

**What CIO's Will Be Bringing to the Party:
The Future of Technology, and What CIO's Will Be
Able to Contribute**

A presentation for the
CIO Peer Forum

Terminal City Club

Vancouver, B.C.

Thursday, April 7th, 2011

8:30 – 9:15 a.m.

I. **What's a futurist? My purpose here**

A. A futurist doesn't predict the future, because the future is inherently unpredictable – we will inevitably be caught by surprise

1. The terrorist attacks of 9/11, the tsunami in south Asia, the SARS epidemic, hurricane Katrina, the collapse of the bridges in Montreal and Minnesota, and the financial panic of 2008 all demonstrated that
2. Note, though, that each of these events had been forecast by competent experts, but the forecasts had been dismissed as “alarmist” or “far fetched” by the relevant authorities
3. This illustrates one of the fundamental realities of dealing with the future – that we are often hobbled by our own lack of imagination

B. I'm a generalist, not a specialist – if you don't know more about IT than I do, than your company is paying the wrong person

1. You are the experts on IT. I do have a degree in computer science, but that was back when we had to

stoke coal into the firebox to get the water pressure up to run the CPU!

C. But let's take a look at what the future of technology is likely to look like, and then think about how that's going to affect your responsibilities as a CIO

II. The pace of technology, past and future

A. ENIAC, University of Pennsylvania, 1946

B. IBM System/360, 1964

C. Macintosh IIe, c.1987

D. BlackBerry & iPod

E. Smartphones

1. Today's smartphone has more computing capacity than one of the supercomputers used by NORAD in the 1980s

III. The future of technology

A. In many ways, this is the part of your future with which you're most likely to be comfortable

B. But having said that, I think that the technology is going to surprise even us with how fast it progresses

C. Moore's Law: computers will double in speed, and halve in price every 18 months

D. The continued rise in computing power

1. Moore's Law is wrong: not only is the rate of changing in cost-effectiveness increasing, but the rate of acceleration is increasing as well

2. By 2021, in ten years' time, computers will likely be 1000 times more powerful and cost-effective than they are today

3. It's been estimated that by 2030, computers will be a billion times more cost-effective than they are today

4. Now imagine the capabilities of a \$1000 computer that is a billion times faster than today's desktop computer - and then imagine how it would need to be programmed

a) **I'll come back to the programming aspect in a moment**

IV. It's not just how fast they will be, either - it's also how smart

A. **As one example of how computers are going to get smarter, I want to talk about Genetic Programming, which is one form of machine learning**

1. There are other forms of machine learning, such as the software IBM used to form Watson, the computer that played the TV gameshow *Jeopardy!*

2. Genetic programming is a machine-learning technique where the system evolves by reinforcing success

a) **It uses the idea of natural selection to discover solutions**

b) **The solutions that work best are combined to discover even better hybrids, much as cross-breeding horses, for example, can create offspring that are faster and more robust than their parents**

c) **GP is not an artificial intelligence system.**

d) **There is no attempt to mimic human reasoning.**

3. Genetic programming is a means of creating algorithmic rules to identify patterns by means of natural selection. This means that you evolve solutions to a particular question.

4. An example of the kind of rule that might be evolved using GP might be "If gene x is expressed on,

and the expression of gene y is greater than or equal to 1.57 times the expression of gene z, then this person will have an higher probability of having a relapse following surgery for colorectal cancer.”

5. In fact, there’s a company in Ann Arbor, Michigan, that is just about to market an oncology test that does just that – and it was developed through GP

V. What are the implications of this kind of boost in computer power and sophistication?

A. The rise of everyday robots

1. Robots have been part of popular mythology for hundreds of years, and prime material for science fiction and Hollywood screen writers for the past century

2. But now computers are becoming fast enough, and software tools sophisticated enough, that robots will become part of our everyday reality

3. You won’t see “Rosie the robot” doing dishes and making beds in your home within the next 10 years, because within that time frame, humanoid robots will still be too expensive – about the price of a luxury car

4. But we will see function-formed robots increasingly appear within industrial and commercial environments, and perhaps humanoid robots being used in health care to support and assist nurses and other health practitioners

B. The rise of computer intelligences

1. But we won’t need a physical form to encounter different kinds of computer intelligences – computers that act as if they were human. Indeed, we already encounter them in frustrating encounters over the phone when we’re trying to reach “customer service” departments of cable and phone companies

2. These illustrate a good example of how not to use computers: the economics of customer service seem to indicate that automating these functions makes good business sense
3. And I sort of agree: If your goal is to irritate customers to the point where they start actively trying to replace you, then computer-based CSR systems do this very efficiently

C. The destruction of privacy: an important implication

1. As computers become faster, and information flows explode, privacy will continue to be nibbled away until we wind up living naked in a goldfish bowl, with no secrets
2. This includes, but is not reliant on, the emergence of such developments as quantum computers, which may render today's encryption systems obsolete, and smart dust, which allow the unscrupulous and our governments to violate our privacy, even in our homes or offices
3. The ability to gather and collate enormous amounts of data, and infer from them will complete the pieces of the puzzle
4. From a corporate point of view, this means that ethical behaviour is not just a good idea – it is becoming a self-enforcing reality
 - a) **If we live in a world where there are no secrets, or where secrets remain secret for shorter and shorter periods of time, then CIOs should be at the table telling everyone else that any corporate secrets will eventually get out**
 - b) **This means your organization can no longer afford to have “dirty little secrets” that you don't want to see splashed all over the media – so keep your operations above reproach!**

VI. But in many ways, what the technology will be capable of is not as important as what people will want done – and this is much harder to forecast

A. Before cellphones were first licensed in Canada in the early 1980s, there was a survey of consumers to find out how many people would be likely to use one

1. They found that there was indeed a market for cellphone users: they estimated that about 7-8% of consumers would want one
2. They were wrong by about a factor of 10

B. It's difficult to figure out what people will want done before they've ever experienced it. They don't know themselves whether they want it or not

1. And it makes a difference how well a technology is executed
2. For example, e-books had been around for more than a decade before Kindle and the iPad created a real market for them.

C. So how do you tell if a new technology will catch on?

1. Drucker's 10 times rule: "For a new technology to replace an existing technology, the new technology has to be *10 times* better to get companies to give up the money they have invested in the existing technology."
2. Worzel's corollary: "For you to overcome the natural inertia of consumer behaviour, what you offer has to be perceived *by the consumer* as being 10 times better than what she's using now."
3. This is a rule of thumb, not a law of nature, but it's the best guidance I know of how to tell what will work and what won't

VII. Now, you know that there's a lot more to the future of technology than I've discussed

- A. I've said almost nothing about cloud computing, data security in an era of mobile devices, social media, and the desperate need for a better user interface
- B. But let's move on to the corporate implications of tomorrow's technology, and your role as a CIO

VIII. First, technology is going to even more of a game-changer for corporations over the next 10 years than it has over the past 20

- A. In particular, because of the acceleration of computer power, robots, computer intelligences, and automation, the potential is there for dramatic improvements in productivity
 - 1. I say **potential** because potential doesn't always translate immediately into execution
 - a) Despite decades of investment in computer technology, economists couldn't see any significant improvement in technology in the western economies until well into the 1990s
 - b) Yet, productivity increases tripled in the early 1990s, and then increased by another third into the late 1990s and into the early 2000s, and this was attributed to a catch-up for IT applications
 - 2. So, while the potential is for organizations to dramatically improve what they do, and how, it will take a lot of hard work to turn new technologies into productive technologies - and that is one area where CIOs will need to lead
- B. In particular, it's going to be important to be able to identify those technologies, and applications of technology, that are important from those that aren't

1. Companies that saw the potential of online supply chains early got a first-mover advantage over those that didn't, and were able to cut their costs and increase their profits while their competitors were still studying the situation
2. Likewise, companies that saw the potential for pay-per-click advertising got a real advantage over those who didn't
3. Yet, an awful lot of companies wasted an awful lot of money in the tech crash, after being suckered into thinking that cyberspace was the only thing that mattered

C. So in this regard, your task is both finely nuanced, and quite difficult: you need to be an early warning system of new technologies that have potential, and you need to assess whether a new technology is a passing fad, or something important

IX. Next, there are two conflicting technological trends that you're going to need to cope with

A. First, technology is going to continue to come to us instead of us going to it

1. The concept of "user friendliness" used to be a joke, but now it's a make-or-break feature of new products
 - a) **Look at the iPod, iPhone, and iPad, and their share of market as examples**
 - b) **In a recent review of the iPad2 vs. Motorola's Xoom tablet computer, *The Washington Post* got right to the heart of the matter: "[The Xoom tablet] does fit into a growing pattern of tablet manufacturers thinking they can compete with Apple's bestselling device by putting the right specifications on the box -- instead of trying to match the iPad's elegance and ease of use."**

(1) Rob Pegoraro, *Washington Post*, March 10, 2011.

c) In other words, the numbers don't count if the device doesn't win the user-friendly contest

2. Therefore, as technology advances, it gets easier to use – and to the extent that you are involved in advancing technological boundaries, you need to make sure that either the technology you import into your organization, or develop internally, focuses in user-friendliness as one of, if not *the* primary features

a) And, as someone who used to write software for a living, I know how tempting it is to write software that's easy for the writer to use – but is a nightmare for anyone else

b) So, as a rule of thumb, think about whether your mother could use it. If not, then insist on something better.

B. The second trend is slightly contradictory to the first: even though technology is getting more powerful, and easier to use, as a general rule, we are going to need more nerds in future, not fewer.

1. As the cost of computing continues to fall, and as the power of computing continues to explode, the number of computers will continue to explode as well

2. This means that the demand for programmers is going to continue to outstrip the supply of programmers

3. If today's 3 GHz desktop computer runs Windows, with perhaps 100 million lines of code, how many lines of code will we need to use a 3 THz computer effectively in 10 years' time?

4. The ability of computers to compute will outstrip our ability to write code to direct them – and we become the bottleneck

a) It's true that computers will gradually take over the creation of code, but the need for humans to be involved in systems analysis and

architecture will continue to outstrip the available pool of talent

b) This is especially true since, in my view, the only acceptable programming is excellent programming. OK programming is typically hard to use, and hobbles the people trying to use it

C. So, the contrary trend is that you're going to need to struggle to find great people, fight to hire and retain them, defend them vigorously from internal problems, especially politics, and then, in turn, demand great things from them

X. Which leads me to the most difficult of the tasks ahead of you: interpersonal relations within your own organization

A. Let's be honest: we nerds are not classically known for the smoothness of our ways, and our ability to warm cockles and tickle vanities

1. I, myself, have been told that I never call a spade a spade, but rather a friggin' shovel

B. Yet, if IT is to be taken seriously, if your organization is going to profit from the potential of the technological explosion ahead of us, and if your group is going to become the driving engine that it could be within your company, then you are going to have to learn social graces and human politics

1. So, first, I would suggest that you get some training in this, and I'd suggest you go to the head of HR for advice on where and how to get it

2. The way is known, and can be both taught and learned, so look for courses that can teach you how to be a better manager, how to be a better follower, and how to work well with others

C. Critical is the Law of the Other Person's Goals

1. If you go to your CEO and start talking about your needs and the needs of your group, she will listen for a time, and then will stop listening, and just wait for you to run down – if she doesn't cut you short instead

2. But if you go in and talk about **her** goals, and how you can help her get there, she's going to be a lot more interested, and a lot more supportive of what you're trying to do

3. Likewise, the other C-level executives in your organization are all looking for ways of forwarding their goals, and complaining that they're not getting enough resources or attention

a) I know for a fact, for instance, that HR executives are fretting over this very same issue, because I'm coming back to Vancouver next week to talk to a group of them on this exact subject

4. And the best part about all this is that most executives will generally be happy to tell you what they're trying to achieve if you just ask – partly because it gives them a chance to talk and demonstrate their importance

a) That doesn't mean they don't also have a hidden agenda, but most of the time, executives truly are trying to do their best for the organization – and themselves, of course

D. If you can support the efforts of your colleagues, then it will be easier for you to enlist their support of what you're trying to do

1. And if you can solve problems for them, or warn them of problems coming at them, then so much the better. It's a way of building social equity

XI. Perversely, the more capable technology becomes, and the more it does for us, the greater the importance of the so-called “soft skills”

A. When automation has finally taken over all the routine work, then what will be left will be non-routine work, which means creative, innovative work, plus the human skills of leadership, teamwork, interpersonal relations, the ability to communicate – all will become more important, not less

B. In short, the more successful you are at improving and fostering the use of technology within your organizations, the more important your interpersonal skills will become

1. It doesn't seem fair, I know!

XII. The way ahead: How do we cope

A. Let me leave you with one last thing: a toolkit of how to anticipate and prepare for the future.

B. This is a handbook I've developed over the years for my consulting clients, called “Risk Management and Scenario Planning: How to Avoid Problems and Spot Opportunities”

C. Alan Kay: “The best way to predict the future is to invent it.”

D. I wish you good luck, and God speed. Thank you.