

Breakout Session 4

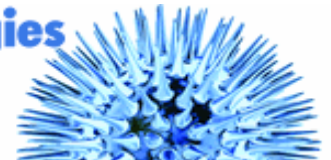
Nanomaterials in Electronics
*The Major Domain of Existing
Nano Enabled Products*



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Examples of Documentary Standards

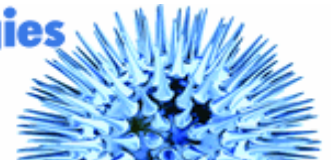
- **Preliminary List of Existing:**
 - **IEEE 1650™-2005, *IEEE Standard Test Methods for Measurement of Electrical Properties of Carbon Nanotubes.***
 - **Standards from other SDOs and countries**
- **In Review:**
 - **IEEE NESR working group for: *Nanomaterials Characterization and Use in Large Scale Electronics Manufacturing.***
- **In Progress (known):**
 - **IEC 62565: *Guideline for Carbon Nanotube Specifications for Electrotechnical Applications***
 - **IEEE P1690™, *Standard Methods for the Characterization of Carbon Nanotubes Used as Additives in Bulk Materials.***
 - **IEEE P1620.2™, *Standard Methods for the Characterization of Printed and Organic Diode Bridges Structures for RF Devices.***



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Documentary Standards Needs

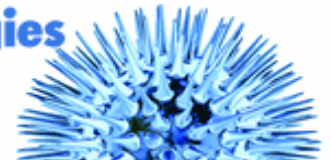
- Short term (less than 2 years)
 - Take IEEE NESR to the next level
 - What do we do with existing nano-enabled products on or entering the market? (e.g. nano-enabled batteries)
 - IEC TC-113 Framework Survey
 - Coordination of SDOs involved in nanoelectronics standardization.
- Medium term (2-5 years)
 - Crystal ball is cloudy!
- Longer term (>5 years)
 - What crystal ball?



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Measurement Needs

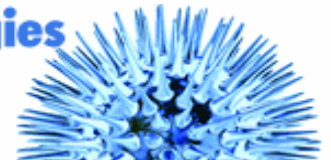
- New tools/techniques needed
 - Contactless measurements
 - Non-destructive techniques
 - Framework for validation of embedded nano-enabled product claims



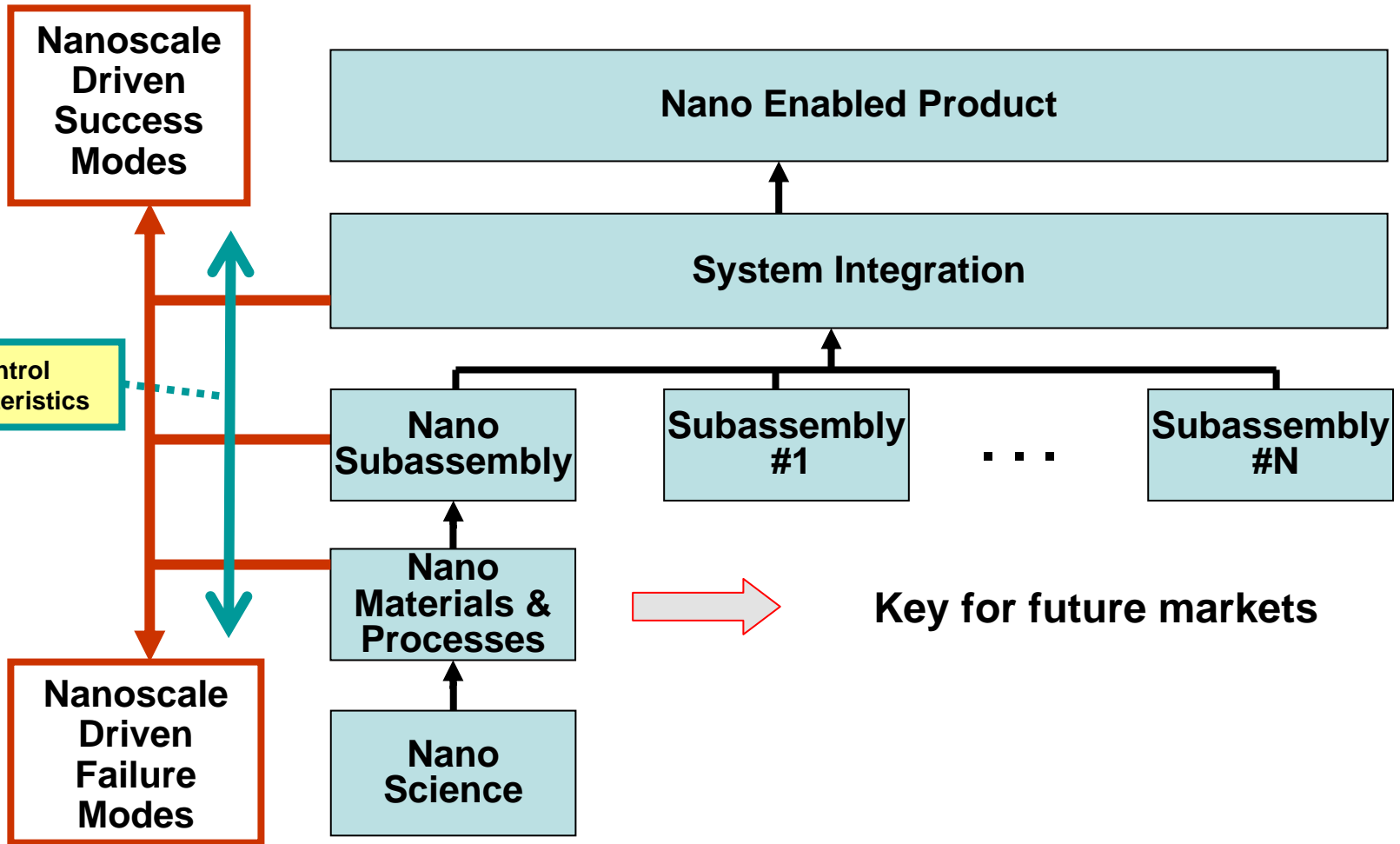
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The Nanoelectronic Value Adding Chain

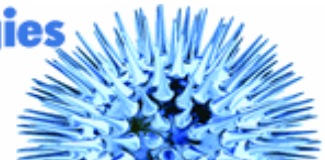


NLST



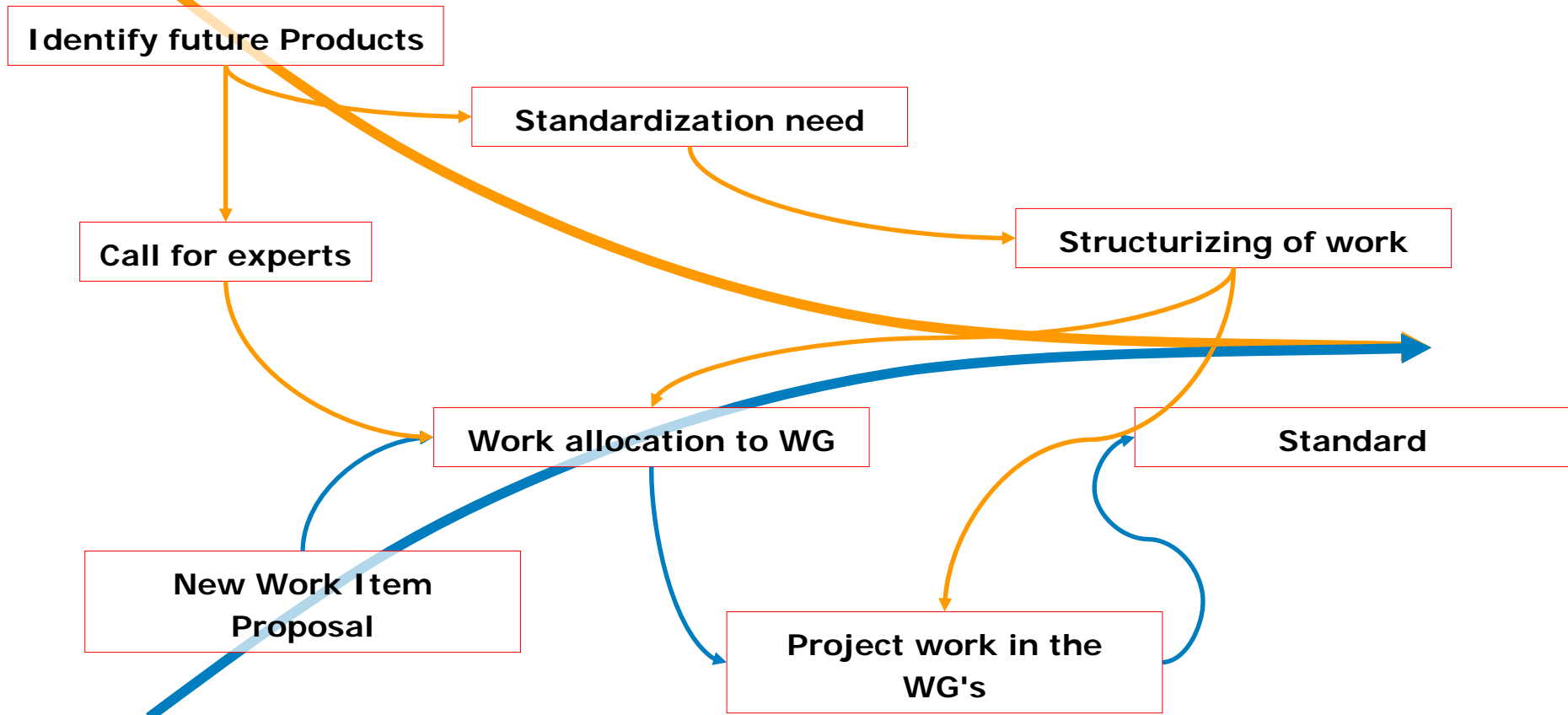
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Standardization Strategy of TC113

Top Down



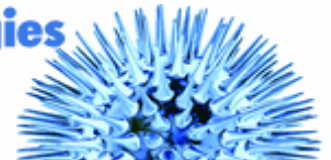
Bottom up



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Factors driving standards

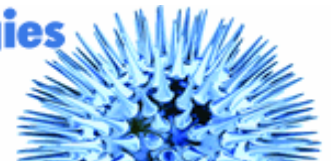
- Life Cycle Concerns: From Concept to End of Life. How will nano-enhanced electronics be disposed?
- What should be specified? What should be measured?
- Understanding nanoscale driven failure/success modes
- Multi-committee sponsorship
- Education/Communication readily accessible
- Need more source information that is driving nano-enabled products.
- Non-tariff technical barriers to trade (e.g. WTO)



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Barriers

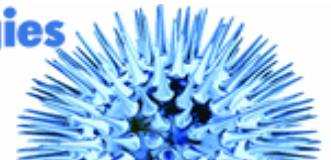
- Uneducated individuals approving standards just because it is new.
- Overlapping jurisdiction between committees/standards
 - Requires a short-term solution
- Potential impact of regulations that inhibit the use of enhanced materials
 - Reluctance of the public/private sectors to share information
- Fear of losing Intellectual Property rights or Trade Secrets as a result of involvement
- Need for PNR, CNR
 - Measurement simulation & visualization



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Resources

- Existing resources
 - IEEE-SA and IEEE NTC-SC
 - IEC TC113 Working Groups
 - ISO TC229 Working Groups
 - SEMI
 - Other SDOs as appropriate
 - Other stakeholders (e.g. MRS, Asia Nano Forum, OECD, VAMAS)
 - Regional nano-initiative organizations
 - SCITOPIA.ORG (free vertical search portal)
- Resource challenges
 - Availability of experts, time & funding
 - NMI involvement.
 - Private Sector involvement
 - Trusted central repository of enabling information



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