. IC-Brazil Program

1. Objectives
2. Organization
3. Training Centers
4. Design Houses
5. Examples of IC

2.1 Brazil-IC Program Start-up

- June 2005
- Launched by CATI/SEPIN/MCT
- Initiative of Academy, Government and Industry

2.1 IC-Brazil - Vision & Objectives

- To promote the development of an ecosystem in microelectronics in Brazil and the insertion of Brazil in the semiconductor market
    - Promote local IC companies
    - Attraction of international companies
        - E.g., Freescale – today 170 IC designers
        - SMART Modular – DRAM back-end fabrication
        - HT Micron
    - Promote electronics innovation: DTV, instrumentation, automation
- Synergy with other governmental incentives:
        - Informatics law
        - PADIS – new program for semiconductors and displays
        - Direct subsidy for R&D in-company (by FINEP agency and BNDES Bank)

2.1 Focus on IC Design

- Demand for new ICs:
    - Growing markets
    - New applications
    - Growing opportunity for Fabless (since 2006: > 20%)
- Fertile field for innovation
- Some Technical Challenges:
    - Growing complexity & functionality
    - Power consuption and heat removal
    - SoC and SIP
    - Growing parameter variability – redundancy and route auto-correction

2.2 IC-Brazil Organization

- Steering Committee
  - 3 sub-committees
    - Infrastructure
    - Education
    - Business
  - Meetings each 3 months
- Executive Office
  - Located at CTI, Campinas

2.2 IC-Brazil – Organization & Activities

- Support for design houses
- Support for fabrication:
  - Wafer fabrication
  - Packaging
  - Testing of IC´s
- IC design training program

2.3 IC-Design Training Centers

- CT1 – UFRGS, Porto Alegre – started on April 2008
- CT2 – CTI, Campinas – started on August 2008
- Format: Phases I, II e III – Non-degree
  - Phase I: teory and EAD tools – 5 months
  - Phase II: design assignment – 7 months
  - Phase III: internship at DH´s or companies – 12 months
- 370 designers in professional tools (Aug. 2010)
- 127 under training (Aug. 2010)

- Certification of Instructors by Software tool vendor
  - 10 Theory
  - 12 EDA Tools
- Support from 2 Toshiba specialists during 2010-2011
- Financial support: FINEP e CNPq
  - Current annual expenses CT1 e CT2: R$ 3,5 millions
  - Fellowships: Phase I/II + Phase III: R$ 5 to 6 millions

2.4 Design Houses

- Originally: 7 DH´s: CTPIM, CETENE, CESAR, CTI, WvB, LSITec, CEITEC .
- Call 59/2008: 11 DH´s

Type 1 - private		Type2 – non for profit	
DH	UF	DH	UF
Freescale	SP	Floripa DH	SC
Idea! S.E.	SP	DHBH	MG
Siliconreef	PE	DFchip	DF
ExcelChip S.E.	SP	NPCI	RJ
CM-Chipus M.E.S.E.E	SC	SMDH	RS
PortoChip	RS	TE@I²	PE

2.4 Design Housesin Brazil

- Total = 18
- 450 Designers
- Locations

2.4 Design Houses – numbers Dec. 2009

DH	Designers	Eng Becas	Industrial Chips	WIP Design	DH	Designers	Eng Becas	Proj. concluídos	WIP Design
CTPIM	11	1	2	3	TE@I²	6	0	0	5
CETENE	27	27	2	6	DFchip	12	9	0	2
CESAR	8	8	0	2	DHBH	6	5	0	5
CTI	52	46	2	8	NPCI	9	4	0	2
LSITec	35	35	4	6	Floripa DH	7	7	0	8
WvB	20	0	2	2	SMDH	7	6	0	3
CEITEC[1]	70	0	>12	?	*Siliconreef*	4	1	0	1
					Idea!S.E.	17	12	?	?
					ExcelChipS.E.	7	7	?	?
					CM-Chipus	5	5	?	?
					Freescale	160	30	?	?
TOTAL	**223**	**107**	**12+**	**27+**		**240**	**86**	**0+**	**26+**

2.4 Design Houses

- Financing:
  - Fellowships: CNPq
  - EDA: FINEP
- Wafer fabrication:
  - International Foundries
  - CEITEC – under set up
- Packaging:
  - International Services
  - CTI
- Test:
  - International Services
  - Packaging (3 companies) & Test (ATE) abroad

2.4 CEITEC – Wafer Fab & DH

Building 2 - 5.100 m2

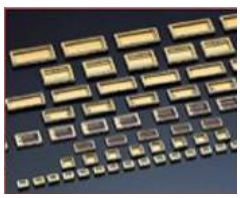
- Design Center; Marketing
- Process engineering
- Technological incubator
- Training Facilities

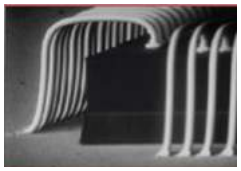
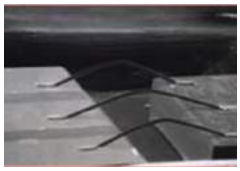
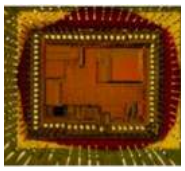
Building 1 - 9.600 m2

- 2.000 m2 Clean rooms: production and training (800 m2 class100)
- 4.000 wafers/month (200 a 15.000 chips/ wafers)

2.4 Packaging - CTI

- Small scale ceramic packaging – engineering phase of IC design
- Chip on Board (COB) technology for prototyping;
- Packaging of sensors and SAW devices
- Microsoldering of Al and Au wires
- Special dicing for different substrates:
  - Si, GaAs, Al2O3, LiNbO3, glass, quartz, circuit boards, etc.

2.4 Characterization and Failure Analysis

Teradyne MicroFlex tester


Logic analyzer-HP16500B


Wafer prober – Micromanipulator 6400


Optical Microscope


SEM w. EDX/WDS


FIB/SEM dual beam (@ CCS-UNICAMP)

2.4. Reliability and Certification


Climatic chamber – Vötsch 7033


Thermal cycling chamber Vötsch 7012


Burn-in

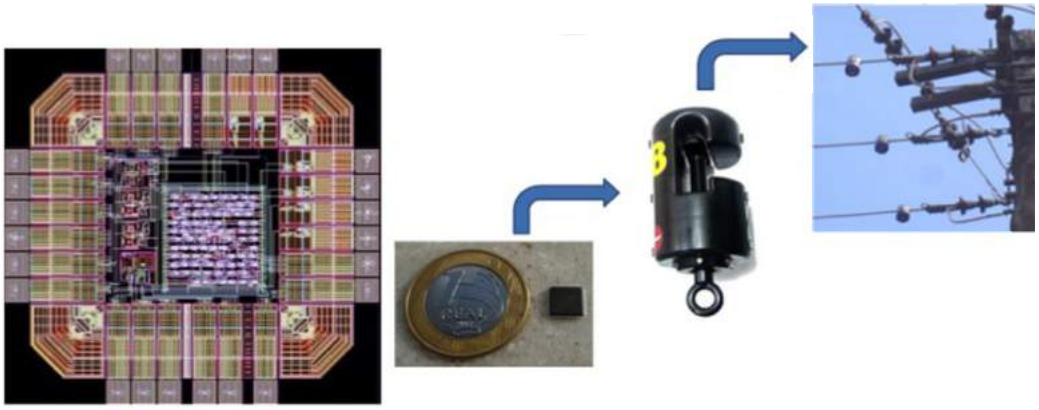
2.5 Some Examples of IC's

2.5 DH´s - Examples of IC's - CETENE

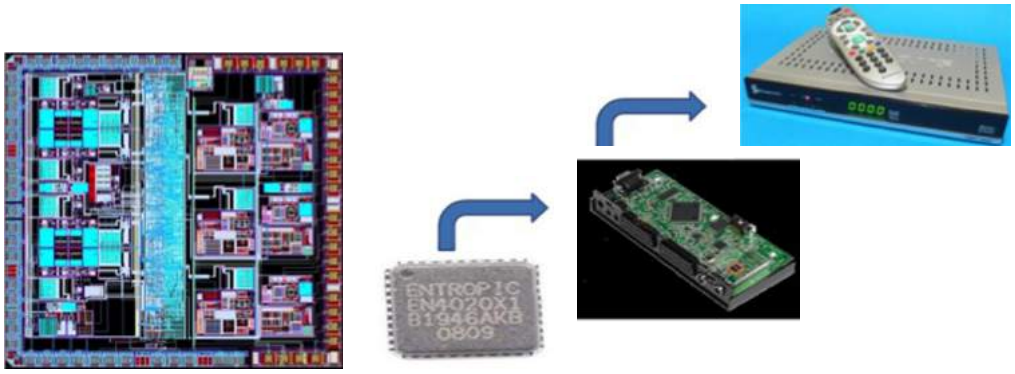
- Modulators for Digital TV: DVB-C and DVBS2 in FPGA
- Tec-Sys
- Other IC's:
  - decodifier MPEG4
  - decodifier MP3
  - microprocessor 8051
- Control circuit for public illumination in FPGA
- FINEP/Sebrae

2.5 DH´s - Examples of IC's - LSITec

1. Failure detector/signalizer on high-voltage transmission lines
- CPFL



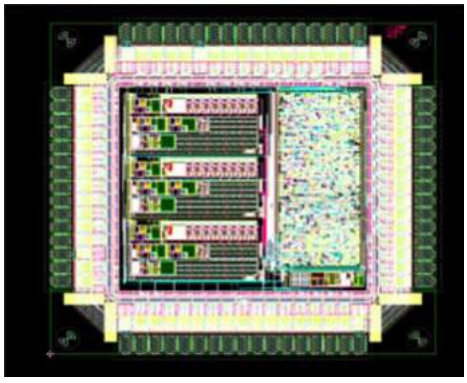
2 Failure detector/signalizer on high-voltage transmission lines
- CPFL

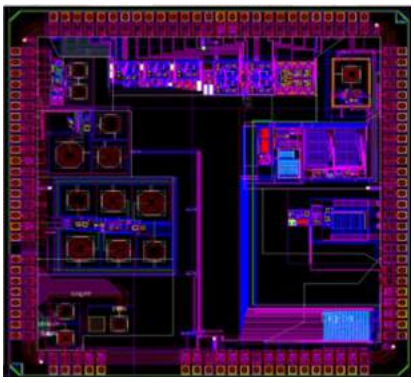


3. Digital and analog industrial instrumentation and communication protocols
- Treetech

2.5 DH´s - Examples of IC's - CTI

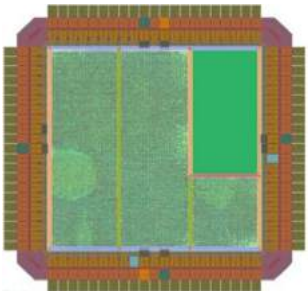
- Magnetic card interface for commercial and bank automation
- CIS Eletrônica
- Chip set for wireless telephone
- Intelbrás



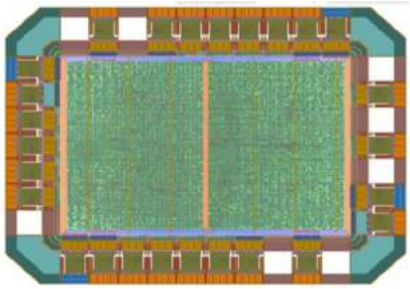


2.5 DH´s - Examples of IC's - CPWvB

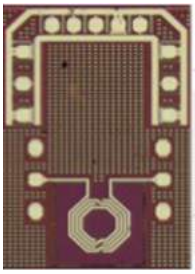
- 8 bit microcontroller based on Z80 for analog TV applications
- Semp-Toshiba



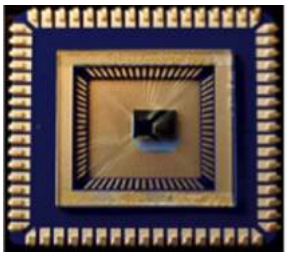
- Cryptographic core forAES128 algorithm
- Semp-Toshiba



- RF data receiver
- RFID

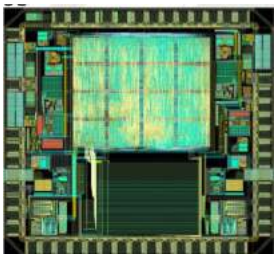


- Microprocessor, designed by 20 engineers during 6 month training at Toshiba, Japan



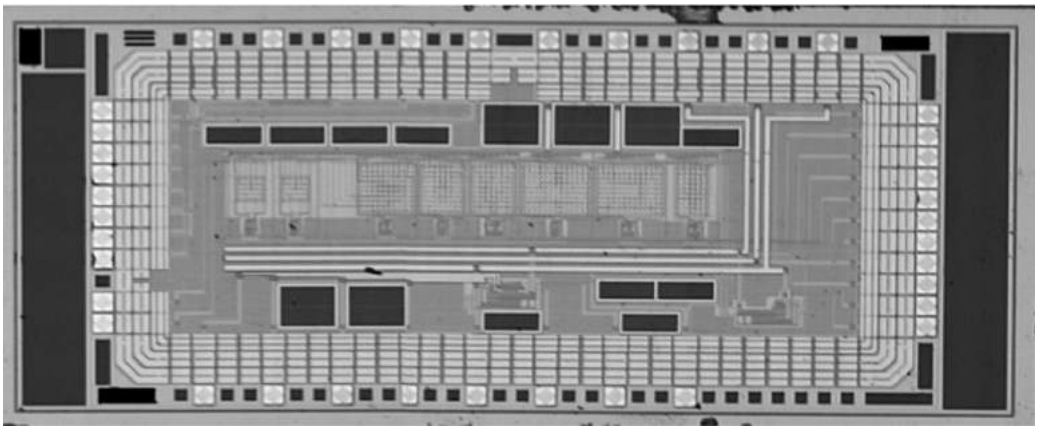
2.5 DH´s – Examples of IC's - SMDH – Santa Maria Design House

- ZR16: Microcontroller (MCU), contains processor, memory and I/O functions, analog conversion voltage, internal oscillator and EEPROM and RAM memories.
- Exatron
- Proprietary architectures: EEPROM, Timer and watchdog, Flexible supply voltage, A/D converter, by chipus



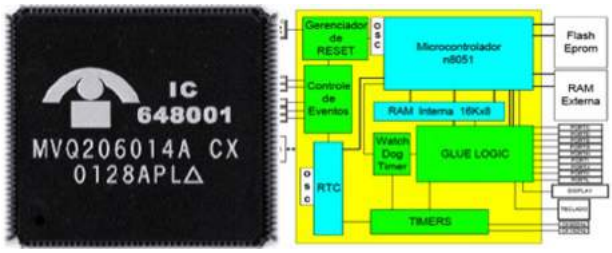
2.5 DH´s - Examples of IC's – NPCI

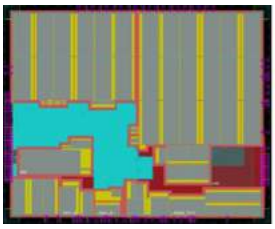
- Filtering stage for a cavitation system at large electricity generators



2.5 DH´s - Examples of IC's – IDEA!

- SoC for public telephone, containing:
  - microprocessor 8051
  - Real Timer Clock
  - Internal RAM memories
- Icatel
- DVB-S2 modulator for digital TV satellite transmitters
- Collaboration with CETENE
- Tecsys do Brasil
- ID-DTV01 demodulator for Brazilian digital TV receptor
- Contains tuner, ADC, demodulator and USB
- Collaboration with Instituto Eldorado
- Cost reduction of 50% compared to competition
- 65 nm technology





3. Related Activities

1. University Programs
2. NAMITEC Research Network

3.2 University Programs

- Programs and annual budgets:
  - Brazil-IP: fellowships, expenses and investment: R$ 1,4 M
  - PNM National Microelectronics Program: M.Sc & PhD felloships: R$ 830 K
  - EDA: R$ 1,000 K (36 Univ. & Colleges of Engineering)

Microfabrication Course at UNICAMP for undergraduate and graduate students

- MOS Technology
- Hands on practice.
- 3 times/year (80 h)
- 15 students/class
- Partial support from NAMITEC and EDS/IEEE
- Over 400 students during 11 years

Students, Calderon and Ortiz with Prof. Diniz (right), coordinator of the course

28 IEEE Electron Devices Society Newsletter ❍ July 2010

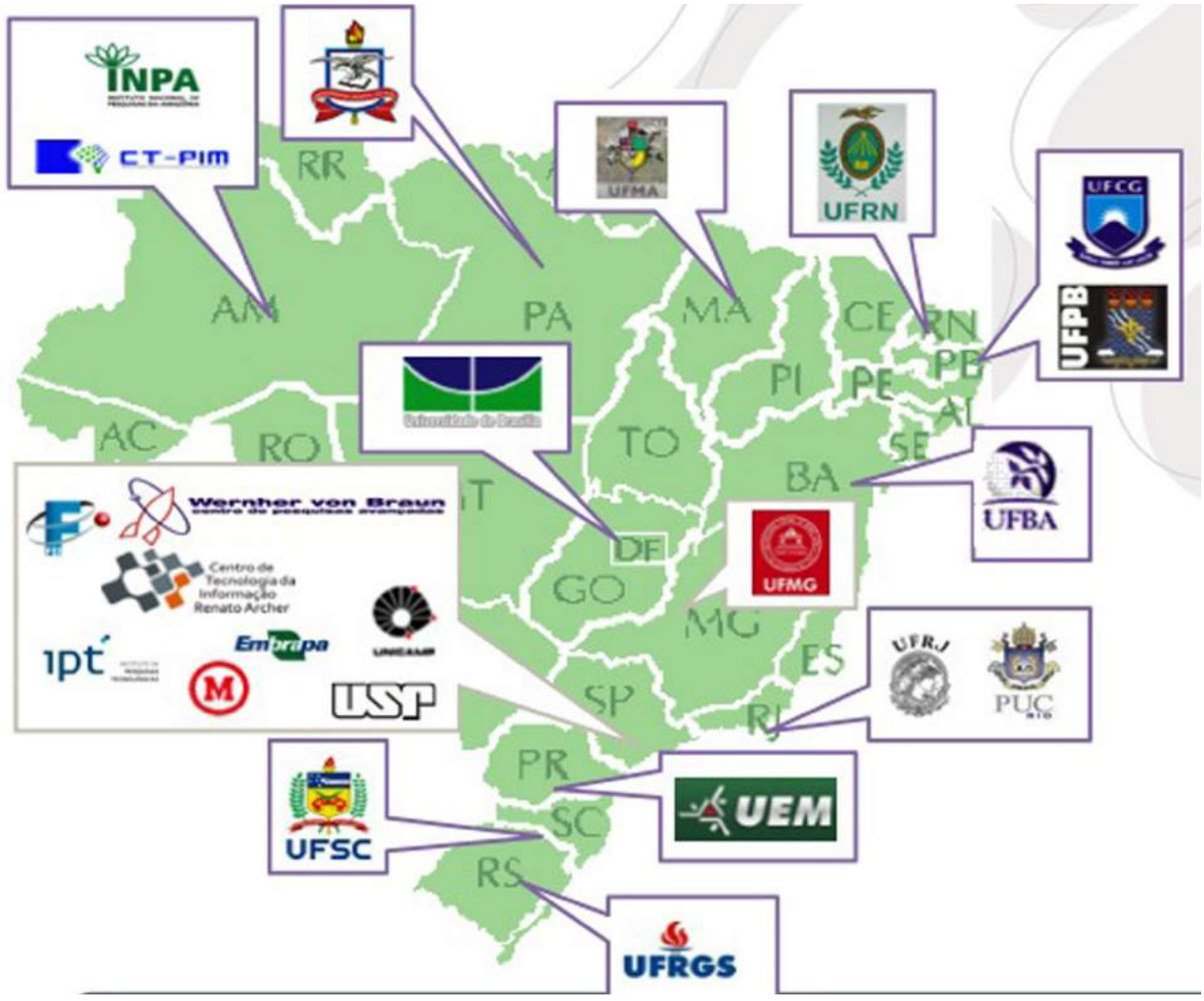
3.3

inct
institutos nacionais
de ciência e tecnologia

- Program of CNPq/MCT with partnership of FAP´s, CAPES, BNDES, Petrobras, MS, MEC
- 122 projects
- R$ 605 millions (3 years)
- Period: 2009 a 2014

INCT NAMITECMicro and Nanoelectronics Systems

- Members:
- 136 researchers
- 23 institutions
- 13 states
- Financial support:
- CNPq + FAPESP + CAPES
- R$ 7.197.327,57 + 431.839,65 = 7.629.167,22 (3 years)



NAMITEC is anInterdisciplinary Network

- EE Dept's: 13
- Informatics/Computer Dept's: 3
- Physics Dept's: 3
- Chemistry Dept's: 1
- Agriculture: Embrapa
- Biologia/ecologia INPA
- General R&D Institutes: IPT, CCS, CTI, CT-PIM, VonBrauwn

4. Summary

1. Microfabrication/electronics is a key element for innovation
2. Development of the area, specially in emerging economies, needs government support.
3. Good engineers are essential, specially IC designers with professional skills.
4. IC-Brazil program (training and DH's), University Programs and NAMITEC Research network are part of the effort.

ACKNOWLEDGMENTS

BNDES O BANCO DO DESENVOLVIMENTO DE TODOS OS BRASILEIROS

FINEP FINANCIADORA DE ESTUDOS E PROJETOS MINISTÉRIO DA CIÊNCIA E TECNOLOGIA

CNPq Conselho Nacional de Desenvolvimento Científico e Tecnológico

bampi@inf.ufrgs.br
jacobus@fee.unicamp.br

www.ci-brasil.gov.br
namitec.cti.gov.br

Development of Human Resources Development for the Electronics Industry in Latin America

Moshe Kam
29 March 2012
Philadelphia, PA

- 2011 President and CEO, IEEE;
- Department Head of Electrical and Computer Engineering, Drexel University

Purpose of this talk

- Provide a quick general overview of the Electronics Industry worldwide
- Discuss the development of human resources for developing this industry in Latin America
    - Especially Uruguay

Why is this even an idea to ponder?

- Because Uruguay once had a thriving electronics industry
- Because the Electronics Industry has the potential to provide significant added value and diversify the Uruguayan economy
- Because the success of the software industry in Uruguay has shown that “it can be done”
- Because there are examples of niche markets where Uruguay is playing a role in the electronics industry
    - Namely – pacemakers and other implantable medical devices (CCC del Uruguay)

The Electronics Industry

International trade in the electronics sector

- The global electronics market has been estimated at $2 trillion each year
- Semiconductors alone account for $275 billion revenue worldwide, with annual growth forecast of between 6 per cent and 8 per cent

- Given the manufacturing strength of Japan, Korea, China and the US, these countries offer the greatest opportunities for trade

Major electronics industry corporations in Japan

Sony, Pentax, Casio, Citizen Watches, Hitachi, Mitsubishi Electric, Panasonic, Roland, Sharp, Canon, Epson, Yamaha, Sanyo, Fujitsu, Korg, Fujifilm, JVC Kenwood Inc, Toshiba, Pioneer, Nikon, TDK, Nintendo, Olympus, Star Micronics Co., Ltd

Value of the Electronic Industry in selected countries (USD)

- China (mainland): 475 billion
- China (Taiwan): 300 billion
- Japan 220 billion
- UK: 100 billion
- India: 11 billion
    - The following now manufacture in India: Siemens, Texas Instruments, Matsushita, Alcatel, LG, Samsung, Sharp and Lenovo

Main Subgroups

- Machinery components, e.g., microprocessors
- Cloud computing Support
- Telecommunications equipment
- Consumer electronics
- Medical equipment
- Instrumentation
- Process control
- Optical and photographic equipment
- Electronic systems design
- Photonics
    - optical technologies, lasers and laser processing equipment and lighting

Value of the Electronic Industry in selected countries (USD)

- Conceptualization and testing of new ideas and new products
    - Including market analysis
- High level design
    - Block diagrams, operation concepts
- Prototype-level design
    - Including additional market analysis and consumer receptivity testing
- Design for manufacturing
- Manufacturing

Some Characteristics of the Electronics Industry (1)

- Very adaptable; serves a very large spectrum of old and new products
    - From refrigerators to iPads

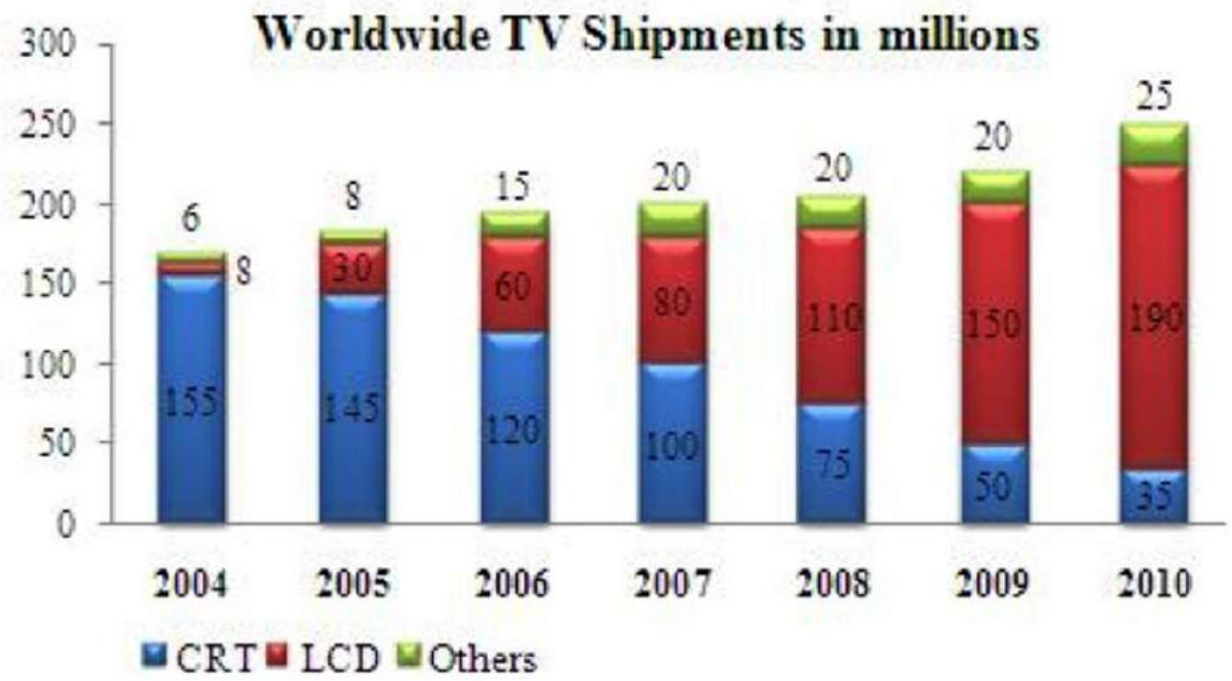
- Capable of shifting focus: example – the computer systems industry
  - 1950-1980: high-end enterprise-class hardware
    - Cray, IBM mainframes
  - 1980-2010: personal computing
  - Now: consumer electronics (smartphones, tablets and game consoles); data centers

Main Subgroups

- Capable of shifting focus…
  - Only 7 years ago (2004) the main driver of the Korean electronics industry was believed to be a combination of a VCR and a DVD player
    - Where are these technologies today?
    - Where is the Korean electronics industry today?

- A wide variety of consumers and types of products
  - Smartphones: a communication, computing and networking devices that allow
  - multimedia access, entertainment, multi-mode communication and computing
  - Cell phones: cheap, yet powerful electronic devices that drive the leading edge of technology
  - Avionics: expensive electronic devices that are based on old, previous-generation technology

Main Subgroups



Quick Changes: past success is no guarantee for future results

JANUARY 19, 2012, 1:12 AM LEGAL/REGULATORY | RESTRUCTURING/BANKRUPTCY

Eastman Kodak Files for Bankruptcy

BY MICHAEL J. DE LA MERCED

Eastman Kodak, the 131-year-old film pioneer that has been struggling for years to adapt to an increasingly digital world, filed for bankruptcy protection early on

Increased Emphasis on Intellectual Property and Patents

- Increasingly it has become important to companies to own patents in their fields of development
  - To use or to block others from using…
- We observe large purchases of corporations because of their patent portfolios
  - And the emergence of “patent trolls”
- Example: in August 2011 Google paid $12.5 billion for Motorola’s U.S. Smartphone business and its 17,000 patents.
  - “This is $12.5 billion that one of America’s most creative companies will not use to innovate, fund research or hire anyone beside patent lawyers.

Samsung sues Apple over patents in SKorea

Associated Press – Wed, Mar 7, 2012

SEOUL, South Korea (AP) — Samsung Electronics Co. says it has filed a second patent lawsuit against Apple Inc. in South Korea, alleging infringement of tablet and smartphone technology.

Samsung said Thursday that the lawsuit filed earlier this week in Seoul alleges that Apple's iPhone 4S and iPad 2 infringe three of Samsung's patents.

Samsung's lawsuit comes as Apple unveils its new iPad in the United States this week.

The technology giants are engaged in a legal battle in many countries. Apple sued Samsung in the United States in April last year and Samsung sued Apple in South Korea in the same month.

Apple claims Samsung's Galaxy tablets and smartphones "slavishly" copied its iPhone and iPad models.

7 Reasons the Samsung Galaxy Tab 10.1 is Being Sued by Apple

Posted by Emily on August 20, 2011 in Apple, Samsung, Tablets

In Germany, a Judge recently invoked a ban on sales of all **Samsung Galaxy Tab 10.1** tablets in the EU until he could investigate the technological law-breaking claims made by lawsuit-happy Apple.

They claim that Samsung made their 10.1 inch Galaxy Tab Android tablet to intentionally look like the iPad 2, thus violating their Community Design rights. Community Design delivers a "monopoly right for the appearance of the whole or part of a product resulting from the features of, in particular, the lines, contours, colours, shape, texture and materials of the product or its ornamentation." If Samsung's **Galaxy Tab 10.1** is more than just coincidentally similar to the iPad 2, that is a case for the courts to decide.

The current trend: Tablets, tablets everywhere

- Apple's iPad has spawned a host of challengers
  - Currently the Apple iPad rules the market
  - Motorola's Xoom, which is one of the first built on Google's new Android 3.0 Honeycomb platform, which has been specifically designed for tablet-style computers.
  - Toshiba, Lenovo and a host of other firms also work on new tablets.
  - The number of tablets bought in America will soar from an estimated 10m units this year to 35m by 2012, with Apple still dominating the field by then.

Main Subgroups

- Smartphones
- Dedicated e-readers
- Mobile Navigation Systems

Yet Additional Areas of Expansion

- Home and remote healthcare
  - electronics can be deployed to track the health of the population
- Flexible electronics
  - flexible display, flexible solar cell, printed RFID, flexible lighting
  - 1500 research groups are at work…
- Power electronics and photo-voltaics
- Polymer electronics
- Quantum dot displays
- RFID-related technologies

Intel's telemedicine unit

Data Centers

Human Resources

International trade in the electronics sector

- Success of the electronics industry goes hand in hand with strong academic institutions
  - Especially in countries that focus on R&D
- Increase in R&D induces a higher growth rate of the industry
  - this impact is particularly high for small firms

How Others Have Done that

- Silicon Valley in California was created and fueled by Academic institutions
  - Most notably Stanford and Berkeley
- The electronics industry of Korea owes much of its foundation to KAIST
- In Taiwan - Industrial Technology Research Institute of Taiwan
- In Israel – the Technion, Tel Aviv University, Ben Gurion University and the Hebrew University

In New York City…

Cornell Alumnus Is Behind $350 Million Gift to Build Science School in City

Ruth Fremson/The New York Times

Mayor Michael R. Bloomberg said Monday that Cornell University had been chosen to build a high-tech graduate school. The school will be operated with Technion-Israel Institute of Technology.

By RICHARD PÉREZ-PEÑA
Published: December 19, 2011

In Campinas, Brazil…

“Brazilian Silicon Valley”

- It is a modern city, located near a giant metropolis, São Paulo
- It has a vibrant, high-tech university and research environment
- A number of high-tech, non-pollutant electrical and electronics industries have settled around Campinas
- Several industrial parks and incubators for high tech companies in the fields of microelectronics, computers, software, and telecommunications have developed there.

High Tech Industry in Campinas

- IBM
- Lucent
- Samsung
- Nortel
- Compaq
- Motorola
- Dell
- Fairchild Semiconductor
- Huawei
- 3M
- Texas Instruments
- Celestica
- Solectron
- Bosch

Educational Institutions in Campinas

- University of Campinas (UNICAMP)
- the Pontificial Catholic University of Campinas (PUCCAMP)
- the UNISAL (Centro Universitário Salesiano de São Paulo)
- the Center for Research and Development in Telecommunications (CPqD)
- the National Laboratory of Synchrotron Light
- the Renato Archer Research Institute (CenPRA)
- the Brazilian Company of Agricultural Research (EMBRAPA)
- the Agronomical Institute of Campinas
- the Biological Institute, the Food Technology Institute
- the Eldorado Institute
- the Werner von Braun Institute and several others.

- Campinas boasts a researcher/population ratio equal to those of the most advanced technology centers

Determination of R&D Location

- At the regional level:
  - R&D wage difference
  - Knowledge infrastructure difference between home and host countries
  - The science and engineering talent pool size
  - Political risk level of host countries
- At the firm level:
  - Experience of overseas R&D projects
  - Prior experience of research in the host country

Human Resources

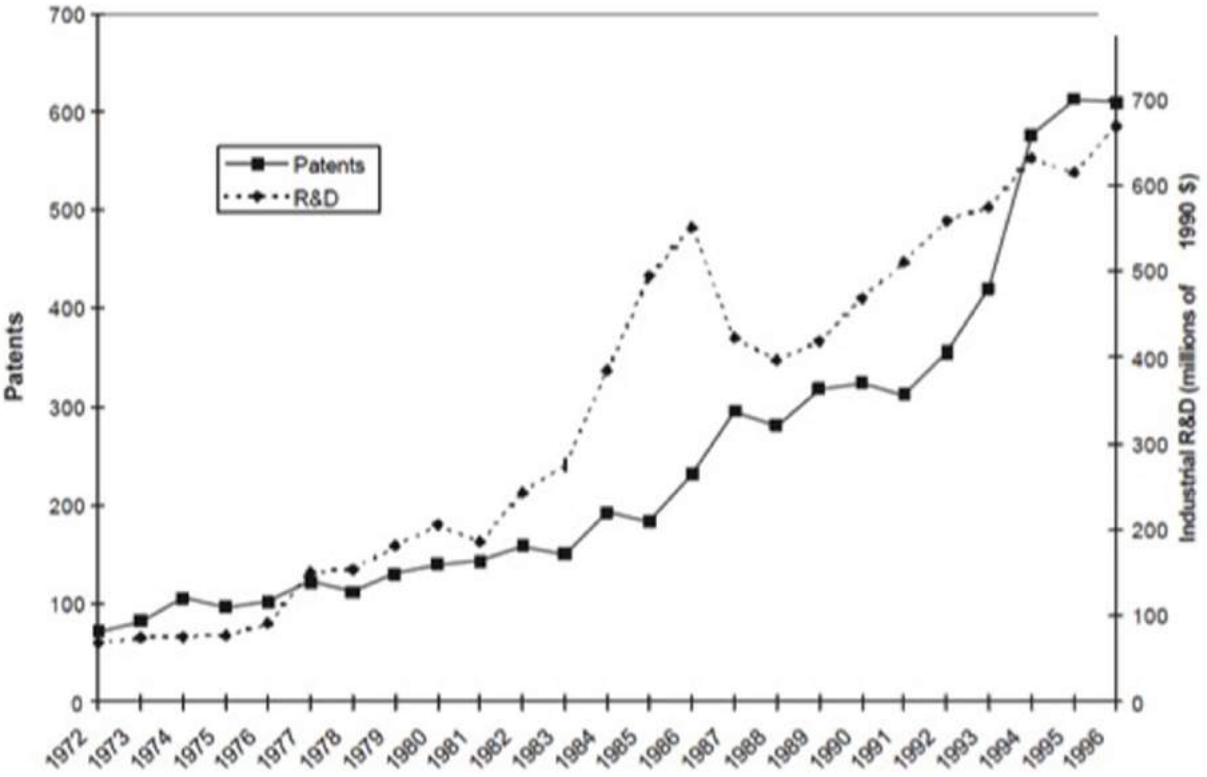
Inventions from Israel (at least to large extent)

- The cell phone
  - commercialized by Motorola, with its largest R&D center being in Israel
- Most of the Windows NT operating system
- Voice mail technology
- VOIP technology
- Many video, image and audio compression techniques – for example the technology used in GIF and PNG
- Instant messaging (ICQ)
- Firewall security software
- Intel wireless computer chips
- [Numerous medicines]
- Miniature video camera capsules to examine internal organs

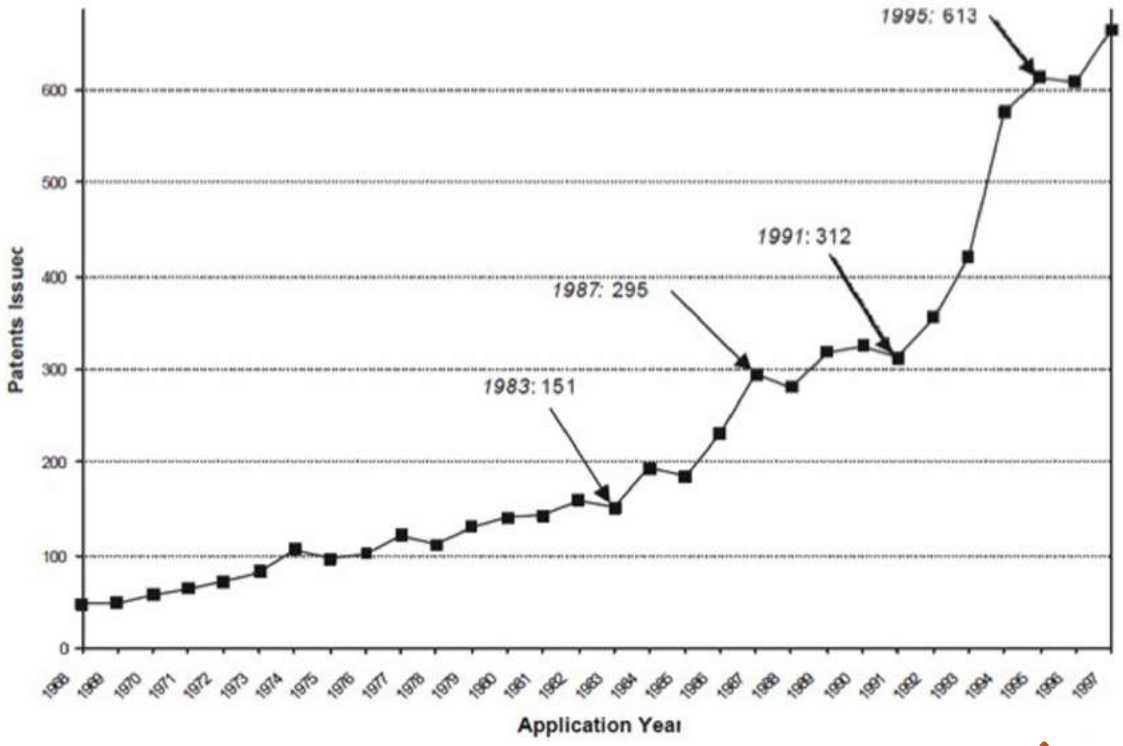
Inventions from Israel (at least to large extent)

- More Israeli patents are registered in the US than from Russia, India, and China combined
  - despite the enormous population disadvantage
    - about 7 million in Israel vs. 2.5 billion combined in the other 3

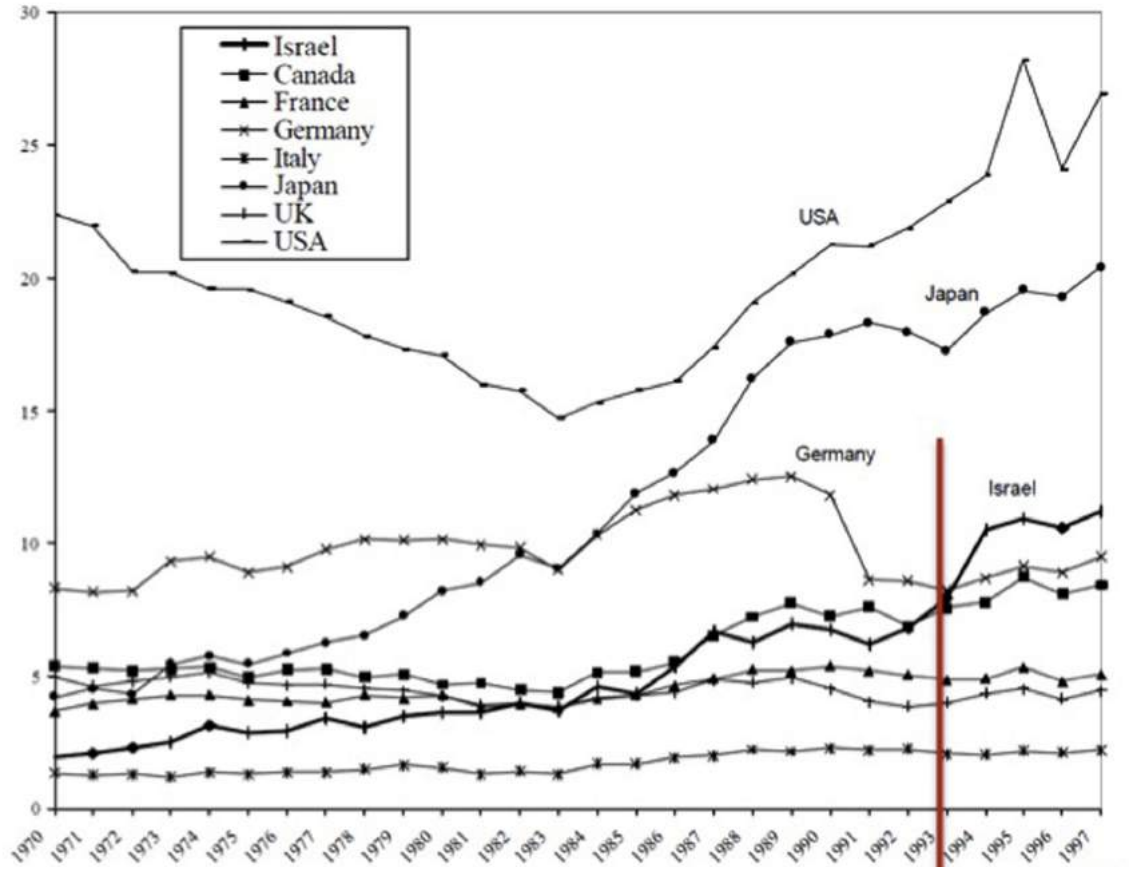
Israeli Patent and Industrial R&D



Israeli Patents in the US



Patents per Capita: Israel vs. the G7



Patents per Capita: Israel vs. the G7

- "Magnet," a program to encourage pre-competitive generic research conducted by consortia
- A program of technological incubators
- Various programs involving bilateral and multilateral international R&D collaborations

Lessons for Uruguay

The Key Lessons (1)

- The electronics industry is a multibillion dollar wealth generator
- It has a lot of potential added value
  - Uruguay lives at present of exporting commodities
- "Don´t reinvent the wheel" - look into success cases like Taiwan, Korea and Israel, and try to adapt the relevant elements to the local scenario
- The best time to embark on new directions is when the economy is doing relatively well

The Key Lessons (2)

- Create good graduate-level academic programs and associate with schools abroad to generate local skills
  - Joint Ph.D. programs may be the leading way
- Include a strong entrepreneurship component in engineering and science degree programs
  - Patents are part of the process!
- Get international commercial skills from successful Business schools
  - Can we convince a major business school to use the Electronics Industry in Uruguay as a test case?

The Key Lessons (3)

- Look for associations with multinational companies to be part of an added value supply chain, thus generating local know-how and spin-offs.

Call for Action – create the Uruguayan hi-tech student consortium

- Identify students from Uruguay who are in graduate school (worldwide)
  - Electrical engineering, Computer Engineering, Biomedical Engineering, Computer Science, Materials Engineering, Physics, Business
- [Identify Uruguayan researchers in leading universities]
- Get them together in Montevideo when they are likely to be in Uruguay
- Create an action committee of these students/ future technology leaders – make them part of the effort

Call for Action – create the intellectual brain power

- Identify high-quality programs outside Uruguay which educate many Uruguayan students in High-Tech and life sciences areas
- Develop agreements with them – on student and faculty exchanges, recruiting, student support and mutual development agreements
- Develop program for funding Uruguayan student graduate education abroad, in exchange of commitment to serve the country after graduation

K&L GATES

Development of Technology Companies in Emerging Countries: Possible Strategies

Ministerio de Industria, Energía y Minería and IEEE
Montevideo, March 29, 2012

David Frazee, Partner
K&L Gates LLP
Silicon Valley Office
630 Hansen Way
Palo Alto, California 94304 USA
Direct: +1 (650) 798-6771
Email: david.frazee@klgates.com

Keys to Success

- Talent
- Capital
- Markets
- Entrepreneurial ecosystem
    - Critical mass and multi-generations of mentors and experience
    - Professionals, middle management, thought leaders
    - Universities
    - Spirit of entrepreneurship and culture of risk/failure
- Government policy
    - Technology protection
    - Technology transfer
    - Tax, trade, contracts, grants, and investment stimulation

Issues in Emerging Countries

- First generation problem
    - Brain drain and returnees, lack of middle level management
    - Multinational mentoring
- Insufficient venture capital
    - Insufficient amounts, poor terms, inexperience of investors
    - Investors often do more damage
- Skewing of development and talent
    - Low capital and time intensive development favored
    - Higher skill and capital intensive development rarely occurs
- Lack of government support
    - Related issue: ill-conceived programs, such as poorly designed direct grant
    - programs or incubators
    - Most advisors lack real experience
- Lack of intellectual property and global sophistication

Best Practices

- Focus on a few areas of national importance
    - Some competitive advantage or significance
    - Significant investment, from education to R&D to tax and trade policies and investment decisions
    - If target areas are of high value, potential for spinoffs is huge
- Jump start technology economy
    - Attract multinational technology companies for high value work
    - Attract returnees to start new and innovative businesses
    - Attract best advisors and professionals with practical experience
- Improve local talent pool
    - Get best students to want to study subjects and stay in country

    - Professionals
    - ManagementAttract best funds and investors
    - Matching funds and loans, tax policy and credits
    - Presence in Silicon Valley and relevant regions
    - Opportunity to be regional hub
- Help develop markets
    - Government purchasing
    - Government grants (with performance)
    - Trade assistance and work with nations with relevant markets and technology
- Make universities meaningful partners
- Stimulate creation of valuable intellectual property

Improving the Typical Solutions

- “Naked” incubators and tech parks
    - Real estate does not make entrepreneurs
    - Can work if coupled with best practices, training, support, networks, mentoring, advisors, capital, etc.
    - If combined with vibrant ecosystem, can help create critical mass
- Indiscriminate funding
    - Entrepreneurs and companies are made, not born
    - Real value comes building real businesses and creating or exploiting real markets (products, engineers, revenues, margins, profits)
    - Requires discipline, focus, relentless drive
- University technology transfer by itself
    - Need to create and protect good IP to begin with
    - And strive to maximize value of the asset to society

Questions?

Please contact me at:

David Frazee, Partner
K&L Gates LLP
Silicon Valley Office
630 Hansen Way
Palo Alto, California 94304 USA
Direct: +1 (650) 619-1631
Email: david.frazee@klgates.com