Executive Summary

IT units are increasingly being asked to improve the innovative capabilities of their enterprises. However, few chief information officers (CIOs), or indeed their business counterparts, feel their IT units have the competencies and credibility to deliver on those demands.

This case describes how Intel’s IT function rose to the challenge. It developed a network of innovation centers, a set of methods and enabling tools, a dedicated innovation delivery team, a clear delivery process, and numerous training programs and innovator workshops, all brought to fruition through a bootstrap-oriented funding approach.

Three years after launching its innovation initiatives, IT was the fastest-growing contributor to Intel’s intellectual capital, and IT innovations had delivered significant business benefits. The innovation capabilities enabled by Intel’s IT units have become an important contributor to the firm’s strategy of building competitive advantage through innovation.

The Intel case provides seven lessons for CIOs aiming to build innovation capabilities: (1) Take the lead in innovation; (2) Build momentum and use it to expand scope; (3) Measure value and publicize progress; (4) Culture is not a prerequisite; (5) Build an enabling environment and infrastructure for innovation; (6) Don’t innovate alone; and (7) Gain and maintain executive support.

INCREASING NEED TO DEVELOP IT INNOVATION CAPABILITIES

Senior management teams are increasingly looking to IT to improve the innovation capabilities of their enterprises. But many CIOs are unsure if they have the capabilities to deliver the required innovations. For example, in Gartner’s 2007 State of the CIO survey, 87% of respondents stated that innovation was important to the success of their enterprises, but only 26% believed their innovation processes were sufficient to enable genuine IT-based innovation.3 This situation is not limited to IT. In a 2007 Boston Consulting Group survey of more than 2,000 senior executives, 66% of respondents said innovation was a top-three priority for their firms and 67% planned to spend more on innovation.4 However, less than half were satisfied with the returns from their innovation investments.

IT executives, though, face an extra challenge. Before being accepted as sources of strategically important ideas and leaders of business change, they must first be seen as effective contributors to organizational performance. Intel’s IT function had to improve its IT management before taking on the challenge of IT-enabling innovation.
In 2003, Intel® was starting to reap the rewards of a strategy to “invest our way out of the recession” driven by then-CEO Craig Barrett (see Figure 1). The firm had also begun to prepare for the launch of its Centrino® processor technology, which marked a significant change in product strategy. While Intel’s mission and goals had previously been to be the pre-eminent building-block supplier to the world’s semiconductor industry, Centrino processor technology marked a change in direction. It integrated different components, such as CPU, wireless chipset, and other components into a single platform. Although Intel would build many elements of the platform, the firm would also need to collaborate with other firms to build on the platform to increase functionality and market demand.

Intel’s IT function, too, was going through considerable transformation. In the late 1990s, IT was a poor performer. Many of its internal customers cited poor quality, high costs, and delivery timeliness as issues it needed to address. CIOs Louis Burns and then Doug Busch changed this perception by fundamentally transforming the IT function. They established a vision that IT would be recognized as a key contributor to Intel’s success, both inside and outside the firm. The new mission was to fuel Intel’s success with outstanding strategic IT leadership and IT services.

Burns and Busch embarked on a series of initiatives, including consolidating the infrastructure, improving measurement, creating transparent governance mechanisms, and focusing continually on process improvement. These initiatives completely changed IT service delivery and customer perceptions. Total cost of ownership for PCs was reduced by more than 50%. Infrastructure unit costs and service quality improved significantly as measured by external benchmarks.

By 2003, customer satisfaction had improved, with over 80% of internal customers rating the IT function as a strategic business partner (rather than a technology expert, provider, or vendor). The improvements were achieved during a time when the overall IT budget (and the IT budget as a percentage of revenue) was reduced.7

### STARTING THE IT-ENABLED INNOVATION JOURNEY

The IT function’s significant improvements in quality and customer satisfaction started to deliver on Busch’s vision of being recognized as a key

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5 The term “IT function” is used in this article to denote the Intel-wide IT organization. “IT unit” is used to denote a particular business-facing element of the IT function.

6 Intel, Intel Leap Ahead, and their related logos are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

7 For more on the transformation of the IT function at Intel, see: Curley, M. “The IT Transformation at Intel,” *MIS Quarterly Executive* (5:4), December 2006.
contributor to Intel’s success. But IT needed to do more to fulfill its mission of providing strategic IT leadership and services. The logical next step was to help the firm grow its innovation capabilities.

In 2003, IT staff member Martin Curley and one of his team members proposed that CIO Busch establish a team to develop innovative solutions and improve the innovation capabilities of the IT function and, potentially, Intel. The team would have three strategic goals:

- To create new solutions that would improve Intel’s internal efficiency and effectiveness
- To deliver key applications that would create demand for new Intel platforms
- To conduct research and create thought leadership that would influence and inspire key customers.

The innovation team would take a portfolio approach, with its efforts and expenditures allocated in three roughly equal parts to the three strategic goals. Overall, the team would not only improve Intel’s own business, but would also improve the marketplace’s perception of Intel as an innovative company. Shortly after the organization was formed, a fourth goal was added: to develop innovation-enabling capabilities.

The timing of this proposal was opportune, given Intel’s change of direction from a semiconductor building-block component firm to a platform company. To drive increased revenue and profitability, Intel needed to offer an integrated platform value proposition. Intel was in the process of launching its Centrino processor technology and also planned to launch other platform products. Because platforms are infrastructure—and multi-purpose by definition—they are harder to launch than specific applications or products. Thus Intel also needed to seed innovation in its broader business ecosystem, spurring industry partners to develop innovative components and solutions based on Intel products.

CIO Busch accepted the proposal, and the IT Innovation (ITI) Group was formed in the first quarter of 2003. The group agreed to an ambitious innovation and research agenda that would require substantial effort and creativity to achieve the goal of having an Intel-wide and industry-wide impact.

To frame its challenges, the group adopted clear vision and mission statements based on the IT function’s vision and mission:

- The vision is to be a catalyst for worldwide IT innovation
- The mission is to drive Intel’s competitive advantage and industry leadership through systemic innovation and breakthrough research, solutions, and practices.

**The First Challenge: Defining What “Innovation” Means**

One of ITI’s first challenges was to develop a useful working definition of the term innovation. Different people throughout Intel and its ecosystem had different views. Some believed that only a true breakthrough counted as an innovation. Others considered even incremental improvements to be innovations. Still others believed that an idea was an innovation only when it was invented within Intel, whereas others believed that innovation included applying outside ideas to important internal problems and opportunities.

In collaboration with other groups, ITI initiated an Intel-wide Innovation Conference, one output of which was a common definition of innovation:

“The introduction of something new which creates value for the organization that adopts it.”

With this definition, an innovation occurs only when customers (internal or external) adopt a solution that creates value. An innovation combines existing, emerging, and new knowledge and solutions in an intelligent way to develop new and superior solutions. Thus reusing internal capabilities and adopting external ideas are both critical elements of innovation.

**STAGED APPROACH TO BUILDING INNOVATION CAPABILITIES**

The definition of innovation left open the role that the IT function could play. IT leaders were confident that they could build a small team of expert innovators who could generate ideas for innovation and implement them. But they recognized that innovation is a “team sport.” A small, centralized group could never have the perspective and creativity of a large number of people—especially those at the edges of the enterprise. People closest to the problems and opportunities of particular business units or customer segments are best positioned to identify and implement useful innovations. Furthermore, Intel’s platform strategy meant that innovation could not just be internally
generated; Intel needed its external customers and partners to build innovations onto the Intel platform. Such innovation would significantly help to accelerate adoption of a platform.

ITI concluded that making the innovation initiative scalable—and spreading the benefits of innovation widely throughout the business—required a force-multiplier effect achievable only by helping others to innovate. Accordingly, it adopted a two-stage approach to embedding innovation capabilities:

- **Stage 1: Capability Creation**
  
  ITI kick-started the capability creation stage by leading through example. It set about creating next-generation research, proof-points, thought leadership, products, and solutions. Intel’s IT function already had an R&D council, which had a limited budget to fund proposals that could be submitted by anyone in the company. ITI incorporated the R&D funding process into the IT innovation process. This involved developing a new R&D agenda focused on Intel’s IT and business imperatives, designing a new subcommittee process to improve project selection, and developing tools and methods to improve portfolio management and pipeline yield.

  Three examples of innovations funded in this way were:

  1. Use of advanced statistical and analytical software to increase the availability of a key constraint tool by 2%
  2. A new solution providing designers with real-time factory information to enable faster time to market for new Intel products
  3. Application of gaming theory and risk assessment approaches to better predict demand for new product introductions.

  To further boost the innovation process, ITI established an Innovation Delivery team to focus on specific opportunities or problems. This team is responsible not only for building solutions, but also for ensuring innovations are adopted. For example, the team successfully implemented “Intel PC Basics Software,” an e-learning solution that helps first-time PC users learn how to use their PCs effectively. This solution has been localized in more than 15 languages, and over 250,000 copies have been shipped by original equipment manufacturers (OEMs) around the world.

  The Innovation Delivery team has a broad mix of skills that includes analysis, rapid prototyping, testing, and change management. It uses a flexible resourcing pool to dynamically allocate headcount to particular problems or opportunities. The broad skill mix and flexible resourcing enable the team to implement proofs-of-concept and full innovations quickly and creatively. The team is primarily funded on a co-funding and cost-recovery basis to ensure that every project it undertakes is “real,” meaning there is an inherent intention to deliver a working solution for a specific problem or opportunity. Although the Innovation Delivery team proactively scouts for innovation opportunities, its growing reputation means there is often a backlog.

- **Stage 2: Diffusion**

  The initial capability creation stage—building a small team of expert innovators who could innovate for the firm—was difficult but relatively straightforward. However, making innovation sustainable required a second stage: diffusing innovations and innovative capabilities across the enterprise and its business ecosystem.

  Internally, ITI educated and influenced business unit managers and staff on innovation concepts and capabilities. Each major IT unit in Intel has its own innovation champion who is responsible for driving innovation goals. Champions mentor IT personnel in innovation and the use of processes and tools. They also coordinate training, provide content evaluations, identify problems and opportunities that innovators can pursue, and serve as a critical link between the IT units and ITI. They devote part of their time to innovation efforts and are rewarded for innovation performance.
Diffusing capabilities more broadly required ITI to partner with other groups. Intel’s Solutions Marketing Group sponsored and funded IT innovation and research activities in several vertical industries. Externally, ITI showed businesses in Intel’s ecosystem the innovative capabilities and possibilities available from working with Intel.

Intel’s skool™ technology platform9 (www.skoool.com), developed and operated by ITI, illustrates innovation involving third parties. Intel partnered with government ministries of education and private sector firms to develop the platform, which is now an integral part of Intel’s World Ahead program. The project is an example of advanced corporate social responsibility, where firms and governments co-develop initiatives and help drive structural changes through these initiatives.

THE INNOVATION CENTER NETWORK

At the heart of Intel’s IT innovation activities is the network of Innovation Centers. This network encompasses two roles—a set of physical innovation centers and a Virtual Innovation Center that hosts the broader ITI global network of innovators.

Physical Innovation Centers

Starting in 2003, ITI began building its global network of IT Innovation Centers, using a small seed investment from Intel’s IT function. The mission of the centers is to drive Intel’s competitive advantage and industry leadership through systemic innovation and breakthrough research into solutions and practices. By the end of 2006, there were 12 centers, including four in the U.S. and one each in China, Dubai, India, Ireland, Israel, Malaysia, Russia, and Turkey. Each center serves as:

- An environment to catalyze disruptive technology development
- A showcase of IT solutions and practices
- A location to conduct innovation-related training and executive seminars
- A venue for innovation and outreach to industry and government

9 skool is a multi-award-winning eLearning product that aims to bring highly innovative, interactive, and exciting learning to secondary-level students in multiple countries worldwide, with a special focus on math and science. In 2004, skool.ie won the overall award at the Irish National Digital Media awards, and the Ireland IT innovation center was named Irish eLearning company of the year.

- A networked source of competitive intelligence.

The centers host innovation creation teams made up of Intel and non-Intel personnel. They are the home base for the people who operate the innovation infrastructure. They also play a critical role in diffusion by educating people about IT innovations, tools, and processes. Figure 2 shows the layout of a typical Innovation Center. Figure 3 shows the full layout of the Innovation Center in Ireland.

Each main center is run by a full-time employee and occupied by full-time innovators and researchers. Personnel from Intel business units may also be co-located at some centers. Several centers host “Innovators-in-Residence,” people with good ideas who have been temporarily assigned to a center to develop a particular idea or prototype. The staffing of the centers is in line with Intel’s goal of operating effectively on a lean budget. IT budgets provide seed funding through the innovation assignment process, but all parties who will benefit from a particular innovation project contribute funds.

Intel business groups provide about 50% of the funding for the innovation center network and projects, with government and EU research funding augmenting the Intel research spend. Co-funding of joint innovation projects by Intel business groups has resulted in shared ownership of success and shared risk/reward for business and IT stakeholders.

Providing a continuous stream of “wins” was essential to making the case for continued investment in Innovation Centers. The centers have proven to be key strategic locations for Intel customer and industry engagements. In 2006 alone, the 12 centers hosted more than 32,000 visitors at a variety of executive workshops and internal and industry events. The centers have also demonstrated product platforms and solutions to stimulate and attract innovation related to IT design, implementation, and use-case development.10

Examples of projects conducted by the Innovation Centers are:

- The center in Russia delivered the “WiMAX Car” project, which demonstrated new models for connectivity in rural regions. In 2006, this center was awarded a gold medal by the

10 At Intel, “use-case development” is the process of envisioning and testing usage models for IT solutions. Business value is often only created by IT solutions when they are used, and use-case modeling and development helps create and substantiate these value opportunities.
Russian Academy of Medicine “for building mobile solutions for telemedicine.”

- The center in Ireland worked with a hospital in Alabama to help improve ward throughput through integrated use of radio frequency identification (RFID) technology, mobile computing, and electronic display boards.
- The Malaysian center worked with the Malaysian Multimedia University to design a cost-effective wireless sensor to monitor parameters affecting the yield of rice paddies.
- The center in China worked to develop an innovative pilot called “Happy Farmers” to support the use of technology to enable agriculture.
- The center in Folsom, Calif., collaborated with Intel platform groups to generate proof-points, and conduct testing, validation, and usage model development of new enterprise platform
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capabilities, while uncovering and helping solve "showstopper" issues.

The Virtual Innovation Center

The network of physical innovation centers is enhanced by the Virtual Innovation Center (see Figure 4), which acts as a focal point for making new innovation tools and activities available throughout the IT function and Intel. The Virtual Center scales the activities of the physical centers to a broader company-wide innovation network, substituting collaborative tools and processes for the specialized staff and face-to-face interactions of the physical centers. It also provides enabling tools for local staff to innovate and a virtual space in which people can create and diffuse innovations. Several of its components, including the Innovation Engine, innovation self-assessment, and training courses, are described below.

INNOVATION CENTER TOOLS AND PRACTICES

In the four years since its inception, ITI has built the tools and infrastructure, and defined the activities, that form the basis of the physical and Virtual Innovation Centers’ operations. Of particular interest are:

- The innovation pipeline process
- The innovation pipeline process enablers
- Creativity and collaboration enablers
- Culture-change and individual-enablement tools

These tools and practices have improved Intel’s IT innovation capability, changed the innovation culture, and enabled innovations that improve efficiency and effectiveness, both in IT units and more generally.

The Innovation Pipeline Process

To more predictably deliver the benefits that an innovation promises, a managed IT innovation process has begun to emerge in Intel’s IT organization.11 The process addresses six dimensions of innovation in parallel:

11 For further details and a case study, see: Baldwin, E., and Curley, M. Managing IT Innovation for Business Value, Intel Press, November 2007.
• Vision of a problem or opportunity identified by an employee or customer
• IT-enabled solution
• Business case
• Business process change
• Organizational change
• Customer adoption, which will likely require customer or societal changes.

The starting point for an innovation is someone having a vision of how a particular opportunity can be exploited or how a particular problem can be solved by using IT. Typically, the vision will evolve over time. Delivering the IT-enabled solution is often the easier part of achieving a new IT-enabled innovation. Just as important, and often more difficult, is the business case—planning how the innovation will be launched, adopted, and generate returns.12

The other three dimensions are concerned with “soft” issues. These issues can often be the most problematic part of delivering an IT innovation. Typically, an IT innovation will deliver some form of business process change. In the past, the change was typically business process automation, but now it frequently involves business process transformation. Business process change often requires organizational change, in the form of new behaviors, new roles, or even new organizational structures. Business, resource, and ecosystem dynamics significantly influence organizational change requirements.

Finally, and perhaps most importantly, an innovation will only be successful if it is adopted by customers. Many of today’s IT-enabled innovations have societal impacts, so society’s willingness and ability to accept an innovation is crucial for its success. If an innovation requires customer or societal change, innovators must put mechanisms in place to facilitate those changes.

The transformation of services in the City of Westminster in London, England, through wireless technology provides an example of managing the six dimensions to deliver value. The City had an agenda of civic renewal (crime reduction, cleaner streets, etc.), and improved services provisioning and employee productivity. Westminster City Council CEO, Peter Rogers, had a vision of how the city might be transformed through the adoption of wireless technology but was unsure of the best way to accomplish this. A rapid prototyping and pilot approach was used to manage all six dimensions carefully to deliver a significant transformation, based initially on adopting wireless IP closed circuit television (CCTV) cameras instead of fixed CCTV cameras.

This solution was innovative both in terms of technology and the business case. Technologically, the wireless cameras provided much more flexibility than fixed cameras because they could be moved overnight. The business case derived from the significantly lower capital cost of wireless cameras (80% less than fixed cameras), which meant that some of the funding for CCTV cameras could be used as part of the transformation project. When implemented, the wireless platform met initial requirements at lower cost and also served as the basis for valuable extensions such as noise monitoring and improved parking compliance monitoring.

Innovation Pipeline Process Enablers

Intel’s IT innovation pipeline process is enabled by a set of tools and methods implemented by ITI and others over the past three years. The most significant are the Innovation Engine, the IT Innovation Zone, innovation assignments, IT “concept cars” and the innovation pipeline yield process.

Innovation Engine. The Innovation Engine is an online tool that enables Intel’s large employee base to suggest new ideas for solving complex problems. In the past, such ideas would have been generated by only a handful of experts; the Innovation Engine taps into the collective intelligence of a much larger base. Thus it provides an environment for capturing, managing, and leveraging employee ideas to address key business problems or opportunities.

When Intel launched dual core technology, the firm solicited ideas for scenarios or usage models where dual core would benefit end-customers. Employees suggested more than 300 usage models, several of which have since been adopted. And when Intel sought its employees’ views on improving the firm’s structure and efficiency, they posted more than 3,000 efficiency-improvement ideas to the Innovation Engine.

The Innovation Engine also helps to support the firm’s Technology Strategic Long Range Planning (TSLRP) process. It captures ideas for off-roadmap disruptive technologies and opportunities and provides Intel’s Technology Leadership Council with an efficient

12 The business case is especially important after the “dot com” crash, when the culture of “irrational exuberance” switched to “irrational pessimism.” Although the pessimism has diminished somewhat in Intel and elsewhere, a solid business case remains a requirement for an innovation to proceed.
tool for selecting which ideas should be explored in more detail by the full TSLRP process. In 2007, this use of the Innovation Engine tripled the number of off-roadmap ideas. What’s more, the quality of submissions improved because all employees could view and enhance them.

**IT Innovation Zone.** Most of the value from innovations occurs when they are diffused and adopted by broad user bases. To facilitate such adoption, ITI established the IT Innovation Zone, which is a hub for exchanging IT ideas and prototypes. More than 10,000 Intel employees are now registered users.

**Innovation assignments.** ITI developed a pilot process to support a fixed-duration assignment in an innovation center, co-funded by the host organization and the innovation center. An innovation assignment enables an employee to invest time, away from his or her “day job,” to turn an innovation idea into reality (with approval and funding from the innovation group and the employee’s manager).

One example of an innovation assignment was an IT engineering employee who investigated how remote wireless technologies and the new Intel Viiv™ technology could lead to innovations for the home. He successfully developed a sophisticated algorithm to improve home air conditioning efficiency. He now leads a small team in Intel’s Digital Home Group, while continuing to work in the Innovation Center.

**IT “concept cars.”** ITI has adopted the concept car process from the automotive industry, so Intel can iteratively build and validate innovative IT concepts with end users. A small pool of funding is available for developing IT concept cars so that high-potential ideas can be quickly and comprehensively evaluated.

**Innovation pipeline yield process.** ITI recognized that Intel had a backlog of IT innovation ideas. There were many creative ideas but few of them “crossed the chasm.” To alleviate this issue, ITI established an innovation pipeline yield (IPY) process, systematized by Malvina Nisman (see Figure 5).

IPY recognizes that there are multiple inputs to the innovation and research process, and multiple outputs that could be considered as a yield. For example, only a small percentage of topics researched make it through the formal pipeline to a new solution, but influencing a change in IT architecture or adding a new feature to a future Intel product were also recognized as a valuable yield. IPY includes a rapid adoption yield category where a solution can be quickly deployed and diffused without passing through the formal IT product lifecycle process. Additionally, since the IT function would not want to productize all potentially valuable

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**Figure 5: The Innovation Pipeline Yield Process**

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solutions, ITI created a process to enable external commercialization. By defining the end goal, and grounding every innovation in a business need, IPY lays the roadmap for keeping innovation and research investments focused and delivering the highest value.

Creativity and Collaboration Enablers

Tools and methods aimed at improving the innovation process can only go so far. Teams still need to be able to develop the creative and effective solutions on which innovations depend. To assist innovation teams in their activities, ITI developed a set of creativity- and collaboration-enabling tools.

The Innovation Studio. This environment enables advanced research and innovation with Intel products. For example, a virtualization test bed in the Folsom, Calif., innovation center enabled the development and testing of compelling proof-points for new Intel products. A similar test bed in the Ireland Innovation Center is enabling the advanced characterization of emerging enterprise software products on new Intel hardware. A new Innovation Studio called “GoPro,” designed to accelerate adoption of Intel Centrino with vPro™ technology, delivered the first production-worthy implementation of the technology at Intel. It also generated invaluable learning about the deployment of this technology combination in an enterprise environment for the Digital Enterprise Platform Group.

The Innovation “Collaboratory.” ITI established the Innovation Collaboratory to develop advanced collaboration solutions that improve Intel’s ability to collaborate and innovate across geographies. The Collaboratory is rooted in research on virtual interaction and interaction complexity. Its goal is to create collaboration solutions that are “better than being there.” The Collaboratory has analyzed complex global workflows to develop new scenarios and workflow solutions. A prototype called “Being There,” which enables a very high quality remote one-on-one meeting, has been deployed in the innovation centers in Arizona, California, and Ireland.

Infomania. This productivity program aims to reduce information overload, interruptions, and distractions, which Intel estimates costs it a significant amount each year. So far, Infomania has identified the need for an e-mail effectiveness utility and e-mail “quiet time.” It has also suggested innovative solutions for applications, such as adapting multiplayer gaming techniques for business use.

Culture-Change and Individual-Enablement Tools

In addition to building enabling tools, ITI has also focused on changing the IT function’s culture to make it more open to innovation. These changes required a significant amount of work to assess and improve the culture of IT units and to provide the support that would sustain initial cultural improvements. They also required consistent support from senior management. The goal is to make innovation an inherent part of every employee’s daily activities. ITI developed several tools and programs to assist in this culture change.

Innovation self-assessment tool. ITI created an innovation self-assessment tool by modifying a self-assessment methodology that Intel had used to drive a cultural change in attitudes toward safety. The innovation self-assessment consists of about 40 questions and takes about 15 minutes to complete. It is available as hard copy and online at the Virtual Innovation Center Web page. Key elements of the self-assessment include management commitment to innovation and comprehensiveness of the available tools.

IT and business unit managers can use the self-assessment to understand and diagnose issues in their units’ innovation capabilities. The results provide managers and employees with specific actions they can take. As awareness of the self-assessment tool grows, other parts of Intel, such as corporate services, are also using the tool. And external partners’ growing awareness of Intel’s progress with IT-enabled innovation has led to many of them requesting visits to learn more, creating further interest in the innovation tools and centers.

Innovation training program. In addition to inaugurating a bi-annual Intel Innovation Conference, in 2006, the company held more than 80 innovation training sessions, workshops, and conferences attended by more than 1,000 Intel employees. ITI developed a workshop called “Systemic Innovation for Teams (SIfT)” to help teams manage the innovation process in a controlled fashion. SIfT training was delivered globally to diverse teams ranging from senior managers to engineering teams. At the same time, a

14 An example of advanced characterization is testing and assessing improvements in performance through the use of hardware virtualization.

15 For more information, see: http://www.cio.com/article/120852/Intel_s_E_Mail_Overload_Solution.
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Community of practice grew up around an established creativity methodology called TRIZ. Other training sessions delivered worldwide include:

- **Imagination camps**, which focus on creative brainstorming to identify imaginative solutions to challenging problems
- **Innovation 101**, which explains the basics of innovation and points employees to various innovation resources
- **Innovation Engine workshops**, a focused session that uses the Innovation Engine to actively collect and build on ideas to accelerate a solution to a problem
- **Intellectual property workshops**, which aim to increase the number of invention disclosures and patents by Intel’s IT employees.

**Incentives and awards.** ITI sees incentives and rewards as essential to reinforcing the culture change started by the Innovation Centers and metrics. Awards are given to people who discover and develop an innovation, and also to innovation catalysts—people who create the environment or provide crucial assistance in enabling an innovation. For example, one employee in the U.K. Innovation Center received an award for his catalyst role in raising Intel’s partners’ awareness of the potential of WiMAX. Because of his success, he was subsequently recruited by the sales and marketing organization. Another employee received an Innovator of the Year award for reusing existing code from a now-defunct internal lab to create the Miramar product. Miramar has now been licensed externally and is being commercially developed by a third party.

**MANAGING AND OPERATING THE INNOVATION INFRASTRUCTURE**

ITI has put procedures in place to manage innovation investments, monitor and measure its innovation efforts, and build open innovation relationships.

**Managing Innovation Investments**

Although Intel invests a small proportion of its IT budget in building and sustaining the innovation infrastructure, it achieves a high ROI, averaging more than 350%. Some of the innovation budget is managed centrally to fund innovation staff and provide innovation incentives. The remainder is spread across various Intel IT units to promote innovation efforts throughout the firm.

The Business Value Index (BVI) is a key tool for identifying innovation opportunities that have potentially high ROIs. This tool quickly assesses a potential solution against three key parameters: likely business value, IT efficiency impact, and likely financial attractiveness. While Intel’s IT function would like every innovation to have a spectacularly high return, the truth is that many innovations will provide only incremental returns. In building a portfolio of innovation investments—both incremental and radical—the BVI tool helps to identify potential returns so that projects can be selected and managed appropriately.

The IT function constantly monitors and measures its innovation development projects so that it can shut down innovations that are moving too slowly or generating negative net present value (NPV). But unsuccessful innovations are not seen as failures. Failing fast and learning fast can enhance the firm’s innovation capabilities.

**Using the Innovation Index to Monitor and Measure Innovation Activities**

Intel’s IT units systematically gather many process and output measures. One particularly useful metric is the Innovation Index, which includes several weighted components including net value delivered as well as the number of invention disclosures, research proof-points, ideas gathered, and innovation campaigns conducted. These leading and lagging indicators are presented as thermometer-like readings that provide an indication of the current state of IT innovation in the firm. The full list of Innovation Index components for 2006 is shown in Figure 6.

All components of the Innovation Index metric are clearly defined and approved by relevant Intel departments. Up-to-date descriptions and values for most of them are available on the innovation Web page. One complex component—innovation-related business value—is calculated with the help of the finance staff. It is based on the standard approach used by the company’s IT units, where business cases are computed from Intel’s “value dials,” such as days of inventory, employee productivity, factory uptime, and system end-of-life savings. Typically, Intel targets

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16 TRIZ, a theory of inventive problem solving developed in Russia, uses a systematic approach to innovation. For more information, see: http://www.triz-journal.com/archives/what_is_triz/.
17 Miramar is a virtual meeting space aimed at overcoming difficulties of temporal or geographic separation in global teams.
18 Source: Intel’s Business Value Program.
19 The list was updated for 2007 to reflect the adoption of innovation tools and training.
innovations at improving specific business variables and measures improvement of these variables against baselines prior to investing.

Using a consistent business value metric that has been validated by the finance department has resulted in a strong, credible track record of sustained value delivery, as described later. In addition, the use of metrics has highlighted areas for continuous improvement and tuning. For example, ITI used the innovation metrics to actively manage the innovation center portfolio. It closed five lower-performing centers in 2006 to optimize the efficiency and effectiveness of the innovation network in response to the corporate efficiency initiative.

Building Open Innovation Relationships

Since the best ideas and solutions are likely to emerge when Intel can combine its efforts with those of outside experts, ITI has built relationships both inside and outside Intel. The aim of these partnerships is to leverage investment, ideas, and effort to achieve innovations that no single organization could do on its own.

Internal partnerships. ITI’s internal partnerships aim to help particular Intel business units meet their challenges and opportunities in innovative ways. In 2006, ITI partnered with seven different business units for specific projects. Some of these partnerships included:

- Working with the Technology and Manufacturing Group for a high-performance maintenance project
- Working with the Digital Home Group to identify and demonstrate intelligent applications for reducing energy usage, and other applications in the home
- Working with the Digital Health Group to pilot WiMAX and Intel Viiv technology for technology-assisted living.

Collaborating with governments. Intel’s collaboration with governments focuses on initiatives that address global issues. For example, the Digital Nation initiative, with the Irish Government as a key participant, focuses on transforming government through innovative IT solutions, business practices, publications, and education. Additionally, Intel is a lead contributor to the European Commission’s Digital Business Ecosystem Initiative, the largest open-source initiative ever funded by the Commission under the European Sixth Framework for Research. This initiative is piloting “frictionless” commerce for small-to-medium sized enterprises.

Collaborating with industry. Intel’s industry relationships aim to drive development and diffusion of thought leadership and innovations for the IT industry and profession. A significant milestone was establishing the Innovation Value Institute (IVI) at the National University of Ireland, Maynooth. IVI involves Intel, as well as industry leaders, such as Boston Consulting Group, Microsoft, SAP, Chevron, Ernst & Young, Google, and BP. IVI facilitates a collaborative community of peers who investigate, advance, and disseminate frameworks and tools for managing IT value and IT-enabled innovation. The IVI

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20 “IT Hero” products are particularly successful, having been rapidly adopted by more than 5,000 users.
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21 The IT Capability Maturity Framework (IT-CMF™) is an important part of the IVI collaborative research program. IT-CMF was informed by the early evolution of ITI and then used as a reference model in the further development of ITI and its value results. For example, the IT-CMF Level 5 maturity states of “Sustainable Economic Model” and “Value Center” were defined as the end states for ITI’s business model and budget management, respectively. For more information on IT-CMF, see: Curley, M. “Introducing an IT Capability Maturity Framework,” International Conference on Enterprise Information Systems, Portugal, 2007.

Innovation and Research Efforts

The IT innovation team is role-modeling open innovation concepts and has recruited other players for an ambitious project to research and develop an IT and IT innovation capability maturity framework.  

RESULTS FROM INTEL’S IT INNOVATION EFFORTS

Intel’s IT innovation efforts have resulted in increased demand for Intel platforms, rapid growth in IT-related intellectual property, the delivery of substantial business value, and external recognition of the firm’s IT innovation capabilities.

Increased Demand for Intel Platforms

ITI has successfully applied its techniques outside of Intel to increase demand for Intel platforms. From 2003 to 2005, the innovation centers hosted two-day workshops for representatives from about 15 ministries of education in the Europe, Middle East, and Africa (EMEA) region. These workshops focused on transforming education in each country through technology. Intel’s innovation team used a structured innovation workshop methodology to share advanced prototypes and research from many joint innovation and research projects. In collaboration with the Intel sales organization, these workshops resulted in some of the largest design wins for Intel during that period, generating a pipeline of hundreds of thousands of processor sales. The innovation team, together with the sales team, won a coveted Intel achievement award for this contribution to Intel’s success.

Rapid Growth in IT-Related Intellectual Property

Intel’s IT innovation activities have also resulted in rapid growth of IT-related intellectual property. Within three years of starting the innovation efforts, IT was the fastest-growing contributor to Intel’s intellectual capital. More than 700 IT-related invention disclosures were submitted in 2006, with 85 approved for patent filing or trade secret, compared with less than five patents approved in 1997-2000 (See Figure 7).

Delivery of Substantial Business Value

More important, however, is the business impact of IT innovations. Through 2006, the innovation centers delivered $83 million in NPV terms, over 40% of which came from enabling new revenue (see Figure 8). This value was delivered with about 50% of the cost of innovation projects being co-funded by business units. The overall return on the investment in innovation projects has been more than 350%.
External Recognition of Intel’s IT Innovation Capabilities

Intel’s IT innovation activities are being recognized both inside and outside the firm. Peter Rogers, CEO of Westminster City Council, has said that Intel’s Innovation Center team helped give his organization the confidence and credibility to undertake a significant transformation of the city’s services through wireless technology. The Vice President of Intel’s WorldAhead Organization sees the IT innovation activities as critical to Intel’s World Ahead program. Recently, Intel’s IT function was named by the Boston Consulting Group as a leader in IT innovation. It was also included in CIO Magazine’s CIO 100 list in 2006, based on the work of the Innovation Centers. And the Ireland IT Innovation Center won the Irish National Innovation Export Award in 2005.

SEVEN LESSONS FROM INTEL

Many might think that the situation of Intel’s IT function is somehow different from that in other businesses. After all, Intel’s products power much of the world’s IT infrastructure. However, Intel’s IT function is similar in many ways to those of other enterprises. Intel’s culture is dominated by its engineering and sales units. In such businesses, internal functions like IT, finance, and HR are often seen as playing subsidiary support roles.

Originally, Intel’s IT function was far from being a true partner with the business; it had to earn that position. Even as its service excellence improved, IT staff had to work hard to be considered enablers of business innovation and transformation. They continue to work to earn this status. Additionally, although Intel’s IT budget is relatively large, it is continually under pressure. When money is tight, funding for seemingly non-essential IT activities is even more difficult. IT functions in many enterprises face similar challenges—struggling to be seen as business partners and having budgets under close scrutiny.

Intel’s experience of building and exploiting its IT innovation capabilities provides seven important lessons for IT executives.

Lesson 1: Take the Lead in Innovation—Don’t Wait to Be Asked

Even when the IT function is not considered a full-fledged business partner, IT leaders can still take the lead in innovation. Intel’s IT function started building a foundation of credibility by delivering core services...
both reliably and at low cost. Then it carefully worked its way up to enabling innovation. Even then, much work was needed (and continues to be needed) before business executives were willing to depend on the IT function for key innovation initiatives.

**Lesson 2: Build Momentum Early and Use It to Expand Scope**

Intel began with a small IT innovation team that demonstrated it could deliver successful projects. The team then built on those successes to gain more opportunities in terms of both scope and organizational reach. As always, relationships were critical. Innovators at Intel already had some relationships that they used to identify opportunities. Then they leveraged those relationships to expand their network of relationships.

**Lesson 3: Measure and Publicize Progress**

Innovation is notoriously hard to measure. Although Intel will be the first to say its measures are imperfect, its innovation staff made the metrics as good as they could and then continually measured progress against them. Publicizing progress using well-recognized and credible metrics went a long way to building momentum, sustaining the innovation program, and diffusing innovation capabilities throughout the company.

**Lesson 4: Culture Is Not a Prerequisite—It Can Be Changed**

Intel’s culture did not acknowledge IT people as innovators, and IT people themselves felt the culture limited their innovation capabilities. One of the first steps the IT function took was to create a new team with the right skills and culture. Through the many Innovation Center workshops, this team identified opportunities and created innovations. Many enterprises might be satisfied with this level of innovation. However, ITI worked diligently to change the culture of the *entire* IT organization and then to begin to diffuse this culture change beyond the IT function. It spurred interest in innovation through awareness, self-assessments, and creating a “buzz” around the topic. Then it made it easier for others in Intel to participate by providing skills training, an innovation infrastructure, and supportive innovation roles. The goal was to make everyone feel that innovation is a team effort in which they can all participate.

**Lesson 5: Build an Enabling Environment and Infrastructure for Innovation**

Although innovation is a creative process, it is also risky. Creative people may avoid innovating if they perceive an idea is too big to pursue on their own. Formal processes and tools make opportunity identification and implementation manageable. The processes enable early assessment, facilitate measurement, and reassure people about how to play their roles. The key is to establish methods that enable innovation to be managed without restricting flexibility. ITI did this by identifying key assessment points with prescribed measures and then providing other tools to help the innovation process. The Innovation Centers also played the key role of serving as a physical location for group activities, as well as sharing useful practices across innovation teams.

**Lesson 6: Don’t Innovate Alone: Obtain External People and Funding**

Many innovation protagonists focus on the innovation process and tools but not on the need for funding from business units that will benefit from the innovations. They argue that setting aside a pool of funds dedicated to innovation helps persuade managers to participate in innovation activities because there is no risk to their budgets. The Intel case suggests just the opposite. Intel’s innovation business model is based on co-funding. Although ITI sometimes conducts very early phases of a project on its own, co-funding is required before projects can continue. The requirement for co-funding meant that ITI gained up-front commitment from its partners, forcing them to make a realistic assessment of an opportunity and to continually focus on business value. Projects still failed but usually not because of lack of interest from business partners.

A similar point applies to people. Although a small core team can innovate for the enterprise, innovation is much more likely to be successful when a broad group of people, with diverse perspectives, participates in the process. Intel’s IT function also looked beyond its own boundaries, obtaining research funding from governments and leveraging consortium funding to create innovative solutions to industry-wide problems (IVI is an example).

**Lesson 7: Gain and Maintain Executive Support**

As with any major organizational change, senior executive support is a fundamental requirement of an
innovation program. The strong disposition that Doug Busch (then Intel’s CIO) had toward innovation was a critical enabler of launching and continuing Intel’s IT innovation efforts. Successive CIOs have supported the efforts, both by providing funding and by actively promoting ITI’s activities.

Having a network of business executives who supported the innovation activities was equally important. Often a local executive sponsor (such as the VP of Intel’s Technology Manufacturing Group in Ireland) was important for the success of each IT Innovation Center. Additionally, innovation projects requiring significant investment, organizational change, or the launch of new products and services could not be conducted or fully adopted without buy-in from senior leaders in the Intel units, external companies, or governments affected. ITI’s practices of building, measuring, and publicizing momentum, as well as its willingness to flexibly respond to changing business conditions, were essential in gaining and maintaining support of many executive leaders.

FUTURE DIRECTIONS

Intel has met the challenge of enabling innovation, not only within the IT function but, more broadly, in the firm and its business ecosystem. By establishing the innovation infrastructure, innovation outreach activities and Innovation Centers, ITI created an environment for innovation. It delivered significant “wins” in terms of financial returns, process improvements, and even new products. The efforts have been recognized internally and externally. And momentum has built to the point where managers beyond the IT function, and even outside Intel, have begun to get involved.

But, as in sports, an innovation team is only as good as its last result. In 2007, Intel enhanced its systemic innovation program by leveraging and consolidating the innovation network, improving pipeline yield, and integrating innovation roadmaps with key Intel challenges and opportunities. It continues to promote innovation ideas and cultural change through communications and training events, such as the Intel Innovation Conference, external workshops, and its open innovation relationships. IT innovation champions continue to inject energy into innovation initiatives. Other IT leaders have taken up innovation leadership positions. For example, the Enterprise Production Services General Manager organized an IT Operations Innovation Conference to showcase innovations in IT operations.

Most importantly, however, ITI plans to remain agile, so it can respond to whatever business challenges and opportunities arise. For example, ITI re prioritized its IT innovation investment portfolio in 2006 to significantly increase investments targeted at improving internal IT efficiency in line with Intel’s overall structure and efficiency initiative.

Intel’s IT function is not unique. The business innovation principles and tools developed by Intel’s IT unit can be applied in a broad range of industries and organizations. Applying these lessons will enable CIOs in other enterprises to position their IT organizations as innovation leaders. As more IT organizations take the lead in innovating for their businesses, the term CIO may in the future come to mean Chief Innovation Officer.

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