Building an Autonomous & Scalable Semiconductor VLSI Business

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Senior Director, Product Operations
Storage Peripherals Division, LSI

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## Outline

| Introduction | • LSI overview  
• What is autonomy & scale?  
• Motivation for this talk  
• Key messages |
|-------------|---------------------------------------------------------------|
| **Why Autonomy & Scale** | • Key VLSI industry trends  
• First-to-market vs. lasting leadership  
• Growth isn’t easy  
• Exchange rates & globalization |
| **Autonomy in Semi Business** | • Functional autonomy  
• Management autonomy |
| **Scaling the Semi Business** | • Imagining scale  
• Framework for driving scale  
• Organization  
• Strategy/Planning  
• Operations |
| **Looking Ahead** | • Closing Thoughts |
LSI - A History of Leadership & Innovation

• **History of industry firsts:**
  – First single-chip DSP
  – First 32-bit Microprocessor
  – First single-chip HDD processor
  – First 3Gb/s SAS Controller
  – First 6 Gb/s SAS Switch
  – First 6Gb/s RAID on Chip (ROC)
  – Pioneered gate arrays and cell-based ASICs

• **Over 10,000 active patents**

• **10 active research projects aligned to both product roadmap innovation and path-finding activities with leading universities**

• **LSI holds leadership positions in many industry standards organizations, alliances, consortiums, customer partnership groups and trade groups**
LSI Overview

Focused on Converged Infrastructure
(Storage + Networking)
~ 80% of Revenue Tied to Enterprise IT Spending

Significant Strategic Transformation
9 Acquisitions ($4B+), 3 Divestitures
Elimination of all Internal Manufacturing

Solid Financial Foundation
$2.57B Revenue in 2010
$677M in Cash and Short Term Investments

Strong Global Presence
4500 Employees
> 50 Worldwide Site Locations

Culture of Innovation
11,000+ Patents and Patent applications
LSI’s Product Lines and Technology Foundation

**Storage Peripherals**
- Hard Disk Drive SoCs
- Pre-Amplifiers
- SSD Controllers

**Storage Components**
- SAS ROCs/Controllers
- SAS Expanders/Bridges
- SAS HBAs

**Networking Components**
- Content Processors
- Packet Processors
- Media Processors

**Custom Silicon Solutions**
- Serial Connectivity
- Rich IP Portfolio
- Flexible Model

**Fundamental Storage and Networking Technologies**
- SERDES
- Memory
- CPUs
- Security
- PHY

**Silicon Platform Technologies**
- 110 nm
- 90 nm
- 65 nm
- 40 nm
- 28 nm
- BiCMOS
What is Autonomy & Scale?

Autonomy

End-to-end ownership of business that is more or less independent & is run with limited direction required from a ‘parent’ business

Scale

A business that is successful in responding to the stringent demands of strong growth & avoids becoming inelastic to rapidly changing conditions
Motivation for this talk

• VLSI industry has been at the forefront of dramatic advances
  – Has uniquely contributed to human advancement & broad economic growth

• Vibrancy of VLSI industry worldwide is impressive
  – India’s participation and leadership in VLSI has been growing dramatically
  – There are opportunities to extend leadership & global VLSI footprint

• However, many VLSI products stumble or fail in their end markets
  – Even established giants falter; hurdle higher for newer or smaller companies
  – Product development & innovation focus is necessary but not sufficient

• Driving more autonomy & scale necessary for successful growth
  – Indian VLSI industry in a good position to move further in this direction

• This talk explores the underpinnings of driving autonomy & scale
  – Based in part on LSI’s experiences worldwide & especially in India
Key Messages

• Growth challenges can be met more effectively w/ autonomy & scale

• Additional factors could influence long-term success in geos like India
  – Possible headwinds: Growing pains, globalization & exchange rate trajectories
  – Possible tailwinds: Increased exposure to in-country OEMs & manufacturers

• More autonomy requires end-to-end capabilities & stronger management
  – Functional & management autonomy are both key

• Scale-building requires focus on org, strategy/planning & operations

• Due-diligence in managing entire product life-cycle is key to success
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| Looking Ahead                     | • Closing Thoughts  

# VLSI Industry - Key Trends

<table>
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<tr>
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<tbody>
<tr>
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<td><strong>Industry Growth</strong></td>
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</tr>
<tr>
<td><strong>Customers</strong></td>
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<tr>
<td><strong>Competition</strong></td>
<td>• Significant w/ strong incumbents - not easy to penetrate $B$-size markets</td>
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<td><strong>Globalization</strong></td>
<td>• Increasing across the board</td>
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<td></td>
<td>• “Round the clock” activity</td>
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<td>• Geos across the world capitalizing on unique skillsets or building VLSI hubs</td>
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<td>• Growing w/ generational increases in transistors &amp; frequencies</td>
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</table>
| **Manufacturing Complexity** | • More challenging with node shrinks and more nano-scale effects  
  • Supplier base consolidation | • Skilled engagement w/ & oversight of manufacturing/assembly/test  
  • Effective supplier management |
| **R&D Cost**          | • Increasing w/ design complexity & higher mask costs                     | • Minimal errata/spins & strong product planning & execution due diligence                               |
| **Industry Growth**   | • Maturing but higher growth in emerging geos                             | • Increase in end-to-end ownership & scale in emerging geos                                               |
| **Customers**         | • Continued industry consolidation - bigger & more demanding customers    | • Building strong loyalty via depth of understanding of cust. needs & execution w/ limited room for product failures |
| **Competition**       | • Significant w/ strong incumbents - not easy to penetrate $B$-size markets | • Near-flawless strategy/planning & strong execution due diligence                                        |
| **Globalization**     | • Increasing across the board  
  • “Round the clock” activity  
  • Geos across the world capitalizing on unique skillsets or building VLSI hubs | • Strong global management teams to drive a culture of discipline  
  • Geos to take on more ownership to differentiate themselves from others |

Autonomy & scale increasingly important to keep up with trends
## First-to-Market vs. Lasting Leadership *(examples)*

<table>
<thead>
<tr>
<th>Commercial Product</th>
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</tr>
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<tr>
<td><strong>Portable computer</strong></td>
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<td>HP (excl. Tablet PCs) Apple (incl. Tablet PCs)</td>
<td>PC Mag, Wikipedia, Digitimes, Display Search</td>
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<td>Gartner, IDC, Time, Ars Technica, PC World,</td>
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**Retaining #1 spot requires much more than an early mover advantage – lack of autonomy & scale could be significant disadvantages**
# Growth Isn’t Easy

*Examples from Computer Industry*

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<td>• Quality/Mfg.</td>
<td>CNET, CNET, EE Times, Computer World</td>
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<td>NYT, WSJ</td>
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<td>• Quality/Manuf.</td>
<td>Business Insider (BI), NYT, NYT, CNN Money, Industry Std</td>
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### Examples from Telecom/Mobility Industry

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<td><strong>Nortel Networks</strong></td>
<td>114-yr old Canadian giant was unable to recover from post-Y2K demand fallout &amp; compete with more innovative/cheaper products; acctg. irregularities; filed for bankruptcy &amp; sold some businesses</td>
<td>Financials, Customer Needs</td>
<td>Canadian Business, NYT</td>
</tr>
<tr>
<td><strong>Motorola</strong></td>
<td>Introduced first commercial cell phone but leadership biz plummeted due to late entry to smartphone mkt, delayed adoption of digital (vs. analog) technologies, diversion on Iridium, equipment quality issues &amp; financials</td>
<td>Strategy, Quality, Customer Needs, Schedule/TTM, Financials</td>
<td>CNET, WSJ, Business Week, Forbes, NYT</td>
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<tr>
<td><strong>Nokia</strong></td>
<td>Long-dominant position in smartphone market eroding, challenged on innovation and keeping up w/ market trends &amp; pricing pressures; moving away from Symbian OS platform</td>
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<td>Forbes, The Independent, Gartner</td>
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<td><strong>Research In Motion (RIM)</strong></td>
<td>Revenue &amp; share loss due to less competitive UI &amp; features compared to iOS &amp; Android phones</td>
<td>Strategy, Customer Needs</td>
<td>BI, BI</td>
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Autonomy & scalability enable better end-to-end visibility & comprehensive business management – strong design R&D is just one of many elements required for success
“…..“I would recommend against buying long-term fixed-dollar investments,” [Warren] Buffett said at a public appearance in New Delhi. “If you ask me if the U.S. dollar is going to hold its purchasing power fully at the level of 2011 five years, 10 years or 20 years from now, I would tell you it will not.”

[...]

In March, the dollar — adjusted for inflation — hit its lowest point against major U.S. trading partners' currencies since its value was allowed to fluctuate in January 1973, according to Federal Reserve data. “This is the true measure of what the dollar’s worth,” said Kenneth Rogoff, a Harvard economics professor and former chief economist at the International Monetary Fund. “It shows what you can buy with the U.S. dollar.”

A weak dollar isn’t necessarily a bad thing, Rogoff said — it can make the United States more competitive, bolster exports and help domestic companies that are vying against imported goods here in the United States. It effectively would be playing the China card against China in a battle for manufacturing jobs.

[...]

Moreover, the U.S. deficits seem likely to continue for years. Under current law, the federal government will run deficits totaling $4.5 trillion over the next five years; by 2021, the federal debt held by the public would soar to $19 trillion, up 75 percent from 2011, according to the Office of Management and Budget’s 2012 proposal. Many fund managers say the only way out of that box is a weaker dollar, reducing the value of the massive amount of U.S. debt held by foreigners and increasing the value of American investments abroad…..”
In upcoming decades, weaker dollar & sharp labor cost increases in emerging geos could potentially dampen MNC investments there – geos with more autonomy & scale are less likely to lose their global footprint.

*Naturally, multiple factors determine global business investments – e.g., customer locations, supply chain, cost, quality, TTM, skillsets, etc. However, geos with narrow product focus could be more vulnerable to global changes & increased cross-geographic competition.*
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Functional Autonomy - Greater End-to-End Capabilities

Concept  S1  S2  S3  S4  S5  S6

Exploration  Planning  Execution


- Roadmap/ Strategy Dev
- Strategic cust. engagement
- Product Definition

- Arch definition
- Product POR

- Design & Verif.
- Emulation
- Proto & prodn. planning

- Proto build & validation
- Customer samples/support
- Pre-production ramp/qual

- Manufacturing mgmt
- Demand/supply mgmt
- Customer support

*NOTE: Capabilities listed here are not meant to be a comprehensive list
Functional Autonomy - Greater End-to-End Capabilities

Extent and depth of functional autonomy in India varies by sector. Increased exposure to in-country OEMs usually drives more autonomy.
“...First, firms with “better” management practices tend to have better performance on a wide range of dimensions: they are larger, more productive, grow faster, and have higher survival rates.

[...] Fourth, strong product market competition appears to boost average management practices through a combination of eliminating the tail of badly managed firms and pushing incumbents to improve their practices.

[...] Fifth, multinationals are generally well managed in every country. They also transplant their management styles abroad....

[...] Sixth, firms that export (but do not produce) overseas are better-managed than domestic non-exporters, but are worse-managed than multinationals...”
Management Autonomy – Strong Mgmt/Leadership

Source: McKinsey Quarterly, April 2011

McKinsey Global Survey results

R&D strategies in emerging economies

Exhibit 6

Variable management skills

% of respondents, $n = 454$

Performance of R&D managers relative to each other, by characteristics required for project success

Managers of emerging-economy projects

<table>
<thead>
<tr>
<th>Characteristics in order of importance</th>
<th>Managers of emerging-economy projects</th>
<th>Managers of developed-economy projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership skills</td>
<td>Much stronger</td>
<td>Stronger</td>
</tr>
<tr>
<td>Communication skills</td>
<td>Stronger</td>
<td>The same</td>
</tr>
<tr>
<td>Functional skills</td>
<td>Stronger</td>
<td>Much stronger</td>
</tr>
<tr>
<td>Local influence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management proficiency</td>
<td></td>
<td></td>
</tr>
</tbody>
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1. Respondents who answered “don’t know” are not shown.

Functional autonomy needs to be matched with management autonomy
Requires building superior management skillsets to drive the business
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## Imagining Scale

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<th>Success Typically Means More...</th>
<th>Which Calls For Non-Linear Improvements in...</th>
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<tbody>
<tr>
<td>Customers</td>
<td>• Customer requirements management</td>
</tr>
<tr>
<td>Channel Partners</td>
<td>• Customer support</td>
</tr>
<tr>
<td></td>
<td>• Marketing and sales</td>
</tr>
<tr>
<td></td>
<td>• Partner management</td>
</tr>
<tr>
<td>Products</td>
<td>• Strategy &amp; product definition</td>
</tr>
<tr>
<td>Volumes</td>
<td>• Time to market performance</td>
</tr>
<tr>
<td>Revenues</td>
<td>• Product quality</td>
</tr>
<tr>
<td>Profits</td>
<td>• Product delivery</td>
</tr>
<tr>
<td>Cash</td>
<td>• Financial management</td>
</tr>
<tr>
<td>Employees</td>
<td>• Management/leadership team</td>
</tr>
<tr>
<td></td>
<td>• Management structure</td>
</tr>
<tr>
<td></td>
<td>• Right skillsets</td>
</tr>
<tr>
<td>Suppliers</td>
<td>• Supplier/vendor management</td>
</tr>
<tr>
<td>Logistics</td>
<td>• Logistics management</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>• Infrastructure management</td>
</tr>
<tr>
<td>Competitors</td>
<td>• Competitive assessment &amp; response plans</td>
</tr>
<tr>
<td>Investors</td>
<td>• Investor relationship management</td>
</tr>
<tr>
<td>Communication</td>
<td>• Media management</td>
</tr>
<tr>
<td></td>
<td>• Policy engagement</td>
</tr>
<tr>
<td></td>
<td>• Communication framework</td>
</tr>
<tr>
<td>M&amp;A...over time</td>
<td>• M&amp;A management</td>
</tr>
</tbody>
</table>

Scale requires recognizing where & when new or different approaches are required to solve challenges of growth.
Jim Collins’ “Good to Great” Companies

Collins & his team did an assessment on 1000+ US companies and identified a subset that they believed reflected superlative performance over at least 15 years. Chart from Jim Collins’ book “Good to Great”, Harper Collins, 2001, p. 4

Scaling doesn’t happen by luck or accident – and you’re never “done”
Driving Scale – A Culture of Discipline

“The Good-to-Great Matrix of Creative Discipline”

Discipline should never be an end into itself
Intent should be to achieve & accelerate business goals
### Organization – Focus & Diligence

<table>
<thead>
<tr>
<th>Key Focus Area</th>
<th>Optimal Scenario for Scale-Building</th>
</tr>
</thead>
</table>
| **Leadership**            | • Company comes first, over personal goals  
                               • Based on a foundation of trust across teams                                                                                                               |
| **Structure**             | • Optimized for long-term success & scalability  
                               • Not built around specific personalities per se                                                                                                                                 |
| **Skillsets**             | • Tailored for building world class capabilities                                                                                                                |
| **Goals & Alignment**     | • Clear goals & ownership with full alignment  
                               • Goals understood broadly within org                                                                                                                         |
| **Ownership & Accountability** | • Unambiguous roles & responsibilities                                                                                                                             |

Organizational discipline is one of the three pillars of creating scale.
Strategy / Planning - Focus

Using the intersection of these three circles to hone in on the focus for the company will likely enable the most sustainable growth path.

Discipline in setting strategic direction starts with laser-like focus. Strategic agility on business environment changes is essential.

Strategy / Planning - Diligence

ANNUAL
- Market/Segment/Customer Analysis
- Long-Range Strategic Plans
- Long-Range Business Plans for Products

Approved business & investment plan

QUARTERLY
- Quickly refresh market/customer trends & needs
- Refresh focus project list & resources

Refreshed business & investment plan

PER PROJECT
- Exploration Definition
  - Concept S1 S2
  - Business Need Market Req. & Prelim Biz Case Product POR

Product planning due diligence

Establish focus on what needs to be done at a high-level & drive due diligence on the planning to get it done
## Operations - Focus

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# Operations - Focus

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Due diligence in operations cuts across products, technologies/capabilities & overall business management.
1. Establish who does what & what every stakeholder needs from others at all stages
2. Plan & state what we intend to do (e.g., POR), then follow-up & do what we said (actual v. POR)
3. Eliminate communication barriers and always face up to reality & customer needs
4. Drive a culture of discipline for scalability, but provide appropriate flexibility
“I tell this story to illustrate the truth of the statement I heard long ago in the Army: Plans are worthless, but planning is everything.”
– Late US President Dwight David Eisenhower, 1957
### Introduction
- LSI overview
- What is autonomy & scale?
- Motivation for this talk
- Key messages

### Why Autonomy & Scale
- Key VLSI industry trends
- First-to-market vs. lasting leadership
- Growth isn’t easy
- Exchange rates & globalization

### Autonomy in Semi Business
- Functional autonomy
- Management autonomy

### Scaling the Semi Business
- Imagining scale
- Framework for driving scale
- Organization
- Strategy/Planning
- Operations

### Looking Ahead
- Closing Thoughts
Closing Thoughts

• **Industry trends & challenges call for autonomy & scale building**
  – Businesses in “emerging” geographies like India should embrace this more

• **Opportunities exist in India to expand scope of VLSI businesses**
  – End-to-end VLSI capabilities that encompass greater system-level knowledge could increasingly be an asset & value-add
  – Design IP might be primary value-add currently, but businesses can’t take more control over their destiny without mastering end-to-end capabilities

• **India can participate more broadly on the global stage**
  – Industry & government should look to enable the right environment & infrastructure to facilitate greater autonomy & scale over the next decade
  – Growth of in-country OEMs & manufacturing could offer favorable conditions
Backup Slides
“….. Lately, Hyundai, and the affiliate it controls, Kia Motors Corp., have become formidable competitors. About a decade ago, Hyundai was a global also-ran—a maker of small, cheap, no-frills cars with a reputation for breaking down. In the late 1990s, Hyundai and Kia together ranked as the world's 13th-largest auto maker, according to the International Organization of Motor Vehicle Manufacturers.

But in the past decade, the company worked hard to root out defects, improve quality and design, expand production into low-cost locations and offer cars with more features than its competitors, like a 10-year warranty. And it has pulled off some feats that many of its rivals haven't been able to accomplish, or dared to try.

[...]

Several years ago, Hyundai made no secret that it hoped to become the world's largest auto maker some day. Mr. Yang says that thinking has changed. GM and Toyota became the world's largest and then stumbled, he noted, adding that making 10 million cars a year would require running 50 factories—more, in his view, than a company can run effectively.

"Should there be a certain range, maybe 6 million or 7 million, that is best?" Mr. Yang said. "We don't know what size is optimum. But bigger, bigger, biggest is always good? We don't think so."......"
Linking Strategy & Execution

• Assuming that a company’s strategy has been well defined & communicated, serious challenges might prevent that from being translated into sound execution

• OnPoint Consulting 2006 survey of senior managers and executives at numerous companies elicited the following response:
  – “Nearly 50% of business leaders say there is a gap between their organization’s ability to develop strategy and their ability to execute it”
  – “Even more disturbing, 64% lack confidence in their org[…]’s ability to close that gap”

• Numerous analyses & surveys have called out the impact of poor requirements definition & planning & impact of resource conflicts on high percentages of IT project failures (e.g., ZDNet 1, ZDNet 2)

• HBR’s “Why Most Product Launches Fail” (by Joan Schneider and Julie Hall) highlighted areas where misunderstanding of market needs, as well as quality & manufacturing issues end up amongst the top reasons why new products don’t succeed