THE FUTURE OF TECHNOLOGY…SO WHAT?
Turning Emerging Technologies into Long-Term Growth
Kellogg Innovation Network (KIN) Dialogue

Executive Briefing Center
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On the subversive edge: "Forty percent of what consumers actually do on a broadband connection is piracy: downloading music, games and videos that they probably have not paid for. However, one of the interesting things about technology is that it is very instructive to look at the subversive edge. What is, in fact, just beyond the light? What is barely legal or even, frankly, illegal today but is responding to a real need?"

-Guido Jouret
Chief Technology Officer, Emerging Markets Technology Group
Cisco Systems, Inc.

On creating effects: "One of the fundamental shifts in our business is that we have said, 'What are our core technologies, and how do we look at those technologies as capabilities?' We've changed the basic language within the organization… to systems, (which has created) a million new ways to think about products and speak to customers."

-Louise Francesconi
President
Raytheon Missile Systems

On external networks: "When you only look internally to your company…you don't see the connections branching out. For white collar professionals, where information is the commodity that moves, really interesting possibilities…(are) not just inside the company. Those connections can tell you where your company naturally intersects with companies and markets where you currently don't play."

-Ellen Levy
Vice President, Corporate Development Strategy
LinkedIn

EXECUTIVE SUMMARY

The KIN dialogue focused on the following interests expressed by the participants:

- Discovering and assessing new technologies

- Creating value—especially end-to-end solutions or new business models—at the interfaces of market needs and emerging technologies

- Understanding where to place technology bets… and when to let go

- Transitioning proven technologies into an organization that resists (e.g., "not invented here") or just moves too slowly

Key Summit Insights:

- Leaders need to place a portfolio of bets on the future and drive focused strategies around those choices. If top leadership is not fully supportive, however, there are still ways to move forward:
  - Determine the CEO's "hot button" issues and focus innovation concepts on them
  - Socialize innovation programs and projects with the CEO's top advisors
  - Start with "small bites" to build credibility. (This is also a good way to test the market. However, don't get dragged down chasing small opportunities or pet projects.)

- Good leaders set the strategic context: i.e., what are the growth targets and innovation directions that emerging technologies are trying to address? (Make sure you are focused on future challenges, not the war you just fought.) In order for people to rally around the strategy, it must be simple, intuitive, mission-focused and clear about the types of innovation being sought.

- In the early stages of innovation projects, you want people who are passionate (won't give up when the road is bumpy) but who also are able take feedback (are willing to change direction when warranted). No special financial compensation is typically required, as these types of people are internally motivated to make their ideas real. (You can sometimes find internal entrepreneurs among people from small companies you've acquired.) When a concept is proven, you need evangelizers and people with a marketing focus. In the final stages, you need people skilled in operational efficiency.

- Having a defined emerging technologies investigation and project graduation structure can mitigate problems with transitioning projects and scaling them up. It avoids "the founder's deadly embrace" by setting expectations for when certain people will "leave the stage."

- In the early stages, you also want to select your customers. Think of them as partners in development, not just a potential source of revenues.

- Established companies face a Liability of Leadership: In the fact of a disruptive threat, they are unable to abandon the ideas and products that made them successful. The few that succeed generally set up a separate division with separate P&L to pursue it, so that there is freedom to think beyond one-for-one replacement of old technology. Conversely, your company's weaknesses may be a strategic advantage if it means you are willing to adopt strategies that your competition will not.

- To anticipate possible disruptions, think about what would happen if someone gave away what you're currently selling. Consider also that disruption often comes from competitors whose offering cuts across your business units and hence falls between organizational cracks.

ANTICIPATING THE CHANGING DEFENSE BUSINESS EQUATION
Louise Francesconi
President, Raytheon Missile Systems

Raytheon missile systems was born out of the consolidation of General Dynamics and Hughes missile divisions, which was then further merged with Raytheon missile capabilities in 1997. Overall market growth in recent years has been slow: only about 3% per year. So the question has arisen: What are our core techs that we can leverage into new markets to expand *our* growth?

An important step in the process was to shift corporate thinking from products — e.g., seekers, algorithms, air frames, etc.—to capabilities. When you look at the world in terms of capabilities rather than "stuff," it changes the basic language within the organization. It creates new and different ways to think about product and, more importantly, speak to our customers. Today, we think about the impacts we can have, about the effects we can create, and where that might have value for new customers in new markets. Our focus areas are affordable systems solution, situational awareness and management, systems engineering and integration, and scalable energy application (directed energy).

How did we do it? It's hard to get an organization to make such a dramatic move, but, in our case, the following worked:

1. Get alignment with direct reports

2. Speak to the language of change from the top, as often as possible, both inside the company and with customers

3. Exercise personal leadership in budget allocation. (A leader cannot listen for a vote. She must be ready to place bets.)

4. Reorganize departments, and focus executive attention on the ones that represent the future
   (Note: This is politically difficult. In our case, it meant taking power away from programs. It also meant having the core compete <u>constructively</u> with the new.)

5. Hire new talent (E.g., We hired gaming engineers to work on the front end of our modeling and simulation programs.)

This being said, when you open up the aperture to look at new markets, it can be hard to understand the new customer base. Historically, the defense industry has been quick to recognize its technical gaps and form development partnerships, but now we're being challenged to form partnerships for market access. For defense, the jump to adjacent markets is bigger than for commercial companies. We've had some successes—e.g., licensing oil shale recovery technology to Schlumberger this year—but we need better, more innovative (for us) models of how to form such go-to-market partnerships.

One way we've tried to address this is through a new organization we call the "Bike Shop." Its job is to take help take the R&D that we invest in advanced technologies—25% of our total R&D—to help productize or license things faster. Some of our new customers, such as Special Forces, are excited by how fast an idea can be turned into a product. We've also put more emphasis on modular architectures that permit us to insert commercial technologies more quickly into our complex systems. It allows us to devise common solutions across our traditional customer bases.

THE IT REVOLUTION: BUSINESS, MILITARY, GLOBALIZATION
William J. Perry
Michael and Barbara Berberian Professor of Management Science and Engineering
Stanford University
Former United States Secretary of Defense (1994-97)

The speed and scope of the IT revolution is unprecedented in the history of the world. It has led to an explosion of new businesses, a revolution in military affairs, and globalization. After the invention of the integrated circuit, process and design engineers have doubled their capability every 18 months, as forecast by Intel-founder, Gordon Moore, in 1965. Doubling performance every 18 months means increasing it by a factor of 1000 every 15 years. After 30 years, we are now at one million times the performance (or one millionth the cost per function).

In photography, for instance, digital cameras are now better than film. That was predictable. What was not predictable was that millions of people who never used a film camera started to use digital cameras. It was an entirely new market. However, the leaders in the film market are not the leaders in the digital camera market. Current market leaders rarely succeed in the new market, because doing so requires "killing off your children"; i.e., abandoning the products that gave you success in the old market. This Liability of Leadership is widespread. The few companies that overcome it generally believe they have no alternative. And they set up a separate division with separate P&L to pursue it, a division with the freedom to think beyond just making a one-for-one replacement of old technology for new.

In the late 1970s, the US government embraced the IT revolution to address the Soviet threat. The Soviets had a 3-to-1 advantage over the US and Western Europe in conventional weaponry and parity in nuclear weaponry. The US was unwilling to commit the economic and political costs to match the Soviets tank for tank. Instead, we developed advanced technology—stealth, intelligent sensors and precision munitions—to offset the Soviet numerical advantage. Those capabilities created the dominant US conventional forces the US enjoys today.[1] The offset strategy helped foster transformation change in part because it was simple, succinct, and mission-focused. If you wish to rally people around an idea and have clarity of direction, it must be simple to understand.

After the end of the Cold War, numerous countries moved toward market economies, most notably India, China and the newly-independent states of the former Soviet Union. These political and economic changes made globalization a possibility. Technological changes made globalization a reality. Today, a company's R&D can be done anywhere in the world and in several places in the world simultaneously.

There are, of course, unintended consequences. Our dependency on the Internet makes us vulnerable to disruptions by hostile parties. Globalization is tearing apart the Islamic world, fostering a small violent minority who consider the concomitant westernization to be a catastrophe. A terrorist obtaining a nuclear weapon is the ultimate preventable catastrophe. I am working with George Shultz, Henry Kissinger, and Jack Nunn to get the world stimulated toward elimination of all nuclear weapons.

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[1] Interestingly, we later learned that, at the same time, General Ogarkov of the Soviet General Staff was proposing the same strategy. His proposal was rejected in favor of maintaining a large number of tanks and artillery. This is another example of the Liability of Leadership.

CISCO'S INTERNAL INNOVATION MODEL AND LESSONS LEARNED
Guido Jouret
Chief Technology Officer
Emerging Markets Technology Group
Cisco Systems, Inc.

Cisco created the Emerging Markets Technology (EMT) Group about two and half years ago.   The company recognized that the locus of innovation in IT was moving from the enterprise space (e.g., eBusiness) to the consumer space. And the pace continues to increase. EMT seeks to detect trends when they are early and nascent and find ways for Cisco to take advantage of them

How is the world changing? We're moving from an Internet of people to an Internet of things. Everything will become IP based. Anything that can be connected will be connected. Also, the internet is moving from text-based to video-based applications. There are three key technology groups that will be critical to the emergence of this world: Video, Mobility, and Virtualization (the ability to run an application on multiple devices).

In 2007, the amount of traffic consumed by consumers exceeded businesses for the first time, due to video. Five video sites generate more traffic than the entire US internet in 2001, and all of them were created in the past four years. Cisco projects that telepresence will generate more traffic than the entire US internet today. (Fortunately, the network should be able to keep up, as the rate of change of networking techs is even faster than Moore's law, due to algorithm development.)

Today, much of video traffic is piracy. But this "subversive edge" is instructive, as it reflects a real market: people want is the convenience of music and video on demand. Every service provider is trying to stamp out the underlying peer-to-peer protocols, but they just become more robust, more scalable, and more bulletproof. In the future, these technologies will enable the reinvention of television, where you download content from your neighbors without the need for a large content distribution network. The beauty of it is that the more customers there are, the faster the peer-to-peer network works.

So how can Cisco take advantage of this, beyond acquisitions, partnerships and the like? EMT is designed to organically grow new ventures inside the company. EMT has a separate budget to fund incubation. In looking at other companies, it found no successful examples of decentralize incubation. A central group with a strong mandate is required to defend innovation projects against both corporate antibodies (the people who want to kill it before it gets started) and corporate love (the people who want to latch onto it and turn it toward their priorities). Also, it was deemed important to be accountable for projects all the way to building and selling product, not just develop concepts for others to prove out.

Because Cisco is large, EMT has to focus on large targets. Wall Street's expectations give us a $6.5B gap to fill in the next few years. So we look for markets that can generate $1B within 5-7 years. So we think we need 15 successful EMT businesses; enough to spread risk but not so many as to get dispersed. We want 75% to succeed.[2]   This means we have to start 20 projects, which means having at least 1000 ideas.

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[2] EMT believes it can do this by avoiding the problems plaguing startups, such as the founder problem (great idea people who can't manage), running out of cash, being killed by bigger competitor, or having poor integration with products made buy others.

How are we going to get 1000 ideas? Best places are from business partners, customers and employees. We started a wiki call iZone to gather these and a WebEx space for collaboration. Then we created an iPrize. The winner will be given $250,000 and Cisco will invest $10M. As a result, they received more than 1,200 ideas in two months! Many of them are not good, but sometimes they represent individual views of a big market opportunity. We work hard trying to find those market opportunities, which are much more lucrative, as they can be addressed by families of products.

We then turn ideas into projects, which involves fleshing out the concept. For that, you need entrepreneurs. Cisco discovered more than half of the entrepreneurs in the start-up companies they acquired over 10 years were still working at Cisco. When they found out what EMT was doing, they came knocking. A typical project team will have a general manager, an engineering lead, a product development person and a business development person. If it looks promising, it graduates to being a business, and it hires its own engineers. By the time they have a product, there may be fifty or so people on the team.

About six months before we come to market, we form a "tiger team" of people from manufacturing, finance, service, sales, etc., to work out all the dependencies. They meet every week to determine the go-to-market strategy. It's important at the early stage to select your customers, as opposed to trying to interest everyone. Those early customers should be viewed as partners, not just potential sources of future revenue. If you try to please everybody with your version 1.0 product, you will get bogged down.

It's important to realize that a project moves through different lifecycles during this process, and the personnel have to be matched to this. Some people are great inventors; others are great evangelists; others are great optimizers. Projects need to be run like a relay race; passed on to a different group as they reach their next stage of maturity. For inventors, you want people with passion but also "coach-ability." (If they are stubborn, they can kill projects.) In the next stage you need great marketing people, like a Steve Jobs. In the final stage, you need great operational people, the kind who are running your business units today.

EMT has found that it was not necessary to create large financial incentives for its projects.[3] People have been eager to become a part of it. Many have been involved in failed startups. They are mostly motivated to see their ideas succeed. (There are some who want you to pay them up front for sharing their idea, but in fact the best entrepreneurs tend to be the ones who are telling everyone who will listen.) Additionally, having a home for ideas such as EMT provides something of a pressure value for the company. It gives people a place to go, someone who will listen, which is useful in its own right.

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[3] Having separate financial incentives can disrupt internal equity in a company. Google has found this with its Founders Awards. Success has a thousand parents, and everyone gets into haggling about how much their contribution meant.

NEW TOOLS FOR THE FUTURE…AND A LOOK AHEAD
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It is possible to make accurate forecasts, if you can identify the right influencing factors. (One of the most important factors to consider is where the money will come from. What is the real consumer need?) But more important is making *useful* forecasts. That depends on the mindsets of the people using them. Can they hold open their mind to the possibility of entirely new frameworks; i.e., radically different realities? Is there clarity about strategic goals? There are four basic mindsets:

- Traditionalist: An overt resister; e.g.., "We tried that and it didn't work."

- Maintainer: A covert resister; e.g., "Interesting idea but don't make waves."

- Adapter: Someone who likes to learn new things

- Pathfinder: Someone who pursues new things (eliciting reactions in the organization such as, "Doesn't she understand who we are here at XXX?"

Data can be an important enabler for forecasting. Better data, focused on what we're interested in, and delivered sooner than to others, can create actionable ideas. Modern, computer-based analytic engines, for instance, can monitor news stories worldwide through the internet. One can map the trends as they move around the globe. For instance, stories about lead in Chinese-made toys began appearing in Singapore three days before they hit the papers in the US. What if you had seen that and invested based on the information? What if you were with a toy company? Clearly, quality data at the right time can be powerful.

Visual models are particularly useful for forecasting. Humans look at possibilities in visual terms. But our maps are often distorted, too narrow or fragmented. (Antique maps tell a story about how distorted our view of the physical world used to be.) A good visual model can challenge and provoke ideas, by highlighting opportunities that defy logic in the current climate. Consider consumer-generated commercials, an idea that would have seemed outlandish a few years ago but is an emerging reality today. What are the entrepreneurial opportunities with these new media products? What might be the impacts on lifestyle?

Examining "edge cultures" is another way to inspire creative thought about future possibilities. Medical tourism began emerging a few years ago. Recently, an insurance company adopted it as an offering, saving them millions of dollars. Hybrid cars were an edge culture in Europe a few years before they were introduced in the US. Examining the adoption patterns there would have given one good insight into the popularity of hybrids in the US market a few years later.

Finally, it can be useful to play the exercise, "kill your future." Consider what would happen if someone gave away what you're currently selling, in order to leverage another revenue stream? What technology or market change would take away 100% of your current core business?