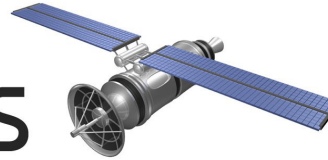


# FutureHorizons

The Global Semiconductor Industry Analysts



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## **Business Credentials**

**Providing**

- **Industry Analysis**
- **Market Size & Trends**
- **R&D & Manufacturing**
- **Technology/Product Appraisal**
- **Investment Due Diligence**

**For**

**Business & Market Developers**

**IP Creators & Purchasers**

**Financiers & Investors**

**Public Authorities & Investigators**

# Introduction

**Five Decades Of Semiconductor  
& Electronics Industry Experience ...**

***“From The First Commercial IC To SoC Integration”***

**No Other Analyst Has The Depth Of Experience**

**Future Horizons** are a global semiconductor industry analyst. It is also widely recognised as a world authority on the Former USSR and East European electronics markets. Its founder, Malcolm Penn, a 48-year industry veteran, heads the company. Other key researchers include Russian-based analyst Sergey Orlov and CTO Mike Bryant, a highly experienced chip and systems designer.

**Let Future Horizons Save *You* Time & Money**

## Future Horizons

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**Business Credentials**

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**RELEVANT EXPERIENCE (NON-EXHAUSTIVE)**

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**Key Research Staff****Malcolm Penn, Chairman & Chief Executive Officer**

Malcolm Penn is the Chairman and founder of Future Horizons, the global semiconductor industry analysts. He is also the President of Future Horizons' Moscow-based subsidiary firm, East-West Electronics, the world's top market research consultant on the Russian and East European electronics industry. Established in April 1989, Future Horizons provides business support services for use in opportunity analysis, business planning, and new market development in the semiconductor and related industries. Its areas of activity include market research reports, custom consulting, industry forums and seminars, IC and system design evaluation, and industry training.

Mr Penn has over 48 years experience in the electronics industry, and for most of that time has worked extensively throughout Europe as well as in the United States, the former USSR, Japan and Korea. Future Horizons was also a member of the 1994 European Commission sponsored Cornu Panel of senior industry executives responsible for publishing the "Report of the European Microelectronics Panel" used to help formulate the strategy for EC microelectronics support in Europe and the formation of MEDEA.

His industrial experience has involved him with all aspects of the management, manufacturing, marketing and use of electronic components, particularly semiconductor devices. His previous responsibilities included the management of semiconductor operations, export sales, sales forecasting, budgeting, market intelligence and data gathering, competitive analysis, new product planning, promotion and marketing of semiconductor components, and the design and development of digital electronic instrumentation.

Prior to establishing Future Horizons, Malcolm was Vice President of Dataquest and Director of Dataquest's European Operations, responsible for establishing all Dataquest's European-based research operations. Before joining Dataquest, he was Manager of Component Engineering for ITT Europe (now Alcatel), and prior to that, held various operations and marketing management positions with the worldwide ITT Semiconductor group.

**Mike Bryant – Chief Technology Officer**

Mike Bryant is Future Horizons' Chief Technology Officer. He is an experienced rf and analogue/mixed signal IC design engineer, specialist in providing IC design and consultancy services on hardware and systems design partitioning, software and digital signal processing design methodology and implementation. He has extensive experience in the use of power discrete devices in highly integrated OEM system designs.

Upon graduation in 1977, Mr Bryant joined Hewlett Packard's Queensferry Telecommunications Division in Scotland. He worked there for ten years on a variety of audio and PCM (Pulse Code Modulation) telecommunication test equipment, and also on large-scale system performance monitoring software. Successful projects at Hewlett Packard included the HP3779 PCM Terminal Analyser, the HP3776 PCM Terminal Test Set, and the HP4947 Transmission Impairments Measuring Set.

He joined Fujitsu Microelectronics in January 1988 and managed the growth of the Communications VLSI R&D laboratory based in Manchester, England. Recognising the convergence of many software and digital hardware design techniques, this was one of the first places in Europe to use HDLs (Hardware Definition Languages) and logic synthesis exclusively for all logic design. This permitted many software design methodologies to be used to improve design efficiency, and also gave better design flexibility in the design of ICs using both specialised hardware and on-chip firmware to meet design requirements. Projects here included both analogue and digital VLSI ICs for various ISDN terminals, voice data compression equipment, X.25 and frame relay controllers and telecommunications system switching control equipment.

Mike then joined Westell Europe as head of Systems Engineering, based in Cambridge, England. Westell was the first company to develop ADSL and HDSL modems for the provision of high-speed data access using existing telephone lines. Working in conjunction with the Copper Access group at BT, the Westell Supervision Broadband Access Platform was specified under Mike's supervision, and designed in Europe to meet their requirements. This is based upon a high performance ATM switching core, a variety of ATM network interface cards, controlled by a SNMP based management system. This type of product has since become known as a DSLAM (Digital Subscriber

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## Business Credentials

### RELEVANT EXPERIENCE (NON-EXHAUSTIVE)

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Line Access Multiplexor). Similar products exist for other access technologies such as wireless, optical or cable.

In addition to Mike's extensive experience in the communications-related industries, other experience includes Soundcraft Electronics (part of the Harman Audio group of companies), one of the world's leading manufacturers of professional audio mixing equipment for live, broadcast and recording use, to head their R&D development team of 35 people. The consoles used advanced digital technology, including high speed 24 bit A-D and D-A converters to transfer analogue signals to and from the analogue domain, all other signal processing being undertaken by banks of the high-performance DSP chips. A selection of Ethernet, ATM, USB, Firewire, Bluetooth, ADAT and TDIF interfaces allowed internal and external networking to other equipment.

#### Sergey Orlov - Executive Director, East-West Electronics

Based in Moscow, Russia, Sergey Orlov is Executive Director of East-West Electronics, a wholly-owned subsidiary of Future Horizons; a position he has held since the establishment of East-West Electronics in August 1991. Prior to joining the Future Horizons organisation full time, Mr Orlov was project manager for AmSovInvest, a Russian/American joint venture specialising in new business opportunities between Russian and western firms, in the position of Future Horizons account manager. AmSovInvest represented a change of career direction, from medicine, where he was a fully qualified doctor, to electronics, driven by his personal interest and hobby in computers and software and the new opportunities opened up by perestroika. Mr Orlov is fluent in Russian (his native tongue) and English.

### Multi-Client Reports

Future Horizons publishes a range of multi-client, market research reports, covering various aspects of the European and worldwide semiconductor and electronics industry. Due to the fast-changing nature of the information published, reports are researched and updated on an annual basis. Key current reports include:

- Global Semiconductor Monthly Report (12 issues p/a)
- Annual Semiconductor Report
- Semiconductor Application Markets Report
- European Fabless Semiconductor Report (Optional Database)
- Penn On Paper Newsletter (12 Issues p/a)
- East European Report Newsletter (12 Issues p/a)

### Consulting Projects

Pursuant to the successful execution of this assignment, Future Horizons has a proven track record of significant industry and consulting experience directly related to this assignment, including, but not limited to, in reverse chronological order:

**Long-Term Market Prospects For The Fab-Lite Business Model.** An analysis of the potential competitive advantages and disadvantages of adopting a fab-lite IDM business strategy. (Client Confidential - August-October 2009)

**Anti-Competitive Analysis of the Proposed NEC-Renesas Merger.** A commercial, market and technical appraisal of the potential anti-competitive aspects of the proposed Renesas-NEC merger. (Client Confidential - July-September 2009)

**EDA Deep Sub-Micron Statistical Modelling Tools.** A due diligence report on the market opportunity for a proposed start-up venture to be spun out from a UK University. The Report focuses on the key commercial

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assumptions for the business in terms of product, price and available market potential with a view to assessing the start-up business model is viability. (Client Confidential - March 2009)

**Silicon Oscillators.** A top-level domestic and export business opportunity and technology analysis for a novel new technology for silicon oscillators/resonators. (Client Confidential - January 2009)

**Embedded Die.** A technology and business opportunity report for a novel new packaging technology for embedding die and other components inside a PCB. (Imbera Electronics - June 2008)

**RF IC Testing.** A technology and business opportunity analysis for a novel new technique for testing rf ICs in the mobile wireless and networking markets. (ATTEDA - March 2008)

**Machine Vision LED Lighting Controller.** A market opportunity analysis for a novel range machine vision LED lighting controllers in the semiconductor and associated equipment industries. (Gardasoft - September 2007)

**Freescale Semiconductor.** A company analysis of its product and market share positioning together with a SWOT analysis and restructuring recommendation. (Permira - April 2007)

**High Volume European 200mm Wafer Foundry.** A business and market opportunity study for a proposed new European-based 200mm semiconductor wafer foundry. (Client Confidential - April 2007)

**European R&D Report.** A description of the various European and individual country R&D initiatives in the field of microelectronics (including MEMS) and nanotechnology together with a review of their current status, objectives and progress. (SIRIJ - March 2007)

**European R&D Initiatives.** An overview of the various European and country R&D initiatives in the field of microelectronics and nanotechnology. (Client Confidential - March 2007)

**Freescale Semiconductor.** A company analysis of its products, markets, technology and applications. (Permira - October 2006)

**Flash Memory.** An overview of the worldwide Flash memory market (Permira - October 2006)

**East European Scenario Analysis.** An overview an opportunity analysis on design innovation and opportunities in the East European microelectronics industry. (Cadence - June 2006)

**Philips Semiconductor.** A company analysis of its products, markets, technology and applications. (Permira - May 2006)

**Automotive Semiconductor Industry Trends.** A market opportunity analysis of the key automotive semiconductor industry issues and trends. (Fujitsu Microelectronics - May 2006)

**EDA Industry Trends.** A market opportunity analysis of the key semiconductor industry issues and trends, and their likely impact on the EDA market. (Mentor Graphics - January 2006)

**Semiconductor Application Markets.** A market study of the key semiconductor application markets and the likely investment opportunities for the semiconductor VC industry. (Client Confidential - October 2005)

**Advanced Concepts For SoC.** A business and market opportunity study for a proposed new fables semiconductor start-up. (Client Confidential - August 2005)

**Market Analysis For Thinned Semiconductor Wafers.** A market opportunity analysis and key industry trends for thinned semiconductor wafers. (Asyntis - June 2005)

**Analogue IC Test Methodology Technology Audit & Market Opportunity Analysis.** A technology audit and market analysis of the potential business and customer opportunities in the analogue and mixed-signal microelectronics systems and SoC IC test market. (Client Confidential - February 2005)

**Semiconductor Wafer Fab Investment Trend Analysis.** A bespoke study on the size, technology, and investment trends in the semiconductor wafer fab market. (European Investment Bank - November 2004)

**European Semiconductor Investment Opportunity.** A strategic analysis and critique of the investment criteria and

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feasibility for a European-based 300mm advanced semiconductor wafer foundry. (Scottish Enterprise - October 2004)

**FPGA & SoC IC Design Methodology Technology Audit.** A technology and market potential audit for a novel methodology for SOC/FPGA IC design. (Client Confidential - August 2004)

**SoC IP Market Analysis.** An end market size and semiconductor content analysis of the digital consumer electronics market pertinent to a novel IP technology development. (Client Confidential - April 2004)

**Power MOSFET/BCD Market Analysis.** A market and technology analysis of the discrete power MOSFET and integrated BCD markets together with a recommended potential business entry strategy. (Client Confidential - April 2004)

**Semiconductor Wafer Market Analysis.** A bespoke study on the size, technology, and investment trends in the silicon wafer market. (Wacker Siltronic - September 2003)

**Nanometer IC Technology Development.** An analysis of the technological and industrial aspects of next generation nanometric microchip development. (European Commission - May 2003)

**East European DRAM Market Analysis.** A study on the market size and technology trends in the East European DRAM market (Infineon Technologies - May 2003)

**Analogue & RF Electronics Market Analysis.** A market research report and analysis on the technology and design aspects and likely future trends associated with analogue and RF electronics (Scottish Enterprise - August 2002)

**DRAM Industry Structure.** A strategic analysis of the DRAM industry and its relative importance to the global semiconductor industry. (European Commission - January 2002)

**SiGe Foundry Opportunity.** A strategic analysis of the SiGe wafer foundry potential and the relative pricing levels compared with bulk CMOS wafer technology. (European Investment Bank - October 2001)

**Electronic Design Business Development:** A bespoke market research and analysis programme for the preparation of two reports related to the developments in business technology for electronic design. (The Alba Centre - September 2001)

**Semiconductor IC Design & Wafer Fab Support.** A bespoke market research support programme for the provision of technical and market information on the semiconductor IC design and wafer fab industries. (Scottish Enterprise - May 2001)

**European Semiconductor Investment Opportunity.** A strategic analysis and critique of the Atmel foreign direct investment proposal for the mothballed Siemens' NTS wafer fab, including presentation to the DTI review board. (UK Department of Trade & Industry - September 2000)

**European Semiconductor Investment Opportunity.** A strategic analysis and critique of the Amkor foreign direct investment proposal for the mothballed Siemens' NTS wafer fab. (UK Department of Trade & Industry - May 2000)

**European Semiconductor Investment Opportunity.** A strategic analysis and investor (Mosel Vitalic) of the investment opportunity for the three wafer fab plants currently lying vacant in the UK. (UK Department of Trade & Industry - November 1999)

**MEDEA Mid-Term Assessment.** An Executive Report to bench-mark the current status of MEDEA relative to its own objectives and current industry practice. (MEDEA Activities Co-ordination - MAC - Members - December 1998 to May 1999)

**IC Wafer Fab Facility Investment Risk Assessment.** An analysis of the factors affecting and influencing foreign direct investment in wafer fab. (Consultus, on behalf of Sandvikem, Sweden- October 1997)

**Semiconductor Wafer Fab Production In Europe.** An analysis of the European semiconductor manufacturing industry and potential investment opportunities for inwards investment. (NUTEK, Sweden - March 1997)

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**SC Wafer Fab Requirements In Europe.** An executive study on the market and economic factors affecting semiconductor wafer fab investment in western Europe. (European Investment Bank - August 1996 to September 1996)

**European Semiconductor Growth Analysis.** An analysis of the UK and European competitive situation in the world-wide and European semiconductor manufacturing industry. (UK Department of Trade & Industry - first published April 1996, updated yearly)

**The MEDEA Proposal.** An executive study on the suitability of MEDEA as an appropriate follow-on step for a new pan-European microelectronics initiative. (Dutch Ministry of Industry & Economics - March 1996 to April 1996)

**The Effect Of Silicon Foundries On Economic Development.** An analysis of the European market potential for an independent UK/European-based silicon foundry and its likely impact on the UK economic development. This study was used by the Welsh Development Agency to justify the UK Government's \$100 million public support for the setting up of Newport Waferfab Ltd & LG Semicon wafer fabrication sites. (Welsh Development Agency - December 1994 to April 1995)

**European Microelectronics Panel.** Future Horizons was part of an EC-commissioned panel of senior industry executives, led by Mr J Cornu, Technical Director Alcatel nv, charged with publishing a report on European Microelectronics to be used to help formulate a strategy for future EC R&D funding. (EC - May 1994 to January 1995)

**Russian Microelectronics Manufacturing.** A strategic overview of the opportunities and benefits of developing an advanced IC manufacturing capability within Russia, with particular emphasis on the downstream significance to the Russian electronics systems manufacturing industry. (Russian Ministry of Electronics - May 1994 to November 1994)

**Power Discrete Semiconductor Market Analysis.** A strategic review of the high-power bipolar and MOS discrete semiconductor market with the view to develop a business plan for a new firm planning to enter the market (Client confidential - April 1994)

**Business Development Plan.** A study on the feasibility, cost, operation, market and associated business development plan to set up an advanced wafer fabrication facility in Russia. (Angstrom/CS First Boston/EBRD - January 1994 to November 1994)

**European Silicon Wafer Manufacturing Opportunity.** A study on the market opportunity and feasibility of setting up an advanced 150mm silicon wafer production facility in Europe, targeted at the European IC manufacturing industry, including an analysis of the current and projected market need and potential downstream benefits (i.e. incremental sales potential) for a world-wide silicon market leader but with currently no EU-based wafer manufacturing capability. (Client Confidential - September 1994 to October 1994)

**Strategies For Developing The Microelectronics Industry In China.** A study on the feasibility, cost, and operating plan to set up an advanced wafer fabrication facility in China. (Client Confidential - May 1993 to October 1993)

**European IC Back-End Manufacturing Trends.** A study of the market opportunity and feasibility of setting up an independent back end semiconductor capability in Europe targeted at the high pin count, high complexity market. (Client Confidential - December 1991 to May 1992)

**European IC Wafer Fab Opportunity.** A study on the market opportunity and feasibility of setting up an advanced (proprietary) IC wafer production facility in Europe, targeted at the European IC end user market, including an analysis of the current and projected market need and potential downstream benefits (i.e. incremental sales potential) for a niche player but with currently no EU-based wafer manufacturing capability. (Harris Semiconductor - September 1989 to December 1989)

**UK Semiconductor Support Industry Evaluation.** A study to describe the critical elements for the manufacture of advanced semiconductor devices including the site, cost and infrastructure issues together with the relevant upstream and downstream implications. (Welsh Development Agency - April 1989 to May 1989).





**22nd Year Of Service  
Founded 1989**

**5th Decade  
Of Semiconductor  
Experience**

**Our Experience  
Starts With The First  
Commercial IC**



Established in April 1989, Future Horizons provides market research and business support services for use in opportunity analysis, business planning and new market development. Its industry information seminars and forums are widely considered to be the best of their kind. Emphasis is placed on the world-wide semiconductor and electronics industry and associated markets. Emphasis is placed on the worldwide microelectronics and electronics industry, and European market environment.

Malcolm Penn is the founder and CEO of Future Horizons, with over 45 years experience in the electronics and semiconductor industry. He has worked extensively throughout Europe as well as in the United States, the former USSR, Japan and Korea, and was an early pioneer of pan-European research and product development collaboration in the 1970s during his tenure with ITT Europe. His industrial experience has involved him with all aspects of the management, manufacturing, marketing and use of electronic components, particularly semiconductor devices.

Future Horizons offers a high-quality, cost-effective, flexible alternative to expensive subscription-style, market research. Our experience commenced with the industry in 1962, from the first commercial IC to SOC integration. For all of your semiconductor business development needs ...

**Let Future Horizons Save YOU Time & Money**

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