Manufacturing Quality Issues from the EMS Perspective

Bill Barthel, Plexus Corp.

Executive Summary

As more electronic assembly moves from OEM to EMS providers, a number of key issues arise in the overall value stream of production. This presentation will provide a comprehensive look at quality and reliability issues in circuit assembly processes from one of the world's leading EMS providers. OEMs, material and component suppliers, and EMS companies will gain valuable insight on how to avoid these pitfalls and directly impact their bottom line.

An EMS Perspective on Manufacturing Quality Issues

Bill Barthel

Plexus, Corp.

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Agenda

- EMS position in the supply chain
- Key quality systems for EMS companies
- Summary
- Conclusion

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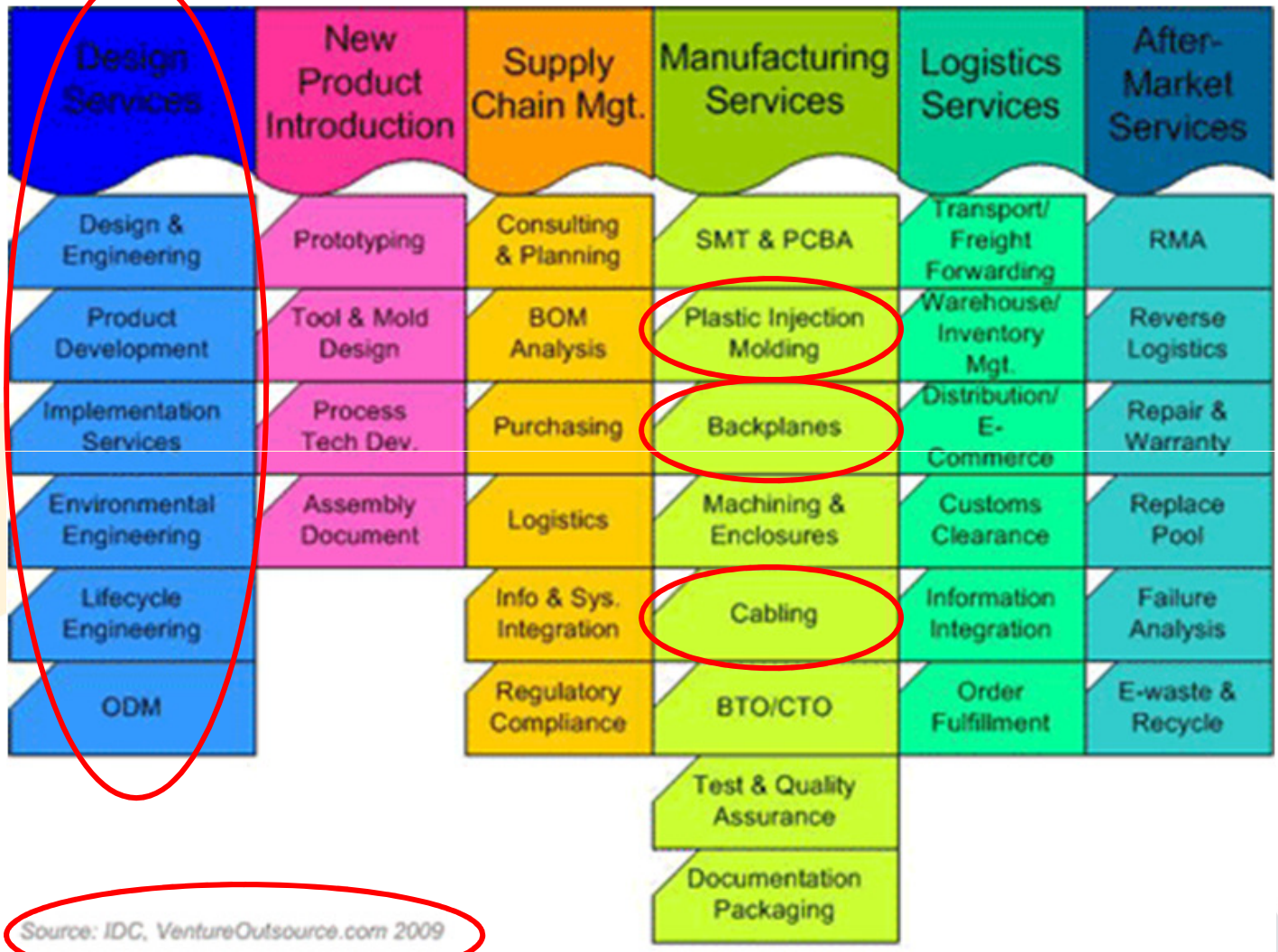
Scope of EMS Services



Source: IDC, VentureOutsource.com 2009

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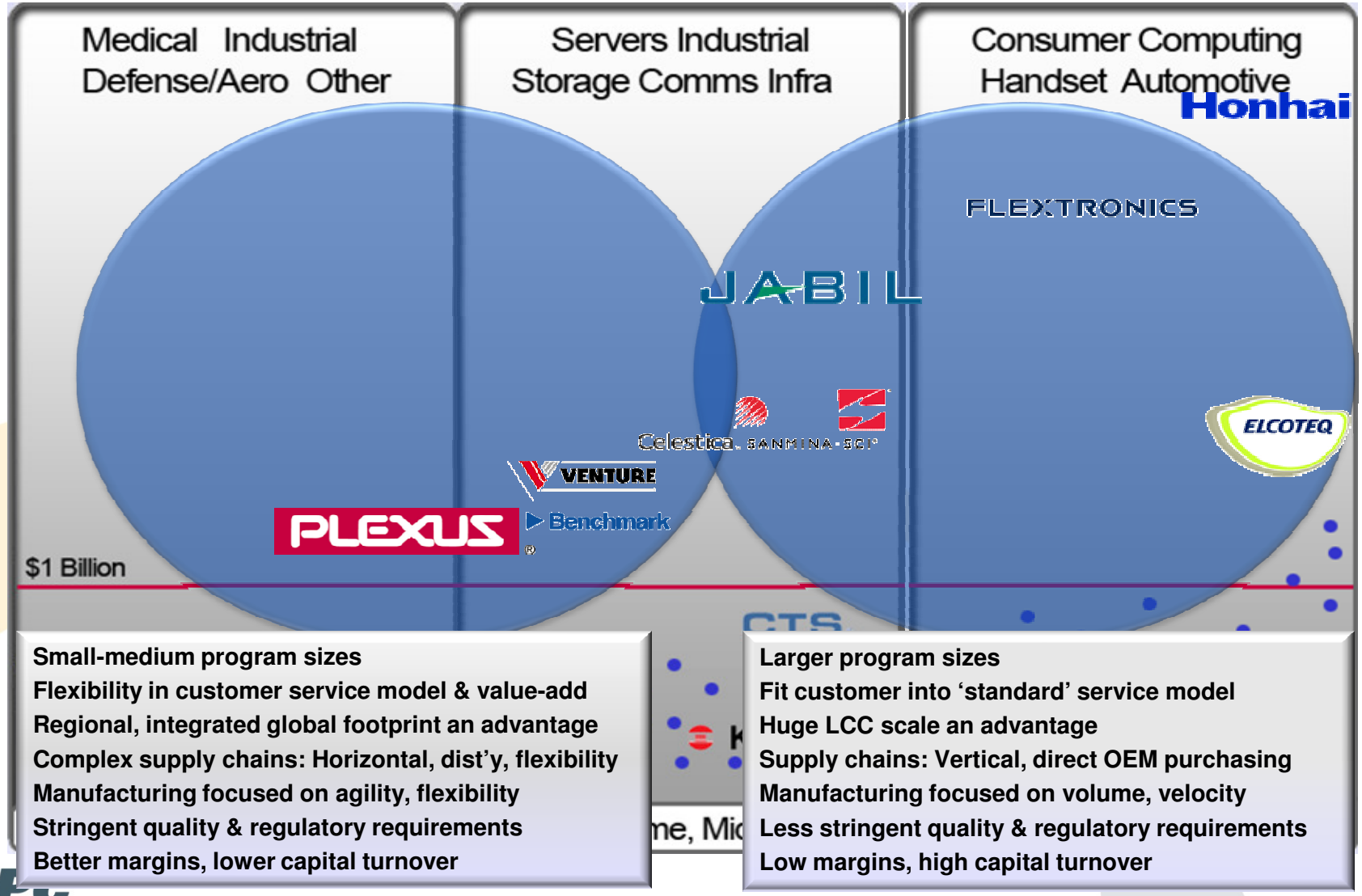
EMS Universe



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Certification Matrix

ISO 9001	ISO 13485 (Medical)	21 CFR part 820 (FDA) Medical	TL9000 Telecom	AS9100 Aerospace	ISO 14001 Environmental	OHSAS 18001 Health & Safety	ANSI/ESD S20.20	NADCAP AC7120	FAR145 Repair Station
Manufacturing Sites									
2003			2005	2008	Q4F09			2009	
Q1F10					Q2F10				
2003	2008		2003	Q1F10	Q4F09				
2003	2002	Class II 2002 Class III 2006			2009				
2008	2008	Class II 2008			2009				
2003	2004				F10				
2002	2006	Class II Q4F09		2008	2002	2008			
2009	2009				Q2F10	Q2F10			
2003				2004	Q1F10			2009	
2003			2003	2009	Q1F10		2005		
Q1F10	Q1F10			Q3F10					
2003	2004	Class II 2004 Class III 2007	2004	2003	2005		2009	2009	
2007	2007	Class II 2007	2007		2007				
2005			2005		2005	2006	2009		
2003					Q1F10				
2005	2007		2007						
2009	2009		2009						

Quality Systems Approaches in Multi-Regulatory Environments

A: Customize and dedicate factory to Sector/Customer requirements

B: Develop a single quality system to meet all industry and customer requirements

C: Combination of A & B

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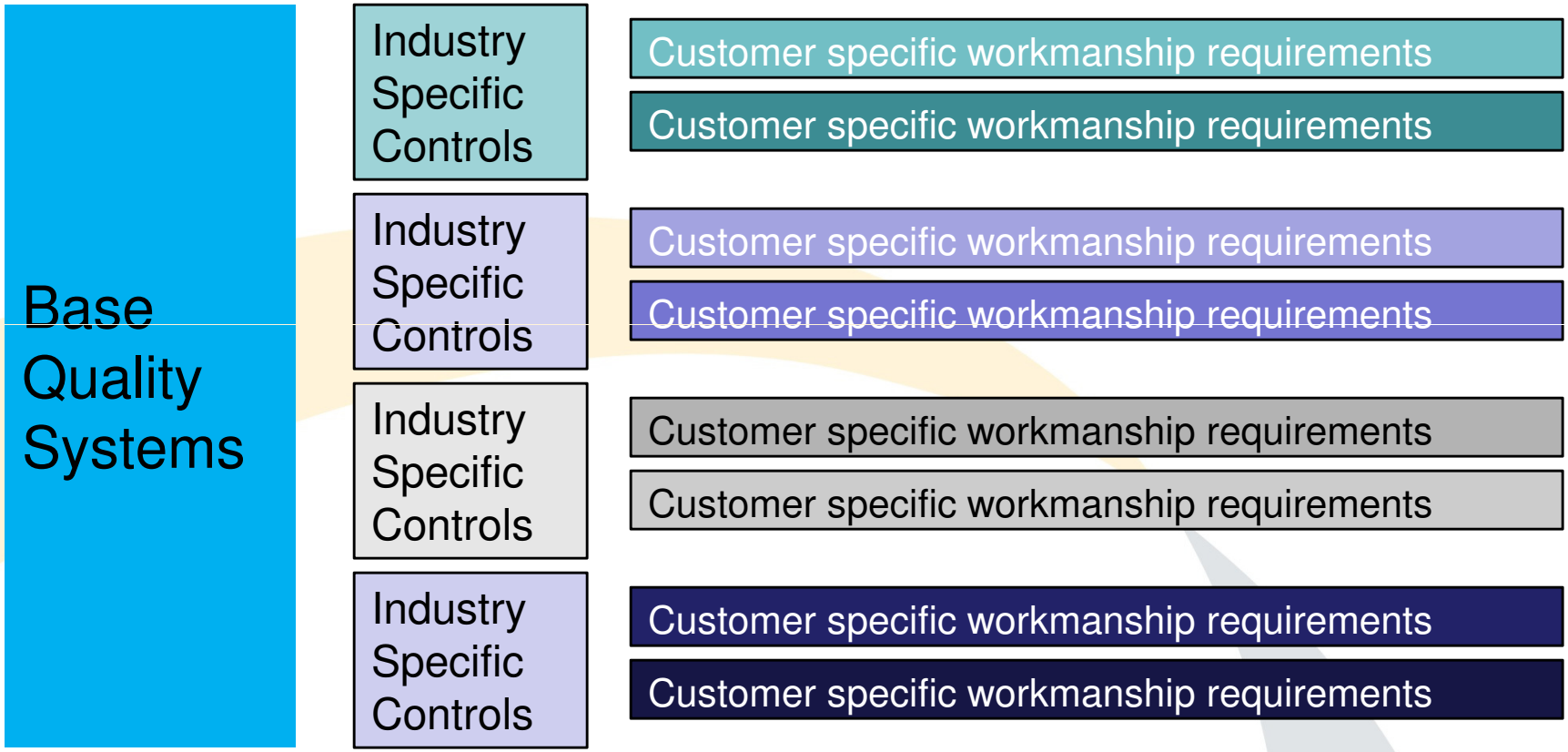
Quality Systems Structure



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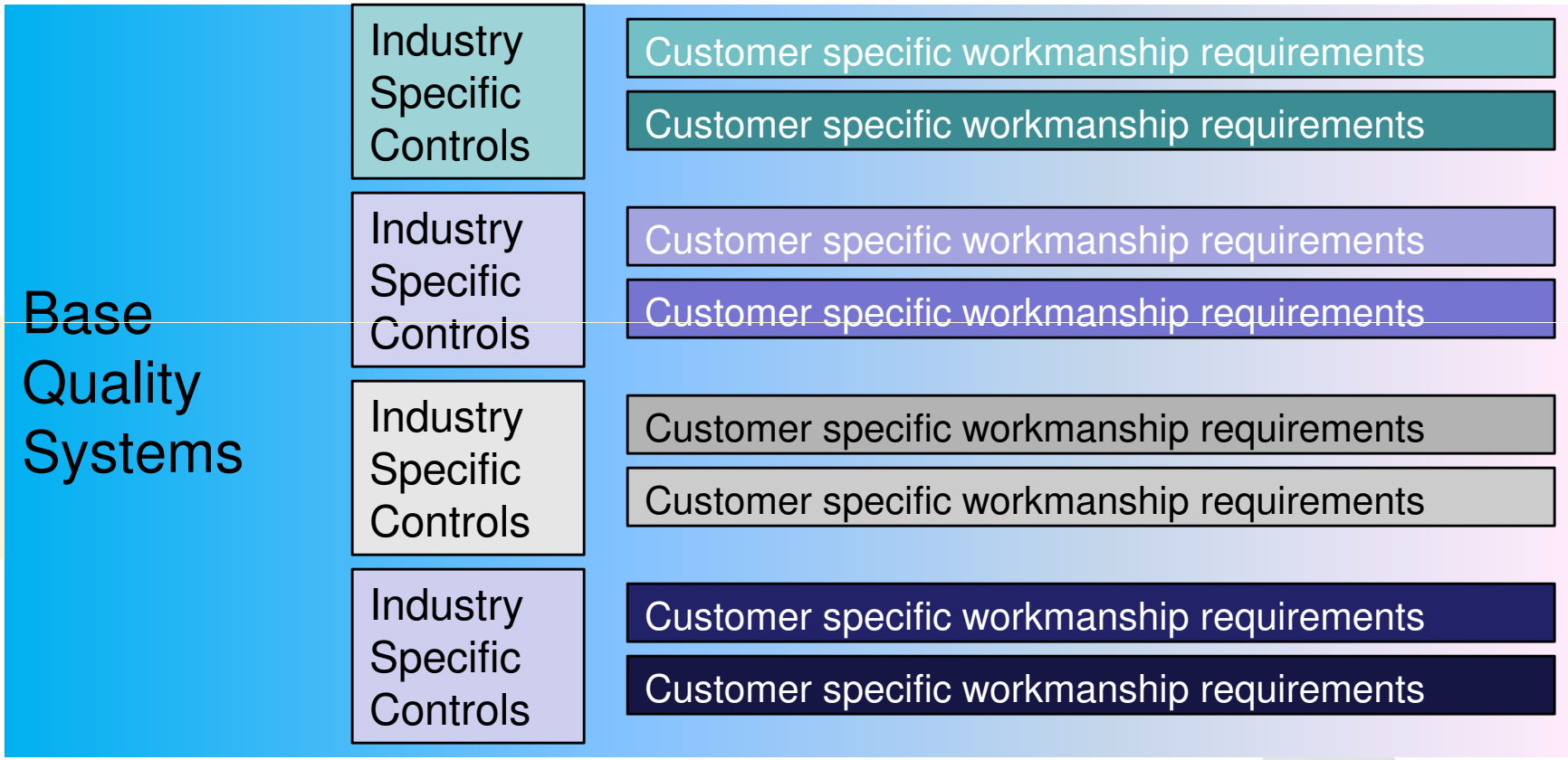
Quality Systems Structure



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Hybrid Quality Systems

- ISO provides basis for most components
- Industry specific needs must be met
  - One process or many?
  - Baseline *PLUS* approach
    - Audits and documentation to match
  - Standards PLUS Customer specific workmanship
    - “If it wasn’t for IPC there would be no EMS”
- Skill set of employees must reflect the various requirements

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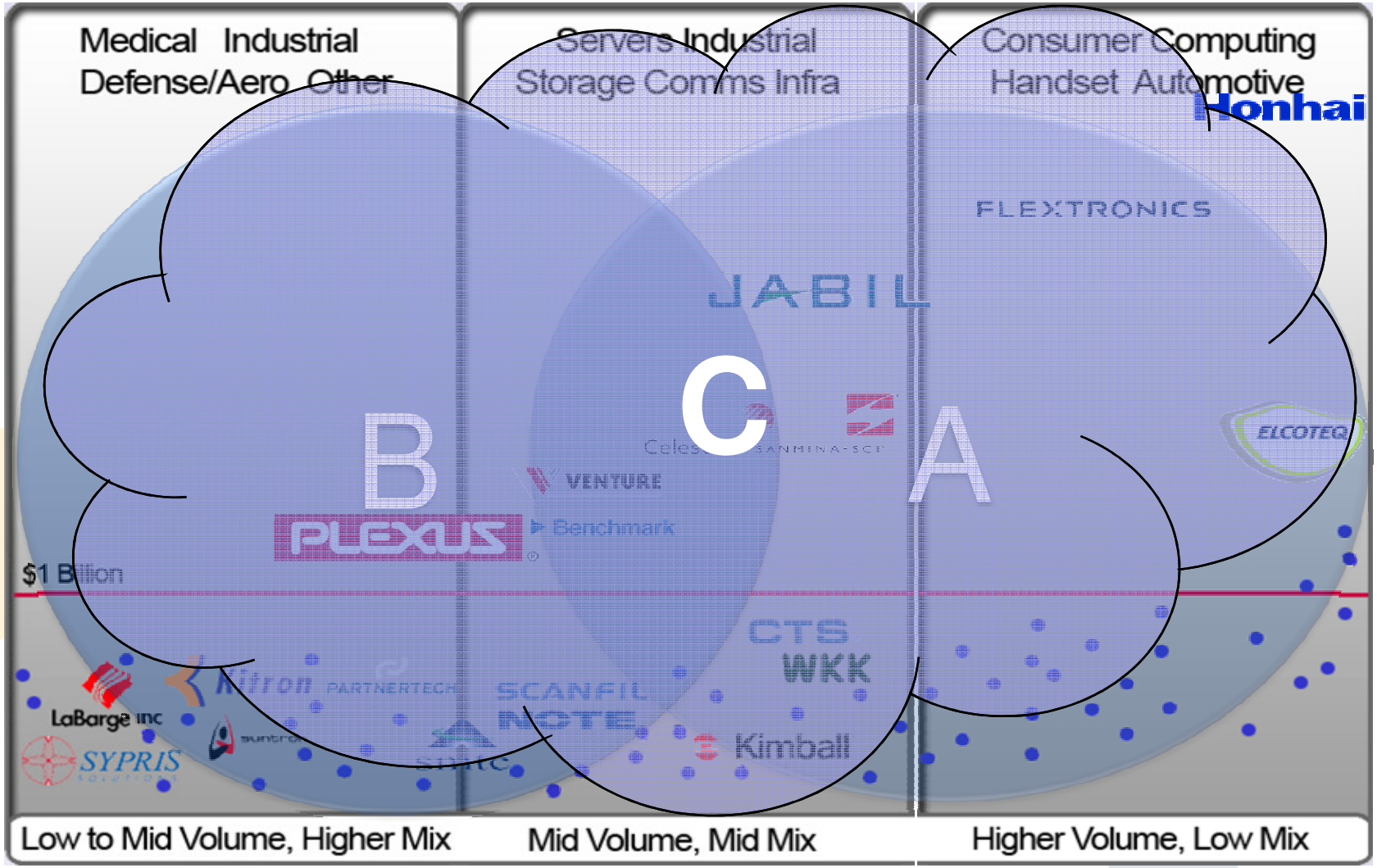
Quality Systems Approach



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Liability

- Most EMS providers do not have IP ownership of the design (e.g. ODM)
- EMS can only warranty workmanship and compliance to build specifications
  - *"All we truly manufacture is solder joints"*
- Higher level support goes beyond this to help OEM Partners with supply chain management

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Focus Issues

SMT and related PCB assembly processes range from 4 – 6 sigma yield levels. EMS companies are now looking elsewhere for big gains:

- Supplier qualification and control
- Manual assembly processes

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Who “Owns” the Supplier Relationship?

- Most EMS companies have developed relationships and contracts with component suppliers
  - Mutual business benefits
  - Opportunities to reduce transaction costs
- When a design includes parts that do not match the EMS approved manufacturer’s list (AML) the lack of a relationship can impede quality issue resolution
  - This is exacerbated when the OEM is also the part supplier

Counterfeit Parts

- "Assured supply chain" becoming more difficult to define
  - Incoming inspection is not the sole remedy
  - Focus on developing, improving, and monitoring supply chain management practices
    - Many tools being developed based on information systems
- Control measures are a "continuous improvement" effort, not a finite project
  - Akin to anti-virus tools for computers

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The Down Side of Lean

- Lean manufacturing trends have permeated the supply chain and improved productivity – but at what cost?
- Often difficult to pin down but with negative economic trends have seen companies with good track records experience problems not seen before
  - Fewer people accountable for more tasks
  - Less experienced people
  - Cost cutting/task reduction impacting vital controls

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Manual Assembly

Not just “hand stuffing” any more

More companies are outsourcing entire systems leading to an adjustment in the definitions of “post PCBA” assembly steps

- Higher Level Assembly
- System integration
- Mechatronics

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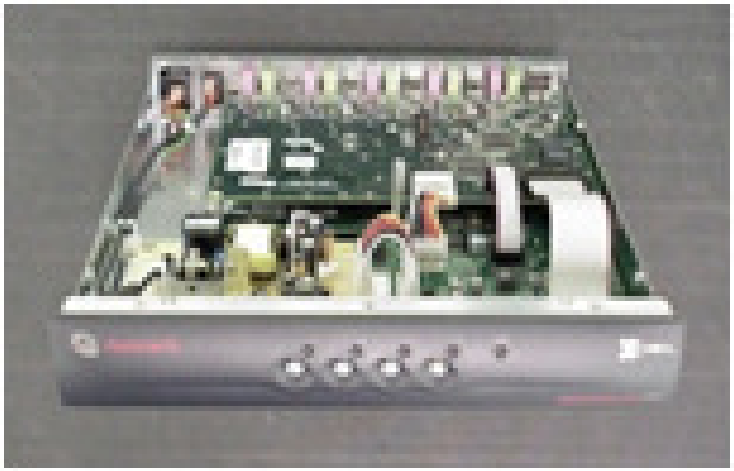
Higher Level Assembly

- Has been a part of the EMS “suite of services” for some time
  - Face Plates, Enclosures or Housings
  - Fasteners
  - Cable and Wire Harness
  - PCBA s
  - Software



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System Integration

- Integration of HLA Items and one or more of the following systems:
  - Information Processing
  - Optics
  - Displays
  - Metering & Measurement
  - Modular Applications
  - Materials Management Solution

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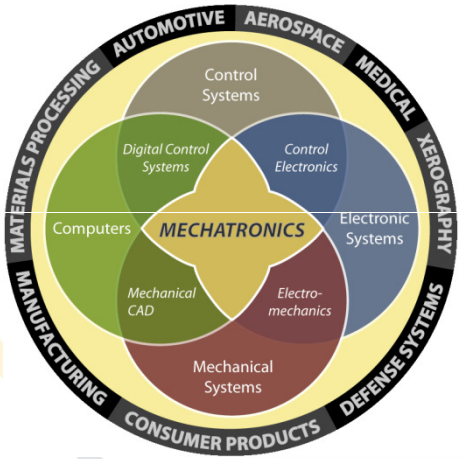
Mechatronics

Product Assembly with complex system integration of HLA, electromechanical and can include one or more of the following systems:

- Motion control systems
- Sensing
- Drive systems
- Fluids, hydraulics, pneumatics systems
- Sophisticated manufacturing concepts
- Test solutions
- Reverse & repair logistics
- New technologies, innovative solutions



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Manual Assembly Issues

- Fewer standards, more custom parts and processes
- Processes have lower fungibility requiring more ancillary system investments
  - Up front: Evaluation, qualification, selection, ramp to yield
  - On going: Training, audits, process controls, documentation, maintenance, supplier management, etc…

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Summary

- Product sectors greatly influence quality systems requirements. Companies must either focus on a small number of sectors or find ways to deal with wide variations in requirements
  - These approaches correlate to EMS business models
  - Liability definitions are a key component to good supply chain systems

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Summary - 2

- Supplier quality management is a growing proportion of EMS quality issues
  - Non-standard parts, counterfeits, economic pressures
- Manual assembly is becoming a significant part of EMS service content
  - No industry standards, less automation

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Conclusion

- EMS companies must match their quality systems and tools to their business model
- The industry must continue to develop standards for full product assembly

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