Optimization of Material Resource Conservation in Electronics

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Today

- Role of EPEAT in closing the logic on resource conservation in electronics
- Reflections on the Present and Future of Electronics
- Challenges to achieve sustainable ICT
- Paths forward

An Introduction to EPEAT™

www.epeat.net

- EPEAT is an environmental procurement tool designed to help institutional purchasers in the public and private sectors evaluate, compare and select computer desktops, laptops and monitors based on their environmental attributes.

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The Two Dimensions of EPEAT©

1) A set of voluntary environmental performance criteria (IEEE 1680 American National Standard for the Environmental Assessment of Personal Computer Products)

2) A Registry to identify products which meet the standard (www.epeat.net) and a system for verifying conformance

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IEEE 1680.1 Environmental Performance Categories for PCs & Displays

- Environmentally Sensitive Materials
- Materials Selection
- Design for End of Life
- Product Longevity/Life Cycle Extension
- Energy Conservation
- End of Life Management
- Corporate Performance
- Packaging

51 PC/Monitor Criteria
- 23 required
- 28 optional

Plus for Imaging Equipment

- Consumables
- Indoor air

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1. EPEAT Bronze – Meets the 23 required criteria
2. EPEAT Silver – Meets 23 required criteria and at least 50% of the optional criteria
3. EPEAT Gold – Meets 23 required criteria and at least 75% of the optional criteria

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Who is Using EPEAT?

- **U.S. Federal Agencies**
  - EO 13423 & the Federal Acquisition Regulations (FAR) mandate federal agencies to buy EPEAT registered products.
- **U.S. Federal Government** (approx $60 billion in contracts citing EPEAT) NASA, DOD, EPA, DHS, DOE, DOI, GSA.
- **Canadian Federal Government** Master Agreement
- **New Zealand**: Environmental and Defense ministries
- **Private Sector**: Kaiser Permanente, Premier Inc., McKesson, HDR, Marriott International
- **Cities** including San Francisco, CA, Phoenix, AZ, San Jose, CA, Vancouver, BC, Seattle, WA, Portland OR
- **States/Provinces** including: Oregon, Washington, Wisconsin, Massachusetts, New York, California, Province of Nova Scotia, Ontario Lottery and Gaming

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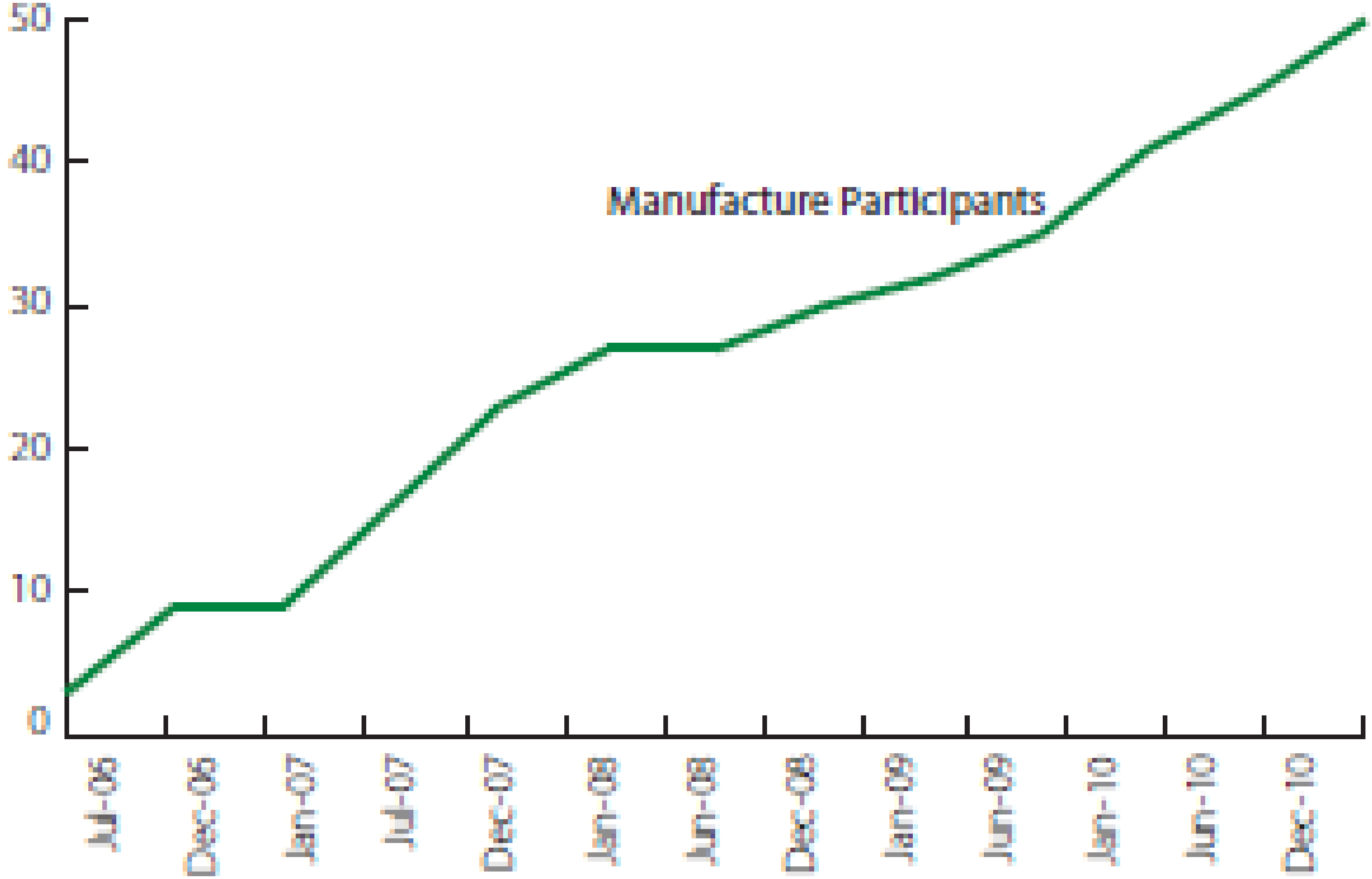
Growth in Manufacturer Participation



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Potential Role of EPEAT in Closing the Logic on Resource Conservation

- EPEAT sets the agenda for electronics green design in the U.S. and beyond
- EPEAT is an opportunity to influence electronic product design
  - Eco-design criteria that will result in more efficiently and effectively reusing and recycling products

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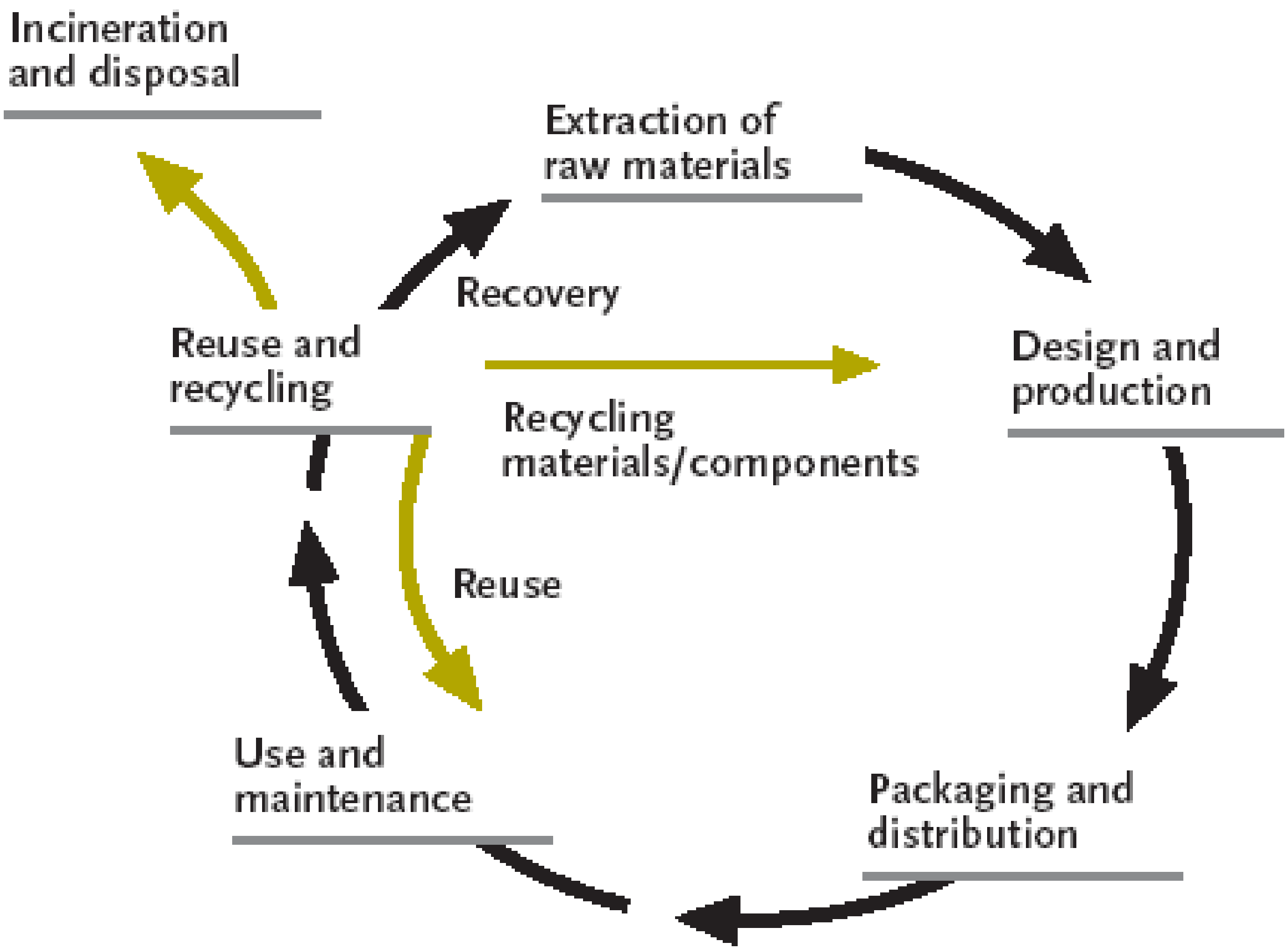
Optimizing the Life Cycle



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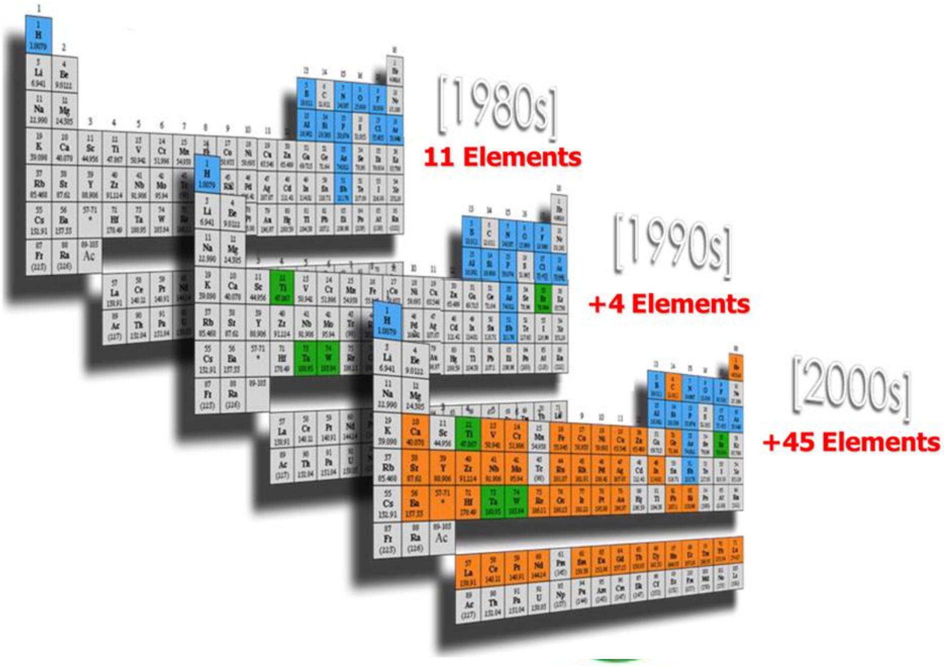
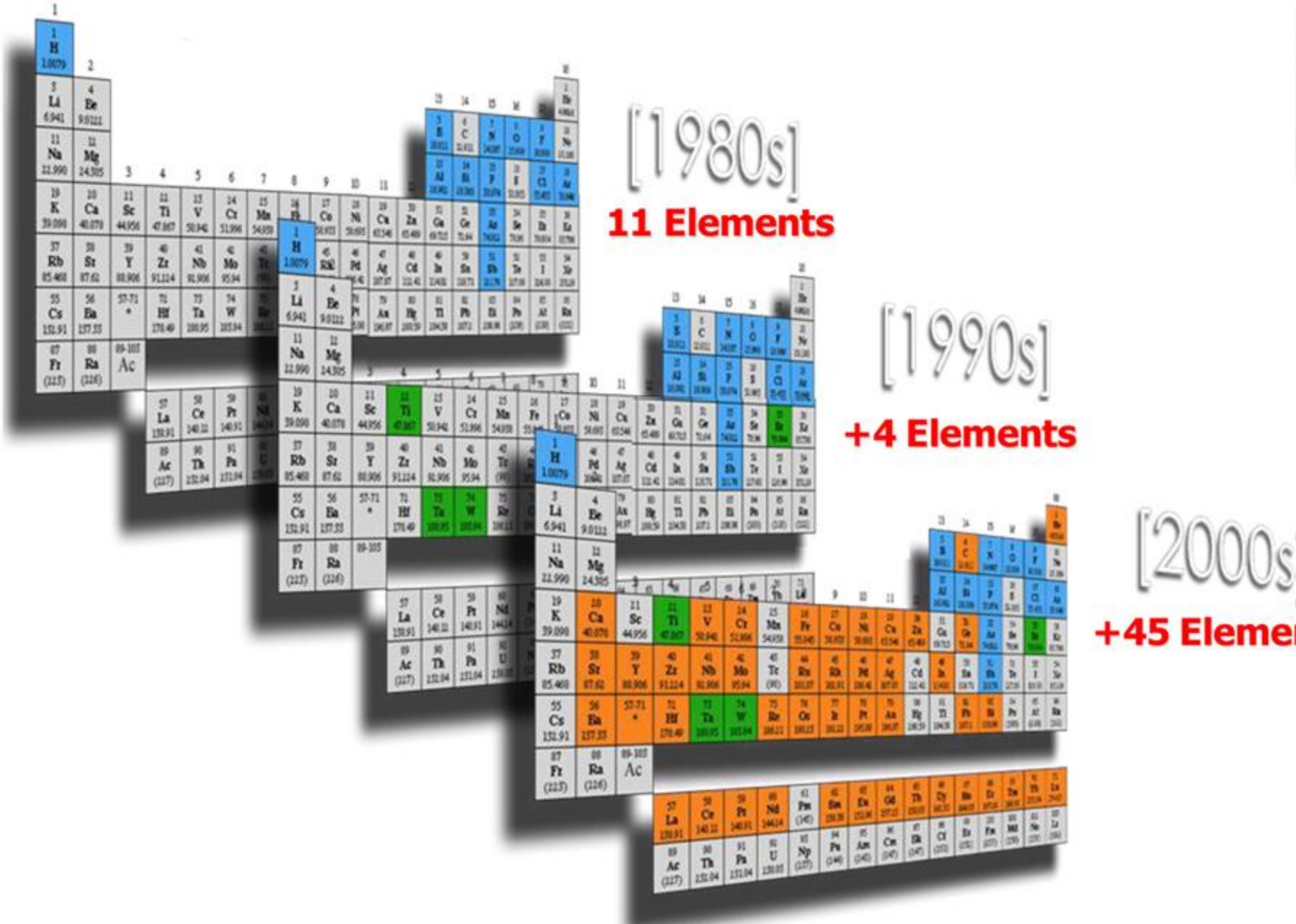
Two Technology Trends

- Ultra miniaturization

- Material composition





Adapted from a figure courtesy of T. McManus, Intel Corporation (2006).

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The Key is Metals Recovery

Environmental equivalency of recovering materials

Material	Environmental Equivalent for 1 mg gold
Plastic	20 gram
Iron	8 gram
Aluminum	2 gram
Copper	1.3 gram
Palladium	0.3 milligram
Nickel	0.25grams
Platinum	0.2milligram
Silver	0.08grams
Indium	0.05grams

Waste from Electronics , Governance and Systems Organisation
Ab Stevels, Jaco Huisman and Feng Wang, Delft University of Technology , the Netherlands

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The Sustainability of Material Supply

- The intensity of extraction is matched by the depth of our ignorance regarding stocks, flows and future needs.
  - Demand is expected to grow 3 – 9 times by 2050
- Potential affronts
  - Unacceptability of extraction to local communities
  - Geopolitical trade gamesmanship
  - Reducing metals concentrations
  - Increased scarcity
- Two opportunities are readily at hand
  - Reducing materials demand by extending product life
  - Increasing material supply by tapping EoL products

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Unhappily – Trends Are on a Collision Course

- Materials are unevenly distributed through products
- Miniaturization makes disassembly more problematic for:
  - Repair and refurbishment
  - Component separation
- UNEP International Resource Panel, “Metal Recycling, Opportunities, Limits Infrastructure”
  - “Recycling has become increasingly difficult today and much value in lost due to the growing complexity of products and complex interactions within recycling systems.”
  - “The focus needs to be on optimizing the recycling of entire products at their end-of-life instead of focusing on the individual materials contained in them.”
  - “The manufacturing industry plays a key role in the design of products that facilitate recycling.”

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Fraunhofer/GEC Disassembly Analysis of Slates

Some key findings

- Huge differences in methods and complexity of disassembly
  - Method of removal of housing
  - Access to and method of separation of key components
    - Batteries and circuit boards
  - Dismantling of display
- Trade-offs
  - Easy access to battery & PCB, less easy access to display, & visa versa
  - More robust for longer life, less disassembly-friendly

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EoL System Challenges to Sustainable ICT

- Low collection rates and low participation in regulated programs
- Export and informal sector recycling

- A suboptimal recovery of metals
  - Recovery rates
    - Ag & Au: 10 – 15%; Rh & Pd: 5 – 10%; Pt & Ru: 0 – 5%

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Paths Forward

- Research
  - EoL chain for optimal recovery
    - Collection, triage/sorting, treatment, processing
  - Product design for life extension and optimal recovery
- Standards
  - Eco-design for repair, refurbishment and recovery
  - Processing to optimize repair and refurbishment
  - Processing to optimize recovery
- Information from manufacturers to EoL system
- Education and outreach

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