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The Next Big Things in IT

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Based on a presentation by Jeff Wacker, EDS

*With the quickly changing technological environment of the 21st century comes a challenge for every executive: to be aware of and then prepare for the **next big thing**. Jeff Wacker, a futurist and Chief Technology Officer from EDS, shared his view of the future, including three revolutions and three IT-specific trends. Mr. Wacker presented each of these revolutions and trends, along with specific examples of how they are materializing in the world today. This discussion will allow you to reflect upon the question: Are **you** ready for the next big thing?*

Introduction and Overview

One of the most difficult struggles that an information technology (IT) executive deals with is how to anticipate what the next big thing is that will impact the industry and revolutionize the way that business is conducted. Jeff Wacker, from EDS, argues that there are three major revolutions currently taking place: biotechnology, nanotechnology, and information technology. Each of these will significantly impact the corporations of tomorrow. He offers his insights into each of these revolutions and offers suggestions about how businesses should prepare for the next big things in IT.

Revolution #1: Biotechnology

Fundamentally, biotechnology is the application of the science about people, plants and animals to technology. Researchers working on revolutions in biotechnology believe that technology has been driving us away from linear models and that we should use nature for models to emulate.

One of the most prominent areas where biotechnology could impact society is in food production. With exponential population growth, how is the earth, with limited resources, going to feed 8 billion people? Scientifically, there are three options: change the climate (not possible), change the ground (not realistic), or change the crops. Using biotechnology, companies such as Frito Lay are genetically engineering crops that will allow earth to deal with the expanding population.

Dolly, the cloned sheep, is a prime example of biotechnology. While she is now bigger than the sheep from which she was cloned, this advancement begs the question: are there other opportunities for cloning and cross-breeding (such as a spider plus a goat for spider silk) that can be used to deal with the problems of the 21st century.

The last, controversial area of biotechnology research is with stem cells and the use of the research to expand human life. Researchers claim that our bodies could last 120-130 years if we did not engage in excesses. This is motivating current work on artificial organs, including the bladder, human heart, skin, cartilage, liver, and retinas. It is believed that eventually scientists will be able to mobilize enzymes to restore cells, thus preventing signs of aging. Using biotechnology, scientists hope to stabilize our bodies at age 40 indefinitely.

Revolution #2: Nanotechnology

While biotechnology is interested in using nature as a model, nanotechnology is concerned with building smaller machines. *Nano*, the prefix of *nano*technology, means "a billionth of," with our human DNA measuring 2 nanometers. Thus, in this revolution, the emphasis is to create nano-machines that are as sophisticated and as big as our human DNA.

A number of developments have already been accomplished in this revolution. Scientists are working on carbon nanotubes that can be used as the basis for creating machines. A 747 built out of carbon nanotubes would weigh 400 pounds and a standard automobile would weigh 50 pounds. The implication of machines such as this is the creation of molecular level gears that are smaller and more efficient.

Future advancements in nanotechnology include: quantum computing (displayed in the picture to the right, reprinted from for more a recent future technology briefing produced by the ISRC), a personal fabricator, smart dust, and mass movers. While Mr. Wacker focused on quantum computing, another possible future technology in the area of computing is the optical paradigm. The picture to the right was reprinted from a recent technology briefing on the subject and is available from our website.

While biotechnology and nanotechnology promises revolutionary new products, the revolution that is most likely to impact business is the third revolution: information technology.

Revolution #3: Information Technology

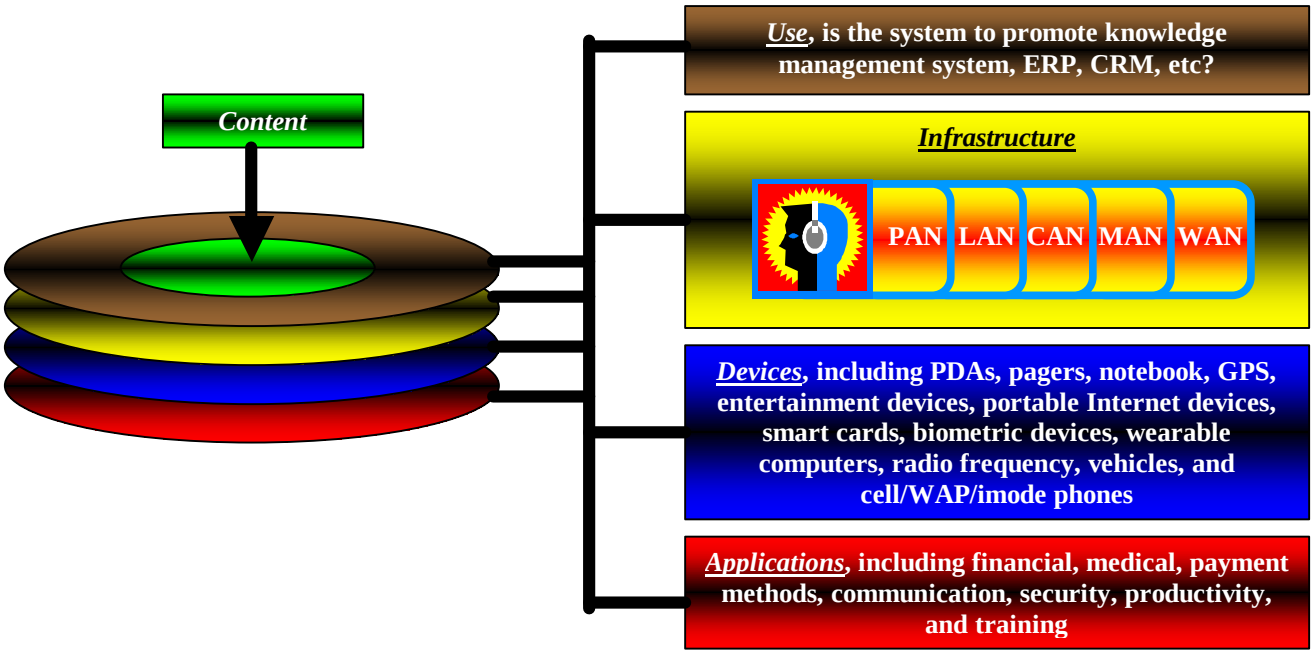
Within the IT revolution, there are three major trends that will continue to impact the industry in the future: mobility, digital delegation, and ubiquitous computing.

Trend #1: Mobility

While the mobility trend of today is the office paradigm, or to put some applications on a PDA so that you have access to basic information, the mobility trend of tomorrow shifts toward productivity. The question becomes, how can you produce mobile technology that meets the criteria of the Right 5:

*The **right** information in the **right** form available to the **right** person at the **right** time in the **right** place*

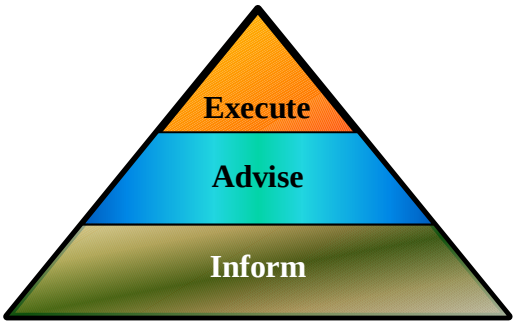
Meeting this criteria means looking at applications, not only from an employee perspective, but also examining how customers can be offered information in the form that is in the right form for them. While most firms today are working on a mobile plan, 82% of firms are working on an employee-oriented mobile plan, not a customer-focused one. The question then becomes: what are you doing? The challenge requires the use of four layers: applications, devices, infrastructure, and use. Each layer requires the designer to determine the appropriate configuration, recognizing that content is the pivotal axis point around which the mobile paradigm of tomorrow rotates. The figure below displays examples of the choices of each layer.



Mobile technology using the Right 5 approach and these four layers will enable an individual to connect with any other individual worldwide from any location (for more information on future methods of communication, the ISRC will be soon releasing a see future technology briefing on the subject—stay tuned!). This will allow individuals to teleport themselves to any location (for more information on how this might occur, see the recent future technology briefing produced by the ISRC on Internet2). Nonetheless, this is not the only trend in the IT revolution.

Trend #2: Digital delegation

While mobility will allow us to be constantly connected, this benefit comes with one potential problem: given the vast number of communication channels available to provide information to us, how can we cope with all of this data without being overloaded? The next trend of IT is to move from overload to unified messaging using IP and a rules base, to prioritize the information coming into our lives.



With prioritization comes the opportunity for digital delegation, or using active agents to perform functions for us. The figure to the left displays the activities that agents will be doing for us: first they will inform us, then they will advise us on appropriate action, and finally, all of this will be executed by the agent instead of by us. Using rule-based and intelligent systems, digital delegation will allow us to be more productive than ever before.

Trend #3: Ubiquitous computing

While mobility will allow us to always be connected and agents will be performing our actions using digital delegation, the final trend represents the convergence of these movements. If objects around us can be used, they will become agents that do our work all around us, and the final next big thing will occur: ubiquitous computing.

Ubiquitous computing is the embedding of chips into everyday objects and making them "smart." First, objects will be given an identity, so that they can be viewed as unique objects. With an identity, the objects can be trained to be aware of the environment and be given autonomous, elemental intelligence so that they can think for us. Examples of products that could benefit us include smart toothbrushes that evaluate our teeth, bed monitors that examine our sleep patterns, smart countertops, intelligent refrigerators and shelves that watch food quality, smart prescription bottles, and machines that monitor the environment.

While Mr. Wacker focused upon ubiquitous computing, a recent future technology briefing from the ISRC compared ubiquitous computing to human-centric computing (for more information, see our website). The table below is reprinted from the briefing and compares ubiquitous to human-centric computing.

	Ubiquitous Computing	Human-Centric Computing
Objective	To create a device that is constantly connected, portable, and available	To create a solution so that the human is always connected, portable, and available
Focus	Devices	Humans
Method of interaction	Work with the device for the information	Speak to the solution for the information
Current Projects	IBM's Project Blue Carnegie Mellon's Project Aura	MIT's Project Oxygen

The Future: A Note of Caution

While it is easy to read a review such as this and anticipate what the future will bring, it should be noted that these projections are dependent upon businesses and research universities working on these endeavors and that there are many obstacles that could prevent the materialization of these ideals. For example, security problems plague mobility (a subject a future technology briefing will address shortly) and privacy advocates worry about what we will be giving up by allowing agents to perform actions for us. Human behavior, albeit rational in the mind of the user, is not predictable and cannot be manipulated into a future that we as a society are unwilling to accept. Thus, this view of the future cannot be read without an appropriate warning.

The Future: What do I do now?

With a review of the next big things in IT, it is easy to become overwhelmed with the possibilities of future forces that continue to shape our world. So, what can IT do today to prepare this future? A few suggestions:

1) Continue your involvement with events such as the ISRC to learn and be aware of the next big things. Unawareness could hurt your ability to adapt to a shifting world.
2) Evaluate your current systems for each trend.
   a) *The mobility trend*. Are you just focusing on the employee or are you broadening your horizons to look at allowing customers to interact with your organization using mobile devices? How are you doing on the Right 5?
   b) *The digital delegation trend*. Do employees in your organization suffer from overload? Can you implement a rules-based IP and messaging system to prioritize their work for them? Can you equip your employees with digital delegation agents that can aid them in their work?
   c) *The ubiquitous computing trend*. Are there ways that your organization can use "smart" objects? Are you looking for the possibilities?
3) Look at your governance structure. Do you have an advanced technology group in charge of looking for opportunities over the horizon? What do you do to keep up with the next big things?
4) Think about how you promote imagination and creativity in your organization. Do you suppress or encourage novel new ideas that might succeed, but also might fail. Does your corporate culture allow people to fail or is success the only accepted outcome?
5) Encourage research and development with your daily actions. Beyond encouraging the development of appropriate uses of the next big thing, finance research and development so that when the next big thing happens, you are ready!

Conclusions

Jeff Wacker ended with a quote from Albert Einstein,

"Our thoughts and our imaginations are the only real limits to our possibilities"

The future is full of possibilities and trends and movements that will impact our society and our businesses. In this session, we have reviewed three major movements and three IT-specific trends that will shape the world of tomorrow. Are you ready for the next big thing?