



Boston
Section

The Global Voice of Quality™

The Future of Quality: Cognitive Production, Ambient Intelligence, Smart Manufacturing, & Emergent Analytics

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Agenda

In this presentation we will:

- Review 7 of the main points from the 2015 ASQ Future of Quality Report, viewed *through the lens of innovation*
 - Share the Report's conclusions
 - Share my conclusions
- Introduce 4 themes and associated lessons that I believe *everyone* who's interested in quality and innovation needs to know about

What is the ASQ Future of Quality Report?

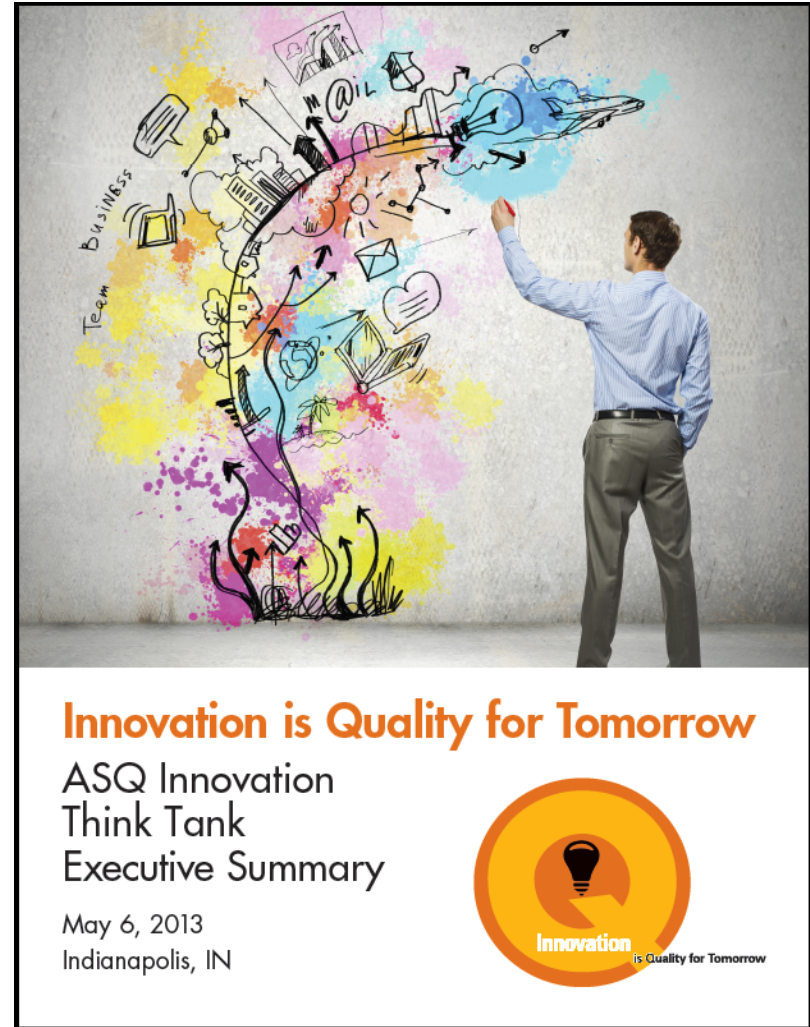
- <http://asq.org/future-of-quality/>
- An annual initiative commissioned by ASQ HQ that explores how key issues related to quality may evolve over the upcoming 5-10 year horizon
- This year, experts from inside and outside the quality profession were engaged



“Through the Lens of Innovation”

- **Quality** (ISO 9001 ¶ 3.1.5):
“The totality of characteristics of an entity that bear upon its ability to satisfy stated and implied needs”
- **Innovation**: “The totality of characteristics of an entity that bear upon its ability to satisfy **future** stated and implied needs”

Innovation = Quality for Tomorrow



<http://rube.asq.org/innovation-group/2013/11/asq-innovation-think-tank-executive-summary.pdf>

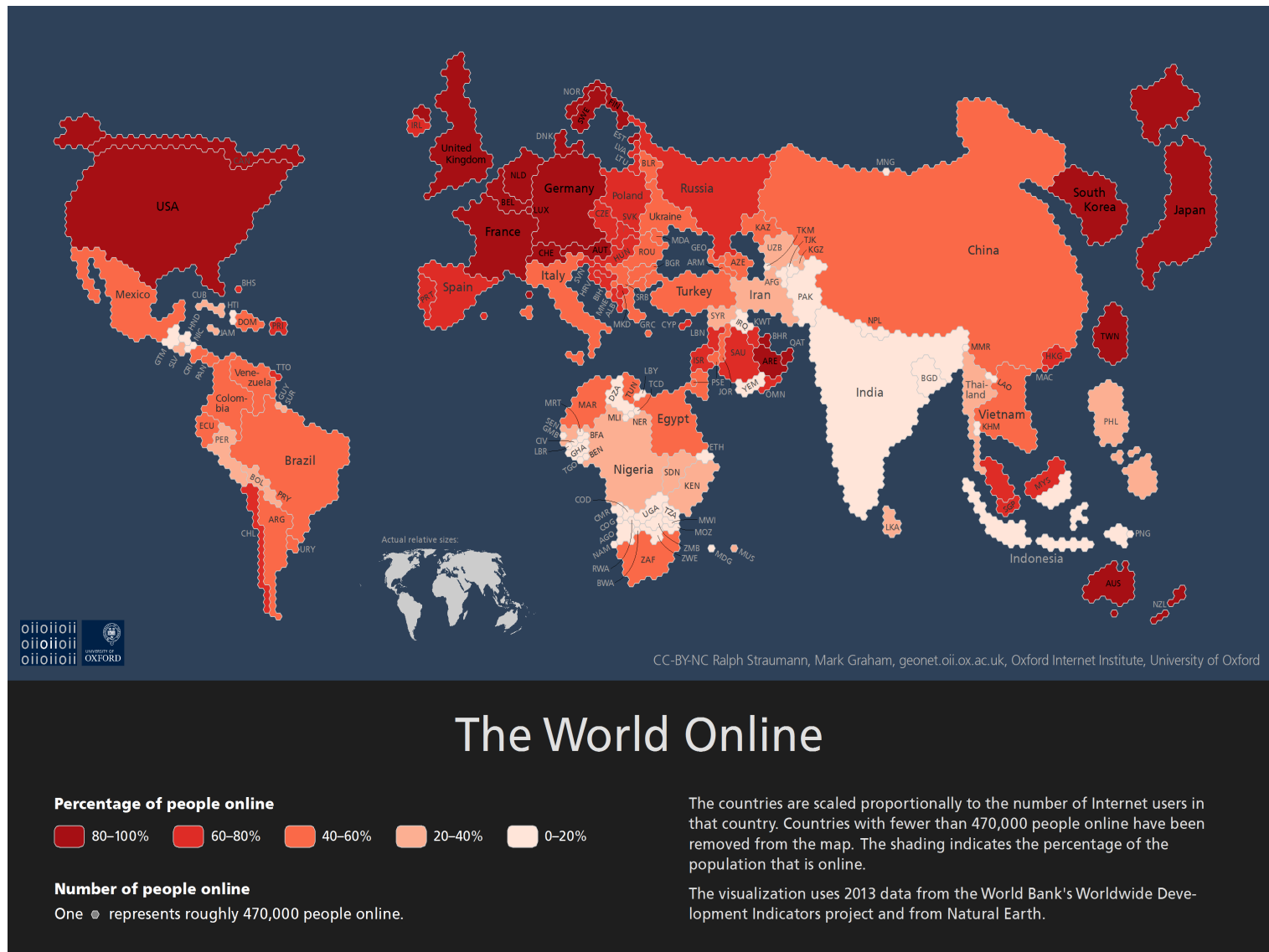
1. The Future of Leadership

From **EFFICIENCY** to **ADAPTABILITY**:

- Top-down management
- Short to moderate horizon view (5, 10, 20 years)
- Performance measured by productivity and efficient use of resources
- Quality (meeting stated and implied needs of stakeholders) and effectiveness of value-adds are also critical
- Increase transparency to empower immediacy in decision making
- “Networked” management: leaders become boundary spanners in service to everyone else
- Long-horizon view (100 years)
- Performance measured by **SELF-AWARENESS & CONTINUOUS LEARNING**

2. The Future of the Internet

- A **platform** upon which a decentralized industrial ecosystem has emerged
- Concepts of “product” and “service” are shifting
- Issues of security, control, and privacy arise
- Effective innovation will require attention to data quality and data management **over the lifetime of that data (curation)**



<https://www.weforum.org/agenda/2016/01/what-the-world-looks-like-by-number-of-internet-users>

3. The Future of Aerospace & Defense

These industries have consistently set the standards for quality and reliability in extreme or mission-critical environments where safety and performance are essential; but now, the status quo is intelligent unmanned autonomous systems

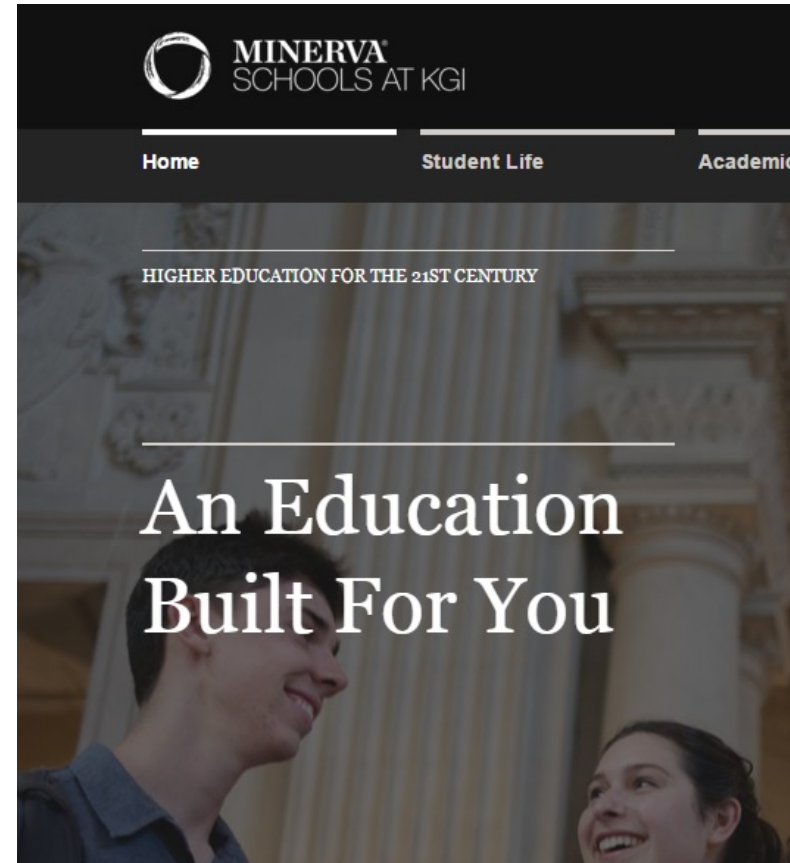
- “We are not just ensuring uniformity of production”
- Artificial Intelligence is becoming an operational requirement, and Strong AI is now needed: new definitions of quality must emerge

4. The Future of Manufacturing

- “**Smart Manufacturing**” automates, redefines, and (possibly) eliminate **seams and transitions**
- Tighter integration of information, materials, and workforce across *things we previously perceived as boundaries* → “**supply chain omniscience**”
- *Not* about individual interests, but ecosystem viability

5. The Future of Education

- “Three key changes —the advent of **digital technology, big data, and customization** —will impact education at all levels/types.”
- Personalized learning: more diversity, more choice.
- Not everyone jumps through the same hoops to get credentialed
- **But will the structure and values of the current system really meet society’s future needs?**



6. The Future of Energy

Not surprisingly, this section emphasizes more efficient energy production & more effective (renewable) choices

- “In the future, buildings will be hubs of energy production and storage as well as consumption.”
- **If we are producers as well as consumers, will critical to quality (CTQ) elements change?**
- **What new possibilities for business models will emerge?**



7. The Future of Customer Experience

Assumes a customer-centric model where organizations invest in “return on relationship” in social design, increasing agility/responsiveness, “in situ” design and development

- Requires **cross-disciplinary** curriculum and **STEAM**
- **A new perspective on seams and transactions** - what if there were no boundaries between us and the companies we interact with?
- ***Individualized technology***



ASQ Future of Quality Takeaways

- Leadership will become more concerned with *adaptability* than efficiency
- Internet becomes an invisible, ubiquitous *platform* upon which concepts of product and service change
- Intelligent systems are progressing into the domain of Strong AI (beliefs, intentions, deep learning)
- Smart manufacturing redefines boundaries
- Workforce development gains many more paths
- Energy becomes a peer-to-peer exchange

Recommendations from Futures Report:

- **Holistic improvement**: radical TQM
- Solving mission-critical problems using approaches like **statistical engineering** (Hoerl & Snee) that work at scales > Lean Six Sigma
- Using “big data” to generate new knowledge (with caution!)
- Accepting & leveraging **natural variability in human** capabilities and interests
- A new “Attractive Quality” model (Q1, Q2, Q3)

But what do these recommendations
mean to you?

My Conclusions

- **The nature of "organization" is changing.** Seams and transactions are fading; business model innovation is becoming more of a critical skill as economic structures evolve (e.g. Bitcoin)
- **The nature of "customer" is changing.** New models do not rely on ownership, consumption, or centralized services. The value-based approach accentuates importance of trust, transparency, and security.
- **Internet of Things (IoT) will force a new industrial revolution.** Retooling and retraining will be required as our devices become more and more aware of us.

Theme 1: Cognitive Production

Computer-Integrated Manufacturing

Real-time and accurate collection of production line data

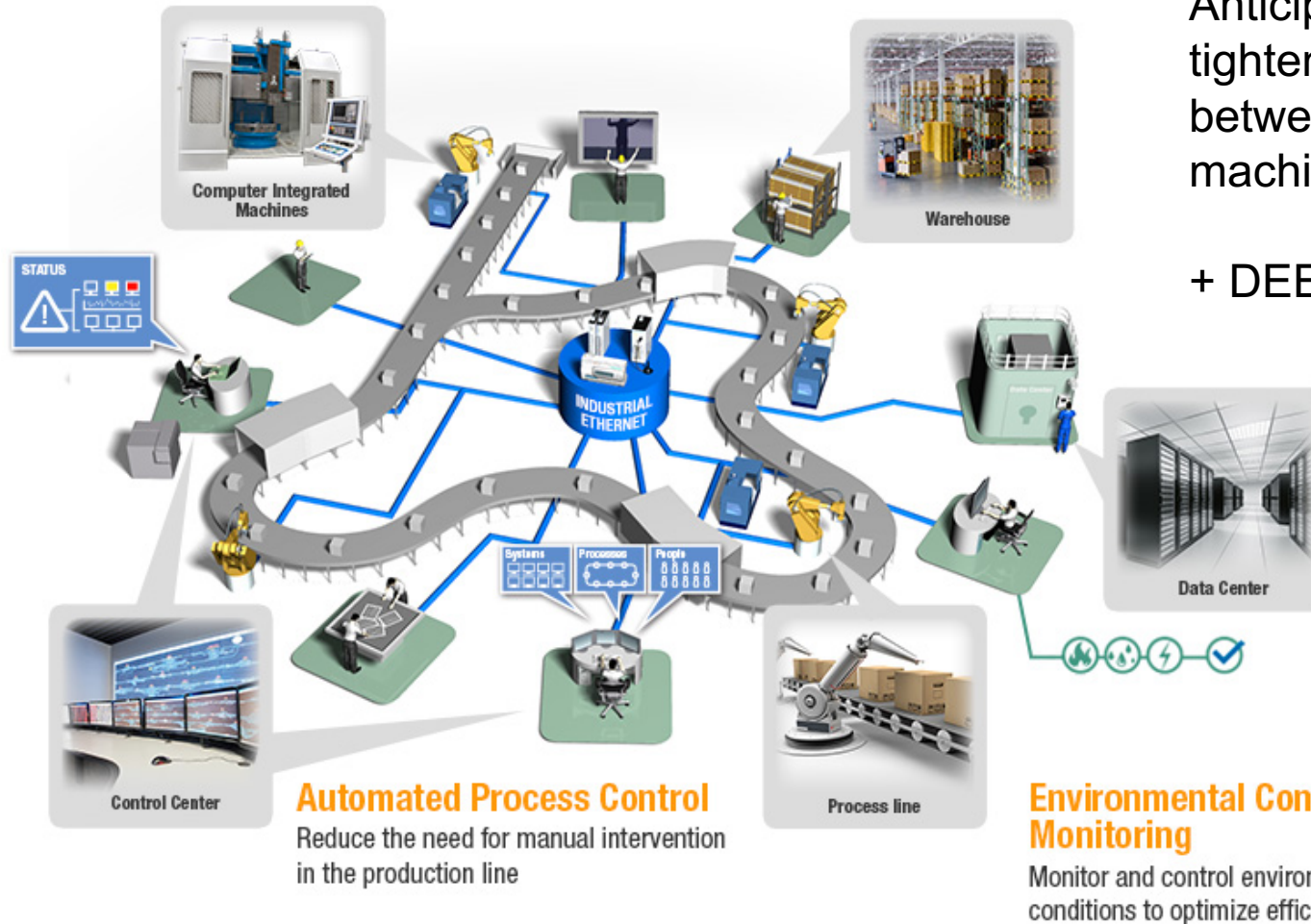
Real-time Production Monitoring

Greater control over the production process

<http://moxa.com>

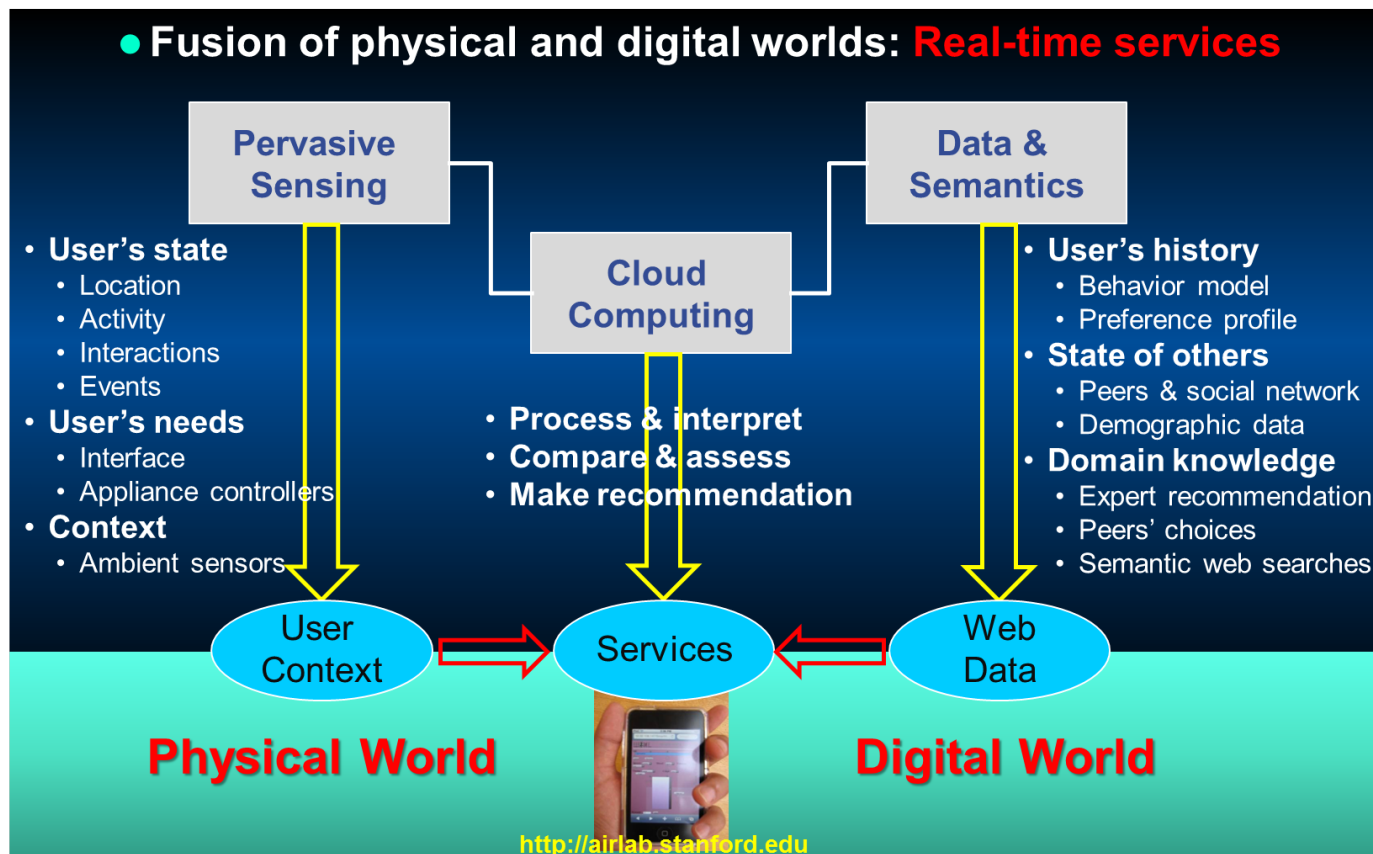
Anticipating changes, tightening the loop between human and machine

+ DEEP LEARNING



Theme 2: Ambient Intelligence (AmI)

- Work Assistance, Smart Products, Environmental Control
- Computing devices seem to disappear, with the introduction of smart materials, embedded MEMS, and mesh networks



Theme 3: Smart Manufacturing



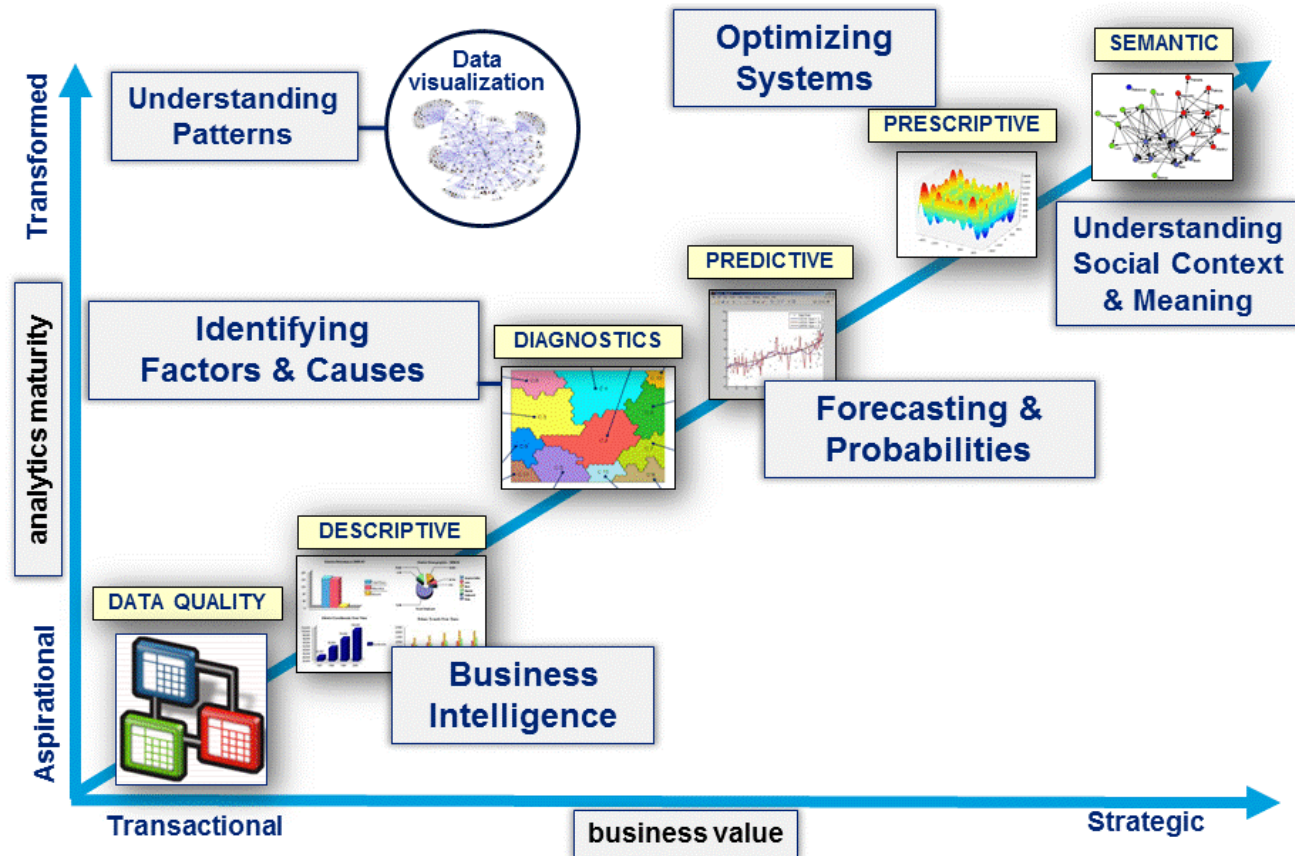
SMART MANUFACTURING

Making Things
Better, Faster, Cheaper
& Greener with
ASTM Standards



Theme 4: Emergent Analytics

- Note: Original Source Unknown*



Key Takeaways for Quality Improvement

In this new world:

- Quality assurance will *not be limited to the point of production*; you may not even be able to assess quality until after a burn-in period where the system has learned
- Voice of the Customer (VOC) will come not only from the customer, but from his or her *stuff* – throughout all phases of the product lifecycle
- Analytics are available everywhere, *by request*, like kanban
- Continuous learning changes the dynamics of workforce development *and* production planning

What does quality management look like when the boundary between humans and machines blurs?

Questions?