White Paper

Next-Generation Clusters

Creating Innovation Hubs To Boost Economic Growth

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Cisco Internet Business Solutions Group (IBSG)

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The Context for Innovation Hubs

As the world struggles to emerge from economic recession, national, regional, and local governments are seeking new, cost-effective ways to stimulate growth and job creation. One of the most interesting strategies is the development of economic clusters of innovation. Michael Porter, a Harvard business professor and leading business strategist, defined clusters as "geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions that compete but also collaborate."[1]

Hypothesis

Traditionally, these clusters have been defined by specific geographies and colocation. The Cisco® Internet Business Solution Group (IBSG) hypothesizes that with the advent of new communication and collaboration technologies, geography need not be the overriding factor for a successful cluster. By bringing together stakeholders, opportunities may exist to create new global partnerships, accelerating the success of these economic clusters through enrichment of the ideation process and an increase in implicit exchanges. These exchanges of ideas and information would not necessarily be conducted to create explicit transactions, but instead to support the greater community.

If geographic proximity is a key direct factor in the development of clusters, formations of new, innovative partnerships are the most important *indirect* factor for successful economic development. In these instances, technology can be used to optimize resources such as capital, labor, and brainpower. These partnerships become "microentities," empowered by strong, local roots. They can become dynamic intermediaries among dispersed communities of interest. Technologies that facilitate communication and cooperation can alter the impact and scale of partnerships' actions, enabling significant results.

In this paper, Cisco IBSG proposes a new vision of innovation stimulation, targeting both locally based clusters and new forms of innovation hubs. The first section analyzes economic output and the role of clusters; the second part focuses on lessons to be learned from the successful Silicon Valley cluster; and the last section explores the roots of the new economic growth paradigm, as well as ways to strengthen innovation by empowering communities and facilitating the emergence of new partnerships beyond traditional boundaries.

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Economic Growth Through Innovation: New Drivers Revealed

To comprehend the impact of innovation hubs for the next generation of clusters, it is first necessary to understand growth factors over the next few years. Output-driven global economic growth can be derived from three sources: labor input, capital input, and multifactor productivity (MFP). MFP is the factor most dependent on innovation hub policies.

Main Drivers of Economic Growth

Labor input is a key objective of policymakers. Since the beginning of the recession in December 2007, more than 7 million people have lost their jobs in the United States.[2] Historical evidence suggests the immediate years following the recession will see little growth in employment. In Europe, despite the loss of far fewer jobs than in the United States, anticipation of slower economic growth, combined with a sharp decline in the working-age population, portends low future growth in employment. As traditional government intervention policies (such as job creation in the public sector and tax and social incentives) are extremely costly, colossal national deficits have steeply reduced job-stimulus plans, at least in the form of "direct intervention." Governments should look at solutions that are less dependent on public resources.

Capital input constitutes the second driver of economic growth. The recession has left many developed economies with excess productive capacity, and this has discouraged significant investment in manufacturing equipment and infrastructure. Additionally, this sector is sensitive to interest and exchange rates. Macroeconomic programs aimed at stimulating capital investment cannot be relied upon to spur the "right kind" of investment, rather than simply adding to an economy's excess capacity.

Multifactor productivity acts as an accelerator of innovation and focuses on stimulating production factors through a more effective combination of labor and capital as well as technology. Whereas the two previously mentioned factors measure only output per unit of input, multifactor productivity reflects innovative combinations of the two. It is a result of new technologies, economies of scale, managerial skill, and changes in production organization, and has been the chief driver of economic growth over the past couple of decades (see Figure 1).

One of the most important points to address is, "Which programs must be in place to create a favorable environment for innovation and maximize MFP growth?" With the reliance on MFP to spur economic growth, it is important to focus on innovation hubs, an instrumental driver of MFP growth.

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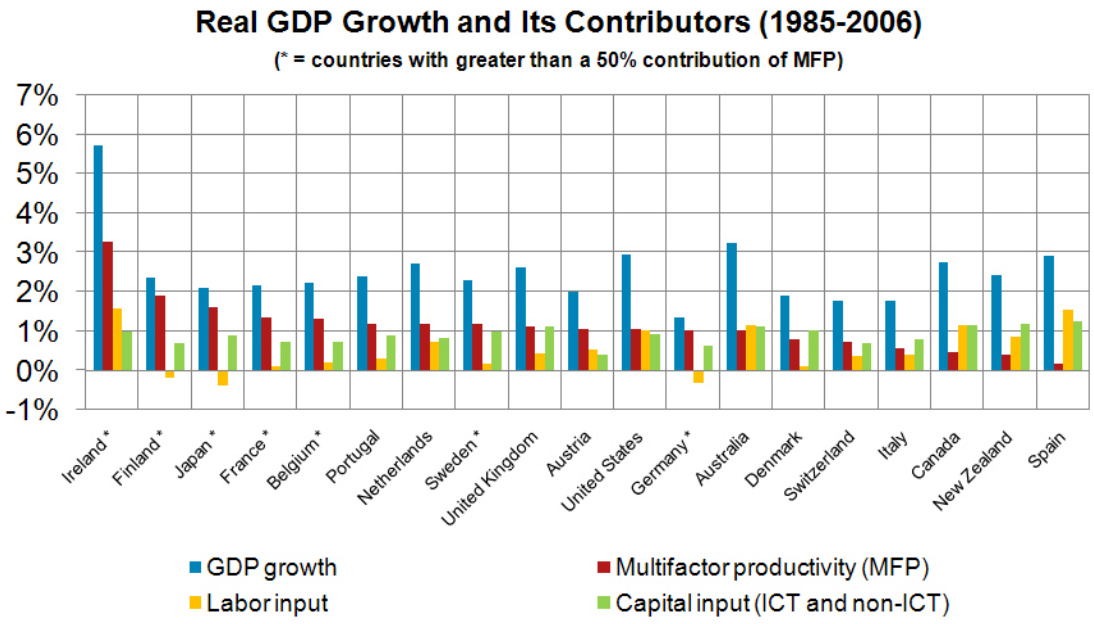
Figure 1. Contribution of Labor Input, Capital Input, and MFP to Long-Term GDP Growth, by Country



Source: Cisco IBSG, 2010; OECD, 2009

A Case for Conventional Cluster Policy: Success and Limits

The general framework of clusters elaborated by Professor Porter explains how firms collaborate to create a comparative advantage over those outside the cluster.

This comparative advantage may be as simple as actors congregating around a source of relatively inexpensive inputs, like nomads gathering around a desert oasis. Clusters can also be based on man-made comparative advantages. In the 16th century, Charles Cusin's founding of a watchmaker's guild in Geneva led to the development of a major Swiss industry.

With the goal of a new level of excellence, clusters are taking advantage of the connection capacities of the "Triple Helix" model,[3] which combines government, business, and public research in the development of knowledge-based innovation systems.

Clusters have proven to be a driving force for fueling businesses with advanced research and for accelerating entry of products and services into the market. Cluster-based businesses usually invest more in training and education than is typically done in their industries and countries. Consequently, firms within the innovation hub have a higher ratio of R&D to sales, effectively transforming research projects into new commercial products and services.

The cluster set up around the University of Wisconsin-Madison (UWM) in the United States embodies this virtual process particularly well. UWM has industrialized its R&D transformation process by "incubating" the university itself; it enjoys one of the highest concentrations of advanced degrees in the country. Forty-six percent of tech-based startups in the cluster have at least one founder from the university, which has developed a unique institutional model of cooperation between business and public research.

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Cluster policies help create an environment that is particularly favorable to small and medium-sized businesses (SMBs), a factor reputed to drive job creation. Local governments usually combine a sophisticated set of levers to facilitate SMB development, such as:

- Local growth-oriented measures that reduce the obstacles and time required to start a company
- Reduction of customs paperwork and other structural roadblocks (such as tariffs, quotas, or other regulatory barriers) that inhibit growth of imports and exports
- Politically driven investments in network communications to foster entrepreneurial activities (particularly helpful to individual entrepreneurs)
- Policies that encourage venture capital investments by injecting public-sector equity
- Proactively stimulated pools of knowledge to improve sophistication of services/products and attractiveness of the cluster
- Access to inexpensive and reliable utilities, transportation resources, or raw materials
- Provision of improved local public services to attract the "best and the brightest" with the quality of the environment and the promise of a better place to live
- Proactive public procurement that is likely to spur startups and SMBs by creating demand

These are only a few examples of the levers at the disposal of public authorities wanting to support the growth of SMBs in a given locality. The combinations within these various public incentives may differ, but they have in common the will to stimulate the desired multifactor productivity.

The immediate question is how to evaluate the success of these policies. There have been many experiments in developing successful clusters. Calculating the return on investment has been notoriously difficult due to the combination of multiple indirect and qualitative benefits, which are hard to measure, yet represent a significant portion of the overall advantages of clusters. Nevertheless, existing models provide useful indications of the drivers. Two factors must be considered to measure the benefits:

- The macroeconomic impact of each strategy (MFP)
- The degree of differentiation the cluster can create relative to its business counterparts or surrounding areas. Hence, the greater the contrast between the cluster and the rest of the economy, the greater the cluster's economic benefit.

Attributing the macroeconomic gains emanating specifically from clusters is notoriously difficult. Differentiating "fresh" capital from merely "reallocated" capital and comparing the economic gains from a cluster's interactions to those coming from the remainder of the economy are both impossible tasks. Yet, the development of certain clusters has shown encouraging economic results. Official reports of successful use cases abound. The Organisation for Economic Co-operation and Development (OECD) report, "Clusters, Innovation and Entrepreneurship," indicates that in the county of Oxfordshire, U.K., a leading high-tech cluster grew from 190 companies with 2,000 employees at the end of the 1980s to approximately 3,500 businesses employing nearly 45,000 workers in 2004. Consequently, the cluster represents 12 percent of the county's workforce.[4]

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The same OECD report mentions that Grenoble, home to a flourishing micro-nanotechnology industry located in the French Alps, is one of the world's most dynamic global hubs. In this cluster, the ratio of jobs attributed to this industry compared with others is 3:1—clearly illustrating the power of such innovation hubs.

These examples highlight the potential impact of cluster policies on local job creation. Successes like these have permitted cluster policies to flourish around the world, enabling better benchmarks and fine-tuning in national industrial policies.

Understanding Silicon Valley's Model for Future Economic Development

Northern California's Silicon Valley remains one of the most successful industrial clusters ever created. The San Francisco Bay Area has specialized in the semiconductor, computer, software, and electronics industries. Starting in the 1970s, as Stanford University professors and graduates founded high-tech startup companies in the region surrounding the university, the hub grew and expanded, becoming a major driver of the biotechnology, nanotechnology, and "green" technology industries. Twelve percent of all patents registered in the United States are from companies in this evolving organism. This cluster is especially strong in attracting capital, with 27 percent of total venture capital investments in the United States. Over the past five years, incomes in this region have grown faster (14 percent) than the national average (9 percent).[5]

This cluster is unique because it grew organically; it was not the result of government planning. Therefore, the biggest challenge for policymakers who wish to re-create clusters like Silicon Valley will come with trying to use the tools of government to replicate something that was created naturally.

We believe that three pillars—the culture of networks, international connections, and sustainable innovation—have driven these organisms, and by molding a cluster with this blueprint, public policy can help new clusters blossom.

Culture of Networks: The flow of people, capital, and technology can mobilize quickly, facilitated by the strong sense of networks in the cluster. The fluid transfer of knowledge is especially prevalent in this case, due to the high mobility of its people. An engineer can easily go from a large firm to a startup, or to a venture capital firm. This mobility is not limited to similar industries, but Silicon Valley is unusual in its ability to facilitate movement of people to unrelated sectors. University of California at Berkeley Professor Jerry Engel cites the perfect example of Vinod Khosla, cofounder of Sun Microsystems, who shifted from the computer industry to investing in IT with his Khosla Ventures fund, and eventually focused on the nanotech, energy, and clean-tech industries.[6] From a policy point of view, one should focus on models of cooperation to accelerate the transformation from research laboratories into startups. Additionally, in a connected world, geographic proximity should not be the only way to mold business networks.

International Connections: In addition to relying on the local network that Silicon Valley offers, entrepreneurs and businesses use their international connections to grow. Twenty-five percent of all new companies in Silicon Valley have a foreign national as a founder.[7] Two of the cofounders of Sun Microsystems, Khosla and Andy Bechtolsheim, are Indian and German nationals, respectively. Additionally, Google cofounder Sergey Brin of Russia and

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Yahoo! cofounder Jerry Yang from Taiwan are prime examples of the success of Silicon Valley's diversity.

Immigrants flock to Silicon Valley after completing undergraduate degrees and earn their advanced degrees at prestigious universities in the area such as the University of California at Berkeley, University of California at San Francisco, and Stanford University. This environment of diversity spurs excitement, energy, and creativity, which are transformed into continuous innovation.[8] Also, these immigrants use important contacts and resources from their countries of origin, which can result in offshoring of operations, research, and distribution. Darwin Tu, from China, is a prime example of this. After receiving master's degrees in statistics from Stanford University and business administration from the University of California at Berkeley, he worked for FICO and TransUnion. Taking advantage of his experience in credit-card marketing and consumer credit risk management, he founded Sino Credit Corporation, the leading marketing service provider for the consumer credit industry in China. He is now part of many startup projects involving Silicon Valley and China.

Sustainable Innovation: Silicon Valley has weathered bubble bursts and sustained growth by continuing to innovate—from business practices to new products and new industries. According to Professor Engel, most established firms (such as Hewlett-Packard, Intel, Apple, Cisco, Google, Genentech, and eBay) have grown from entrepreneurial projects. These are prime examples of startups that have expanded and grown on a global scale, while still creating value with a business model driven by innovation. The mobility of people, knowledge, and technology has enabled this cluster to evolve and grow into new industries, such as nanotechnology and clean tech. Based on the Silicon Valley Index of 2009, clean-tech companies in Silicon Valley account for 31 percent of total VC investments in the United States. Additionally, in 2007, the cluster was responsible for 20 percent of all green technology patents in California.[9]

Collaboration, globalization, and sustainable innovation constitute the key success factors for clusters in the 21st century. Technology will play the most pivotal role in enhancing these three pillars for clusters. In a digital world, Internet-based exchanges of capital, skills, and intellectual assets will have an exponential impact on linked innovation hubs. Consequently, Silicon Valley remains the model. With special focus on these three pillars, however, it is possible for policymakers to replicate this cluster's success.

Moving Toward a New Model Led by Virtually Connected Innovation Hubs

Cisco IBSG believes there is an urgent need to update the cluster model and shift the focus toward more globally oriented innovation hubs. Few clusters have exploited all the opportunities of the digital economy in terms of collaboration, partnerships, virtualization, and resource sharing. Most of the industrial sites located within cluster zones have regarded technology as an industry to be attracted or supported, rather than as a catalyst for their own innovation and growth. Consequently, this huge potential for innovation and growth remains untapped.

It is therefore important to replace the notion of the traditional cluster—typically a closed-space run on conventional working methodology—with innovation hubs that are open to

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global opportunity, free of geographic restrictions, and embrace the full potential of technology. This new paradigm calls for three fundamental shifts:

- From geography-based to community-driven
- From locally processed innovation to open, borderless innovation
- From technology-driven to technology-enabled

From Geography-Based to Community-Driven

Instead of viewing innovation hubs as defined geographies, they should be characterized as digital communities of interest, cohering through close intellectual proximity, and not solely through geographic proximity. It is important to comprehend the growing power of online social networks and collaboration tools in the business sphere. In our global world, collaboration and teamwork cannot be limited to geographies; as the sun sets on one innovation hub, it is rising on another, allowing workers dispersed across different time zones to continue work and optimize productivity every hour of the day.

Attracting New Prospects: First impressions play a vital role in attracting new members to these digital communities. For instance, entrepreneurs considering sites for businesses can compare and contrast a variety of value propositions from the comfort of an armchair. According to Bob Ady, founder of one of the world's leading site-selection firms, the dynamics of site selection have dramatically changed with the emergence of the Internet.[10] Prospective clients use the community's website and other online references as primary sources of information. Before these entrepreneurs engage in formal discussions on moving into the hub, they will have gathered significant amounts of information to fuel their decision-making process. Innovation hubs thus have the opportunity to differentiate companies from their competitors and attract future participants cost-effectively. The possibilities of today's online experience are such that a large proportion of information that was once delivered by telephone or in physical meetings can be provided by online events, seminars, and even brainstorming sessions.

Private companies need to access this information to make expansion to other countries successful as well. This is a win-win partnership between industry and government. The Soft Landing Zone, an initiative launched by Coventry University Enterprises in partnership with government body UK Trade & Investment, focuses on introducing British companies in other countries. The process set up by this team is an interesting indicator of what works and what could be done better. The Soft Landing Zone program offers a myriad of services to companies that open an office abroad—from IT support to expertise on all legal, financial, cultural, and practical issues involved in doing business in another country. Additionally, the program provides valuable contacts to R&D laboratories, research centers, and academic institutions. Other locales, such as Paris, are developing similar programs. Although the initiative's concept is advanced, its infrastructure is not virtual, and it operates on a basic technological level, preventing candidate companies from obtaining 24/7 service.

Online environments will only become richer; the creation of virtual worlds (pioneered by sites such as Second Life) is rapidly moving into the mainstream. Enterprises such as Cisco, Oracle, and many others have begun to create virtual events and fairs where visitors can explore 3D worlds and create avatars to facilitate business exchanges. Cisco, for example, is increasingly conducting major sales and corporate communications events exclusively online—a move that has not only reduced operating costs, but also increased participant

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engagement. The potential of these new environments is invaluable for hubs desiring to present themselves in the most attractive way, and for visitors interested in freely exploring their next virtual world.

Using On-Site Communities: The potential for virtual management of existing communities is also promising. By offering hub members an array of highly responsive and personalized online services to address specific questions or needs, loyalty to the hub will be immediately enhanced.

The list of such services is potentially endless, and each innovation hub will have to define its own return on investment and value proposition. Nevertheless, obvious ideas emerge from observing the hub community's primary needs for speed, higher focus, and better networking:

- **Speed:** Basic e-concierge services can be provided online. By posting the right information in the right place and combining this with social networking software, information reaches its appropriate audience faster and smarter. In addition, click-to-talk capabilities allow residents to access support from anywhere, without having to visit the hub's physical reception desk.
- **Higher Focus:** Imagine a vertically oriented service that pulls together a broad range of potential virtual supporters and providers, covering tasks ranging from marketing and sales to manufacturing. Mashups and online matchmaking could dramatically enhance the process.
- **Better Networking:** Among other ideas, innovation hubs could partner in creating "Virtual Tuesdays," when entrepreneurs make a series of pitches to potential investors around the world. Virtual Tuesdays are modeled after "First Tuesdays," a social movement focusing on technology, the Internet, and future innovation that started in 1999 in London's Soho district, eventually spreading across Europe. Virtual Tuesdays could involve entrepreneurs from more than one hub, at both national and international levels. The concept is a virtual one-on-one or face-to-face meeting, using a mix of CiscoTelePresence™ sessions and web-based conferences. (Cisco TelePresence is an immersive, virtual-meeting experience that combines innovative, real-time video, audio, and interactive technologies to give people in distributed global locations a wide variety of face-to-face collaboration experiences.) Any interested entrepreneur can pitch his or her idea and business plan without the exorbitant cost of travel. The virtual meetings could involve 3D experiences as well.
- Another concept could be the Startup Stop and Shop, a web space where video recordings of all entrepreneurs' pitches are made available so that potential investors can search for opportunities at their own leisure. "Virtual Guardian Angels," a mentorship program that connects those seeking and offering best business practices and advice, could provide yet another virtual experience.

The beauty of virtual services is that they are not tied to traditional operating hours—instead, they enable 24-hour global access. While some may be averse to the costs needed to implement these services, two arguments may reverse their objections:

- By empowering the community and authorizing plug-and-play, open-source applications and tools, the innovation hub could find opportunities to minimize usage of public funds while at the same time improving the service experience for key

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stakeholders. Trusting the community and letting it build its own tools is paramount in a digital culture.

- More important, all of these services could be shared and amortized among several hubs to create a global exchange for growth. Designed to expand relationships to other areas, the global exchange for growth would work as a forum for global collaboration that enables business, government, investors, and educational stakeholders across the world to meet, communicate, and collaborate.

In addition to promoting sharing of costs and eliminating duplication of effort, innovation hubs can increase the reach of all of the above initiatives in several ways:

- The "wisdom of crowds" elevates relevant ideas to relevant audiences. These community interactions would reveal areas of mutual interest that otherwise would not have been identified, resulting in innovative, new partnerships that stimulate and accelerate economic growth and wealth creation across local, regional, and international boundaries.
- Collaboration on a larger scale would expand the number of potential contributors and raise virtual bridges wherever it is relevant to connect partners from different geographies.
- "Coopetition" (defined as cooperation in a context of competition) would deliver its full potential; an alliance of innovation hubs will gain better visibility than any separate initiative.

Whatever the scale of this global exchange for growth, it works for one hub, effectively supports bilateral partnerships, and can be extended to multilateral cooperation with the click of a mouse or an email. This changes the value of implicit exchanges likely to occur on the Internet. Without formal engagement or explicit transactions, people can help and support each other to a significant degree. Individuals derive value from these informal relationships and cultivate them until they translate into tangible deals. This is the ultimate benefit of the virtual network and the reason an increase in these informal exchanges can directly impact business and growth.

From Locally Processed Innovation to Open, Borderless Innovation

In today's global economy, the innovation chain has become more dispersed and complex, independent of the sophistication of business relationships inside or outside existing hubs. The only way to keep innovating is to connect the dots through new—and sometimes unexpected—paths. Colocating all these participants in a unique physical place is increasingly difficult. As a result, it's essential for innovation hubs to create "networks of networks," or concentric innovation circles.

Local communities (as described above) can play the role of catalyst to engender a new, more organically driven model of innovation, based on alliances that focus on specific opportunities.

Involving the Community of Business Partners and Peers: Globally, there are enormous opportunities to enable teams located in different countries to contribute to shared projects. The Global Exchange for Growth will provide opportunities for creating international teams that can contribute on joint efforts. There are already examples of the effectiveness of this approach. For example, Cisco I-Prize—now in its second year—is an open, global, innovation

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competition in which entrepreneurs worldwide can collaborate and submit their proposals for Cisco's next billion-dollar business. Following last year's competition (which drew nearly 2,500 entrants), innovative thinkers will have access to an expanded portfolio of Cisco collaboration solutions on which to build as they share their ideas with other participants around the world. The winning team will be eligible for $250,000 in prize money.[9]

Contest participants have access to the following Cisco collaboration solutions, which can help break down communication barriers associated with global innovation:

- Cisco Show and Share, a social-video community where contest participants can record, edit, and share videos; comment, rate, and tag interesting content; and use speech-to-text translation for easy video search and viewing
- Cisco Pulse, a search platform that dynamically tags content as it crosses the network, allowing contest participants to accurately locate and rapidly connect with the best experts and information on a particular topic
- Cisco WebEx™, an online meeting platform for audio and web conferencing that enables users to share documents and desktops in real time
- Cisco TelePresence (described earlier)

I-Prize participants also enjoy access to a unique management platform, powered by Spigit, that enables participants to buy and sell ideas on an open market. The idea market lets contest participants establish the value of their ideas through trades. Participants purchase shares of ideas with "virtual currency" awarded to them, based on the value of their contributions to the platform.

The concept of open innovation through global collaboration already has a notable success story in the development of Linux, one of the most famous examples of free and open source software collaboration. Linux followers pioneered this digital collaboration in the 1990s, engendering many new companies and products as a consequence. What has changed is our ability to industrialize this process and replicate it consistently.

Partnering with the Hub Population To Increase Speed and Quality of Innovation: Innovation hubs can also play a critical role in empowering the local community to create new services and products—especially in the area of public services.

The potential for the hub population to cocreate products and services with local entrepreneurs cannot be underestimated. Involving the local community in proof-of-concept market tests for products and services developed by hub entrepreneurs not only creates a potential market, but also can shorten product development cycles and provide proof points for attracting new investment.

Government also can be a catalyst by using a similar cocreation and market-test approach to develop and deliver new public services. The procurement function allows government to play a prominent role in local and national testing of new technologies, and helps smooth the entire innovation chain—from research to go-to-market.

Taken together, these stimuli allow startups to create more sophisticated products based on trial and error at the local level. After these innovative projects have been developed locally, they can expand more rapidly on a global scale than in the old model. As a result, hub

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communities not only create loyalty to the hub—they change the innovation model, accelerating both pace and impact.

From Technology-Driven to Technology-Enabled

Technology should be harnessed to enable growth in all industry sectors (as opposed to focusing solely on hubs that rely on technological innovation). The degree of availability, quality, and efficiency of web infrastructure supporting the hub will determine the strength of these digital communities and the pace of innovation.

An evolved technological infrastructure will tear down the barriers between work and home, and between professional workspace and personal space. On-site innovation centers will be designed to facilitate this bridge between "intelligent offices" and "connected homes" for workers who do not perceive boundaries between their personal and professional environments. These new innovation centers would provide Cisco TelePresence, cafeterias, web conferencing, and children's daycare, delivering a more personal and eco-friendly work environment. Essentially, this will transform the entire experience of doing business.

Conclusion

The crucial factor for future economic growth is sophisticated collaboration. Professor Engel attributes a large portion of Silicon Valley's success to its intense cooperation among actors. Due to sophisticated shared-ownership agreements, workers' interests became even more aligned with the success of their employers. The role of "coopetition" was vital, where collaboration even extended to competitors who helped foster critical mass, formal and informal standards, and effective customer solutions.

"Think," a motto coined by Thomas J. Watson for IBM,[11] was altered by Apple nearly a century later to "Think Different." Cisco IBSG would like to propose the motto "Think Together," where collaboration will be facilitated through greater investment in virtual networks and technology-driven communication tools. Moreover, actors must use these tools under more evolved and sophisticated cluster policies.

Implementing a new model that fosters cocreation, coproduction, mutual evaluation, and cross-industry investments will require significant cultural changes, greater trust in individuals, and the acceptance of a novel form of collaboration. At different levels and without predefined hierarchy, these community-driven hubs will thrive by involving virtual residents in a global dialogue. They enter a world in which organizations become less important than their members, in which geography fades into virtual territories, and where economic growth translates into personal wealth for community members across the globe.

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