



***Test Research, Inc.***  
***www.tri.com.tw***

# Test Research, Inc.



- **Establishment: April, 1989**
- **Founder & CEO: Jason Chen**
- **Capital: TWD 2362 million  
( USD 72 million)**



# Main Product Line



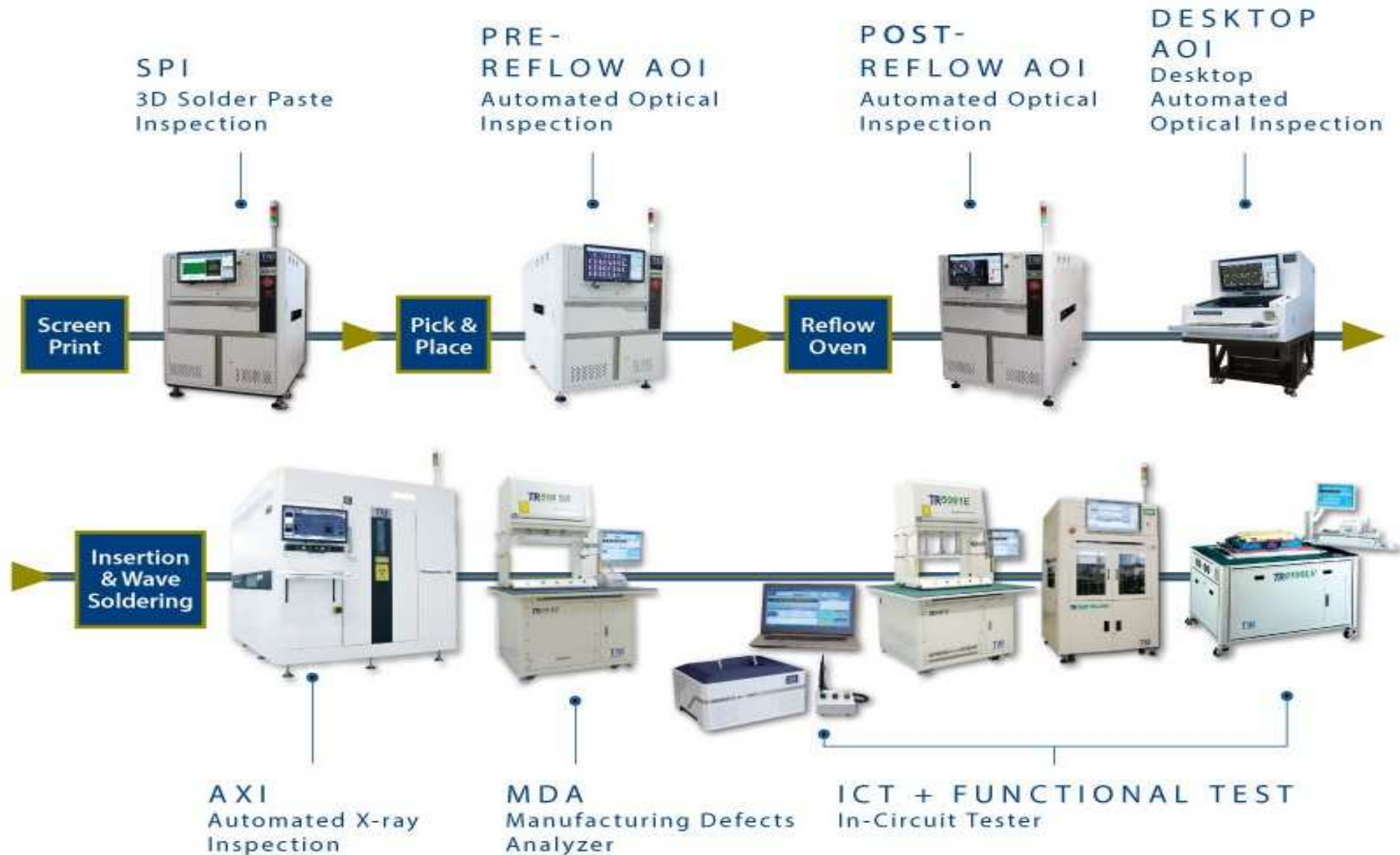
## ★ **IT(Image Tester)**

- ★ **SPI(Solder Paste Inspection)**
- ★ **Pre-reflow AOI / Post-reflow AOI**
- ★ **AXI(Automatic X-ray Inspection)**

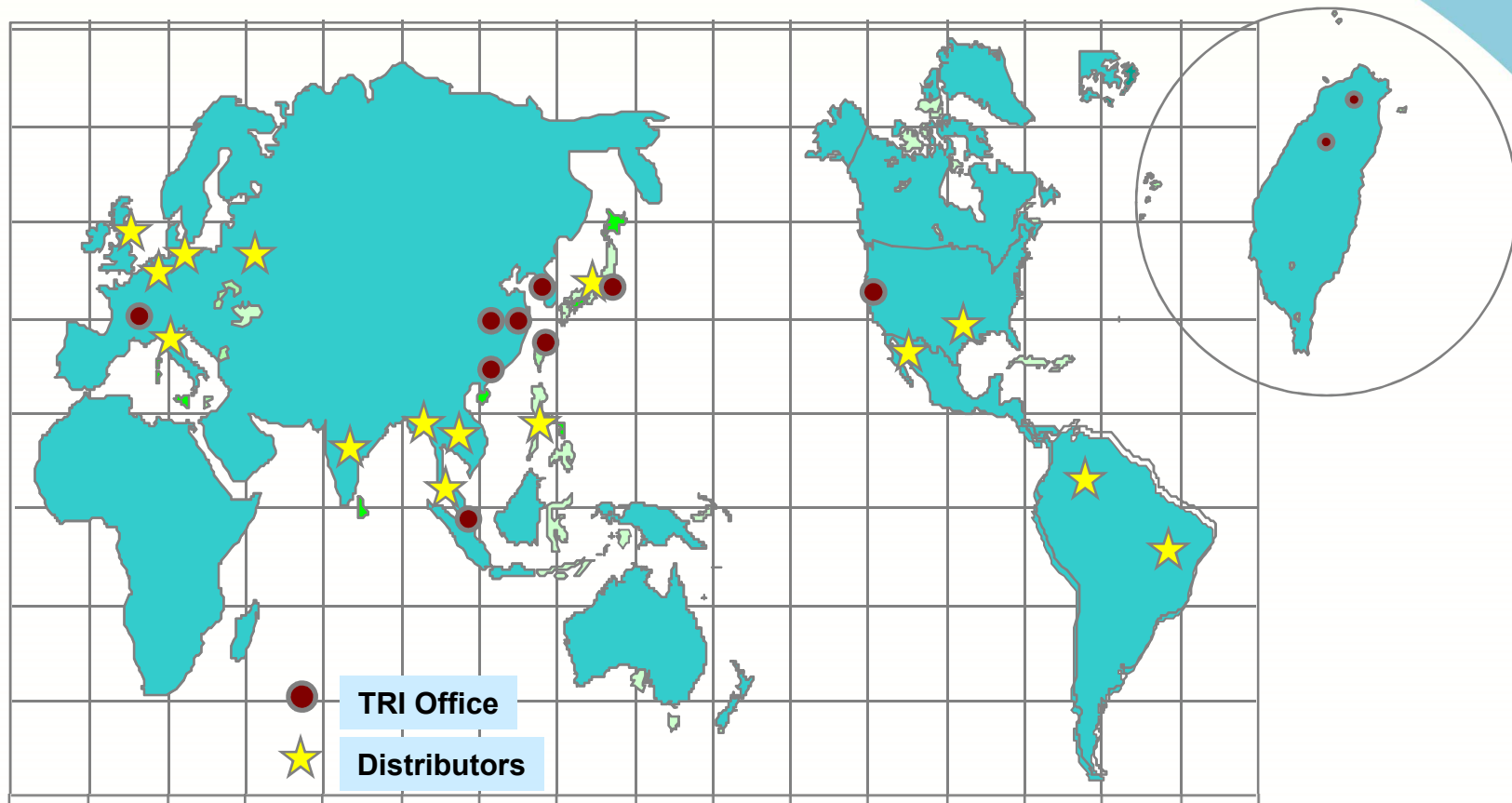
## ★ **In-Circuit Board Tester**

- ★ **MDA**
- ★ **ICT**

# One Stop Solution Provider in PCBA Production

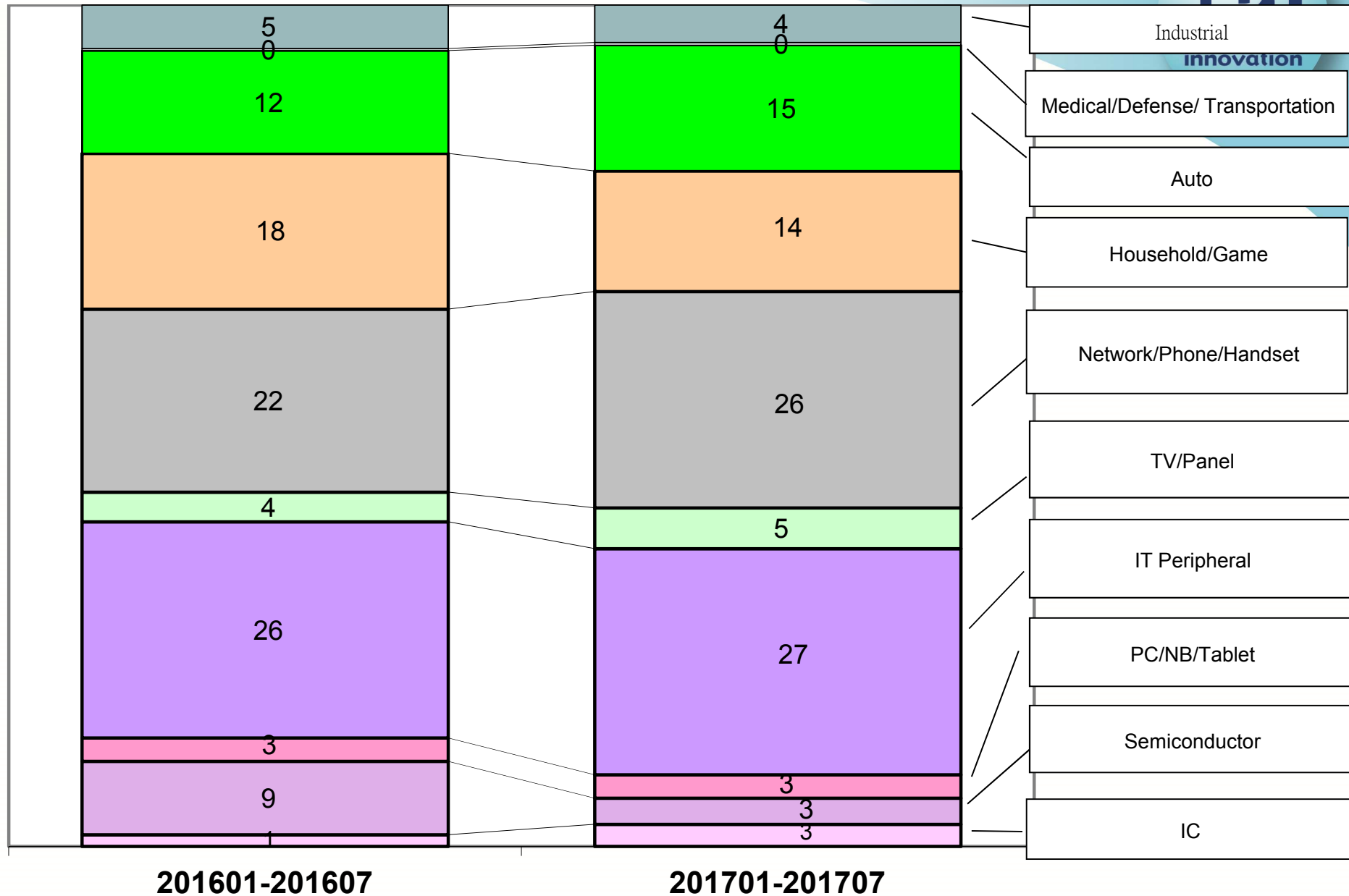


# Global Service Network





# Electronic Industry/Revenue Movement

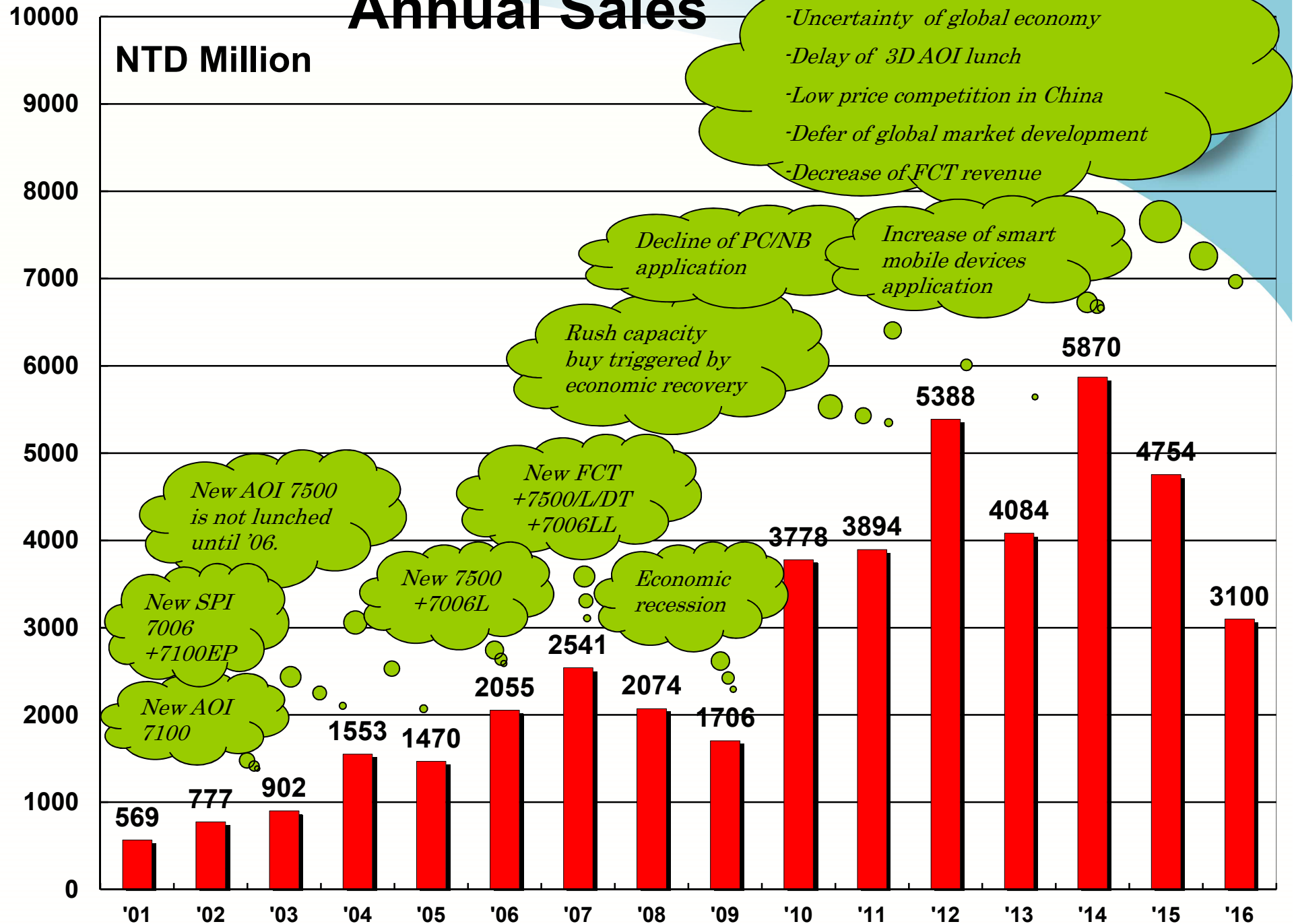


# Major Competitors



- Korea: Koh Young
- Japan: Omron
- China: Jutze/Sinic-Tek/Holly
- Malaysia: Vitrox
- USA: Keysight/Teradyne
- Europe: Viscom/SPEA

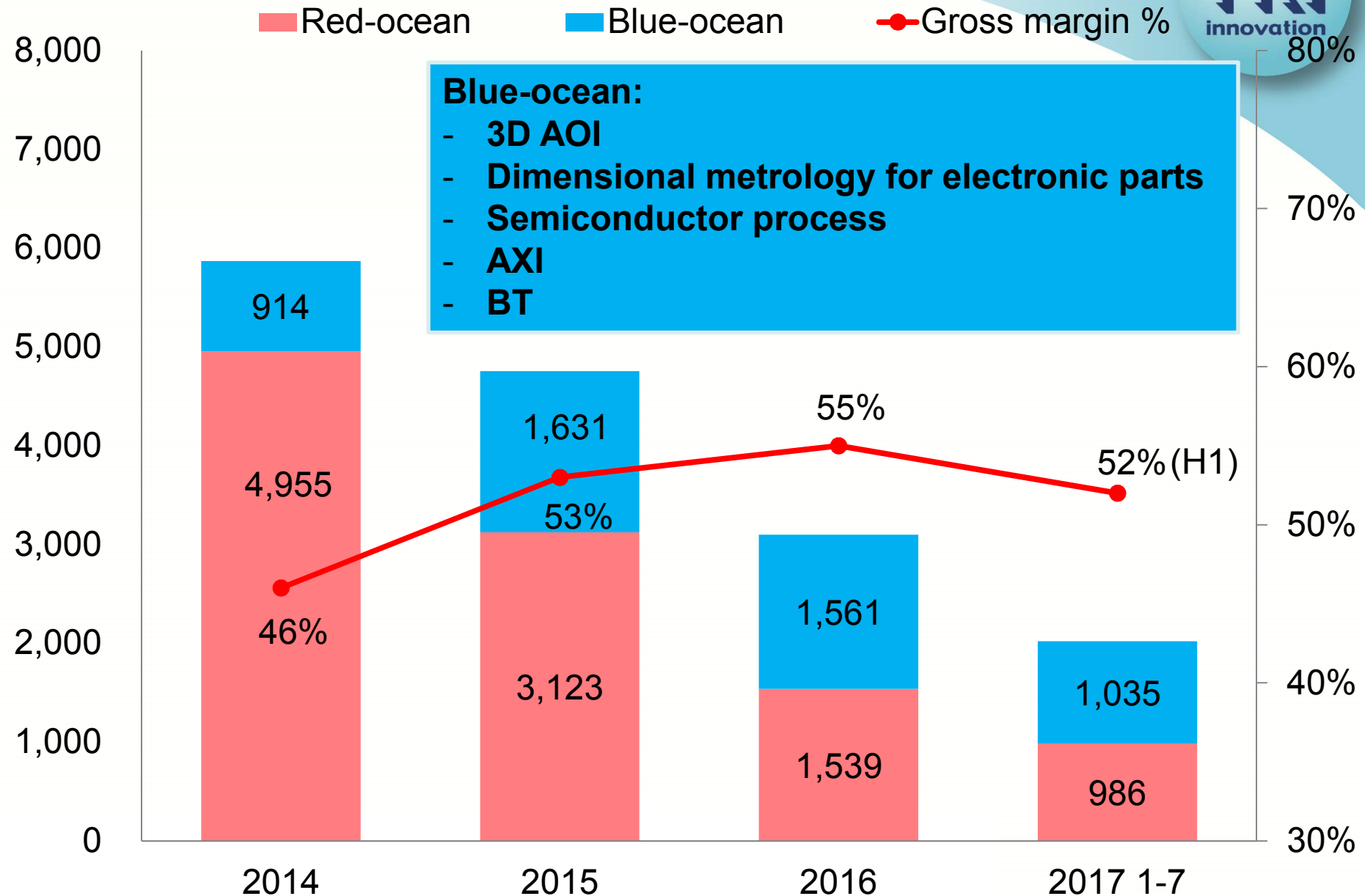
# Annual Sales





# Red & Blue-ocean Market Movement in Revenue

NTD Million



# 3D AOI with 2D+Side view

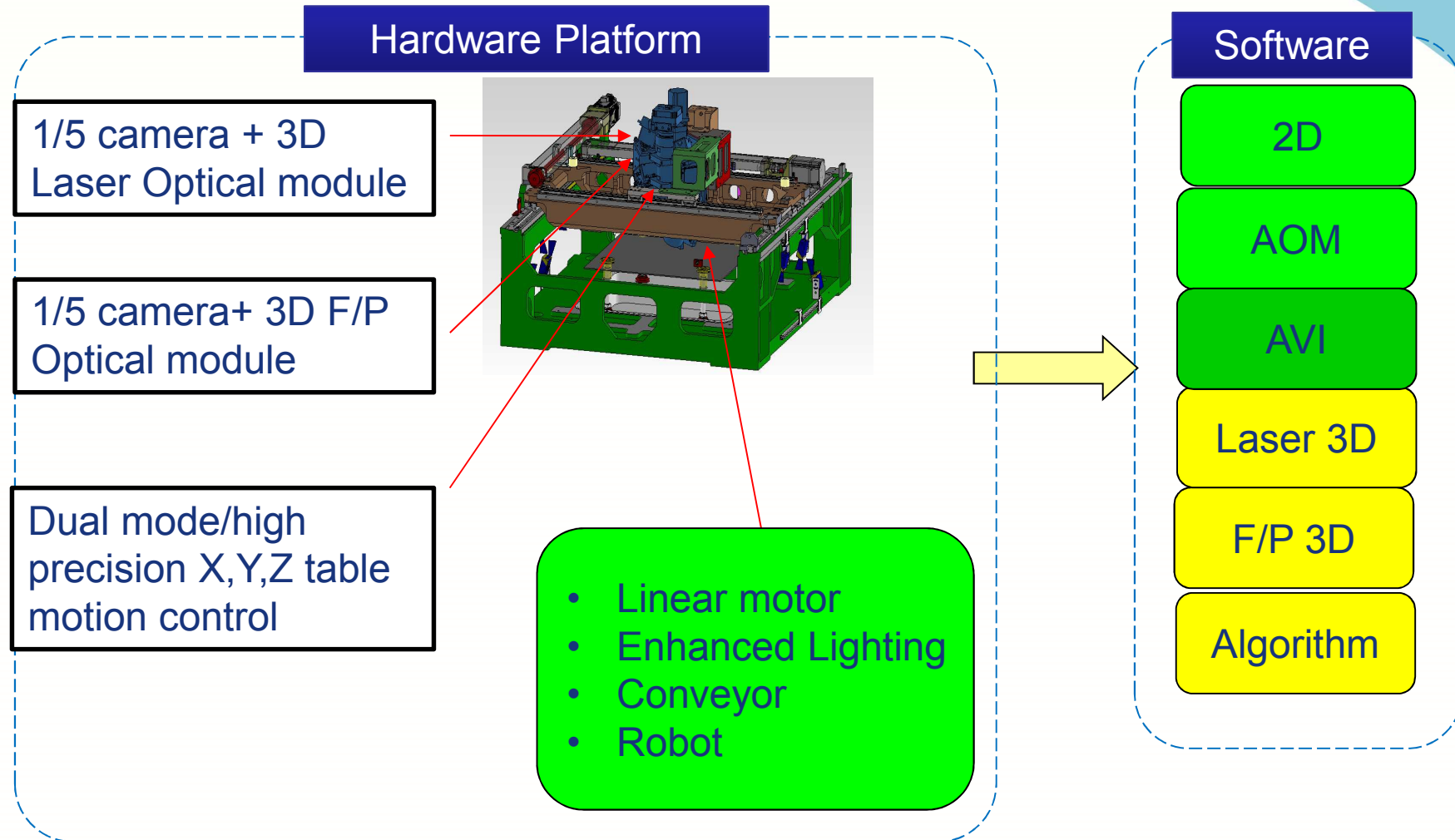


|                           | 2D AOI  | 3D AOI  | 2D+3D AOI | Side View |
|---------------------------|---------|---------|-----------|-----------|
| Missing/Extra comp.       | Good    | Good    | Good      |           |
| Shift                     | Good    | Partial | Good      |           |
| Polarity mark             | Good    | N/A     | Good      |           |
| OCV/OCR/Bar code          | Good    | N/A     | Good      |           |
| Bridging                  | Good    | Partial | Good      |           |
| Lifted comp.              | Partial | Good    | Good      | Good      |
| Height measurement        | N/A     | Good    | Good      |           |
| Fine short close to comp. | Partial | Partial | Partial   | Good      |



**Zero escape**

# Integration of Vision Technologies for the Demands of Dimensional Metrology for Electronic Parts & Semiconductor Process



# A Full Line of 3D In-Line AXI



**TR7600 SIII**

a new generation of TRI's hallmark inline PCBA inspection solutions. Designed for 100% inspection coverage at production line speed, industry's fastest high resolution imaging speed with greatly improved image quality in the industry's most advanced automatic X-ray inspection.



**TR7600LL SIII**

high performance and high speed 3D AXI for the largest server, networking and power PCBs. TRI's Planar CT technology brings true 3D solder joint review for maximum inspection accuracy



**TR7600F3D**

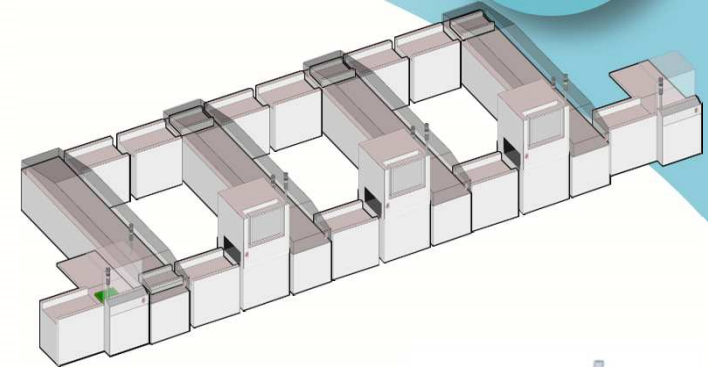
highest image quality maximize production yields on any production line

# Board Test Opportunity



- **Automation**

For Industry 4.0 , Unmanned Factory



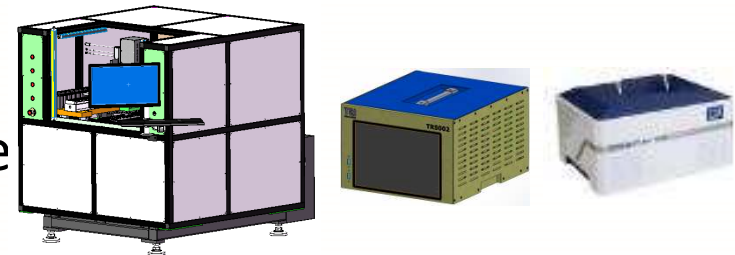
- **Functional Test**

For Automobile Electronics, Air Condition, TV, Smart Phone, Pad



- **FlexPCB Open/Leak Test:**

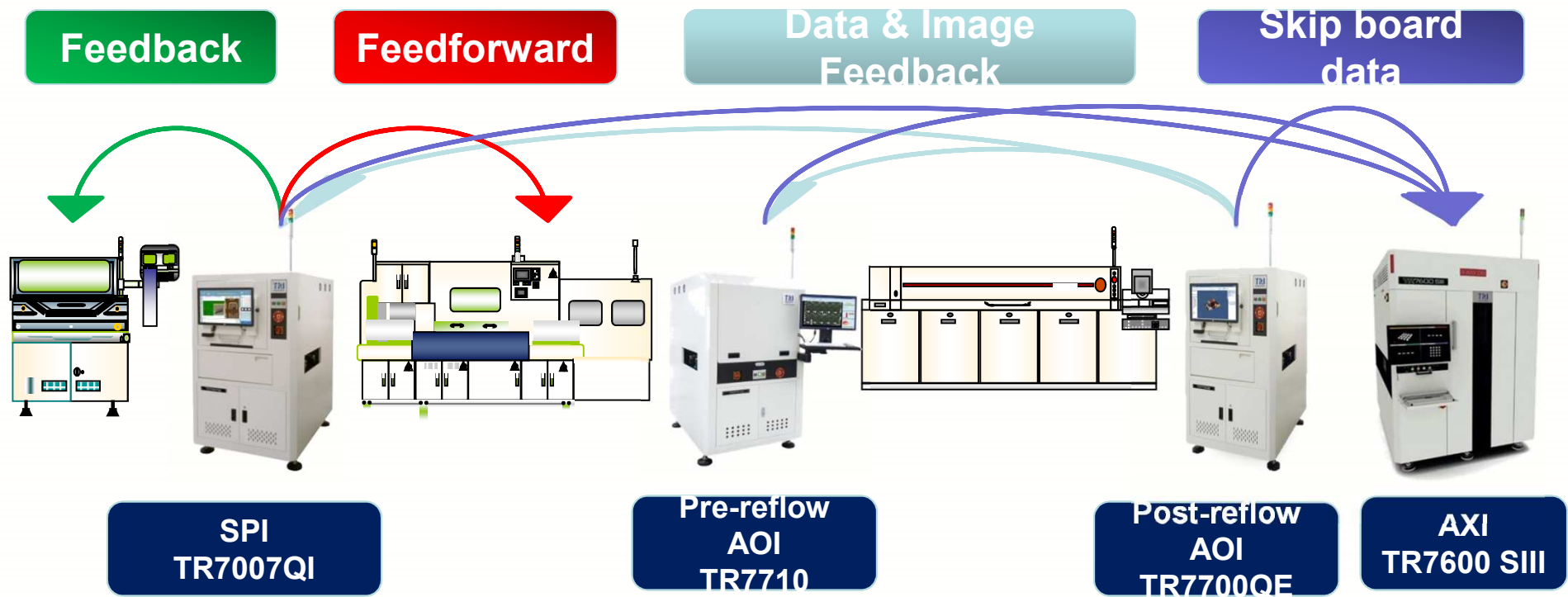
For Smart Phone, Pad, Handheld device



# TRI Support Closed Loop Solutions



## TRI SPI, AOI, AXI Inspection Integration



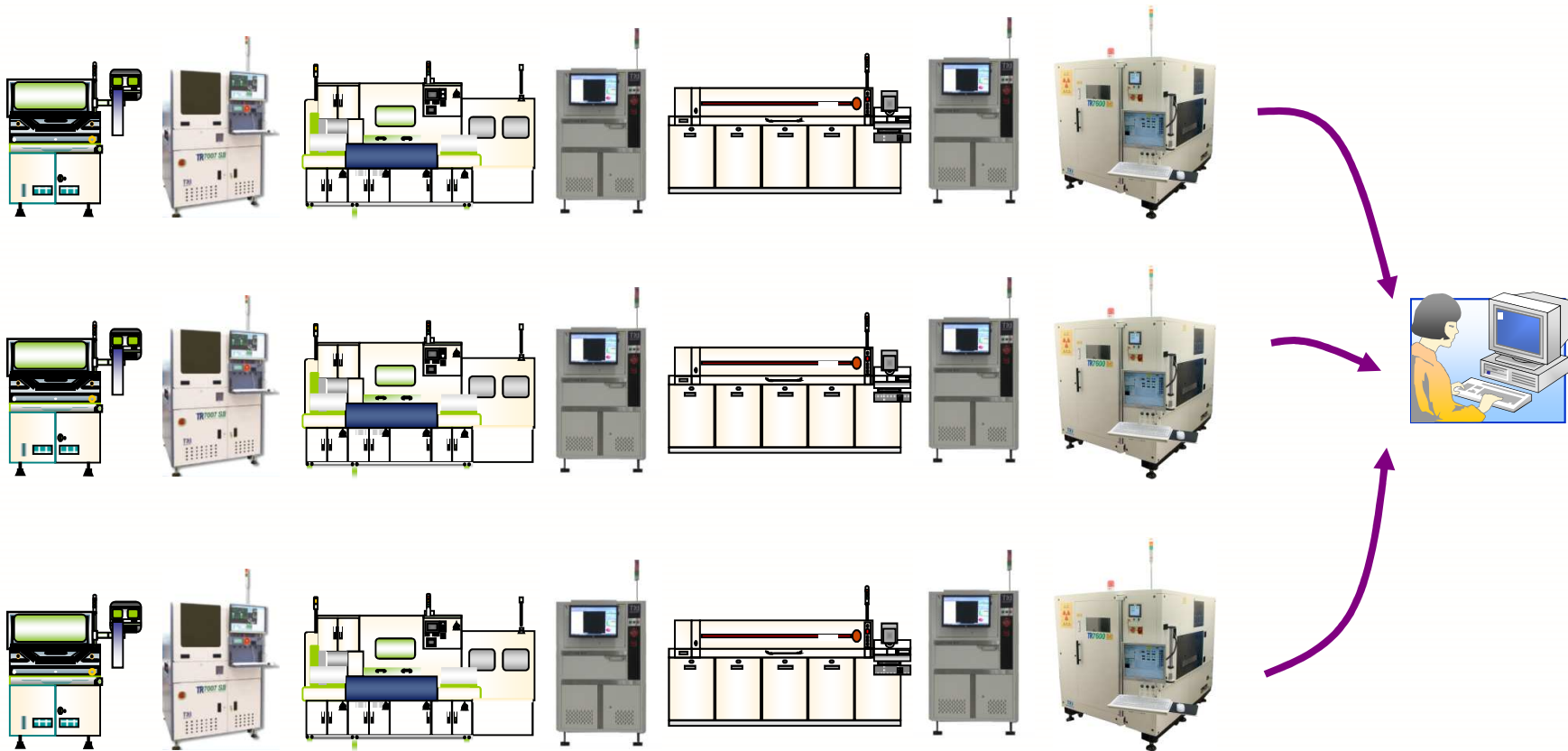


# YMS 4.0 Support Industry 4.0

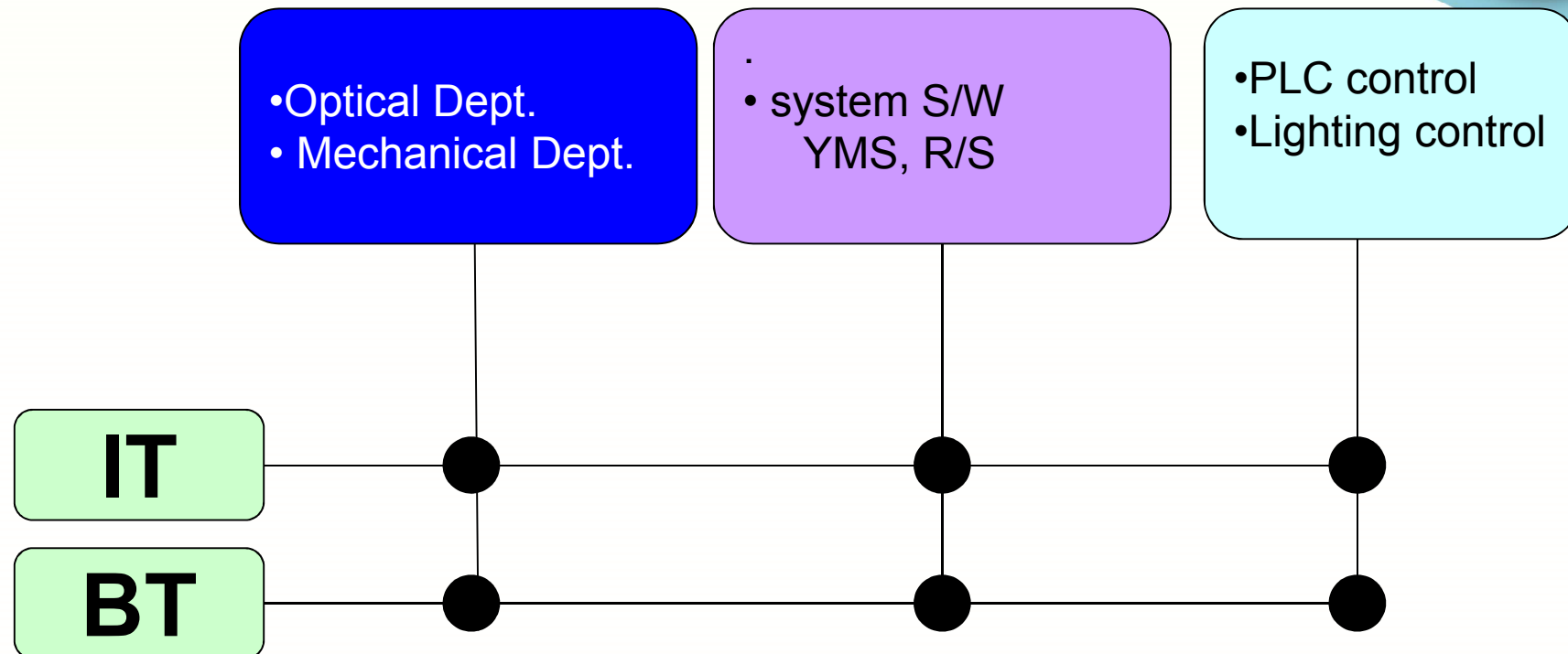


TRI combines SPI, AOI & AXI Data to Improve Yields with **Yield Management System (YMS)** by:

- Overall Image and Data Integration
- SPC Trend Monitoring
- Drill Down Root Cause Analysis



# In-house RD Team



130+ RD ( 2017 )  
5 PhD

# Outside Support



**Department of Computer science, National Taiwan Univ.**

- Image processing / Understanding

**Department of Mechanical Engineering, National Taiwan Univ.**

- Structure Analysis / machine error compensation

**Department of Power Mechanical, Tsing Hua Univ., Taiwan**

- X-ray 3D Reconstruction

- Digital Tomosynthesis Algorithm, CT algorithm

**Center of Measurement Standards, Industrial Technology Research  
Institute Taiwan**

- Length/ Camera / Color calibration and traceability

# Recent Milestones



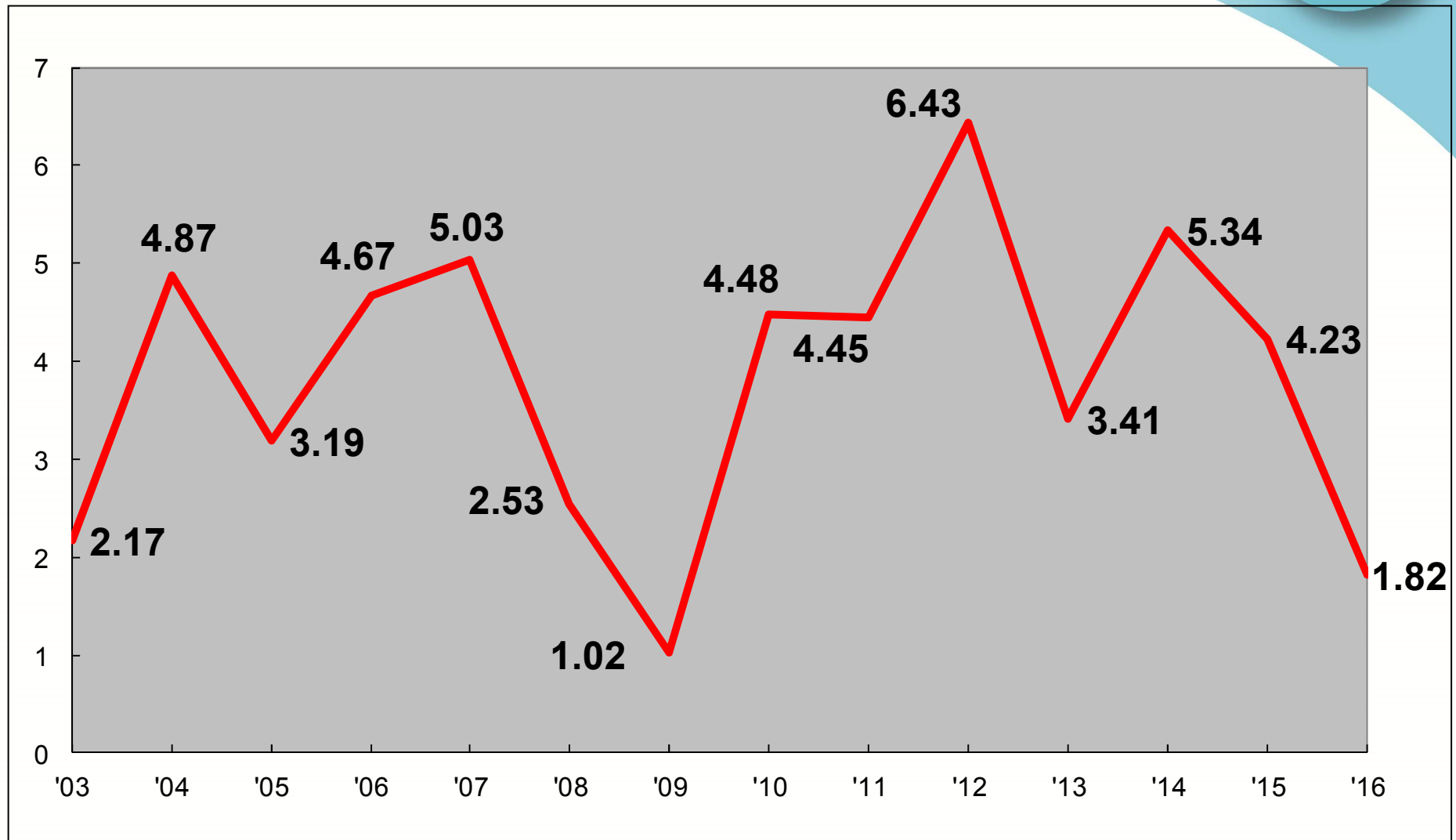
- 2014 Best Supplier Award
- 2014 Asia Innovation Award
- 2015 EM Asia Innovation Award
- 2015 Global Technology Award
- 2016 EM Asia Best Supplier Award
- 2016 Global Technology Award
- 2017 EM Asia Innovation Award
- 2017 Circuits Assembly NPI Award

# Consolidated Finance Ratio



|                          | '12 | '13 | '14 | '15 | '16 | '17H1      |
|--------------------------|-----|-----|-----|-----|-----|------------|
| Gross Margin %           | 55  | 50  | 46  | 53  | 55  | <b>52</b>  |
| Operating Income %       | 33  | 22  | 23  | 24  | 18  | <b>19</b>  |
| Net Income %             | 26  | 20  | 22  | 21  | 14  | <b>14</b>  |
| ROE                      | 30  | 15  | 23  | 18  | 8   | <b>5</b>   |
| Accounts Receivable Days | 84  | 117 | 68  | 101 | 160 | <b>148</b> |
| Inventory Days           | 130 | 149 | 92  | 131 | 173 | <b>159</b> |
| Liability Ratio(D/A)     | 20  | 16  | 16  | 14  | 11  | <b>26</b>  |
| Current Ratio            | 345 | 457 | 476 | 528 | 659 | <b>261</b> |

# EPS



# Safe Harbor Notice



TRI's statements of its current expectations are forward looking statements subject to significant risks and uncertainties and actual results may differ materially from those contained in the forward-looking statements. Except as required by law, we undertake no obligation to update any forward-looking statement, whether as a result of new information, future events, or otherwise.



Better Testing Better Quality



***THANK YOU!***

***For more information about  
Test Research, Inc.***



**Please visit:**

**[www.tri.com.tw](http://www.tri.com.tw)**

