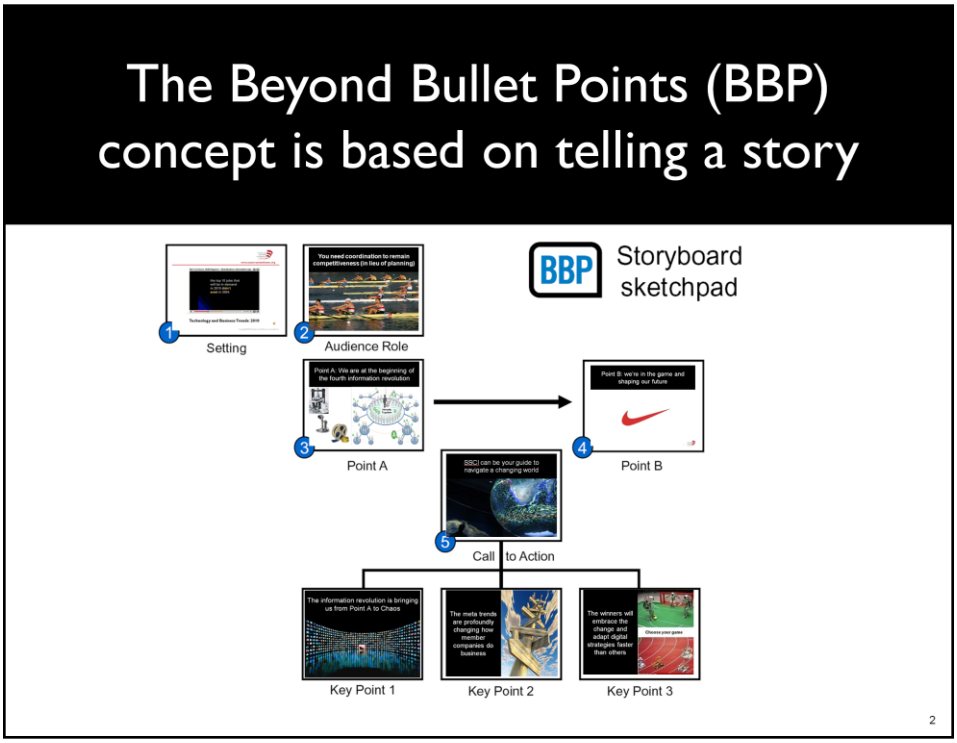
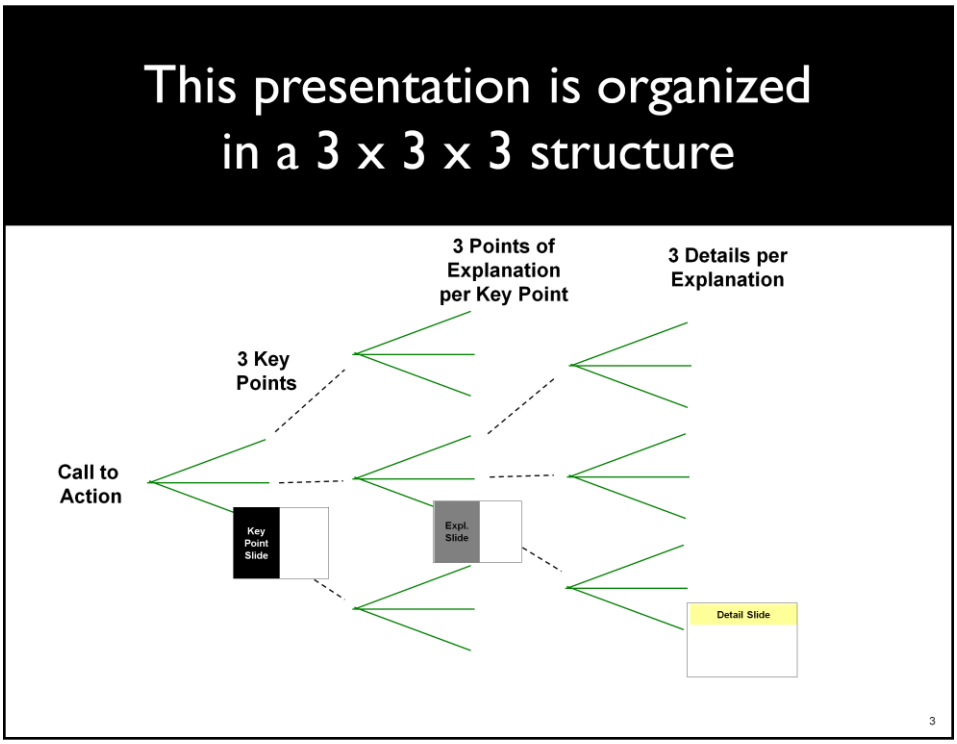
1. Technology is changing every aspect of the human experience, including work.
2. For example, this image is a freeze frame from a movie - **Did You Know**: **Shift Happens**.
   - This is a metaphor for the trends story
   - The message that "the top 10 jobs that will be in demand in 2010 didn't exist in 2004." is such a powerful insight
   - This is the motivation for the trends presentation
3. Mark Blackburn and Bob Small collaborated to produce this Beyond Bullet Point (BBP) style presentation (http://www.beyondbulletpoints.com/).
   - We think this innovative style better aligns with the content of the presentation.

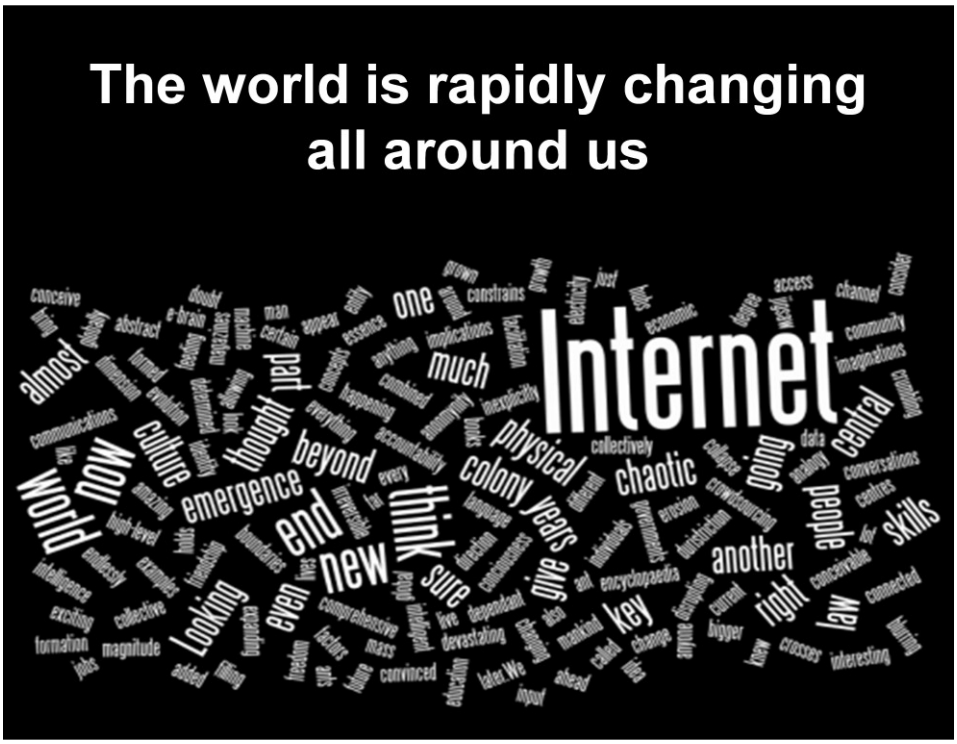


1. Some highlights of the BBP approach are to
   - Use the design pattern of a story to engage the audience; the story is told in 3 acts
     - Act I is the set-up of the story including the setting, the audience's role in the story, where it starts, where it ends, and the call to action
     - Act II presents the details of the story – how to get from Point A to Point B
     - Act III describes what happens as a result of the call to action
   - Decouple the visual message from the verbal message by using images rather than text on the slides

[1] http://www.beyondbulletpoints.com



1. Act II of the story is the body of the presentation
2. It is structured using a 3 x 3 x 3 concept to present 3 key points; this facilitates engaging the short-term memory of the members of the audience.
   - These slides use the black vertical highlight area and white text; this bold design signals their importance
   - If the audience only has time for a 5-minute version of the presentation, you would probably choose these slides
3. Each of the key points is supported by 3 explanation slides, that go deeper.
   - These slides use the gray vertical highlight area
   - If the audience has time for a 20-minute presentation, the presenter would probably choose the top two level of slides
4. Finally, each of the explanation slides is supported by 3 detailed slides
   - The detail slides use a landscape format
   - If the presentation has been planned for an hour, the presenter would give the entire story in all its detail
5. A feature of the BBP style is to place the narrative for each slide in the "notes" section and not on the slide in the form of text bullets.



1. Here is the setting for the story -
   - The Internet is growing in its influence in our personal and work lives, which seem to be merging.
   - There are amazing new opportunities and threats as the world is becoming increasingly flat.
   - Everyone has access to the same technologies.
   - The changes are no longer linear and do not seem to fit anymore into tidy little buckets.
   - These changes are affecting our members' customers, employees, partners, and products and services.
2. This presentation discusses the trends in the context of this changing world.
   - Changes are happening exponentially – for example knowledge is doubling every 5 years.
   - Worldwide collaboration (and combat) exists and will play a significant role as we move forward.
   - It is impossible to anticipate the levels of complexity.
3. **Implication**: our members are best positioned to leverage trends in addressing system development complexity.

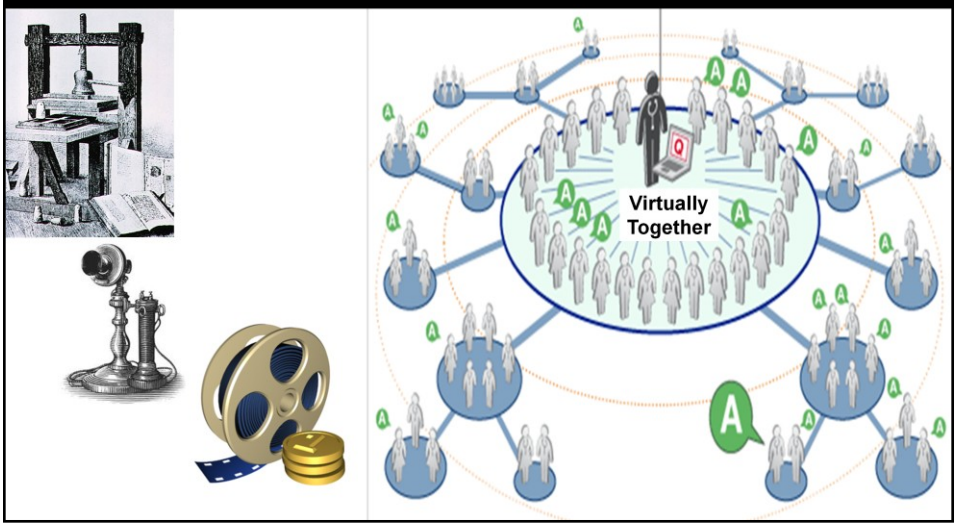
Image credit: http://www.randomwire.com/wp-content/uploads/internet-future-499x310.png

Coordination will displace planning in the race to be competitive

1. Given the accelerating pace of change, with new opportunities and challenges in every realm, how can our companies navigate through this confusing time?
   - What are the current trends in technology and business?
   - How do we make sense of them?
   - Are there reactive things we should do to adjust how we do business?
   - What are the proactive things we should do to ensure our continued competitiveness and success in the future?
2. There are tradeoffs and priorities that impact adapting to the trends:
   - Current customer and requirements for their end users
   - Partners and suppliers
   - Our products and services
   - Competitors and the potential impacts on future customers

Image credit:
http://www.zimbio.com/pictures/jbt6nEhq1GM/Olympics+Day+8+Rowing

Point A: We are at the beginning of the fourth information revolution



1. The four information revolutions and their impact on the world [1]:
   - Revolution 1: The printing press – documents were mass produced for the first time.
   - Revolution 2: The telecommunications – enabled live point-to-point communication.
   - Revolution 3: Movies – added the richness of audio and video and enabled mass communication.
   - Revolution 4: The confluence of the Internet and Social Computing provides mass communication of all forms where the consumers are now also the producers.

[1] Clay Shirky, in his TED talk:
http://www.ted.com/talks/clay_shirky_how_cellphones_twitter_facebook_can_make_history.html

Image credit:
http://www.hgsounds.com/files/Organic%20Chaos%20(cover).jpg

http://cs-exhibitions.uni-klu.ac.at/fileadmin/gdf/gdf10/gutenbergpress.jpg

http://www.stevennoble.com/main.php?g2_view=core.DownloadItem&g2_itemId=1995&g2_serialNumber=2

http://www.veryicon.com/icon/png/Business/Financial/Movie%20industry.png

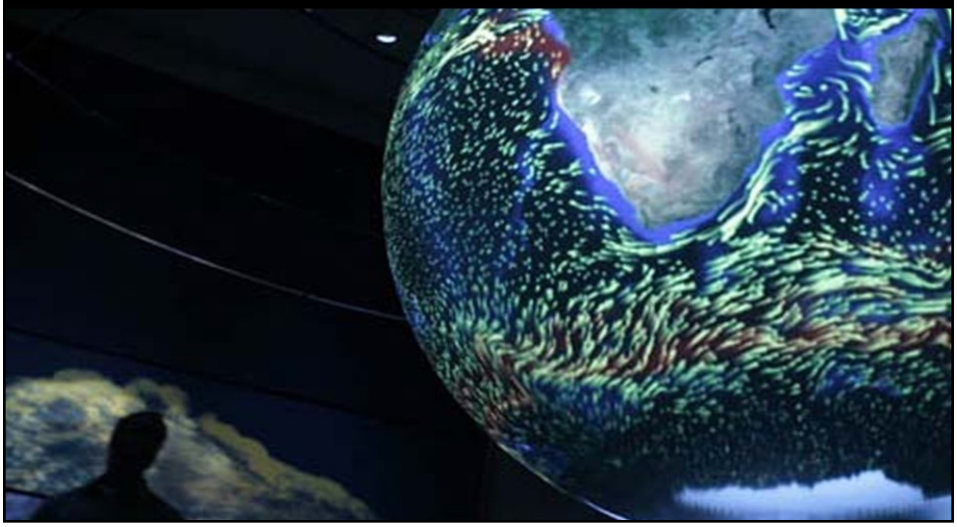
Point B: We're in the game and shaping our future

7

Just Do It!

Image credit: http://www.sunglasstent.com/images/NikeSwooshRed.jpg

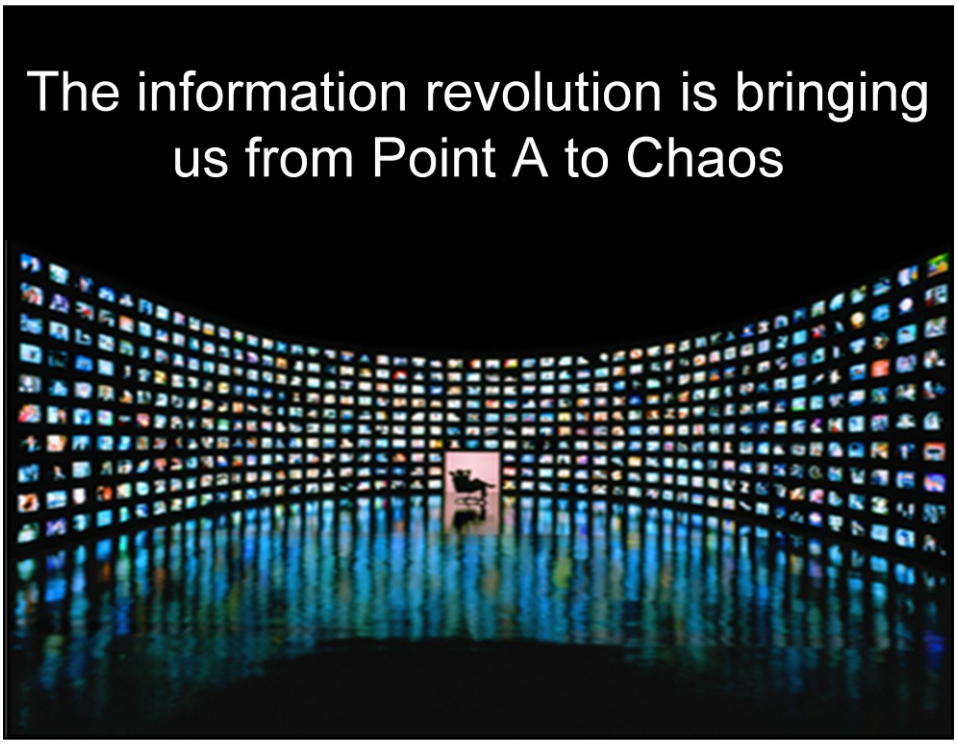
SSCI can be your guide to navigate a changing world



1. **Call to Action:** organizations need maps to navigate through periods of chaos.
2. Unfortunately there is no map for the 4th information revolution.
3. In the balance of this presentation we will discuss these trends and their impacts:
   - Views on the 4th information revolution
   - Meta trends that will profoundly impact our members
   - Interrelationships of some specific trends that are most relevant to member needs
4. Let SSCI collaborate with you to help coordinate your future.
   - Since we created this briefing, we are using slides from the trends presentation in our technology roadmaps.

Image credit:

http://image.absoluteastronomy.com/images/encyclopediaimages/c/co/complexity-map-overview.png

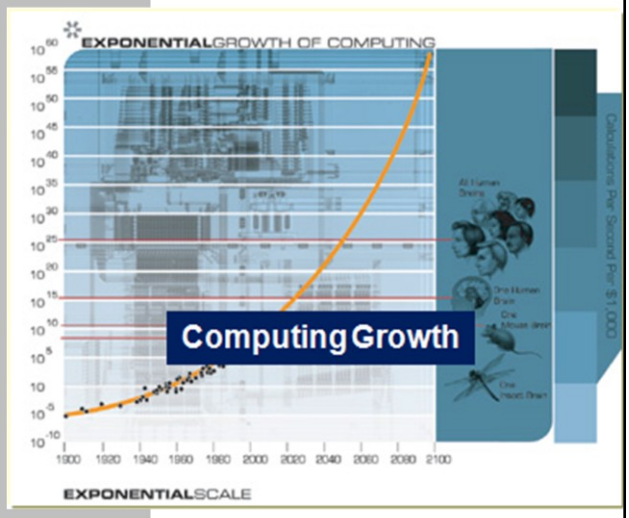


1. **Key point 1**: Revolutions are inherently chaotic and cause huge disruptions in the status quo.
2. The 4th information revolution is no exception.
3. In this section, we will discuss:
   - The impact of technology that is evolving at an exponential pace.
   - The implications now that everyone is connected to everyone and every thing.
   - The roles that technology plays in shaping our world.

Image credit:

http://www.psihoyos.com/pages/Concepts/images/01%20500%20tvs.jpg

Technology is changing at an exponential pace



10

1. Technology is evolving at an exponential pace as pointed out by Kurzweil in "The Law of Accelerating Returns."
2. Exponential growth is likely related to increased complexity.
3. Increased complexity is making it more difficult for our members to develop and deploy systems quickly.
4. The implications of increased complexity will be discussed later, but was the recent recall of approximately 133,000 2010 model year Toyota Prius vehicles related to increased complexity?
5. These types of defects are exponentially costly too.

Image credits: The Law of Accelerating Returns, Kurweil

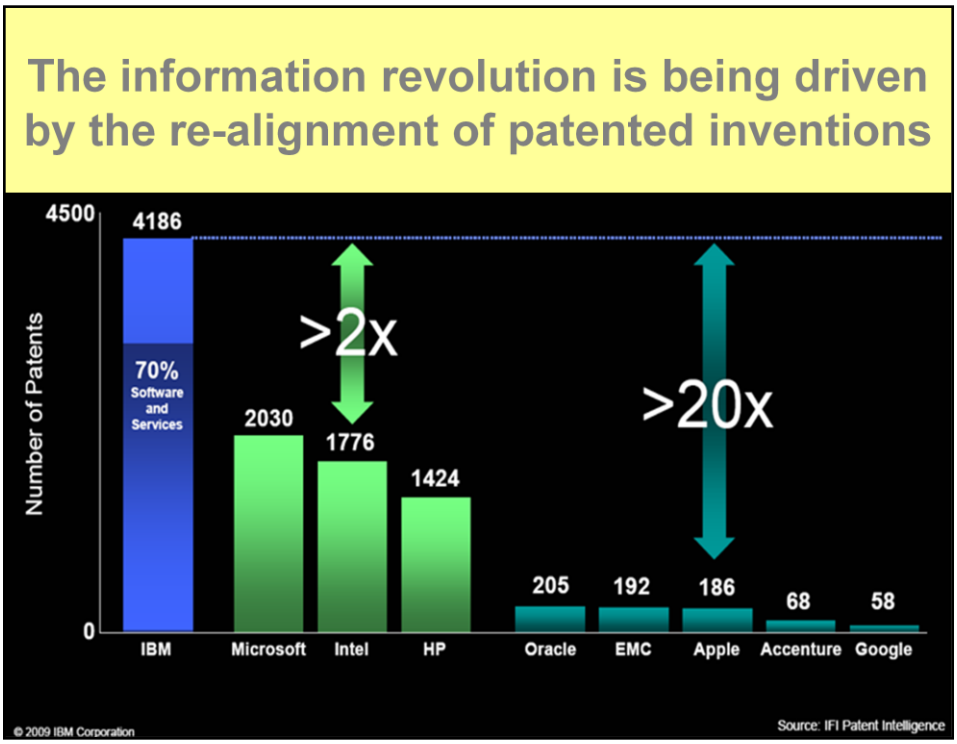
The y-axis in the image is based on the following variables:

- V: Velocity (i.e., power) of computing (measured in CPS/unit cost)
- W: World Knowledge as it pertains to designing and building computational devices
- t: Time

The assumptions of the model are:

(1) $V = C1 * W$

Computer power is a linear function of the knowledge of how to build computers.



1. IBM significantly outpaced all other companies in filing 4900+ patents, and 70% were software/system related.
   - Could that have future impacts on our members' ability to compete?
   - In the 2009 list, there wasn't one member in the top 50, although some of your competitors are.
2. **Implication**: Could this have intellectual property implications on licensing for systems integrators?

The top 10 are:

IBM	4,914
Samsung	3,611
Microsoft	2,906
Canon	2,206
Panasonic	1,829
Toshiba	1,696
Sony	1,680
Intel	1,537
Seiko Epson	1,330
HP	1,273

- See top 50 at http://www.ificlaims.com/IFI%202009%20patents%20011210%20final.htm

Image credit: Jai Menon, IBM Research, Innovation and University Programs,

Are "Industry Best Practices" anti-innovation?

1. "Imagination is more important than knowledge…" -- Albert Einstein
2. Innovation is about being different, diverging from the norms.
3. Best practices are about convergence – applying the same or similar practices.
4. When everything is the same, the only discriminator of products or services will be Quality [subsumes reliability, and other "ilities"], and possibly the brand.
5. **Implication**: innovation is doing things differently to serve customers better. It is the opposite of benchmarking. Go beyond what people expect in imaginative and creative ways.

"Today, just about everything is becoming a commodity, except imagination, except the ability to spark new ideas." -- Tom Friedman, NYTimes, 3/21/2010

See innovation examples at: Ideastorm http://www.innocentive.com/

Image credit: Tombstone Generator at http://www.jjchandler.com/tombstone/

The Internet is an incomprehensibly large repository for all kinds of information

161 million petabytes - amount of data world generated in 2006 [IDC]

Global IP traffic in 2013 expected to top 500,000,000,000,000,000,000 bytes (half a zettabyte, which is one trillion gigabytes) [1]

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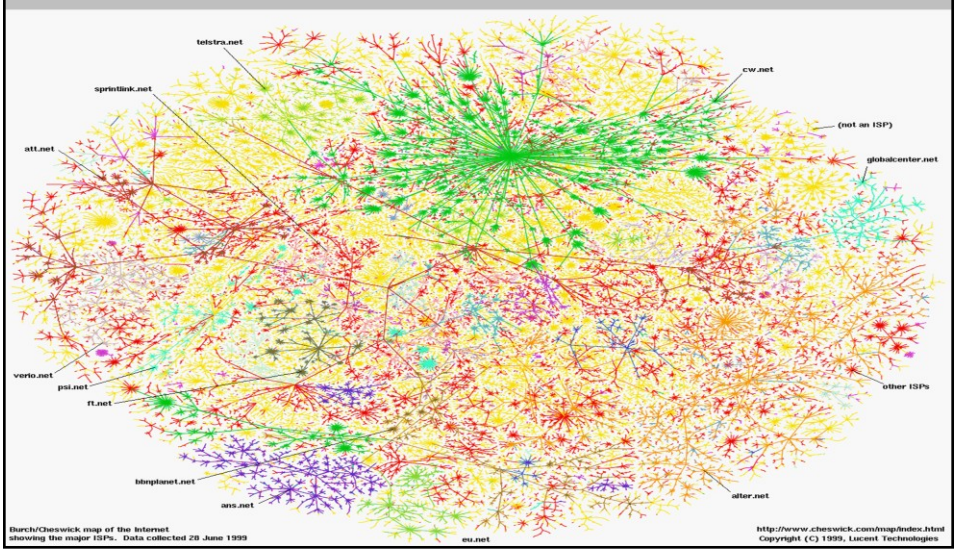
Petabyte - approx. 1,000,000,000,000,000 or 10 15

1. We are just at the dawn of an incomprehensible daily onslaught of news and information – some valuable, much useless.
   - Just to give an idea how big a petabyte is:
     - If every PC had a 50GB hard drive, storing a petabyte would take 20,000 PCs.
     - If one were to transfer a Petabyte of data onto 3.5" diskettes, and you could copy the data continuously at the rate of 1 diskette per minute, it would take you 137 years to do it!!!!!!!!!!!!!!!!!!!!!!
2. We will soon consume more media than there are waking hours, by virtue of multi-channeling at most times.
3. Billions of people will be media producers, including video streaming from most points of view on the world.
4. **Implications**: with so much information, there needs to be a chain of trust between the creators or curators of the information and consumers (i.e., members)

Image credit: IDC http://www.foxnews.com/story/0,2933,256957,00.html

[1] IBM CEO Sam Palmisano

Everyone is connected to everyone and every thing



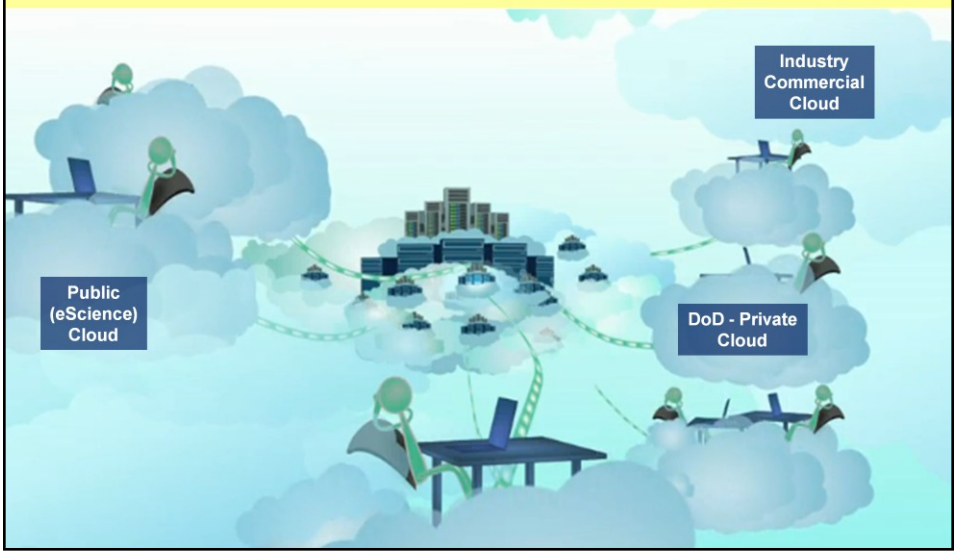
1. Cheswick's Internet Mapping Project of 1998 showed the dense connectivity.
   - This was 12 years ago
   - Depicts a subset of the internet at that time
2. **Implications:** the value of a network is the square of the nodes [1]

[1] Metcalfe's Law: http://en.wikipedia.org/wiki/Metcalfe's_law

Fact: The Internet Mapping Project was started at Bell Labs in the summer of 1998. Its goal is to acquire and save Internet topological data over a long period of time.

Image credit: http://www.cheswick.com/ches/map/

Clouds enable scalable virtualization of resources



1. We discussed the relevance of Clouds, Grids, and Cyber Physical in our 2009 trends study.
2. Cloud computing is the convergence of three ideas:
   - Virtualization
   - Software as a service (SaaS)
   - Utility computing
3. **Pay as you go -** a “utility service” to run and scale these virtualized application distinguishes the “cloud” from SaaS where you pay a recurring monthly service – even if you don’t use it.
   - Virtualizing the application is key to allow easy application deployment, and we’ll discuss that more later.
4. **Implication**: members should consider using private clouds to share information and resources where public clouds may have other implications such security and protection IP data.

Definition: NIST describes Cloud Computing as "a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.“

Image credit: http://www.youtube.com/watch?v=q8CqUxkCwKw

Cyber Physical Systems extend the Internet to manage critical infrastructure

Cyber-Physical Systems: have been characterized as a National Priority for Federal Investment in Infrastructure and Competitiveness.

1. Cyber-physical systems (CPS) will transform how we interact with the physical world just as the Internet transformed how we interact with one another.
2. They promise us autonomous cars; robots at work, at play and at home; intelligent, energy-efficient, earthquake-proof homes and civil infrastructure; embedded medical devices, and more.
3. At the heart of these applications are computational cores that interact with the physical world, with intelligence provided by software.
4. Many of the member companies produce cyber-physical systems
5. **Implication**: there are business opportunities in non-DoD domains to leverage their resources, knowledge and capabilities.

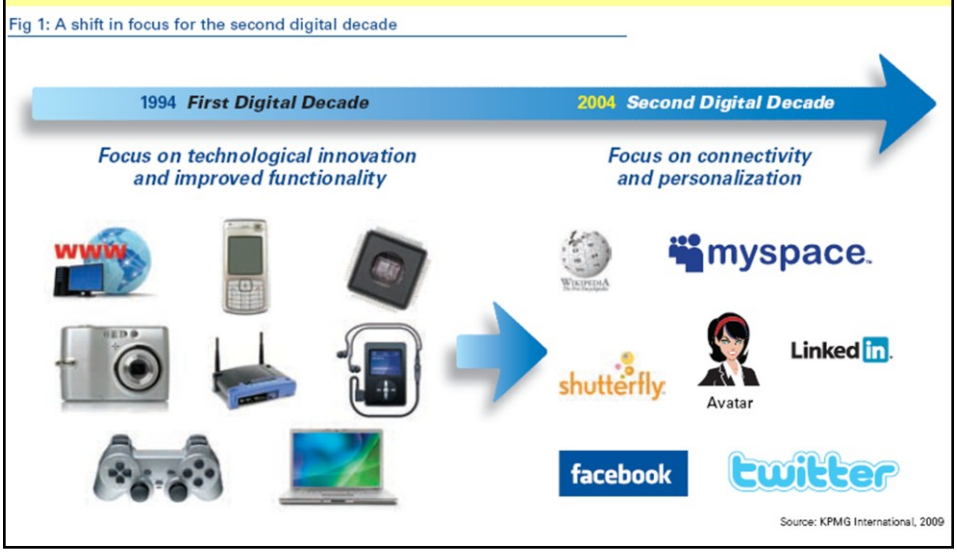
Image credits:

http://www.cyphylab.ee.ucla.edu/_/rsrc/1237766492829/Home/projects/ARR-abstract_fig.jpg

http://news.cnet.com/i/ne/p/photo/orf_500x426.jpg

http://origin.arstechnica.com/news.media/power_grid.jpg

Department of Defense Goes Social



1. On Feb. 26, 2010 DoD published a new policy encouraging the use of social media [1]
2. Mainstream companies and other policymakers cannot afford to overlook it.
3. Social networks' potential greatest contribution is making collaboration and virtual relationships common place.
4. A disruptive characteristics of Social Computing is its capacity to harness collective knowledge for learning and problem-solving.
5. **Implication**: Members need to become comfortable using Social Computing

[1] http://socialmedia.defense.gov/index.php/2010/02/26/dod-official-policy-on-newsocial-media/

Other impacts:

- Driving the creation of new digital divides
- A driver for growth and employment
- Disrupting other industries
- Potential to reshape work, health and learning
- Security, safety and privacy risks are emerging
- Values reside in the practices (the values of social engagement)

Technology is "values neutral”

1. Technology shapes our lives -

   “to a man with a pencil, everything looks like a list.
   To a man with a camera, everything looks like an image.
   To a man with a computer, everything looks like data.” [1]

2. Global forces are changing many things that can impact our members.
3. The demographics and workforce are changing.
4. Now that everyone has access to the same technologies and information, we all have the same opportunities to shape the future.
5. The bad guys have access to the same technologies as the good guys.

[1] Neil Postman

Image credit: http://www.gaj-it.com/wp-content/uploads/google-china-searc.png

The good guys need to adopt and adapt faster than the bad guys

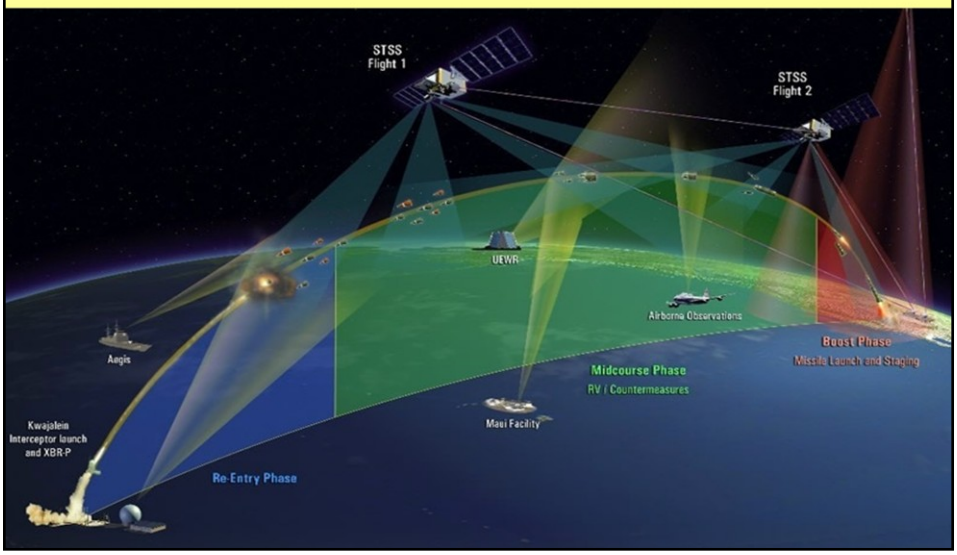
1. Many members support the defense of our nation, but the warfare scenarios are changing as the adversary is constantly changing too.
2. There are increased vulnerability to potential adversaries.
3. **Implications**: the headline is the bottom line.

For an excellent critique see:

Techno-Blinders: How the Cult of Technology is Endangering US National Security, MIT Security Studies Program

Author: Elizabeth Stanley, Assistant Professor, Georgetown University

Members' customers are demanding rapid fielding of new capabilities



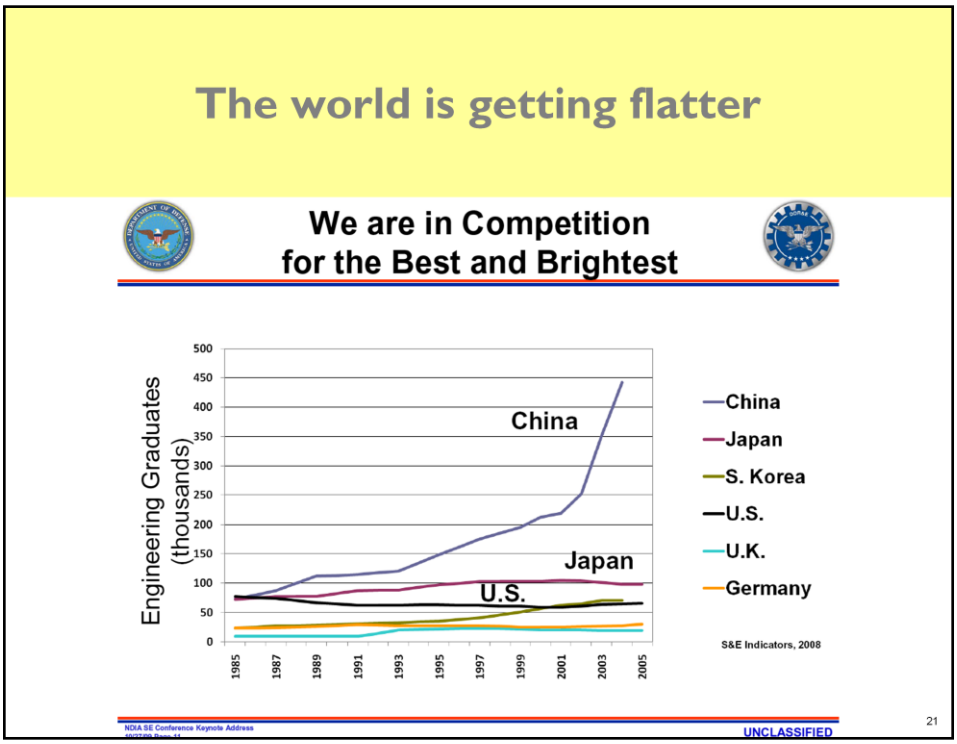
1. Members' customers need rapid fielding of new capabilities to address exponential pace of changing challenges.
2. This strong message presented by Office of the Under Secretary of Defense (OUSD) at NDIA 2009; there are needs for:
   - Quick technology evaluation, architectural trades, fundamental changes in the way design, develop and deploy is performed
3. SSCI conducted OUSD workshop for with representation from members.
4. **Implications**: members should consider recommendations cited as the *New Generation of Concept Engineering Tools* [1] for rapid fielding of capabilities such as:
   - Immersive Virtual Environments
   - "Human-Centered Design" principles and tools
   - Integrated engineering and virtual Modeling & Simulation (M&S)

Capability-based approaches require a greater emphasis on scenarios, tactics, and operational concepts during the conceptual phase of design and structured processes for technology evaluation to support this transition.

[1] Workshop on Technologies for Rapid Fielding For OUSD Study Panel, SSCI, October 19, 2009

Image credit:

http://www.defenseindustrydaily.com/images/SPAC_STSS_Concept_lg.jpg



1. The 2009 NDIA keynote [1] stated:
   - US is lagging other nations in producing engineers that can develop systems of systems.
   - We need to develop world class Science, Technology, Engineering, and Mathematics (STEM) capabilities, as the US STEM workforce is dwindling.
   - Other developing countries have as many as five times the number of engineers as does the US.

2. We know that many of our members are concerned about this and are actively working within their communities to address some of these issues.

3. This concludes the first of the key points in the presentation.

[1] Honorable Zachary J. Lemnios, *Director, Defense Research and Engineering (DDR&E), OUSD AT&L*

Image credit: Defense Research and Engineering: The Path Ahead, NDIA 2009

1. **Key point 2:** The interrelationships between some of the trends are creating a confluence effect that we are calling meta trends.

In this section, we will discuss:

- Systems of systems are emerging in many domains enabling unimagined complexity
- Convergence of data-intensive computing and social computing will enable new frameworks for innovation
- Coordination will replace planning allowing for responsiveness to rapidly changing situations

Image credit:
http://www.rechargelounge.com.au/wp-content/uploads/2008/09/signpost-unmarked.jpg

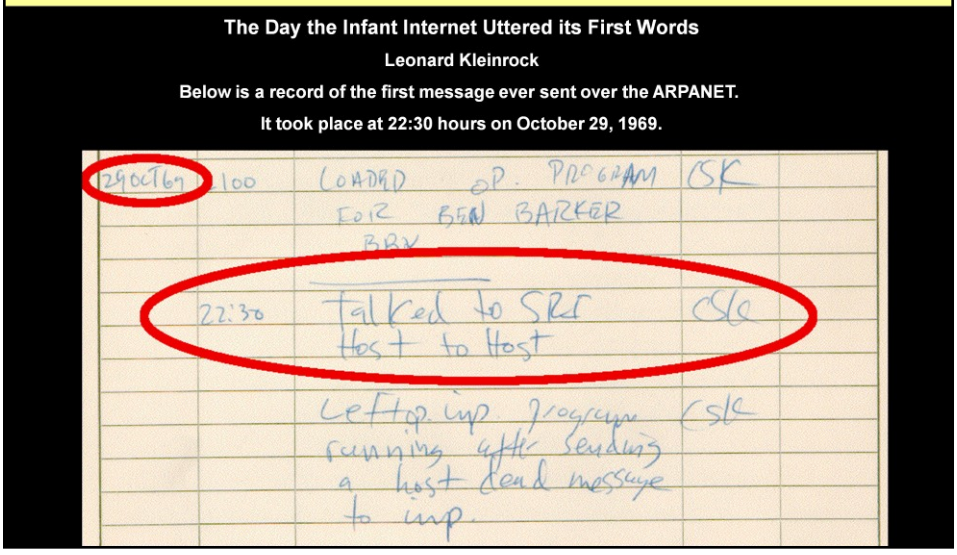
Systems of systems are emerging in many domains enabling unimagined complexity

23

1. Our members are key contributors to the most complex systems of systems built today.
2. Complexity is difficult to characterize and manage, but DARPA claims that we have not fundamentally changed the way we develop systems since the 1960 (DARPA META program 12/22/2009).
3. Systems of systems have a potential of unexpected emergent behavior.
4. We need to better understand the characteristics of complexity to build these system.

Image credit: www.ctc.com/ learnaboutctc/SoSCE.cfm

People who design systems don't know how they're going to be used



1. The inventors of the Internet had no idea of the profound impact on not only the US, but the world.
2. The Internet is a perfect example of a system that has emergent behavior
   - The macroscopic behavior of the system cannot be determined from the sole analysis of the individual, microscopic, behaviors of the elements
   - People work on the pieces not knowing what will happen when they are connected
3. How can we study that…

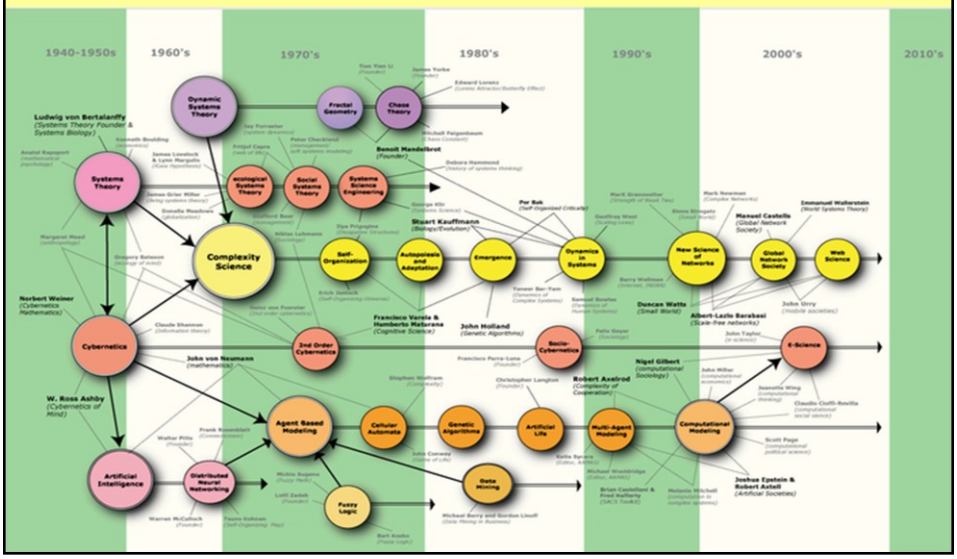
Image credit:

http://www.cs.ucla.edu/~lk/LK/Inet/1stmesg.html

Examples or stories:

- Pandora story - business model changed
- Early researchers used Excel to capture sequences, but Excel interpreted the data inconsistent with the needed interpretation

Complexity science provides perspective of the emerging worldview



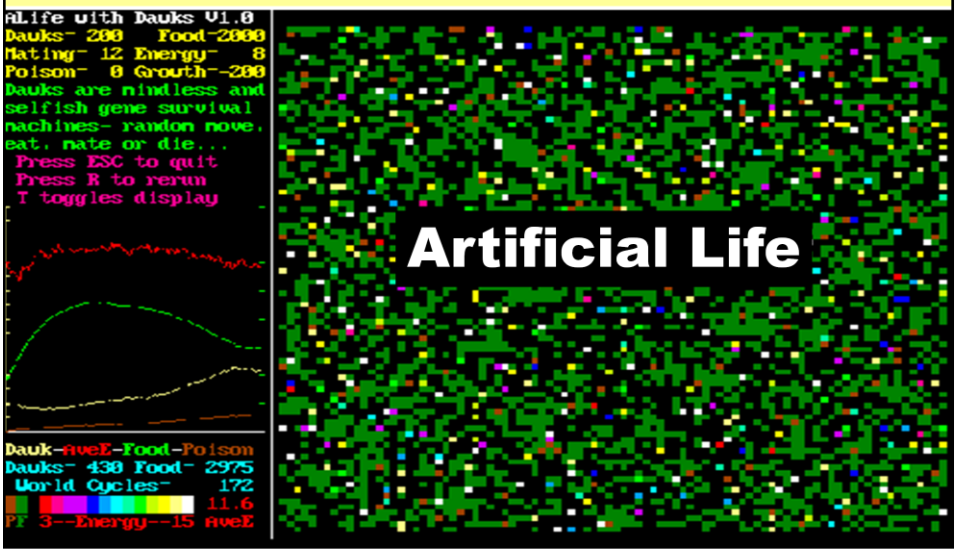
1. The timeline shows the evolution of techniques that are associated with complexity science.
2. The most critical enabler in the development of complexity science has been the exponential growth in computational power.
3. Two examples of non-complex systems are [1]:
   - Problems of simplicity where a few entities interact in a complicated manner.
   - Disorganized complexity where a large number of entities interact in a simple manner.
4. The new realm of interest is in between these two areas, the problems of organized complexity, what has now become known as complexity science.
5. **Implication**: this is a fertile field and members should be investing in innovative approaches as discriminators.

[1] Warren Weaver

Image credit:

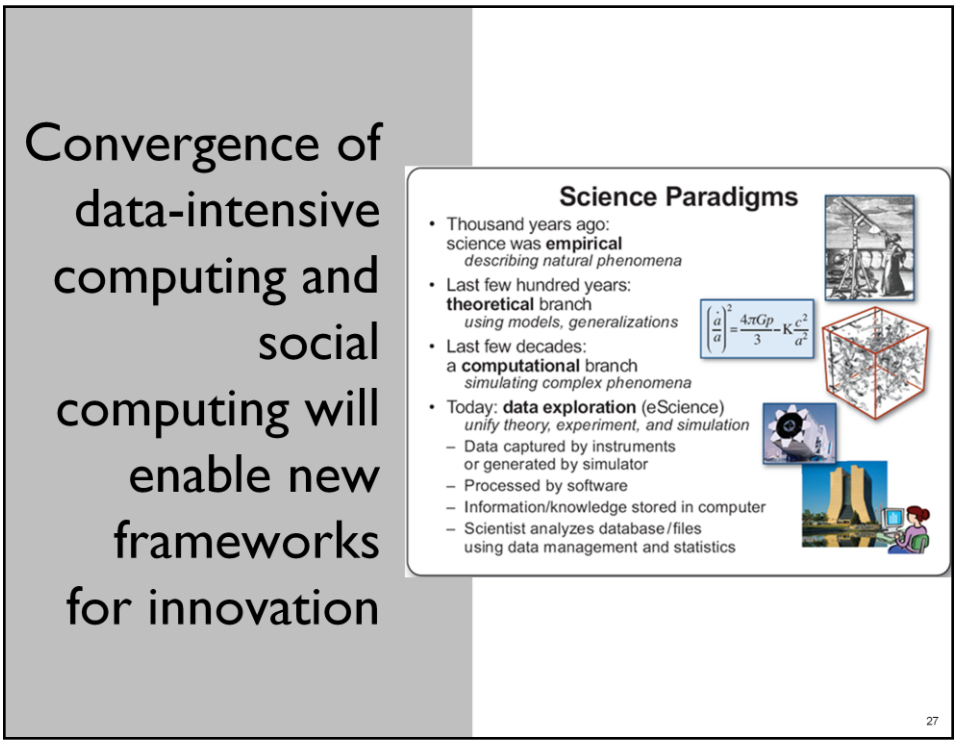
http://image.absoluteastronomy.com/images/encyclopediaimages/c/co/complexity-map-overview.png

How does emergent behavior arise in complex systems?



1. Artificial life is about the study of synthetic, self-organizing systems that behave like living organisms.
2. Our members build and deploy complex systems into systems of systems.
3. These systems of systems might evolve to exhibit emergent behaviors.
4. We need to gain an understanding of the factors contributing to emergent behavior in complex systems.
   - Like the Internet example behavior emerges bottom up (as opposed to top down).
   - Agent-based modeling and simulation, although the most difficult to develop, hold promise in understanding emergent behavior.
5. **Implication**: members should consider investing in research to better understand these issues.

Image credit: http://www.calresco.org/sos/dawk.gif

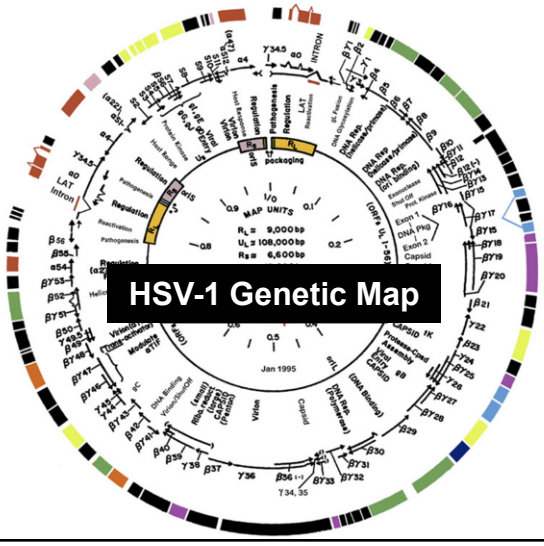


1. The fourth paradigm of scientific research has moved from:
   - 1st paradigm: empirical
   - 2nd paradigm: theoretical
   - 3rd paradigm: computational
   - 4th paradigm: data exploration (eScience)
2. The fourth paradigm for science is based on data-intensive computing, which involves using computers to gain understanding from data created and stored in our electronic data stores.
3. We have moved from a world of data scarcity to data plenty
   - The cost of collecting and storing data is near $0.00
   - Public digital libraries are taking over the role of conventional libraries, and are enabling integration of works
4. Knowledge is doubling every five years and the results are accelerating.

[1] Jim Gray's last talk to the Computer Science and Telecommunications Board on January 11, 2007

Image credit: The Fourth Paradigm Data-Intensive Scientific Discovery, eScience -- A Transformed Scientific Method, Jim Gray.

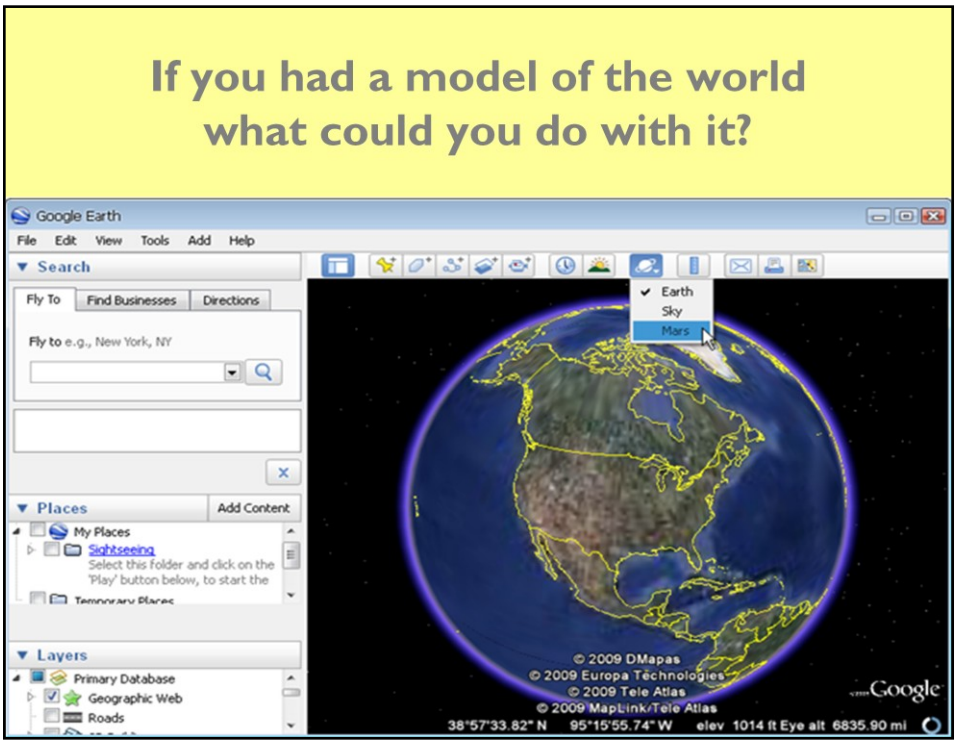
We need new tools to realize the potential of data intensive computing



1. This graphic depicts a genetic map and is important because it illustrates the use of new tools to understanding complex data.
2. Collaboration tools are helping researchers practices eScience, which depends on public infrastructures to capture, curate, analyze and visualize the explosion of data.
   - Many of these tools are open source
   - The data is publically available
3. **Implication:**

- Members may want to be involved in communities that are developing open source tools in domains related to their businesses, and
- The notion of private clouds might help members better collaborate on common repositories

Image credit: darwin.bio.uci.edu/ ~faculty/wagner/hsv3f.html



1. This image from Google Earth reflects on the development of a modeling infrastructure that allows the integration of all types of perspectives.
2. The exponential support of infrastructures is providing us ever expanding models to support our work and life.
3. Once modeling infrastructures are created they are repeatedly applied and expanded for other domains.
4. Creating full-scale models will enable parallel universes and model creation is growing exponentially.
5. **Implication**: what opportunities exist in your businesses for the exploitation of these models?

Image credit:
http://img.digisteps.com/ExploreMarsinGoogleEarth_10822/googleearhtomars.png

1. Eclipse is one of the most influential open source applications and has won numerous awards [1].
2. The open source Eclipse project started when IBM and Borland donated this intellectual property to displace other proprietary development environments, especially Visual Studio from Microsoft.
3. In reality it's an infrastructure resource supporting many types of projects, where each project produces applications.
4. Several of the other "World Class" open source applications are built on Eclipse too.
5. **Implication**: members may need to re-consider policies against the use of open source resources.

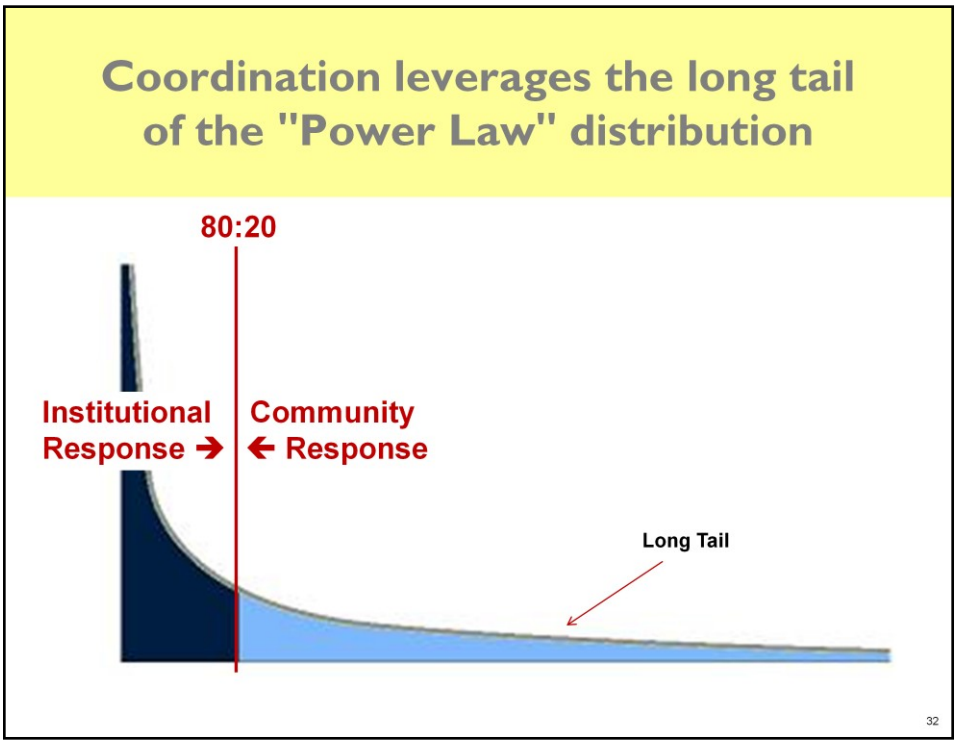
Image credit: http://www.eclipse.org/

[1] 2006 Java Pro Magazine Readers' Choice Award.

Eclipse awarded Best IDE and Best Java Development Suite

1. You probably know what Flickr is, but just in case you don't – it is a social networking site for people to share pictures.
2. Embedding coordination in a tool has resulted in a vast repository of searchable images at $0.00 cost to Flickr.
3. As of October 2009, it claims to host more than 4 billion images. [wikipedia]

Image credit: www.flickr.com



1. I know that you're all familiar with the 80:20 rule – 80% of the results can be attributed to 20% of the contributors.
2. The Power Law distributions reflects the 80:20 rule.
3. From an institutional perspective, it's easy to see why they would focus on the efficiency of the 80%.
4. From a social computing point of view, why would we want to sacrifice the value of the community?
   - The community represent the **Long Tail** of the power law distribution.
5. In changing times, where resources may be more difficult to acquire or retain, **Social Community can be a valuable resource.**
   - IBM, like other companies, is taking advantage of the community involvement in the evolution of Eclipse.
6. If the value is coming from the Community then **Relationships** are more critical than Transactions.
7. This is especially true as new industries are emerging.
8. **Implication**: members should figure out how to leverage the power of the community to gain the benefit of the "Long Tail."

Image credit: http://theconnective.files.wordpress.com/2009/01/long_tail.jpg

The era of mass amateurization has eliminated barriers to entry

"The fundamental unit of the new economy is not the corporation, but the individual."

- Thomas Malone & Robert Laubacher

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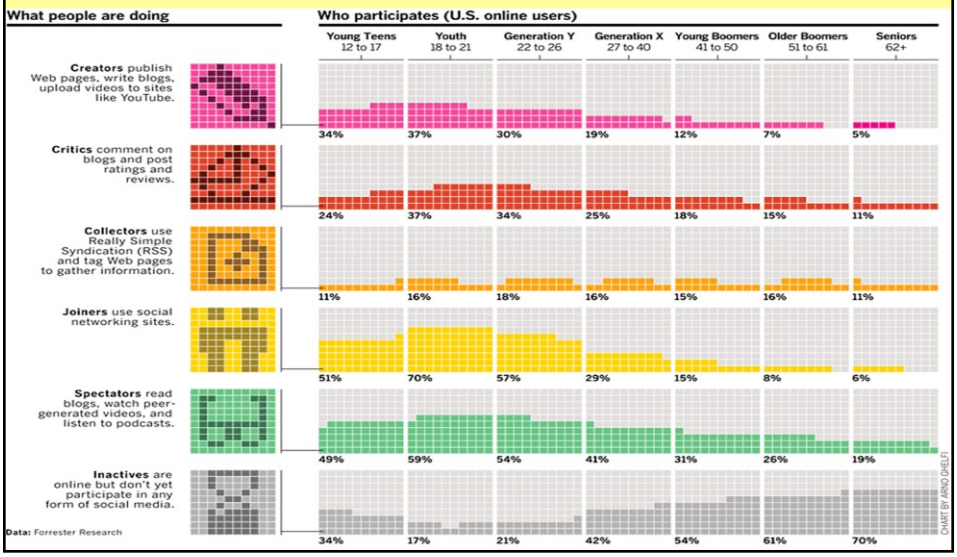
1. In nearly every field of human endeavor there is an emerging amateurization that is displacing professional class.
2. Freely available infrastructure allows "amateurs" to produce or deliver services with no overhead.
3. A consequence, we might not know the credibility of the producer.
   - An example of this is Wikipedia where there are no attributions given for authorship.
4. A little talent and clever innovation can go a long way.
   - YouTube leveraged mostly existing technology to create an entirely new genre of collaboration (and it sold for $1.65 Billion)
5. **Implication:** members may need think beyond the institutional mindset and embrace collaboration to leverage the long tail.

Image credit:

http://www.futuristspeaker.com/wp-content/uploads/2008/05/home-office-empire-of-one-2.jpg

Engage with the "groundswell" to learn from and influence our customers



1. The term “groundswell” [1] refers to the empowerment of different groups in our target audience.
2. The graph depicts six levels of participation: Creators, Critics, Collectors, Joiners, Spectators, and Inactives.
3. The important thing to notice in the graphs is that the only “activity” that increases with age is inactivity!
   - Every other category, except for the collectors, which is flat, the participation peaks in the age groups from 18 to 26.
4. **Implication**: this defines the culture gap that exists in our companies with our employees and customers, and obviously with our future employees and customers.

[1] Charlene Li and Josh Bernoff

Image credit: http://images.businessweek.com/mz/07/24/0724_6insiid_a.gif

The winners will embrace the change and adapt digital strategies faster than others

Choose your game

1. **Key point 3:** In this period of chaos, from the old world order to the next, there aren't good roadmaps to follow. In the *Groundswell*, the winners will launch new experiments in their digital strategy in order to fail quickly, learn something from it, and try another experiment [1].

In this section, we discuss specific trends that are important to our members, their customers, as well as their competitors.

- New modalities of engineering are required to manage exponential complexity
- World-class performance will require virtual everything
- We live in an [information] ecosphere

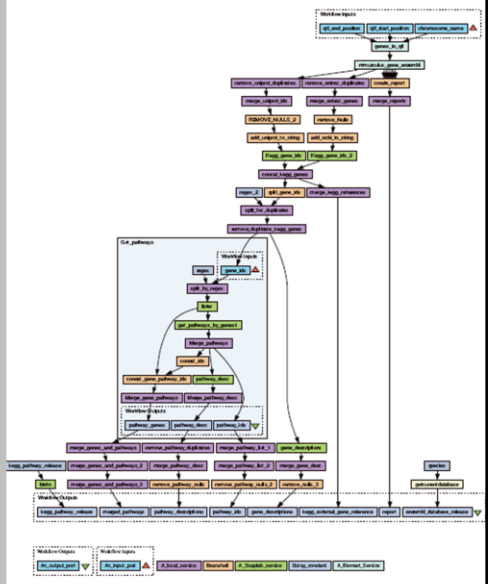
[1] Charlene Li and Josh Bernoff

Image credits:

http://www.freakingnews.com/pictures/33000/Robot-Race--33134.jpg

http://www.mrgadget.com.au/uploaded_images/robot_soccer_robotgames-720918.jpg

New modalities of engineering are required to manage exponential complexity



1. This graphic depicts the *Taverna workflow* that connects several internationally distributed datasets to identify candidate genes that could be implicated in resistance to a micro-organism called African Trypanosomiasis. [1]
2. In the new information era, the Internet will support massive, persistent data sets that will enable scientists and engineers to collaborate in ways that have not been possible before.

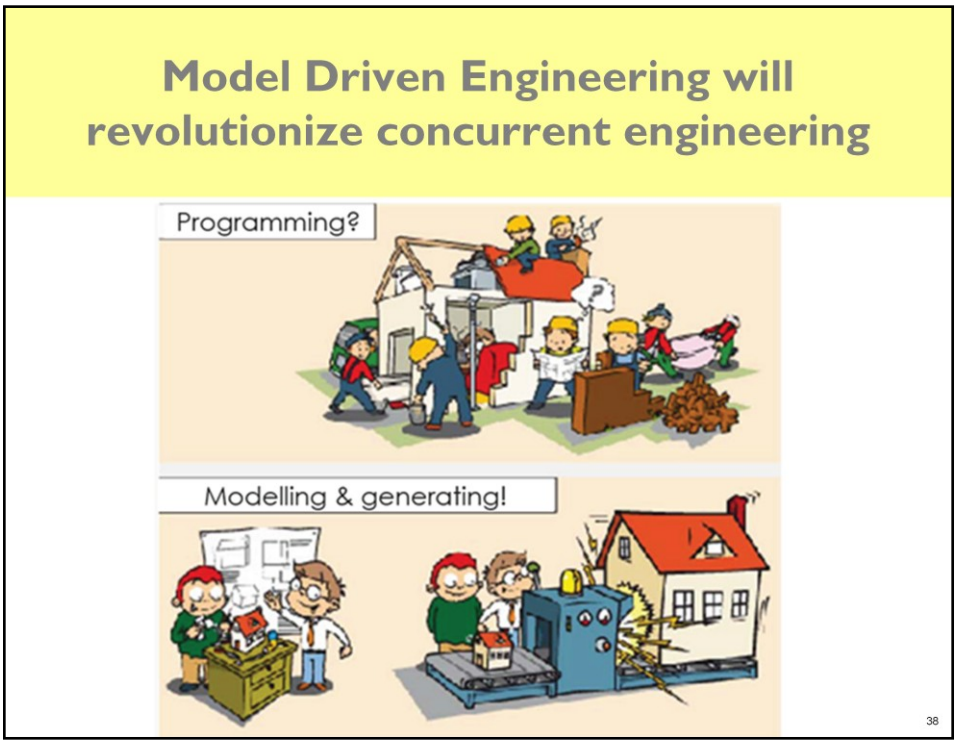
[1] *The Impact of Workflow Tools on Data-centric Research* by Carole Goble, University of Manchester and David DeRoure, University of Southampton.

Image credit: Goble and DeRoure

Virtual persistent immersive environments will enable rapid fielding of new capability

1. This picture is a depiction of Mark Blackburn's avatar in Second Life, about to enter a planetarium.
2. It is difficult to say what is more amazing
   - How rich the current technology is for immersive environments
   - How easy it is to use
   - The fact that so much of it is free
3. These environments enable systems engineers, end users, and other interested stakeholders to participate in using the system they are designing, giving a realistic perspective that is not achievable using conventional artifacts that only describe the design.
4. **Implication**: members should pilot, if necessary, the use of virtual immersive environments to augment their engineering practices and ideally do this with their customers.

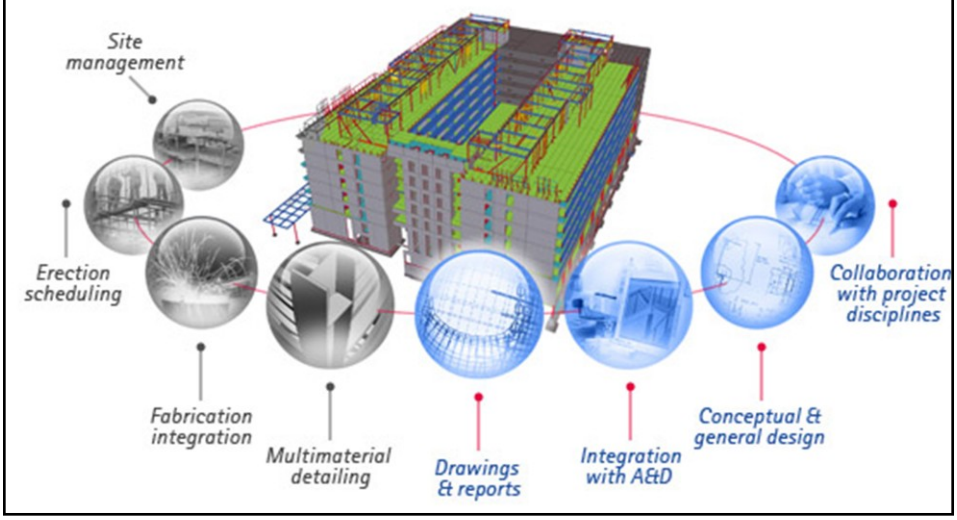
Image credit: Second Life www.secondlife.com



1. This picture provides a powerful contrast between traditional system development and model-driven engineering.
2. Model-driven engineering enables a separation of concerns and allows for in-depth perspectives about key system issues.
   - This provides a “conceptual advantage,” analogous to mechanical advantage in a physical system, that helps systems developers manage complexity.
3. Modeling views that are driven off a unified, holistic representation of a system – including its static and dynamic properties, will support concurrent engineering so that there will be greater confidence in requirements and design choices before the system is implemented.
4. The DARPA META program pre-solicitation synopsis, December 2009, claims that the fundamental design, integration, and testing approach have not changed since the 1960.
   - The META goal is to significantly reduce—approximately by a factor of five—the design, integration, manufacturing, and verification level of effort and timeline for complex cyber-physical systems, and demonstrate the new approach in the context of an appropriate rapid development demonstration platform.
5. **Implication**: many members already understand the potential of model-driven engineering.
   - Speaking directly to the members, if you don’t - suppress the urge to “get smart” on your own - the longer you wait the farther behind you’ll be
   - Call us – we can help.

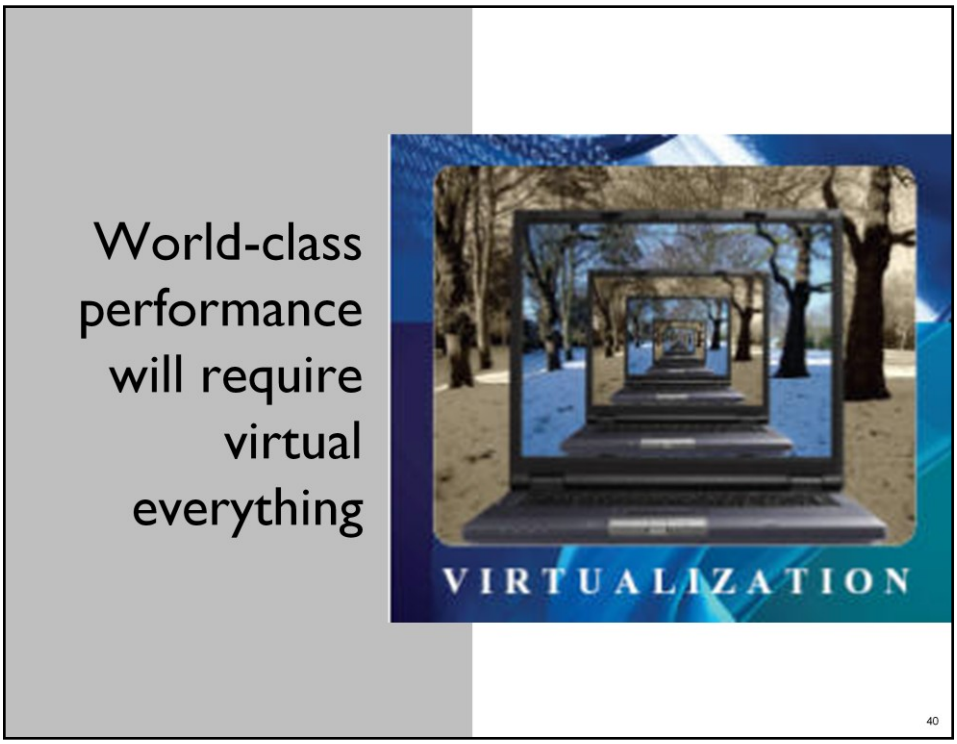
Image credit: http://www.theenterprisearchitect.eu/images/mde_metaphor.png

Automated workflows enable boundary-less collaboration in engineering



1. Automated workflows arose from the manufacturing world.
2. In the information era, it will become commonplace to expect best-of-breed capabilities to be incorporated into any type of system.
3. In information systems, we already see this happening through the use of mash-up technologies.
4. **Implication**: automated workflows capture the business rules of **complex engineering processes** allowing them to be efficiently and accurately performed.

Image credit: http://www.tekla.com/SiteCollectionImages/solutions-bc-other/TS-workflow_engineering.jpg



1. The best performers will use virtual environments, virtual teams, virtual management and the best tools available.
2. It's no longer a dream - people expect the best and know that it is only a click away – "and if I don't get it in 10 seconds I'm gone." – Sue Rose
3. Effective collaboration requires a trust relationship among the collaborators, and building trust relationships in a virtual environment can be challenging.
4. Let's explore that…

Image credit: http://greencomputing123.com/wiki/images/1/1d/Virtualization.jpg

Virtualization will usher in an era of ultra specialization

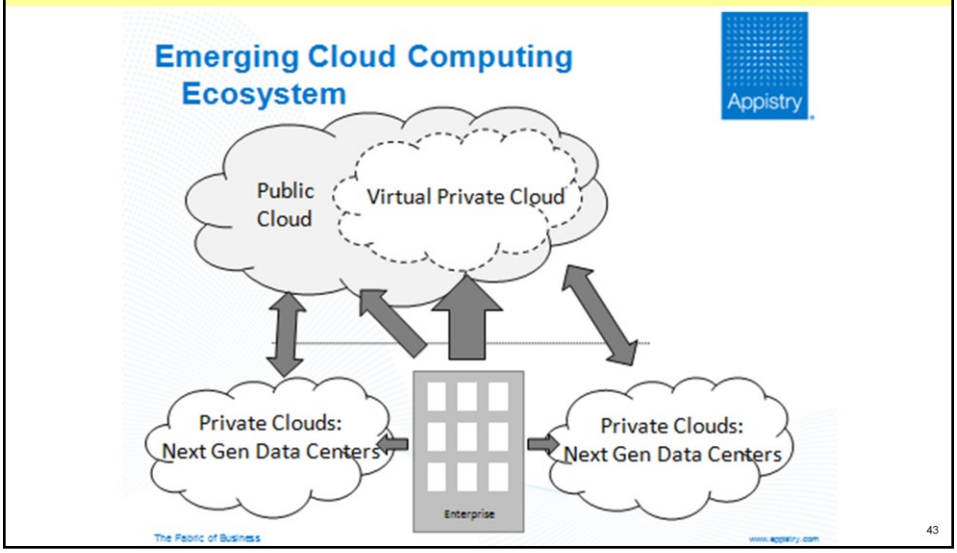
1. In the 4th information revolution, it will become increasingly important for organizations to decide what they want to be good at – really good – and focus their resources accordingly.
2. This dynamic will force generalists to specialize in all fields in order to compete in their niches.
3. This will reinforce the trends toward ultra-specialization and demand that systems integrators (of all types of systems) conform to this model.
4. **Implication**: members need to establish rich collaborative environments for specialists to contribute effectively to programs.

Image credit:
http://www.cosmoslingua.com/images/specialization_content_img.jpg

1. For example – movies are made using this model
   - Production companies are formed to integrate a wide array of talent and capabilities to produce a movie or TV series.
   - They disband when the project is done.
   - The relationship might draw them together again.
2. Virtual teams will need to quickly assemble the right people for the task at hand.
3. Virtual teams will be more effective and more cost effective.

Image credit K2552880 www.fotosearch.com

New classes of clouds will emerge to support virtually everything



1. The rise of cloud computing will enable new services in every imaginable domain and function, including code, middleware, databases, etc.
2. While there are circumstances today that contraindicate the use of cloud computing (e.g., regulatory compliance requirements for certain classes of information) and security organizations in large companies are nervous about not being able to "hug the servers."
3. This is a very attractive alternative, especially for small and mid-sized companies that do not have practical, affordable alternatives
   - They simply do not have the resources to devote to the care and feeding of data centers.
4. **Implication**: members should consider establishing private clouds to address shared information and services (e.g., data-intensive computing).

Example: Netflicks recently announced that it will be moving its web business to the Amazon Cloud, even though they are competitors in the business of distributing entertainment content. [1]

[1] http://www.nytimes.com/2010/04/19/technology/19cloud.html?scp=1&sq=netflix%20amazon%20cloud&st=cse

Image credit: http://www.appistry.com/blog/wp-content/migrated_uploads/sam/2008/12/image_2_1.png

1. The successful organization are leveraging coordination across or in spite of institutional boundaries and business models.
2. It may be a jungle out there, but now it's our jungle.

Image credit: http://www.judyart.com/images/It_s_a_jungle_out_there2.jpg

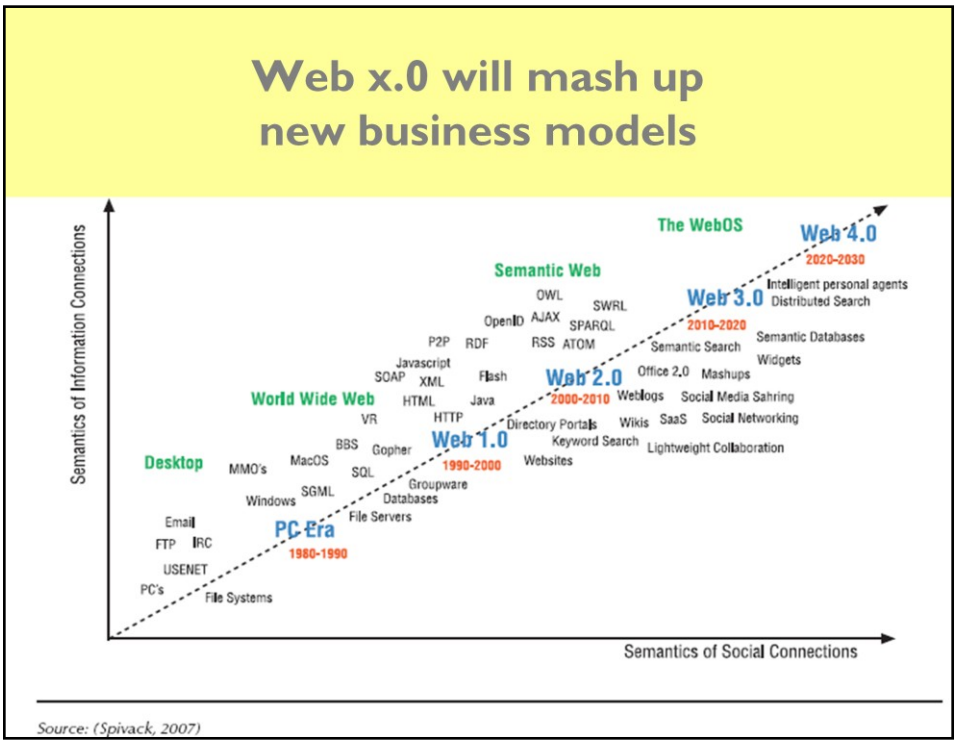
Management must remove barriers that inhibit new possibilities to innovate

1. The 4th Information Revolution is enabling communities and conversations to coalesce around all manner of interest areas.
2. The notion that companies' employees have a "work life" and a separate and distinct "personal life" is becoming quaint.
3. The social networking technology and the ubiquity of the Internet enable collaboration to go on ceaselessly – around the globe and around the clock.
   - It's always 3:00 pm somewhere in the world.
4. **Implication**: businesses that are leaders in innovation will empower their staffs to be creative and they will eliminate barriers to new ideas and practices.

Image credit:
http://blogs.oracle.com/jobsatoracle/images/SocialNetworking.jpg

1. In the mid 1990's the DoD published Joint Vision 2010, which added Operations Other Than War (OOTW) to its mission.
   - Now that it is 2010 and we peer into the future, we can see how the 4th information revolution is changing how the military trains and performs – collaborating with other countries across the spectrum from staunch ally to friends of convenience with intersecting regional interests.
2. Generalizing from this, we see that social networking technologies and the Internet provide the tools for unprecedented collaboration in training, rehearsal, and performing when it actually gets to be "show time."
3. **Implication**: members need to deliver training and education to their employees and for their customers "just in time" (not "just in case")

Image credit: http://usacac.army.mil/cac2/bctp/Images/About.jpg



1. Today people are enamored with Web 2.0 applications.
   - It's important to put this into context, however and remember that this is a progression.
   - Example: notice how Amazon adds value to the shopping experience by offering customized suggestions for you.
2. Extrapolating from the present to the future is so difficult, because we cannot anticipate the nonlinearities and the discontinuities.
   - We have already seen the rise of information mash-ups.
   - Surely this is a wave of the future.
3. **Implication**: the Internet is a rich source of emergent behavior; some of our members contribute to systems of systems where emergent behavior also arises:
   - If your perspective is control, this is a liability.
   - If your perspective is **innovation**, this is a treasure trove.

Image credit: http://i.i.com.com/cnwk.1d/i/bto/20080418/webtimeline.jpg

There are many important ideas that we did not explore

1. This presentation has been intentionally constrained in time and space, but we have discussed what we believe to be the most important issues. Nevertheless, there is a list of topics provided in the narrative that deserve honorable mention and we hope you'll feel free to contact us to discuss them.

List of Parking Lot Ideas (non-exhaustive):

- "Performance-Based Acquisition is contracting for results!" -- GSA
  - We submit that this is a microcosm for all of business
  - Many of our members compete with each other while at the same time they have multifaceted partnership relationships with each other.
- The shift to open standards and open software will destroy the old competitive advantage of technology or vendor "lock in."
- Cognitive computing will evolve with greater human integration.
- Computers will be human digital assistants.
- Rapid technology evaluation
  - Toyota Lean Engineering – The Toyota Product Development System (James Morgan and Jeffrey Liker)

Image credit:
http://torontoist.com/attachments/toronto_vald/2007_08_31_parking_lot.jpg

Conclusion: Necessity is the mother of innovation

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1. To borrow a line from Clay Shirky, “This is the part of the presentation where you expect us to make some predictions about the future but we’ve run out of time, which is good….because we don’t know.”
2. Let’s remember, this presentation is about trends – not recommendations for the members, but here are the highlights:
    - The information revolution is going to be a chaotic time and will cause huge disruptions in the status quo.
    - There are going to be new winners and losers and the established order is changing.
    - The technology trends are revolutionizing the human experience and how we work together.
    - There are huge cultural differences between age cohorts in the workforce; the social computing generation is going to drive out old styles of work.
    - The winners will embrace the change and adapt digital strategies faster than others.
    - In the coming era of convergence and ultraspecialization, quality and intellectual property rights will be discriminators.
3. SSCI is ready to share its insights about these trends with your teams as they work to develop their own maps through this period of chaos in order to build their futures.

Image credit: http://bagnewsnotes.typepad.com