



Innovation Capacity Best Practices in Competitiveness Strategy

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Innovation Capacity Best Practices in Competitiveness Strategy

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CHAIRMAN'S LETTER



On behalf of the Board of Directors and members of the Global Federation of Competitiveness Councils (GFCC), I am pleased to present *Innovation Capacity: Best Practices in Competitiveness Strategy.*

When the GFCC was formed more than three years ago, it was predicated on the belief that the sharing of best practices among national competitiveness organizations and among nations would provide benefit to all. With the release of this year's report, we have again put that belief into practice and created what we hope will be a useful tool for competitiveness initiatives around the world.

Featuring case studies from the Board of Directors and general members of the GFCC, this report offers insights for developed and developing countries. From the promotion of advanced retail business practices in the United Arab Emirates to the development of industry partnerships for crisis management in Japan; from encouraging innovation policy reform in Russia to enabling manufacturing success in the United States, there are valuable contributions from nine GFCC organizations and two strategic partners.

Best Practices in Competitiveness Strategy will be issued annually by the GFCC, and I hope you enjoy this volume.

Sincerely,

ind fullice

Charles O. Holliday, Jr. Chairman, Bank of America; and Chairman, Global Federation of Competitiveness Councils

TABLE OF CONTENTS

EXECUTIVE SUMMARY		5
AUSTRALIA	Australian Industry Group	6
BRAZIL	Agência Brasileira de Desenvolvimento Industrial (ABDI)	11
KOREA	Presidential Council on National Competitiveness	21
RUSSIA	OPORA RUSSIA/ Eurasia Competitiveness Institute	26
UNITED ARAB EMIRATES	Emirates Competitiveness Council	30
UNITED STATES	Council on Competitiveness	40
JAPAN	Council on Competitiveness–Nippon	49
MONGOLIA	Economic Policy and Competitiveness Research Center	56
UNITED KINGDOM	Centre for Competitiveness	59
PARTNERS		
Inter-American Competitiveness Network (RIAC)		
World Economic Forum		74
THE GFCC		78

EXECUTIVE SUMMARY

Innovation Capacity: Best Practices in

Competitiveness Strategy was developed by the Global Federation of Competitiveness Councils (GFCC). Nine GFCC organizations describe their challenges, opportunities, successes and shortfalls in their attempts to make it easier, faster and more efficient for organizations—and for their nations—to thrive. This year's report also features submissions from two of the GFCC's partner organizations, the World Economic Forum and the Inter-American Competitiveness Network (RIAC).

The best practices outlined in this report range from profound policy shifts to strategies for innovation-led growth to the creation of industries that are harnessing the economic power of natural resources. GFCC members engaged with both the public and private sectors are exploring ways for their nations to streamline, boost and grow their economies.

In this report, readers will learn how Brazil capitalized on technology as the cornerstone of innovation, how Northern Ireland continued to push for enhanced renewable energy production, how Dubai Duty Free skyrocketed into the top 10 Duty Free stores in the world, and how Australia improved public-private partnerships between industry and research institutions to elevate a stifled manufacturing sector.

Read how Korea proactively addressed the pitfalls of its vocational high school programs, and worked one-on-one with industry to strengthen them. The report details Russia's efforts to connect innovation policy with measurable economic growth, and how Mongolia is embracing innovation investment. See how the United States ignited a manufacturing movement through strategic conversations with crucial stakeholders.

Learn how our partners in the Americas are driving regional competitiveness through collaboration; and see how the World Economic Forum is collaborating with global competitiveness leaders to identify and promote key trends in competitiveness policy.

The Global Federation of Competitiveness Councils intends *Innovation Capacity* to be not-only informative, but enlightening. These thought provoking case studies provide a rare window into a wide range of policies from around the world—a world in which the line between competitor and collaborator continues to blur.

AUSTRALIA

Australian Industry Group: Strategic Alliances Improving Business Innovation Readiness

An Economy of Paradoxes

While the Australian economy has been relatively successful over an extended period, there are notable contradictions. The boom of the mining sector contrasts starkly with the severe pressures on trade-exposed sectors, including manufacturing, tourism and education. The slump in productivity growth over the past decade has exacerbated the damage to Australia's national competitiveness stemming from the marked rise in the value of the Australian dollar.

Innovation is central to the recovery of Australian productivity growth and to ensuring the ongoing diversity and balance of the economy. Research details a clear link between skills shortages and a lack of innovative capacity, suggesting that policies to boost Australia's skills base will have direct and positive effects on business innovation as a whole. There is a growing body of work illustrating the increasing significance of cooperative arrangements between universities and industrial firms, which help drive productivity and capacity by fostering skills development, innovation and business capabilities.

Australia's major national business capability development program, Enterprise Connect, supports the placement of researchers, from universities or public research agencies, into businesses that wish to develop and commercialize new ideas.

Through Enterprise Connect, facilitators connect businesses with researchers that have specific expertise relevant to the needs of the business, including in the areas of product, process and marketing innovation, as well as environmental sustainability. The innovative delivery of the



program, in partnership with industry associations, provides a new model for research/business collaboration.

Overview

Australia is facing a turbulent and uncertain global economic environment, with divergent growth prospects across varying Australian industries and regions.

The sustained boom in the Australian mining sector is inconsistent with the experience of the Australian manufacturing sector, which, like other trade-exposed sectors, is experiencing significant pressures. In the three years since 2008-09, the manufacturing industry's real gross value added has grown by 1.2 percent, whereas real gross domestic product for the Australian economy has grown by 4.3 percent. Manufacturing, however, is not alone; certain service sector industries and divisions of the construction sector are also experiencing patchy economic performance.

The strong rise in the value of the Australian dollar, associated with increased performance in the mining sector, has transformed Australia into a high-cost country, at a time when other conditions in the domestic industrial sector would traditionally correlate with a devaluation of the currency. Instead of acting to offset the competitiveness challenges, as has been the case in many other developed countries, Australia's currency adjustment during the past decade has stifled export viability and intensified vulnerabilities to import competition. The Australian dollar, currently at \$US 1.05, is expected to remain well above its post-float average level of \$US 0.74 as Australia attracts mining investment and sells rising quantities of mineral commodities at strong prices.

The continued industrialization of China, India and other rapidly developing economies drove global manufacturing capacity to new heights during the past decade. This resulted in a dislocation of manufacturing production around the world, but was felt particularly in the industrial sectors of developed countries.

During the same period, Australia experienced faster growth in unit labor costs than many of its competitors as the rate of productivity declined and nominal wage growth continued unabated. Substantially rising energy costs, anticipated to rise further due in part to the July 2012 pricing of greenhouse emissions, are eroding a competitive advantage enjoyed by many Australian manufacturers.

Consumer confidence has been impacted by uncertainty in domestic politics and across the global economic landscape. The slump in activity for certain sectors, such as residential and commercial construction—important consumers of manufactured goods—has further detracted from manufacturing production.

Manufacturers are finding it harder to retain and recruit personnel in the face of the workforce demands from the mining sector and related construction. This is particularly evident in regions where competition from mining-related activities is a feature of local labor markets. Financial institutions, responding to the perception of higher risks facing the sector, are downgrading manufacturing industries and making access to capital more difficult and expensive.

Transforming Manufacturing

The impact of these competitive pressures on manufacturing is all the more significant given the sector's critical importance to the future of the Australian economy. Manufacturing not only employs almost four times as many people as the mining sector, but it plays a crucial role in the retention and development of skills, which underpin the competitiveness of the Australian economy.

The sector accounts for 25 percent of Australian R&D and 29 percent of national exports. Manufacturing reinforces the strength of the service sector, and is also strongly linked with natural resource capabilities across mining, energy, agriculture and forestry, and other significant areas of national comparative advantage.

Business investment in new technologies is central to the ongoing transformation of the Australian economy. At a time when investment in the mining sector is so prominent, less attention has been given to investment in other sectors. However, despite the rapid growth of the mining industry, during the past three years investment by non-mining sectors has been close to double the level of the mining sector.¹

Investment in new technologies is particularly important for these non-mining sectors, including manufacturing, where considerable transformations are driving businesses to confront the higher Australian dollar, the legacy of extended productivity growth, rising energy costs and growing inflexibilities in workplace relations.

¹ Australian Bureau of Statistics, 5625.0, Private New Capital Expenditure and Expected Expenditure, Australia, September 2011

Absorptive Capacity and Innovation Capacity

The powerful competitive challenges facing Australian manufacturers make it imperative to address the productivity and innovation performance of the sector. Increasingly, businesses are unable to retain the capabilities required to recognize, acquire, assimilate, transform and exploit knowledge from external sources, known as absorptive capacity.² Building these abilities is highly reliant on education policy, management skills, employee engagement and ease of access to information, including the nature and extent of business engagement with the research sector.

Absorptive capacity and innovation capacity are deeply interconnected. The absorptive capacity of the Australian manufacturing sector is constrained by business size, and compounded by Australia's small and dispersed domestic markets and its distance from key offshore markets. Australia has close to 50,000 SMEs that employ less than 200 employees, and some Australian research would indicate that only a small proportion of these enterprises are dynamic in terms of innovation and growth.³

Despite the strength of Australia's public research system, and growing private investment in innovation and R&D, collaboration and networking have been cited as consistent weaknesses in the Australian innovation system when compared with other OECD countries. Just 2.4 percent of innovation-active businesses collaborate with universities, and only 4.4 percent with publicly funded research agencies.⁴ Research by the Australian Industry Group on business investment in new technologies during the past three years indicates that businesses are most commonly discovering new technologies through their employees and other businesses within their supply chain.⁵ In fact, nearly 70 percent of businesses that invested in new technologies reported that the information came from internal sources or their supply chain. External consultants represent another common source of this information.

For the overwhelming majority of businesses, there is no connection between their investments in new technologies and public sector research institutions. Less than 5 percent of businesses reported that they obtained information about new technologies from these institutions, and only 8 percent of all businesses—and 6 percent of manufacturers—collaborated with public sector research institutions as part of their investment in new technologies.

The low level of collaboration between public sector research organizations and businesses, without in-house R&D capabilities, illustrates an area where significant efforts can be made to provide accessible information to a broader cross-section of businesses.

Improved Collaboration Between Business and Research Institutions

Australia's innovation system is characterized by a supply-side, science push model that ineffectively integrates with the innovation needs and behavior of domestic businesses. Existing reward and recognition systems for scholars favor pure research over business collaboration. This is exacerbated by industry perceptions that research institutions are both difficult to partner with and protective of intellectual property.

3 ibid.

² Department of Industry, Tourism and Resources, Absorbing Innovation by Australian Enterprises: The Role of Absorptive Capacity, 2007.

⁴ Department of Innovation, Industry, Science and Research, *Australian Innovation System Report 2011*, 2011 p 82, 84.

⁵ Australian Industry Group National CEO Survey: Business Investment in New Technologies, January 2012

The Australian Industry Group has been instrumental in the design and delivery of a key initiative designed to address and overcome such barriers. The Researchers in Business (RiB) program is an element of the Australian Government's Enterprise Connect program. This initiative facilitates the placement of researchers from universities or public research agencies within participating SMEs, where it has been determined that the placement would help the business to develop and implement a new idea with commercial potential.

Enterprise Connect is a \$50 million a year program that provides support to eligible Australian SMEs to improve their productivity, competitiveness and innovation. Core elements include holistic Business Reviews for eligible participants, and subsequent grant-based assistance to implement the recommendations determined from the Business Reviews.

RiB is geared toward firms that are unable to undertake new ideas due to inadequate funding. Key objectives of the initiative are to:

- help break down the cultural divide between Australian businesses and the public research sector;
- stimulate the dissemination of expertise from research organizations to industry and the return of industry knowledge back into the research community;
- accelerate the adoption of new ideas and technologies by Australian firms; and
- increase the competitiveness of Australian firms.

Enterprise Connect provides partial funding for the salary costs of engaging a researcher, up to a maximum of \$50, 000 for a placement period of two to 12 months. RiB funding is provided to either the research organization or the firm, depending on which party is the approved applicant. A key element of the program's success is the provision of facilitators to help SMEs through all aspects of the application process, including identifying and connecting with researchers who have the specific expertise relevant to the project. Eligible projects include:

- product innovation—developing and testing new or improved products or services targeted at new or existing markets;
- process innovation—addressing production or process issues (e.g. improving manufacturing efficiencies or quality through new or improved technologies); and
- **environmental sustainability**—identifying and measuring of pollution, and reducing waste (water, energy, recycling, etc.).

The innovative delivery of the Enterprise Connect program, in partnership with industry associations, provides a model for a new pattern of research/ business collaboration. The Australian Industry Group is one of a number of industry organizations partnering in the facilitation of the Enterprise Connect program, hosting a team of 19 Enterprise Connect Business Advisers and four RiB Facilitators.

The Australian Industry Group is a peak industry association, which, along with its affiliates, represents some 60,000 businesses in Australia across the manufacturing, construction and services sectors.

Experience with delivery of the RiB program during an 18-month period has shown that this arrangement can provide a number of advantages.

• Connection with a large number of companies through the Australian Industry Group's membership using events, newsletters and direct telemarketing. So far, the RiB program is generally adopted after the company has participated in a Business Review, but, in the future, a more direct approach may be possible by targeting innovation-focused companies.

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- Dealing with a trusted organization aligned with the company's interests. While RiB is clearly identified as a government program, facilitators employed by an industry association can, in some cases, help overcome barriers, particularly with smaller companies that may have concerns about bureaucratic red tape or confidentiality.
- Cross promotion through other industry association services. For example, environment and energy efficiency audits through industry groups could lead to opportunities for future RiB projects.

Tailored Collaboration

Across the Enterprise Connect program, some 6,000 firms have taken advantage of the free Business Reviews, and nearly 130 companies have been assisted under the RiB initiative.

Businesses benefiting from research collaboration through this initiative have been drawn from a broad range of sectors, including machinery and equipment manufacturing; professional, scientific and technical services; basic chemical and chemical product manufacturing; food product manufacturing; textile, leather, clothing and footwear manufacturing, etc.

Projects are specifically tailored to the individual business requirements, as can be seen from the following three examples of successful projects:

 Sydney based health care company Simavita received \$50,000 in matched funding to engage an independent mathematics and information technology expert from Wollongong University's School of Information Systems and Technology. This expert assisted in the validation of a revolutionary new product, which helps manage patient incontinence in aged care facilities, before it was fully commercialized. The project enabled Simavita to quickly take its product to both Australian and international markets. After completing a Business Review with Enterprise Connect, Australian Defence Apparel sought further assistance through the Enterprise Connect RiB program. Australian Defence Apparel designs and manufactures specialized protective clothing, dress uniforms and ceremonial apparel, and supplies governments and large organizations around the world. Participation in the RiB program led to collaboration between Australian Defence Apparel, The Defence Materials Technology Centre and CSIRO to conduct further commercialization R&D in ceramic armour technologies.

Aviva Pure is a clean technology business that develops and manufactures water treatment systems that purify dirty, contaminated water for re-use. Through the RiB program, Aviva Pure was able to make valuable connections with researchers and access their extensive knowledge, expertise and specialized technology. Aviva Pure collaborated with the Royal Melbourne Institute of Technology and Monash University to refine its water purification products. Participation in the RiB program also allowed Aviva Pure to take on a doctoral student, who is engaged full-time in research into the problem of membrane fouling in water treatment plants. From the initial collaborations, however, Aviva Pure has formed lasting relationships with researchers at the universities, providing an opportunity for them to work together on future products and projects.

The Enterprise Connect RiB program is an example of industry-driven arrangements that facilitate greater levels of collaboration between publicly funded research institutions and businesses. The innovative delivery of the Enterprise Connect program in partnership with industry associations provides a model for a new pattern of research/ business collaboration.

About the Author

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BRAZIL

The Evolution of Brazilian Industrial Policy

Introduction

In 2003, when a new federal government took office in Brazil, public-private dialogue and debate on the need to foster industrial development was reborn. In 2004, after more than 20 years, the country launched a new industrial policy under the premise that economic transformation was feasible through the enhancement of innovation activities and skills at the local level. Since then, industrial policy actions have been guided by a determined system of innovation promotion.

This paper provides a brief overview of Brazilian industrial development, showing milestones throughout history and context for actions, primarily the foundation for the aforementioned industrial policy. Innovation is the key theme throughout, and within are the current public policy and institutional arrangements adopted to manage innovation promotion and industrial development in Brazil.

A Brief Overview

The first large growth period for Brazilian industrialization dates back to the 1940s, when major investments aided in the creation of public companies in the steel industry. These companies began to provide local materials for manufacturing operations in the country. Over the following decade, development used a blend of public and private investments, highlighted by the creation of Petrobras in 1953 and the automotive industry beginning in 1955. Although Ford and GM maintained assembly lines in Brazil in earlier years, it was only after the setup of Mercedes-Benz's



manufacturing plant in 1956 that the Brazilian automotive industry saw the development of supply chain linkages.

This model of joining public and private sources of investments, with heavy foreign capital inflows, to attract operations was maintained over time; in fact, Brazilian industry is currently one of the most globalized, and until recently, the country featured manufacturing and engineering operations for the majority of global automotive companies. Countries like Germany and Sweden, for instance, consider Brazil to be an economic partner of utmost importance, and many corporations continue to maintain and grow a significant presence in Brazil.

Several key events in the 1960s and 1970s bolstered the development of Brazil's industrial structure, and created a complex and sophisticated manufacturing sector. The creation of Embraer (Brazilian Aeronautics Company), currently the third-largest global producer of airplanes, and investments in the first three national petrochemical centers, stand out as examples. These ventures were originally implemented with public investments and are now managed by private companies. In the 1970s, the decentralization process began in both the industrial sector as well as in the national economy, and public policies aimed to increase industrial investments outside of the São Paulo-Rio de Janeiro area, the main destination of foreign investment.

Advances in the industrial sector were accompanied by the creation of public sector organizations and the improvement of underlying institutional framework. The National Council for Scientific and Technological Development (CNPq) was formed in 1951, and the following year the Brazilian Development Bank (BNDES) was created. Currently, BNDES disburses more annually than the World Bank and the Inter-American Development Bank combined. Further chambers, committees and government agencies were also created, such as the National Institute of Industrial Property (INPI) and the Brazilian Innovation Agency (FINEP), to address related issues.

During this period, Brazil was in the spotlight as one of the fastest growing countries (GDP grew nearly 7.5 percent annually between 1950 and 1980). The country further diversified its industrial base and created advanced technological solutions, like the National Interlinked System in the electric sector, which operates in real time and is fully integrated across the country.

However, the shrinking international market and the rise of international interest rates had substantial negative impacts on the Brazilian economy. Before 1980, Brazilian economic success was driven mostly by foreign capital, first used by private companies, and subsequently obtained by the public sector, for the implementation of the 1st and the 2nd National Plan for Development (PND). After 1979, with the rise of interest rates in foreign markets, Brazilian accounts became imbalanced, and a moratorium was placed on external debt.

The debt crisis in the early 1980s was followed by years of macroeconomic turbulence. Financial management became the main focus of attention, as high inflation and rising interest rates created volatile short-term financial markets. As a result, improving innovation operations was not the top business management concern at the time.

The opening of trade in the 1990s, and the macroeconomic stabilization that followed, created a new reality in Brazil. On one hand, companies with Brazilian operations faced increasing competition from local and foreign producers; on the other, the main source of revenue was no longer the investment of funds in the financial market. Low levels of economic growth and investment, and a decrease in the number of public-private partnerships, plagued this period. Important areas of the public industrial development framework were dismantled, and industries in Brazil went through significant changes.

The abrupt and disorderly reopening of the markets left companies without time to adapt, leading many to close down or be absorbed by larger stronger corporations. In order to maintain market share, companies had to readjust their management practices and production processes. During this time, Brazil lost a large share of technological industries (i.e. semiconductors) and the associated production skills, including methods of quality and productivity management used by countless companies.

In 2000, with an open economy and inflation finally under control, new challenges became the focus of society's attention. Brazil was still facing the impact of its unstable exchange rate, and society and the public sector maintained their position against an industrial policy and development promotion. These discussions were reinvigorated in the following years, and in 2003, the Brazilian Federal Government began to formulate a proposal. The debates led to a series of plans entitled "Guidelines for the Industrial, Technological and Foreign Trade Policy" (PITCE), and after more than 20 years, Brazil launched a new industrial policy in March 2004. Further plans were created in later years, including the Productive Development Policy (PDP) in May 2008, and the Brasil Maior Plan (PBM) in August 2011, presented by President Dilma Rousseff.

Brazil in Numbers

Economy

- The 6th largest economy worldwide.
- Brazil is the leading economy in Latin America, with a GDP of more than US\$2.4 trillion. Commerce and service sectors represent 67 percent of this figure, while industry represents 27.5 percent and agriculture 5.5 percent.
- GDP growth reached 7.5 percent in 2010 and 2.7 percent in 2011.
- Unemployment rate of 6 percent (6th lowest in the world); for comparison, the US rate is 7.9 percent.
- Investment as percent of GDP: 16.7 percent in 2009, 19 percent in 2010 and 20.8 percent in 2011; 2014 goal: 22 percent.

- The main FDI destination in Latin America; 4th ranked FDI destination in the world for 2009-2011 (after China, USA and India).
- US\$955 billion investment programmed for 2011-2014 in areas of transportation, energy and social development, under the Growth Acceleration Program (PAC).
- Trade reached US\$482 billion and a surplus of US\$29.8 billion in 2011 (up 46.9 percent over 2010).
- International reserves of US\$352 billion (14.2 percent of GDP).

Market

- The largest consumer market in Latin America.
- · World's 9th largest domestic market.
- World's 5th largest market for cell phones.
- World's 3rd largest market for automobiles.
- World's 2nd largest market for executive jets (1st USA).
- World's 3rd largest seller of personal computers; (1st China, 2nd USA).

- World's 9th largest steel exporter.
- World's 3rd largest manufacturer of commercial aircraft.
- Internet sales grew 26 percent in 2011 over 2010 (In 2010 the growth was 40 percent over 2009).
- The government surplus reached US\$76 billion in 2011 (3.1 percent of GDP) up 6 percent over 2010.
- US\$41.4 billion invested in Federal Housing Program in 2011, up 11.3 percent over 2010.

Society

- Full democracy, with no ethnic or religious conflicts.
- Per capita GDP in 2011 increased 1.8 percent (US\$11,000); in 2010 it increased 6.5 percent.
- Poverty level reduced from 35 percent (1992) to 12.9 percent (2011).
- Extreme poverty reduced from 25.6 percent (1990) to 4.8 percent (2008).
- 4th largest labor force in the world (1st China; 2nd India; 3rd United States).
- Average income grew 4.4 percent in 2011 compared with 2010.
- Gini Index decreased 2.1 percent (2011: 0.51; 2010: 0.52; 2009: 0.54).

- Between 2003-2011 the "C" class (middle class) grew by 39.6 million people, a 60.1 percent increase, with a total of 95 million people. The A (5 percent), B (5.5 percent) and C (50.5 percent) classes altogether now represent 61 percent of the Brazilian population.
- 13 million people benefit from the Brazil Without Misery program.
- US\$142.3 billion spent from 2011 to 2014 on the construction of 2 million houses for low income families, under the program My House, My Life.
- Since 2003, almost 17.3 million job positions were created in Brazil.
- From 2002 to 2012, the minimum wage grew 300 percent (2002: US\$105; 2012: US\$327) with a real gain of 66 percent.

The context in which these policies were designed and implemented varied widely from that of the 1950s, 1960s and 1970s. The global economic and national political landscapes have evolved significantly, and industrial development is now fostered through an economy open to international trade. Brazilian industry and the national economy are more robust than ever before, and there is no longer a need to build new industrial sectors, but rather bolster the existing sectors from their current position. The public sector is promoting development not by choosing specific industries but by creating and supporting the conditions necessary for global competitiveness.

The PITCE, and following versions of industrial policies (PDP and PBM), focus on and recognize that innovation is a crucial issue for Brazil to remain globally competitive in the short, medium and long term.

The Role of Brazilian Industry

Today the Brazilian experience shows unique insight into the importance of technological innovation for companies, the labor market and the national economy. The conclusions of the study "Production, Technology and Innovation" by the Institute of Applied Economic Research (IPEA), the main public sector economic research agency, are unmistakable. In short, technological innovation has significant economic and social impacts for Brazil.

Although there are many types of innovation (business model, organizational, logistics, institutional, etc), this paper focuses on technological innovation, as significant research and data is available on this theme in Brazil. Using available data on technological innovation is not an attempt to limit the concept of innovation, but rather using "measurable innovation" to convey the impacts of these strategies on companies and the country.

Since 2003, crosschecked data, including variables such as export values and volumes, average time of employability, source of firm capital, types and sources of innovation, and average wages, among others, have allowed for valuable conclusions about the Brazilian economy.

To gather these results, IPEA set up a broad database of Brazilian industrial companies, from sources like: the Annual Industrial Research (PIA) and Technological Innovation Research (PINTEC), both conducted by the Brazilian Institute of Geography and Statistics (IBGE); the Annual Social Information (RAIS) of the Ministry of Labor and Employment (MTE); the registration of foreign trade operations by the Foreign Trade Secretariat (SECEX) of the Ministry of Development, Industry and Foreign Trade (MDIC); and, the data on capital registration provided by the Brazil Central Bank, among others. So far, this combined research has resulted in the publication of six books, as well as several studies, by the IPEA, some authored in partnership with ABDI.

The first book of this series, "Innovations, Technology Patterns and Performance of Brazilian Industrial Firms," was enhanced by crosschecked data from 72,005 companies, representing 97.5 percent of the country's industrial transformation value. The conclusions are unambiguous: companies that innovate and differentiate their products have major gains, create more and better jobs (higher wages and longer job tenure), grow more, export more and are more productive. These are companies representing the dynamic core of the Brazilian economy; and, fortunately, they are not concentrated in specific sectors, but are found across various branches of the industrial sector.

For this study, IPEA separated Brazilian industrial companies into three different classes:

A. Companies that innovate and differentiate products: includes those who carry out product innovation (information obtained from PINTEC) and export with a premium-price of at least 30 percent compared with average of Brazilian exports of this type (information obtained from the SECEX/MDIC data base).

B. Companies specializing in standardized

products: includes companies that export (information obtained from SECEX/MDIC database) but are not part of category "A" and non-exporting firms that present better or equal efficiency when compared with exporters already included in this category.

C. Companies that do not differentiate products and have lower productivity:

includes all other industrial companies from the database set up by IPEA and IBGE not included in categories "A" and "B."

The delineation of companies based on strategy and performance, rather than traditional sectoral classification, was one of the major methodological advances made by the IPEA team. The development and adoption of the "company that innovates and differentiates products" category represents a reflection of increasing societal interest in innovation. The use of this analytical approach, rather than traditional classifications, has enabled a new and deepening understanding of economic patterns.

This method was used in further IPEA studies in which conclusions reaffirmed the importance of innovation and innovation-based strategies for company performance and national development. In several reports related to employment, IPEA found that if all else remained the same (capacity, product types, technologies, location, etc.) and only strategies differed, those industrial companies that innovate and differentiate products would pay 35 percent more in wages and have higher productivity than those that do not. In addition, innovative companies require more skilled staff, invest more in training programs and create better jobs, increasing labor qualifications and working conditions in the industry.

Another recent Brazilian economic phenomenon was the skyrocketing export growth beginning in the early 2000s; between 2000 and 2008, for example, exports grew by approximately 260 percent. This success has been linked to several factors, and the influence of technological innovation cannot be disregarded. Although the number of companies that export and differentiate products is still low when compared with the total number of industrial firms, there is evidence that a "linkage between technological innovation, internationalization and the premium price obtained in exporting" exists. Innovation incentives should lead to an increase in the volume and technological content of exported products, and contribute to the sustainability of Brazilian firms' international presence.

The data and conclusions from this research demonstrate that innovation makes money, creates jobs and is worthy for Brazil to pursue. If this is truly the case, two significant steps must be taken in devising the public sector path forward: 1) innovation must be an explicit and central part of development policy, particularly industrial policy; 2) the government must determine how to best engender and implement effective innovation promotion initiatives in Brazil, accounting for experiences in other countries as well as local efforts.

The launch of the Industrial, Technological and Foreign Trade Policy (PITCE) in 2004 was a milestone for the design of an explicit industrial policy in Brazil. PITCE assumed internationalization as a key aspect of modern economies, did not privilege specific sectors over others, and was strongly focused on horizontal actions, among which innovation promotion was included.

The emphasis placed on innovation in PITCE drove the adoption of countless measures to spur private investment in research and development, and brought about a new institutional framework for innovation. This new framework includes several laws and rules on private investment, as well as the creation of public organizations, like BNDES and FINEP, acting on similar issues. However, these efforts were not solely at the national level, and the spread of state- and regional-level initiatives and 'innovation laws' by different federal states were important steps forward. The changes originally proposed by the public sector were and continue to be followed in similar private sector initiatives. Organizations and industry federations like the National Confederation of Industry (CNI), the Brazil Competitive Movement (MBC), and others, garner attention for innovation efforts by organizing events, forming groups to address concerns, hiring studies, and spreading information, etc. In short, representative entities recognize that innovation is essential to achieving a business-driven agenda.

The innovation-based focus of the PITCE was only deepened in the Productive Development Policy (PDP) launched in 2008, and the relevance can be seen in the slogan: "to innovate and invest is to sustain growth." However, the two policies differed slightly. On the one hand, the PDP expanded the range of horizontal actions prescribed by the PITCE; on the other, the PDP included measures that, without favoring specific sectors, considered the particularities of each industrial sector and reshaped horizontal actions to be inline with individual realities.

The Current Brazilian Model

The Brazil Maior Plan (PBM) was developed and will be implemented for the period of 2011-2014. This new policy has a clear focus on innovation,

and on upgrading manufacturing and services value chains through the development of capabilities in emerging technologies. At the same time, the interconnection between innovation and internationalization is present as the fundamental rationale behind Brazilian industrial policy.

Current policy recommends the diversification of exports and internationalization through innovation and product differentiation, engaging transnational companies through R&D investments in the country, and emphasizes the relation between foreign trade and innovation.

The PBM is an advanced cross-sector approach to improving Brazilian skills in specific industrial sectors by concentrating cutting-edge innovation efforts in areas like: information and communication technologies, health industrial complex, oil & gas, nuclear, aerospace engineering, biotechnology, nanotechnology, energy and biodiversity. The Plan includes three main implementation sections (Figure 1).

Such a complex endeavor is only possible with a robust public-private governance scheme, reflecting a broader range of action, a cross-sector approach and a deeper public-private dialogue in the industry arena (Figure 2).

Innovation Act (Law 10.793/2004)

- Provides for the establishment of strategic partnerships between universities, technological institutes and companies; involves of science and technology institutions in these endeavors; and encourages innovation in companies. Brazil ranks 28th among 104 countries in university/ industry research collaboration;
- Establishes Technological Innovation Centers (NIT) Technology transfer centers formed by one or more science and technology Institutions, which aim to manage innovation policies and evaluate R&D activities and technological innovation processes. In August 2012, there were 205 NITs in Brazil;
- Creates the Forum of Innovation and Technology Transfer Managers (FORTEC) 2006; and
- INMETRO-National Institute of Metrology, Quality and Technology (Law 12.545/2011) grants scholarships for scientific and technological research to develop technologies, products and processes, directly or by partnership with public or private institutions (including scholarships for foreigners who fulfill legal residency requirements).

FIGURE 1. Plano Brasil Maior Structural and Systemic Dimensions



FIGURE 2.



Law of Good (Law n° 11.196/2005)

- Tax breaks are incorporated into FINEP's finance line "Inova Brasil" (Innovate Brazil), which allows companies to conduct technological research and promote technological development.
- 460 companies benefited in 2008 and 639 in 2010.
- The total value of waivers reached R\$ 1.58 billion in 2008 and R\$1.73 billion in 2010.
- The value of incentive-related projects reached R\$ 8.79 billion in 2008 and R\$8.62 billion in 2010.

Investments in Innovation in Brazil

BNDES—The Brazilian Development Bank is currently the main funding institution of longterm investments in all sectors, including social, regional and environmental dimensions. Since it was founded in 1952, the Bank has been distinguished by its support of agricultural production, industrial activities, infrastructure, trade and services, and for providing amenable conditions for small and medium-sized companies.

The Bank supports investments in projects, purchasing of machinery and equipment, and exporting of goods and services. Apart from this funding, the Bank also acts to strengthen a company's capital profile, and directs grantbased resources to projects that foster social, cultural and technological development.

In its Strategic Planning for 2009-2014, BNDES elected innovation, local and regional development, and socio-environmental development as key issues in fostering current economic conditions. Today the Bank maintains 11 credit lines, 51 sectoral programs and 12 funds with refundable credit and grants directed at spurring development in the following: agriculture, trade, services and tourism, culture, social and urban development, sport, exports and internationalization, industry, infrastructure, innovation, environment and capital market development.

- BNDES disbursements were around US\$ 50 billion for January–September 2012; and, industry and infrastructure accounted for 68 percent of this figure;
- BNDES financing for innovation alone amounted to US\$ 0.7 billion between January and July 2012.

FINEP—The Studies and Projects Finance Organization is a public company that promotes economic and social development by fostering innovation in public companies, universities, technological institutes and other public or private institutions.

- In 2011, FINEP invested US\$1.76 billion in innovation projects;
- "Inova Brazil" (Innovate Brazil) program to support strategic innovation plans by Brazilian companies, in line with the federal policy, Plano Brasil Maior;
- In 2012, FINEP will receive more than US\$ 3 billion, about 50 percent over 2011, from BNDES for funding new reimbursable projects;
- FINEP disbursements for innovation have measured around US\$ 2.3 billion since August 2011.

In 2009, according to the Center for PE/VC Studies (Gvcepe) risk funds invested US\$3.1 billion in Brazilian companies (15 percent in startups);

- 144 PE&VC Firms;
- 258 Investment Vehicles;
- Estimated 1,593 professionals and staff.

These dimensions reaffirm the assumption that innovation remains a crucial variable for boosting Brazilian industrial development through a range of actions, measures and projects in the period of 2011-2014. The goals prescribed in the PBM require a complex legal framework, strong policies to qualify labor resources, and investments and funding lines to support innovation.

Human Resources

- Science without Borders: Federal scholarship program created in 2011 that seeks to strengthen and expand science and technology, innovation and competitiveness initiatives through international mobility of undergraduate and graduate students and researchers.
- The initiative is the outcome of joint efforts by the Ministry of Science, Technology and Innovation (MCTI) and the Ministry of Education (MEC), through their respective funding agencies CNPq and Capes and the Departments of Higher Education and Educational Technology.
- The project recommended up to 101,000 scholarships over four years promoting international cooperation in the scientific research field, so that undergraduates and graduates can participate in internships abroad, keeping in touch with competitive educational systems. The program also seeks to attract foreign researchers who want to settle in Brazil or establish partnerships with Brazilian researchers in priority areas defined by the program.
- IT Maior Program: the Strategic Program for Software and IT Services (IT Maior) seeks to develop the Information Technology (IT) software and services sector. With investments of approximately US\$500 million planned for the period 2012-2015, IT Maior is structured around five pillars: economic and social development; international positioning; innovation and entrepreneurship; science, technology & innovation; and, competitiveness.

The resources will be subsidized by FINEP and CNPq. Furthermore, the program recommends accelerated development of technologybased companies, the consolidation of digital ecosystems, government procurement preference for software using national technology, youth IT job training and attracting global research centers. The Brazilian IT sector already has 73,000 companies and had a turnover of US\$ 37 billion in 2011.

Conclusions

The current Brazilian economic and industrial landscapes show a changing and emerging country that is designing and carrying out sound policies to boost innovation and competitiveness. After the 1980s, Brazil started a remarkably stable path: bringing about strong democracy, underpinned by transparency and citizenship; building deliberate long term macroeconomic conditions; improving labor quality; and, creating industrial tools to spur national competitiveness. Despite these achievements, Brazil faces new challenges in a still unstable global economic picture: maintaining sustainable growth, enhancing human resources and providing conditions to allow for increased innovation. The answer to these challenges lies in the framework of the new industrial policies, which consider the complex variables under which competitiveness is feasible, including the improvement of public-private dialogue, expanding science and technology tools and opportunities, and funding and financing innovative ideas and projects.

KOREA

Establishing an Education System Enabling Education and Employment

Background

Korea is expected to see its economically active population decline from a predicted peak in 2016. The key labor force in the 30s-40s age range has been on a downward trend since 2006. Demographic changes have led to a weakening labor supply and the gradual erosion of the industrial workforce, both detrimental to future economic growth. From a quantitative perspective, education trends are moving toward higher education and away from vocational schooling, which will inevitably cause a technical labor shortage for Small and Medium sized Enterprises. Qualitatively, the vocational education system was not properly meeting labor market demands, and systematic career training was not being provided to students.

Against this backdrop, the Presidential Council on National Competitiveness (PCNC) and the Ministry of Education, Science and Technology (MEST) began establishing an educational system that enables vocational high school students to pursue both education and employment, addressing the decline of Korea's economically active population and labor market shortages.



Current Status of Korea's Vocational Education System

1. Lack of industry demand for secondary education and vocational high school students

Vocational high schools, such as Meister schools (modeled on German academies) and specialized high schools, have failed to address industry labor demands, and students have experienced difficulties securing employment after graduation. In addition, industry-based investment in human capital development has been largely concentrated in colleges, resulting in a lack of investment in vocational high schools and imbalanced employment of their graduates. Due to these issues, vocational high schools have experienced a decrease in enrollment and a number of high school graduates continue onto tertiary-level education rather than finding employment upon graduation.

Newly Enrolled Students in Vocational/Academic High School (Unit: Thousand)					
	1980	1990	2000	2010	
Number of vocational high school students	764	811	747	466	
Number of academic high school students	933	1472	1324	1496	
	1980	1990	2000	2010	
Find employment	182,812	210,113	149,543	29,916	
Enter college	23,919	22,710	122,170	111,041	

2. Need for tertiary education infrastructure that enables both employment and study

Korea needed to design a better education infrastructure, enabling students to work while attending college. Although a number of higher education programs for incumbent workers were created, such as "Colleges in Corporations," where colleges and industries partner to operate departments, and "Special Admission to College for Incumbent Workers," these programs were not effectively operated, and had limited participation. Only a few large companies, such as SAMSUNG Electronics, became involved in "Colleges in Corporations," and those courses simply became retraining programs for incumbent workers. As of 2010, in departments operated by both college and industry, only 7 percent of 271 courses guaranteed students a permanent position after graduation, and the majority of the courses were graduate programs for incumbent workers. Given the post-high school focus of these programs, it was difficult for vocational graduates to continue their course of study while employed.

3. Social and policy traditions hindering 'Employment First, Tertiary Education Later'

Human Resources management systems in Korea are largely based on academic background and seniority rather than job performance. Additionally, mandatory military service often interrupts career development and disincentives companies from hiring those yet to complete their military duty. Businesses are reluctant to hire those who have not yet served, as significant inefficiencies could be generated by any extended absence.

Policies & Measures

1. Industrial Participation in Hiring High School and Vocational Education Graduates

To encourage the employment of high school graduates, the Ministry of Education, Science and Technology (MEST), along with businesses and education institutions, implemented an agreement to hire more vocational high school graduates and provide them with training programs





upon employment. For the public sector to take up an anticipatory role and increase employment of graduates from Meister and vocational high schools, corporate efforts to hire graduates of those schools had to be considered in the business management assessment. Along with these efforts, the MEST and other ministries conducted nationwide campaigns to raise awareness about employing high school graduates. These cam-



paigns promoted best practices from participating companies, such as employment agreements between businesses and vocational high schools, and highlighted policies such as Open Employment¹ in related TV shows. For example, a special TV feature called 'Scout,' aired by KBS TV, was produced to raise social awareness about the employment of high school graduates.

Korea

¹ A policy dedicated to providing more job opportunities to those with high school diplomas.

2. Improving the Institutional Environment for High School Graduates both Working and Studying

The MEST devised various measures to construct a favorable environment, for those simultaneously employed and furthering their education, to ensure that workers can both advance their studies and become qualified professionals in their fields. Such measures include "Special Admission to College for Incumbent Workers," facilitation and creation of "Colleges in Corporations," and the construction of college campuses in industrial complexes. The MEST also designated several emblematic colleges and programs, and provided financial support for incumbent workers education initiatives, with the stipulation that they initiate courses for workers with no more than high school diplomas. In addition, the "Skilled Industry Personnel System" was amended to lighten the military service burden for graduates from vocational high schools. Finally, public sector Human Resources management was improved to reduce those disadvantages experienced by employees with just a high school education.

3. Improving Field training and Internship Programs in Vocational High Schools

The MEST designed various systems and curricula for vocational high schools to help meet industrial demands and allow students to receive field training, internships and employment upon graduation. In March 2011, the 'Guidance Counselor' system was introduced to enhance career counseling in secondary education institutions. Nearly 3,000 guidance counselors began working in schools to support students through aptitude tests and work experience programs. These efforts aimed to achieve the primary goal of improved vocational education and employment of high school graduates, and the results have helped to balance labor market issues of supply and demand within industries and educational institutions. The MEST also established a new industry-centered vocational education system, after reviewing similar systems in advanced countries like Germany, and created both an employment contract admission system and a youth employment internship program to fulfill current market needs. These programs were designed to nurture and grow industry-customized talents by providing field training opportunities to students in vocational high schools and connecting qualified workers with companies best fit for their skills. Additionally, the government granted tax exemption benefits for field training expenses to encourage industry participation; and, in April 2012, the government amended an agreement to guarantee quality job training in a safe work environment by improving the field training system.

Effects & Outcomes

Many of the government measures to improve employment and education capabilities began between 2011 and 2012, and additional measures are currently in process. Due to these measures, the employment rate for high-school graduates has increased, and students, parents and industries all have a more positive attitude about vocational education programs. For example, 89.4 percent of students expected to graduate in February 2013 from Meister schools have already signed employment contracts with companies; in fact, the specialized high school employment rate has stopped its downward trend for the first time in almost two decades. The employment rate of those students who graduated in February 2012 increased from 25.9 percent to 38.1 percent over the previous year. These accomplishments are largely the result of government efforts to encourage industry participation in the design and implementation of vocational high school education. The government has also promoted the employment of high school graduates by creating a variety of jobs in the public sector. This year more than 38,000 high school graduates were able to start careers in the public and finance sectors as well as in large companies.

2012 High School Graduates Employed by the Public/Finance Sectors and Large Companies (Unit: People)

Organization	New Recruits in Schedule
Central Government	200
Local Government	211
8 Metropolitan and Provincial Offices of Education	34
288 Public Institutions	2,508
12 companies	34,320
17 banks	1,050
Total	38,323

Many industries increased employment opportunities for high school graduates, and businesses continue to collaborate with educational institutions on field trainings, industry-customized classes and changing recruitment systems to ensure employment for gualified graduates. For instance, SK Hynix has provided Chungbuk Semiconductor High School, a Meister high school, with semiconductor manufacturing equipment worth 3.6 billion KRW for field training, guaranteed post-graduation employment for close to 100 students, and opened a separate training course in the school. These types of customized classes are now available in 21 Meister high schools, many of which were first founded in February 2010. On average, more than three customized courses are run by each of the 21 Meister high schools, and similar industryacademia cooperation has increased in specialized high schools as well.

This model, however, is not limited to industry applications. The Plaza Hotel, recognizing employment needs in the tourism and restaurant sector, designed a new model for students balancing education and employment. This model enabled students to spend 4 days at work and 2 days in classes, allowing employees to gain higher education in a major relevant to the needs of the hotel.

"Special Admission to College for Incumbent Workers," designed to allow employees with high school degrees to continue working while pursuing tertiary education, was introduced in three colleges in 2010. As of July 2012, almost 45 schools were scheduled to introduce the program over the coming year. It is encouraging that major national universities—such as Kyungbuk University, Kyungsang University, Chungnam University and Chungbuk University—as well as prestigious private universities—such as Korea University, Konkuk University and Hanyang University decided to take part in these efforts, allowing incumbent workers to study while maintaining employment.

Although "Colleges in Corporations" are the best locations to work and study simultaneously, not many schools have moved forward with this program. Only three corporate universities have been initiated since the introduction of Colleges in Corporations in 2005; however, many large companies, such as Hyundai Heavy Industries and Daewoo Shipbuilding & Marine Engineering leaders in high school employment, are planning to establish their own "Colleges in Corporations." These trends demonstrate that industries are becoming more interested in these 'Employment First, Tertiary Education Later' programs for incumbent workers.

About the Author

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RUSSIA

Competing on Creativity: Russian Innovation Index Initiative

Innovation is widely recognized as a key driver of economic growth. China, Republic of Korea, and other countries with similarly high economic growth rates, owe a great deal of their progress to the innovation and technological improvement generated by the companies within their borders.

Despite the fast economic growth of the last decade, Russia is losing its once strong position as a leader in technological innovation. The number of technologically innovative fields has dropped significantly, and the sectors of the economy relying on the use of imported technologies have grown. The Russian government recognized this problem and recently made fostering innovation a major national priority. As a result, the government launched new and ambitious projects-such as Rusnano (a government-owned corporation for supporting and funding research and development in nanotechnology), Skolkovo (a high technology and entrepreneurship hub near Moscow)and focused intensely on new policies geared towards improving the national commercialization infrastructure.

However, despite these policy efforts and the relatively high competitive potential of Russia's current innovation system, there have been few, if any, measurable economic outcomes. The country shows only modest achievements in R&D, value creation, and the export of advanced technology products. Available statistical data indicates that Russia lags behind countries such as Poland and Hungary in international patents, and the share of Russian high technology manufacturing industries in value added and exports is significantly lower than that of China or Brazil.



Responding to the need for new, more comprehensive approaches to enhancing the competitiveness of Russia's National Innovation Systems (NIS), OPORA and ECI launched the project "Competing for the future today; a new strategy for development of Russia's national innovation system," where OPORA served as the project initiator and ECI as the implementer. Project sponsors, including Rusnano, the U.S.-Russia Foundation for Economic Advancement and the Rule of Law, Russian Development Bank, among others, provided invaluable support.

The project aimed to evaluate the current state of Russia's innovation system and devise recommendations for a new innovation policy. It was designed to present a holistic view of the existing problems, and to propose comprehensive policy solutions based on rigorous analysis and vast international experience. To gain a truly broad understanding of the issues at hand, analytical work was combined with ongoing consultations and discussions, with experts and stakeholders, over the course of the project.

Analytical Component: Making Evidence-based Recommendations

To assess the competitiveness of Russia's current innovation system, it was compared with worldleading countries through a comprehensive ranking system. Other research included the analysis of survey data collected from key actors in the Russian NIS. These efforts resulted in a factbased SWOT (strengths, weaknesses, opportunities and threats) analysis of Russia's NIS.

Following the SWOT, a study of international experience in stimulating the development of national innovation systems was conducted in search of existing policy instruments and best practices.

Finally, policy recommendations were formulated and published in the report together with the primary research findings.

A special instrument—the Index of Competitiveness of National Innovation Systems—was developed for the evaluation of Russia's innovation system. The primary factors and policies involved in innovation development were identified through a thorough analysis of international experiences, and the results provided the hard-evidence used as a basis for the Index. The Index was further refined through the incorporation of results from a survey of existing NIS ranking instruments.

The Index includes aggregated detailed statistical data, as well as the results of recognized international rankings and large-scale global surveys. More specifically, the statistical data incorporates factors such as expenditures on R&D and education; the quantity of scientific publications and their citation frequency; and the number of ISO 9001:2000 certified companies. The survey and ranking data combined the results of large-scale global executive opinion polls, such as the World Economic Forum executive opinion survey; comparative studies of education, such as the OECD PISA study; as well as the international rankings of world universities (The Times-Higher Education and other rankings), and other data recognized by world experts for quality and reliability.

Every effort was made to improve the quality of the Index. First, as there is often limited availability for data on drivers of innovative activity, the Index only covered countries where the data availability (as a share of primary indicators available) exceeded 85 percent. Next, to ensure statistical robustness, the Index was structured in line with the best practice of composite indicators. Last, but not the least, regression tests were used to prove statistical relationships between the Index and the key performance variables, such as the per capita number of triadic patent families.

A multi-stakeholder Russian Innovation Survey was conducted to collect data on Russia's innovation system in order to feed a more detailed analysis of the current situation. The Survey involved the executives of large corporations, managers of innovative SMEs, leading Russian scientists working both in Russia and abroad, as well as the general population.

The survey of scientists was intended to assess the effectiveness of government-funded research in Russia, and to identify opportunities for and barriers to R&D and the commercialization of scientific research. The survey of business executives evaluated the innovation climate in Russia, including the availability of incentives and resources for innovation, the focus of the companies' innovation activity and the priorities of government innovation policies. The population poll assessed Russian citizens' innovative behavior (as a consumer), their interest in science and a scientific career (as a source of potential talent), and the importance of science and technology as a budgetary priority (as the electorate). Most survey questions were formulated to match major international innovation surveys to make international comparisons possible and to draw conclusions based on this evidence.

The results of the Survey were combined with the Index to perform a fact-based SWOT analysis of Russia's innovation system development.

International experience of more than 20 countries was studied to provide a solid foundation for effective recommendations, and the report featured three case studies of leading innovative countries (the United States, Finland and China), as well as detailed analysis of 10 innovation policy instruments.

Each case study included the general analysis of the country's innovation system and its development stages throughout the 20th century; a structured description of innovation policies; and a survey of instruments currently used to promote innovation. The most important and effective instruments with highly recognized impact were studied in more detail. These included: the United States' National Science Foundation and Defense Advanced Research Projects Agency, Finland's Tekes, as well as the USSR's Science and Technology Councils and Chile's National Innovation and Competitiveness Council.

Finally, interviews with leading international experts were conducted in order to capitalize on first-hand experience in innovation policy implementation, broaden the project's knowledge base of current best practices and ideas of leading countries, and validate the preliminary findings.

A comprehensive set of policies was proposed as the main recommendation to improve the effectiveness and competitiveness of Russia's NIS. These policies focus on six primary areas:

- 1. Ambitions, strategy & policy coordination;
- 2. Policy in public R&D;
- 3. Policies on the commercialization and development of innovative SMEs;
- 4. Technology policy;
- 5. Regional dimensions of innovation policy; and
- 6. Framework conditions and incentives.

Three different implementation scenarios were considered for the new innovation policy. The first alternative involved improving the existing system by increasing the effectiveness of its current components. The second alternative was the creation of an ideal innovation system, introducing multiple new components, while completely dismantling existing institutions. The third alternative combined both the existing and the new elements.

Consultation Component: Promoting Evidence-Based Discussion and Commitment

The ongoing consultation process had a significant impact on the success of the initiative. It included a series of interviews and structured meetings with experts, as well as a major event dedicated to fostering innovation in Russia.

First, the project team conducted a series of interviews with leading international experts and government officers, who represented agencies responsible for the implementation of specific aspects of science, technology and innovation policy. Various international organizations, including the OECD, the World Bank, UNCTAD, ISO, WIPO and other intellectual centers, provided interview and advisory support.

Next, in order to discuss the state of Russian innovation across a diverse cross-section of the economy, several structured meetings were held with leading experts in different aspects and mechanisms of the development of innovation systems, such as:

- Infrastructure for commercialization;
- Financing of innovative companies;
- The role of standards and technical regulations in innovation policy;
- The system of scientific research, universities and research institutes;
- · Intellectual property; and
- State purchasing and innovation.

Finally, one of the key elements of the project was the National Innovation Forum held by OPORA RUSSIA on March 23rd, 2010. The forum included the first public discussion of the basic conclusions and recommendations of the project. Prime Minister of the Russian Federation, Vladimir Putin, representatives from federal and regional government authorities, the business community and international organizations, and leading Russian and foreign experts attended the forum.

First Results of the Initiative and Further Steps

Results of the project were published by ECI and OPORA Russia in a national report "Competing for the Future Today: A New Innovation Policy for Russia." The report has been made available as a separate publication (a Russian version and an English version), and a section of it has been included as a Chapter in the Russia Competitiveness Report 2011, prepared and published by the World Economic Forum.

It may already be time to observe preliminary results of the initiative. The project stimulated a discussion on national innovation policy and attracted multiple stakeholders, via both the consultation process and the nationwide multi-stakeholder survey. It also provided a general framework for assessing competitiveness, together with the data platform for diagnosing the current situation.

As a next step, the new *Competing for the Future 2.0* report will be published this year, and *Ideas Will Change Our Future* will be released in 2013. The first report will feature the Index of Competitiveness of National Innovation Systems, updated with contemporary data, and rankings of innovation capabilities of Russian regions. It will also contain detailed profiles of each region's innovation performance, strengths and weaknesses, which may be useful for business leaders and policymakers in defining the policy priorities to foster innovation at the regional level.

The second report will summarize the key findings of a two-year, national multi-stakeholder Russian Technology & Innovation Foresight Initiative, covering emerging innovative sectors, innovative technology impacts on traditional industries, and best international practices in technology envisioning and "next practices" ideas for innovation policy.

Both of these reports represent significant dedicated efforts to determine the challenges and barriers to innovation in the Russian Federation, both national and regional, and identify the best path forward to a more innovative, productive and competitive nation.

About the Author

Alexey Prazdnichnykh is a managing director at The Eurasia Competitiveness Institute (ECI) and a board member of OPORA Russia, a leading Russian business association. He is a partner at Strategy Partners Group, leads the Public Sector Practice and has served as an advisor on competitiveness, economic development and public sector productivity issues.

UNITED ARAB EMIRATES

Dubai Duty-Free: Where Over 50 Million Global Citizens Meet and Shop Every Year

Determined to make Dubai International Airport (DXB) world class, the Dubai Department of Civil Aviation opened Dubai Duty Free in December of 1983. With the support of international expertise, Dubai Duty Free grew into a robust and globally competitive enterprise, achieving one of the largest volumes of sales among airport retailers, high levels of customer satisfaction, and sales per square meter of retail space that more than doubles the global average.

The resounding success of Dubai Duty Free is underpinned by its role as a customer-centric enterprise and its process of continuously introducing a series of innovations to the basic duty free business model along all segments and functions of the value chain. Beyond functioning as a globally competitive enterprise in its own right, Dubai Duty Free has had a large and lasting impact on the aviation sector, the promotion and identity of Dubai as a tourist destination, its supplier network, and its growth and maturity as a global duty-free retailing industry now valued at US\$46 billion.

Dubai Duty Free: The Rapid Rise to World Class

Dubai Duty Free opened for business on December 20th 1983. Over the ensuing years, its rapid growth made it the world's single largest airport retailer for the first time in 2008, as measured by total sales. Based on the latest available data (2011) Dubai Duty Free reached a record turnover of AED 5.311 billion (US\$1.455 billion) in that year, which represented a 16 percent growth over 2010, and an average processing of 61,000 transactions per day. In 2010, Dubai Duty Free ranked



Emirates Competitiveness Council

1st in the world, and along with Seoul, London and Singapore, was among the 4 duty-free operations with at least US\$1 billion (see Figure 1).

A Fascinating History

In 1983, the Department of Civil Aviation received a proposal from Ireland's Aer Rianta, Ireland's state-owned national airport authority, to provide technical assistance in the development of the duty free concept in Dubai. About thirty years before, Aer Rianta pioneered the first duty free shop in Shannon Airport, located 135 miles from Dublin, which served as a hub for transatlantic flights. Shannon faced the challenge of being flown-over as aircraft became technically more efficient, and as competing hubs in Paris and London developed. Innovation was required, and, in May 1947, the first duty free shop opened at Shannon's terminal building with much success.

FIGURE 1. Top 10 Duty Free Stores Ranked by Travel Retail Sales, 2010				
Dubai International Airport	Paris-Charles de Gaulle Airport			
Incheon International Airport (Seoul, Korea)	Frankfurt am Main Airport (Frankfurt Airport)			
London Heathrow Airport	Tallink/Silja Terminal (ferry port), Finland			
Singapore Changi Airport	Suvarnabhumi Airport (New Bangkok International Airport)			
Hong Kong International Airport	Amsterdam Airport Schiphol			

The Dubai Department of Civil Aviation was considering options on how to enhance the retail area at Dubai's International Airport when Aer Rianta's proposal arrived. A team from Aer Rianta traveled to Dubai to assess the potential. This resulted in a 6-month consultancy contract for Aer Rianta to develop the concept at Dubai International Airport, with the deliverable of opening Dubai Duty Free by the end of December of 1983.

The late His Highness Sheikh Rashid bin Saeed Al Maktoum, ruler of Dubai from 1958 to 1990, was responsible for the transformation and development of Dubai as a vibrant city and economy. His visionary son, His Highness Sheikh Mohammed bin Rashid Al-Maktoum, Minister of Defense at the time, and current UAE Vice President, Prime Minister and Ruler of Dubai, shared his father's the vision for a world class airport for Dubai, which included the concept of a world-leading duty free. The idea was for an enhanced shopping area that could drive high volumes of passenger growth, and be run locally. As such, the mandate of Dubai Duty Free from the start was three-fold, namely to: 1) be a world-class operator, 2) promote Dubai, and 3) support the local economy. The operation began with a finance agreement of AED 3 million (Approximately US\$800,000) from the National Bank of Dubai, guaranteed by the Dubai Government.

A Globally Competitive Enterprise

Dubai Duty Free was designed and conceptualized to be a world-class operator. It currently operates within some 18,000 square meters of retail space at Dubai International Airport, and will grow by a further 8,000 square meters with the opening of the dedicated Concourse A in Terminal 3, which is due to open in the first quarter of 2013. It has remained true throughout the years to its founding principle of providing travelers with a first class retail experience in a shopperfriendly environment with a wide and diverse range of products. Dubai Duty Free has always kept focused on providing services to its premier customer—the passenger—rather than focusing on maximizing turnover.

Dubai Duty Free sales growth has been impressive-soaring from around US\$20 million in 1984 to US\$1.455 billion in 2011. This translates to an average of 17.2 percent growth annually over the entire period. The increase in sales is an even more impressive 20 percent if only counting the most recent decade. In 2008, it became the largest airport duty-free operation in the world as measured by turnover and retained this position up to and including 2010.

Beyond sales growth, Dubai Duty Free has shown its competitiveness in more discerning metrics. The growth of the enterprise has not been driven only by the upsurge in passenger numbers, but also by a focused strategy to increase sales to these passengers. Indeed, Dubai Duty Free sales have increased at a rate much faster than passenger growth. Over 1984-2011, the number of passengers through Dubai International Airport grew significantly from 3.6 million to nearly 51 million in 2011–a total growth of 1,317 percent, averaging 10.3 percent per year. Sales during this period saw an even more dramatic rise of 7,200 percent, at an average rate of 17.2 percent per year, nearly doubling the rate of passenger growth (see Figure 2).

Similarly, Dubai Duty Free has consistently increased what is known in the industry as passenger penetration rate, which measures the percentage of passengers that purchase at least one item. Dubai Duty Free's penetration has grown to 50 percent, meaning that half of passengers purchase at least one item. This passenger penetration rate is more than double the global industry average of around 20 percent. (In 2011, departing passengers spent on average US\$50 and arriving passengers spent on average US\$9 in Dubai Duty Free).





1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010

Another telling metric that illustrates the success of the operation is annual sales per square meter. In 2011, Dubai Duty Free sold approximately US\$80,832 per square meter of retail space, compared to the global average of annual sales per square meter of \$34,492. The high sales rate makes Dubai Duty Free a global leader in this space, and exceeds the global average by a wide margin of 2.3 times (see Figure 3).

Dubai Duty Free A Creative Business Model with Innovation at the Core of Operations

A business-savvy model focused on innovations has facilitated the rapid rise of Dubai Duty Free to a world-leading operator setting new international standards. This includes the company's keen ability to focus on its customers, its capacity to introduce new concepts and innovation to

airport and duty free retailing, and its dedication to deploying the latest technologies. In addition, it has forged close collaborations along the value chain, with suppliers and service providers, key to its success. Commitments by Dubai Duty Free to developing and retaining talent, using creative and sophisticated marketing techniques, and being a socially responsible enterprise, have all contributed to the sustained growth, economic and social well-being, and performance of the company. These enterprise characteristics are common across diverse international indexes that aim to capture the competitiveness strength of countries, such as the World Economic Forum (WEF) Global Competitiveness Index (GCI) and the Institute for Management and Development (IMD) World Competitiveness Yearbook.



FIGURE 3: Duty Free Annual Sales, US\$ per Square Meter (SQM)

Source: Dubai Duty Free, Moodie International Airport Commercial Revenues Study 2010/2011



Top: One of the electronics counters at Dubai International Airport's retail area in the early days. Bottom: Dubai Duty-Free Shop today, panoramic view of Terminal 1.
Catering to the Needs of its Worldwide Clientele

International competitiveness indices include a variety of indicators that measure how well companies focus on customer satisfaction; the degree of customer orientation (WEF-GCI) and the emphasis companies place on customer satisfaction (IMD-WCY) are just two examples of areas in which Dubai Duty Free has excelled over the years.

Dubai Duty Free has focused on providing services to the passenger by keeping its shelves stocked with a wider variety of items than would be expected from a duty free operation, rather than simply stocking items to maximize turnover. For example, it maintains qualified pharmacists on staff, and both over the counter as well as prescription medicines are available on site.

Additionally, Dubai Duty Free has a very strong warranty system in place that allows shoppers to be confident that the product is guaranteed and genuine. While some luxury items are covered under multi-year warranties issued directly by the manufacturers, Dubai Duty Free provides its own one-year warranty on all products sold in its outlet. In the absence of warranty coverage for a particular country, Dubai Duty Free takes responsibility for arranging for the repair, provided it is within the warranty period against manufacturing defect. Items purchased can be returned within 6 months from the date of purchase provided they are unused, in good condition, in original packaging and with purchase receipt.

Likewise, a commitment to a strong customer service ethos ensures that passenger queries are given priority. Dubai Duty Free deploys mobile customer care units throughout the shop to ensure customers have the best possible shopping experience. On average, the Mobile Customers Service staff provides assistance to about 1000 passengers per day in both Concourse 1 and Concourse 2 of Dubai International Airport. More recently, Dubai Duty Free demonstrated a dedicated understanding of its international customers by adopting a dynamic currency conversion system, which allows customers at checkout counters and cash points to pay in all major currencies, including the Chinese Yuan.

Collaborations along the Value Chain

The WEF GCI measures the extent to which exporting companies have a narrow or broad presence in a given value chain. By extension, the indicator implies that when businesses stick to their core competencies, such as retailing for Dubai Duty Free, one of the keys to unlock competitiveness advantages is to forge close collaboration with other businesses in the value chain.

Since its inception, Dubai Duty Free sought to work very closely with its suppliers. Many of the outlets that existed before the launch of Dubai Duty Free were competing with each other at the airport retail area, with no clear growth benefit to the airport—other than rent—and were adding very little to passenger experience. The operation had to be brought in-house to create an image that would fulfill its true potential and turn Dubai into a "must visit" destination.

Dubai Civil Aviation purchased the inventory of all existing retailers, and offered concessionaires preferential status as suppliers. Several of those original concessionaires continue to supply Dubai Duty Free to this day, and have developed strong and mutually beneficial relationships with Dubai Duty Free, achieving unprecedented scale and transforming business models. To provide more value for its customers' money, Dubai Duty Free negotiates volume-based discounts with its suppliers, as well as brand visibility in the retail area. And, true to its mandate, Dubai Duty Free supports the local economy by procuring 70 percent of its merchandise through local businesses.

Agility, Innovation Capacity and Technology Adoption

The capacity of firms to generate new products, processes and services, as well as their ability to use the latest technology, figure prominently in the WEF-GCI and IMD-WCY measures. Over its history, Dubai Duty Free has introduced various innovative solutions to the basic duty-free business model, and has also been an early adopter of the most advanced technology to improve the efficiency of operations.

For example, from the beginning, Dubai Duty Free has maintained a 24/7 operation, which is seen as a key driver of top line growth, and allows for an increased volume of passengers, who are able to experience the retail environment as part of their overall travel experience.

Other new concepts for a duty free operator that Dubai Duty Free has developed include the creation of its own brand—Akaru, as well as the development of exclusive products only for sale at Dubai Duty Free. Moreover, in 1987, Dubai Duty Free was one, if not the first, to open retail space available to arriving passengers. This initiative continues to maintain high potential to drive growth in Dubai Duty Free and in the global industry. The dynamic currency conversion system detailed in the preceding section is yet another example of innovations that Dubai Duty Free has introduced to the basic model.

Behind the retail area, the growth of Dubai Duty Free has been enabled by excellence in logistics. Dubai Duty Free moves over 120,000 pallets per year from the warehouse to the shops and has implemented a state of the art semi-automated warehouse to cope with this volume. By creatively utilizing the latest information technology solutions, Dubai Duty Free has been able to scale its business while minimizing warehouse space.

Dubai Duty Free's automated warehouse employs the latest technology in logistics and seamlessly moves more than 120,000 pallets per year to the retail area.





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Creative and Sophisticated Marketing

Throughout its history, Dubai Duty Free has placed a premium on creative, internationally recognized marketing campaigns and promotions, another theme featured in WEF-GCI indicators. Dubai Duty Free has awarded 1,500 luxury cars to winners from 70 countries in the Dubai Duty Free Finest Surprise promotion, first launched in 1989. Since 1999, Dubai Duty Free has created 133 Millennium Millionaire winners winning US\$1 million each, and six Double Millionaire winners were awarded with US\$2 million.

Diverse, Long-Serving Staff

Developing and retaining staff, as well as female participation in the labor force, are highlighted as a competitiveness theme in both the WEF-GCI and IMD-WCY. Dubai Duty Free has always maintained a commitment towards developing staff and employee retention, and today, Dubai Duty Free employs around 4,680 people, with a low turnover rate of around 9.9 percent. About 47 of the original 100 employees are still with the company.

These high levels of staff retention are due, among other things, to a policy at Dubai Duty Free of internal promotion and commitment to train and develop its staff. Dubai Duty Free staff training occurs both in-house and through thirdparty providers. In-house training programs developed by Dubai Duty Free include courses such as 'World Class Service', 'Selling Skills', 'Harmony in Cultural Diversity,' etc. Other courses include e-Learning and product training, and selected staff members have access to programs through third-party providers in more specific soft and technical skill areas.

Dubai Duty Free has embraced the importance of diversity as a business imperative and as a source of excellence in service, market insights, and overall competitive advantage. It offers a diverse working environment, employing staff from 45 different countries. In addition, its strong commitment to gender equality has resulted in more than 50 percent of the total workforce being female. The employment of female talent is even greater when considering senior positions, as an impressive 36 percent of all Dubai Duty Free managers are women, including two vice presidents and several senior managers.

Dubai Duty Free: A Good Corporate Global Citizen

The IMD-WCY also measures the level of social responsibility in business leaders. In this respect, Dubai Duty Free provides ongoing financial support to more than 45 charities, supporting diverse causes such as: improving medical treatments for terminal diseases, humanitarian relief funds, assistance to the disabled, and the promotion of culture and the arts. These organizations include the Al Noor Training Center, Médecins Sans Frontiéres, King Hussein Cancer Foundation, The Smile Train, SightSavers, The Princess Haya KHDA Initiative, the Emirates Diving Association and the Dubai Center for Special Needs, among others.

Additionally, the company is committed to reducing the environmental impact, and health and safety risks, associated with warehousing and retailing its goods. As such, it operates an Integrated Management System in accordance with the requirements of ISO14001:2004 and OH-SAS18001:2007, with the objective of providing a safe and environmentally friendly environment for employees, customers and neighbors.

A Multiple Award Winner–More than 250 Awards and Growing

To date Dubai Duty Free has received more than 250 awards from international, regional and local entities, which further illustrate the operation's retail success. Examples of them are the Global Traveler (US) presentation of the 'Best Duty Free

"The Fly Buy Dubai" An Award Winning Marketing Campaign

The Fly Buy Dubai marketing campaign was conceptualized early on and launched formally in 1984, lasting about a quarter of a century. It gave lasting identity to the emerging operation. Beyond supporting the aim of promoting the brand 'Dubai', it also promoted the wider aspiration and vocation of the Emirate as an air transit hub. "Fly Buy Dubai"—those three words are perhaps the best expression of the symbiotic relationship between increased passenger traffic and visits to Dubai with the prosperity of the enterprise. It won in 1986 the prestigious Frontier Award for 'Best Marketing Campaign.'

Shopping' trophy to the operation for the past five consecutive years. At the inaugural ceremony for The Middle East Accountancy and Finance Awards, Dubai Duty Free was presented with the award for 'Excellence in Innovation' for the retail operation's outstanding warehouse projects. And, from Frontier Awards, considered equivalent to the "Oscars" of airport retailers, Dubai Duty Free is a frequent winner of the annual Airport Retailer of the Year, Best Marketing Campaign, and many others.

The operation was also honored at the Sheikh Mohammed Bin Rashid Al Maktoum Patrons of the Arts Awards in April 2012 for its contribution towards cultural and arts initiatives in Dubai.

Beyond the Enterprise: The Impact of Dubai Duty Free

Dubai Duty Free has been a major feature in enhancing and showcasing the Dubai brand and the image of the UAE as a whole. It has been one of the earliest promoters of Dubai, even before the launch of the award-winning Emirates Airline. From the start, the symbiotic relationship with the growth of the rest of the aviation sector was envisioned and made an integral part of its strategy: more passengers led to more shopping, and better shopping leads to more passengers.

Dubai Duty Free is a part of, and has been instrumental in the growth of the aviation sector, which is a major contributor to the economy. According to a report by the Global research firm Oxford Economics the sector currently accounts for \$22 billion, or 28 percent of Dubai's GDP.

Through its strength, innovative drive, and recognition of the synergistic relationship between passenger growth and increased revenues, Dubai Duty Free has been a major player in promoting premier sport events in the Emirate. In the early days it organized the World Karate Championship, sponsored the UIM World Power Boat Race, and continues to be a major sponsor in horse racing events. Notably, Dubai Duty Free built the Dubai Tennis Stadium at the Aviation Club, and owns and organizes the annual Dubai Duty Free Tennis Championships, comprising a Women's Tennis Association (WTA) week played back-to-back with an Association of Tennis Professionals (ATP) 500 tournament. This has become a favorite of many top ranked players, who have voted Dubai as the 'Tournament of the Year' for the last 20 years and regard it as a 'mini Grand Slam.'

Dubai Duty Free has proven to be more than a successful adaptation of the Irish experience in duty free retailing. While the basic model was imported, it was built upon and enhanced with indigenous innovations in Dubai. Moreover, in 1983 when Dubai Duty Free began there was no true duty-free industry in the Middle East. Dubai Duty Free virtually built it from the ground-up – establishing a powerful precedent, and serving as a catalyst for development in the region. The series of innovations detailed here have impacted the industry and have been replicated elsewhere regionally and around the world.

Indeed, over the decades following the opening of the first duty free shop in 1947, the concept spread globally, and as an industry is currently worth some US\$46 billion. However, one can only speak of a mature, consolidated industry after it has reached new heights; with the advent of Dubai Duty Free, retail space management and duty-free operations became a first-tier issue and its role as an after-thought became a thing of the past.

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About the Article

The case study was written prior to the opening of the dedicated Airbus 380 Concourse, which is expected to open in early 2013 with an expected annual number of passengers surpassing 15 million. The article was initially written by Marcos Arocha, an Advisor to the Emirates Competitiveness Council, on the basis of a series of interviews with Executives from Dubai Duty Free between in June-July of 2012. Contributions and editorial support were provided by Emirates Competitiveness Council staff: Najeeb Al Ali, Mohammed Hassan, Alya al Mulla, Samer Kustantini, Shaheena Mohamed, Thuraya Al Hashimi, Hana Ahli, Hanan Ahmed, Maryam Al Madhani and Kai Chan.

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The views expressed are those of the author's and are not necessarily those of the ECC. About the Author: Marcos Arocha previously worked as a consultant on more than 20 competitiveness programs supported by national governments and development agencies around the globe. He holds a Master of Science in Foreign Service (MSFS) from Georgetown University (Washington DC).

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UNITED STATES

U.S. Manufacturing Competitiveness Initiative: Preparing America to Succeed in the 21st Century Global Innovation Economy

Setting the Stage

American manufacturing and ingenuity built a U.S. economy that has been the envy of the world and one of the great success stories of the 20th century. Mechanization and electrification spawned an industrial age that replaced more than 3,000 years of human and animal labor with factories, which drove a rise in manufacturing that correlated with growth in GDP per capita.¹ Industry and capital gave rise to numerous iconic American brands and drove the creation of a vibrant middle class.

As the global economy evolved, greater competition pushed U.S. firms to change in order to compete. And today, many manufacturers believe that global competition has made them stronger, more productive and more competitive. Gains in productivity and output, however, are not translating into broader economic gains and have had an inverse effect on employment. Profits, wages and economic growth rely on productivity, however, as productivity rises, fewer workers are needed to meet the demand for products (Figure 1). During the past 20 to 30 years, U.S. manufacturing employment declined due to dramatic productivity improvements through automation; global competition in labor-intensive goods from low-cost producers; and rapid growth in overseas markets, talent, investment and infrastructure.



The Current U.S. Manufacturing Landscape

Manufacturing continues to be a major contributor to the U.S. economy, adding \$1.8 trillion to GDP, or accounting for 12.2 percent of U.S. total economic output.² Manufacturing firms pay higher wages than those in other sectors and employ 11.8 million U.S. workers, and American manufacturing supports nearly seven million additional jobs in other industries. Due to substantially larger supply chains than other sectors, manufacturing firms have the highest multiplier effect on the U.S. economy of any industry (Figure 2).³ However, America's share of global manufacturing output since 1970–which has remained fairly constant at around 22 percent–recently dipped below 20 percent.⁴

² Bureau of Economic Analysis, U.S. Department of Commerce. Gross Domestic Product by Industry: Value Added by Industry. April 2012.

Johnston, Louis and Samuel H. Williamson, "What Was the U.S. GDP Then?" *Measuring Worth*, 2011.

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National Accounts United National Clustering Distribution COD and its Paralleleum

⁴ National Accounts, United Nations Statistics Division. *GDP and its Breakdown at Current Prices in U.S. Dollars (all countries and regions)*. December 2010.

FIGURE 1. U.S. Manufacturing (Labor) Productivity and Output Have Risen While Employment Has Declined

Source: Bureau of Labor Statistics



As dramatic increases have taken place in both productivity and output, the opposite has occurred in employment. From 1987 to 2010, output per hour in manufacturing increased an average of 4 percent annually and from 2000 to 2007, the increase was even greater—an average of 6 percent annually.

While productivity growth slowed at the onset of the Great Recession, levels have recently approached 5 percent or higher.

During the same period, the United States lost about 7 million manufacturing jobs.

The image of manufacturing as dumb, dirty, dangerous and disappearing-a notion widely held by Americans⁵-is far from accurate. Today, manufacturing is smart, safe, sustainable and surging, involving a wide range of digital, mechanical and chemical technologies that infuse every step of designing, developing, fabricating, servicing and delivering manufactured goods. More than ever, manufacturing is about engaging with customers and creating new products and experiences tailored to their needs and wants. Many U.S. manufacturing firms remain at the technology frontier, especially in computers, medical devices, chemicals, machinery, aerospace and military equipment-though this advantage is narrowing. Manufacturers account for roughly two-thirds of U.S. R&D expenditures and employ more engineers and scientists than any other private sector industry. Manufactured goods also represent twothirds of U.S. exports and drive more net wealth creation than any other sector.⁶

In the modern global, consumer-oriented and knowledge-intensive economy, the competitiveness of U.S. manufacturing has never been more uncertain or important—nor have policy prescriptions been more contentious. Fully examining the global manufacturing landscape, capturing insights from key stakeholders, connecting data, and developing and implementing responsive policy is critical to securing a prosperous and competitive American future. The Council on Competitiveness' U.S. Manufacturing Competitiveness Initiative was formed to re-invigorate the dialogue on policies and practices necessary to ensure the long-term success of American manufacturing.

⁵ Deloitte Research. Managing the Talent Crisis in Global Manufacturing: Strategies to Attract and Engage Generation Y. June 2007. 4.

⁶ The Manufacturing Performance Institute (MPI) and the American Small Manufacturers Coalition (ASMC). Next Generation Manufacturing Study: Overview and Findings. June 2009. 5.

FIGURE 2. Multipliers for Sectors of the Economy

Source: U.S. Department of Commerce, Bureau of Economic Analysis



Preparing for a Prosperous Path Forward: the U.S. Manufacturing Competitiveness Initiative

In June of 2010, the Council created the flagship U.S. Manufacturing Competitiveness Initiative (USMCI) to examine and address the barriers and opportunities in the manufacturing sector. Since its inception, the USMCI has assembled a dynamic cross-section of America's top private sector leaders, representing the entire manufacturing value chain, to advocate for comprehensive solutions that will make the United States the most fertile and attractive environment for highvalue manufacturing.

In December of 2011, the Council hosted the National Manufacturing Competitiveness Summit, a day-long series of conversations highlighting crucial issues and innovative solutions to improving manufacturing competitiveness and growing American prosperity. This event served as the launching point for the Council's national manufacturing strategy, *Make: An American Manufacturing Movement*—a report representing the culmination of more than 18 months of exhaustive research that convened hundreds of business, university, labor, laboratory and government leaders for discussions focused on America's manufacturing future.

The USMCI builds on the heritage of two landmark Council efforts of the past decade. The 2004 National Innovation Initiative, which identified advanced manufacturing as an over-the-horizon issue requiring attention in order to preserve U.S. innovation capacity, and the 2009 Energy Security, Innovation and Sustainability Initiative, which yielded important insights about securing the future of U.S. manufacturing. The USMCI also works closely with other current Council initiatives, including the Technology, Leadership and Strategy Initiative (TLSI), which convenes more than 40 chief technology officers to understand technology investment drivers and strategies for the 21st century, and to establish a new paradigm for collaboration between the public and private sectors to optimize America's investments in research, talent and technology; the Economic Advisory Committee (EAC), which assembles

more than 40 chief economists to suggest actions to spur U.S. economic growth; and the High Performance Computing (HPC) initiative and the resulting National Digital Engineering and Manufacturing Consortium (NDEMC), which is working to energize the growth and development of smalland medium-sized American manufacturing enterprises through simulation and cutting-edge modeling techniques.

Deloitte and the Council: *Global Manufacturing Competitiveness Index* and *Ignite 1.0-3.0*

Concurrent with the launch of the USMCI, the Council and Deloitte released the *2010 Global Manufacturing Competitiveness Index*,⁷ a worldwide survey of 400 C-suite manufacturing executives on their opinions of manufacturing competitiveness today and the competitiveness landscape over the next five years. The *Index* is a ground-breaking analysis of the decision-making process in the manufacturing sector, and has been a strategic tool to advance the Council's work since its release.

The Council and Deloitte teamed up again to develop the *Ignite* report series-a multi-part, interview-driven project capturing insights from diverse leadership groups across the American manufacturing landscape. Ignite 1.0: Voice of American CEOs on Manufacturing Competitiveness,⁸ was released in February of 2011, and recorded the input of nearly 40 CEOs on the measures necessary to advance U.S. manufacturing; Ignite 2.0: Voices of American University Presidents and National Lab Directors on Manufacturing Competitiveness,9 released in August of 2011, highlighted the perspectives of leaders in higher education and research on the importance of education, research and discovery for America's manufacturing future; and Ignite

3.0: Voice of American Labor Leaders on Manufacturing Competitiveness,¹⁰ released in December 2011, featured many of America's top labor leaders on reinvigorating the domestic economy and developing well-paying, high-skills jobs in the United States.

Building on the findings of the 2010 Index, the Council and Deloitte released the 2013 Global Manufacturing Competitiveness Index in November 2012 at the Council on Competitiveness' inaugural National Competitiveness Forum. The 2013 Index is the next phase of a multi-year initiative to better understand the trends creating a hyper-competitive global manufacturing environment and empower business, academic, labor and policy leaders to react to these changes and, where possible, leverage them to their advantage. The Index highlights the top ten drivers of manufacturing competitiveness (and their 40 subcategories) on a global scale, as well as through a regional lens, allowing for a more in-depth study of what works where, and why. The most important driver of manufacturing competitiveness in the 2010 Index, as well as the 2013 Index has been Talent-Driven Innovation, and this is slated to remain important over the next five years.

"Out-of-the-Blue" Dialogue Series

Another major thrust of the USMCI has been the ongoing "Out-of-the-Blue" dialogue series, through which Council members across the country host a series of provocative manufacturing discussions. During the course of the initiative, these strategic conversations have brought together hundreds of experts and practitioners to challenge conventional wisdom about U.S. manufacturing.

The topics addressed during these dialogues focus on important challenges, including talent development and workforce skills; commercialization and capital investment; supply chain logistics and sustainable manufacturing; advanced manufacturing collaboration and materials; food, water

⁷ http://www.compete.org/images/uploads/File/PDF percent20Files/2010_ Global_Manufacturing_Competitiveness_Index_FINAL.pdf.

⁸ http://www.compete.org/publications/detail/1648/ignite-1.0/.

⁹ http://www.compete.org/publications/detail/1731/ignite-2.0/.

¹⁰ http://www.compete.org/publications/detail/2074/ignite-3.0/.

and energy; standards and trade; and intelligent infrastructure, among others. These conversations have allowed the Council to do a deeper dive into the barriers to manufacturing competitiveness and have exposed new paths forward. Participants have encouraged themselves and the nation to re-think what can and should be done to achieve America's full manufacturing potential, and their input has revealed unexpected solutions.

Make: An American Manufacturing Movement

These efforts, in conjunction with ongoing research by Council staff, were distilled into *Make: An American Manufacturing Movement*, a comprehensive national manufacturing strategy that the Council released at the December 2011 National Manufacturing Competitiveness Summit. This strategy puts forth five critical challenges facing American manufacturing and offers specific solutions to address them. The Council's leaders view this strategy as a starting point and envision a multi-year effort with key decisionmakers to implement and evolve the solutions.

Make recognizes that there are enormous opportunities to increase production and grow exports. The digital, biotechnology and nanotechnology revolutions are unleashing vast opportunities for innovation and manufacturing. They will enable new business formation, product development and job creation. In some cases, they will serve as platforms for entirely new industries and markets. Implementing this strategy will require changing the national conversation, embracing new competitive realities and resolving to take meaningful action to unleash America's production potential. Doing so is not ultimately about supporting specific companies, though their success should be celebrated. Nor is the chief aim to solely move the needle on macroeconomic metrics, though progress must be measured. This strategy is about igniting a manufacturing sector that forges good jobs for Americans and a prosperous future for their families.

1. Fueling the Innovation and Production Economy from Start-Up to Scale-Up

Ideas, inventions, knowledge and technology are all deeply ingrained into the American entrepreneurial spirit, however, this does not always translate into domestic production. The United States has fallen from its historical position on the R&D pedestal, and much of what has happened in the American innovation and production economy has more to do with money than minds. The U.S. entrepreneurial enterprise is a critical advantage, and America must do more to enable entrepreneurs to take risks and translate ideas into innovation. America is still leaving ideas on the table. Thousands of inventions continue to lie dormant in the hands of universities, research centers and private companies without funds to move forward.

While the United States does not lack innovative ideas, bringing those ideas to the start-up phase is becoming increasingly difficult. Many firms find both domestic start-up and scale-up difficult due to structural costs, investment constraints, uncertainty, tax and regulatory burdens and offshore incentives. Because of this, companies continue to move production out of the country, and some caution that innovation is not far behind. To capture the full benefits of the American innovation and production ecosystem, both ideas and inventions need to be at the forefront of policy and investment.

The financial and regulatory climate in the United States has led both companies and investors to become extremely risk-averse, stifling growth and eroding the capacity for innovation. One of the major factors for the lack of capital flow within the country has to do with corporate tax structure. To encourage financial investment in innovation and entrepreneurship, the United States needs to replace the current worldwide double taxation system with a territorial tax system, facilitating the repatriation of earnings, increasing investment, stimulating production at scale and neutralizing foreign incentive packages. Innovation is not solely restrained to factories; fiscal and regulatory policy and investment strategies must be re-vamped and re-worked right along with the evolving technologies that will shape the future.

2. Expanding Access to Global Market Opportunities

Cross-border trade continues to be critical for increasing manufacturing productivity, growing exports and creating jobs. Trade allows producers to specialize in goods where there is a comparative advantage and allows consumers to buy goods at lower prices. The United States exported \$1.8 trillion in 2010-\$1.2 trillion in goods and \$600 billion in services-supporting 9.2 million jobs.¹¹ While the United States has maintained a balance of trade in services, it has continued to run the world's largest trade deficit in goods, \$646 billion in 2010.¹²

There remain significant barriers to trade, such as industrial policies that limit market access to other countries' markets, lax enforcement of intellectual property rights, restrictive licensing systems, government procurement restrictions, foreign equity limitations, tariffs, government subsidies to industry, domestic and foreign export controls, lack of transparency in laws and regulations, local content requirements, standards that favor domestic producers, technical regulations that favor domestic firms, in-country testing requirements and more. It is estimated that the elimination of remaining global trade barriers could increase the gain America already enjoys from trade by another 50 percent.

Intellectual property protection, one of the many significant trade barriers, also affects the growth of innovation through the barriers in the United States' technology transfer process. Universities across the country are developing breakthroughs that will not be commercialized—large companies do not see the returns, and small companies do not have the access. Entrepreneurs and start-ups

12 Ibid.

live by the philosophy of nothing to lose, everything to gain. With IP in hand, and this high-risk, high-reward mentality, entrepreneurs and small businesses could bring about radical inventions in this country; inventions that are sitting on the shelves of universities and laboratories waiting to become something.

3. Harnessing the Power and Potential of American Talent to Win the Future Skills Race

The United States needs highly-skilled workers to realize the productivity gains essential to remaining globally competitive. Yet current and anticipated human capital deficiencies exist across the board. Not only are current openings for highlyskilled workers challenging, manufacturing workers are retiring at a much faster rate than they are being replaced. The growing shortfalls represent a critical need for a wide range of skills across many occupational cuts, from the most rudimentary to the most sophisticated Ph.D. level.

Current and future talent and skills requirements can be met. Despite numerous challenges, particularly in K-12 instruction, America's overall education system remains diverse and world class. Top universities and community colleges are linked with local industries, while many companies invest in their workers' educations. Another major focus continues to be graduating more students with advanced degrees in science, technology, engineering and mathematics (STEM) disciplines, as well as improving STEM literacy in general. America remains a magnet for immigration and must build on these strengths to expand the pool of technical and highly-skilled talent.

Old stigmas associated with vocational training must be cast aside. Career and Technical Education (CTE) coursework and certifications, and just-in-time training on the job, in the classroom, at experiential training centers or online offer the most expedient and often most effective pathway for acquiring necessary skills. This is true for both new entrants and incumbent workers. The

¹¹ U.S. Census Bureau. Statistical Abstract of the United States 2012, Table 1300 U.S. International Trade in Goods and Services.

most effective community colleges have long been engaged with the local business community, responding to the needs of employers by tailoring curricula to workplace demands.

The issue is not just policy, and it is not just perception. The United States needs to take pride once again in its workforce, reform curriculum to incorporate invaluable skill sets, and innovate impressions of U.S. manufacturing to attract and retain the necessary talent for an American manufacturing movement.

4. Achieving Next-Generation Productivity Through Smart Innovation and Manufacturing

The potential for manufacturing process innovation is enormous. Smart manufacturing is an ongoing effort to integrate many of the trends described in this strategy—such as HPC, cloud computing, data mining and user-driven customization—across global production enterprises and supply networks. By marrying these technological capabilities with human insight, smart manufacturing promises to revolutionize the way production is organized and delivered. As manufacturing intelligence of this kind grows, it will inspire innovations in processes and products that will unleash new, disruptive capabilities—such as a \$3,000 automobile or a \$300 personal computer.

Smart manufacturing enables a coordinated and performance-oriented enterprise that responds quickly to the customer, minimizes energy and material use, maximizes health and safety, and generates innovation. Today, smart tools and systems that generate and analyze greater amounts of data are being used to plan, design, build, operate and manage industrial facilities and networks. Smart manufacturing is a growth engine for jobs and a sustainable economy, driving manufacturers to achieve higher levels of business performance, turn resources into assets and discover unique opportunities for competitiveness. Though industry is adopting components of smart manufacturing, the infrastructure, capabilities and investments needed to deliver the full potential of this knowledge-based environment have yet to be developed. U.S. private and public sector leaders will need to partner in order to seize this potential advantage. Building and linking emerging advanced manufacturing clusters and centers of excellence across the country is a needed step to cultivate the advantages offered by smart manufacturing. Many countries are moving ahead of the United States in the race to re-industrialize their manufacturing base with smart, safe and sustainable manufacturing.

5. Creating Competitive Advantage Through Next Generation Supply Networks and Advanced Logistics

U.S. manufacturers depend on a wide range of infrastructure to deliver products to the marketplace-energy infrastructure to power manufacturing plants; transportation infrastructure to move people, materials and produced goods; telecommunications and cyber infrastructure for company, factory and supply chain management; and more. From laboratories to factories, progress takes time, and investments are crucial. This is particularly important to recognize with infrastructure development. Roadways, ports, grids and power plants are not built overnight-some may even take upwards of 10 years to reach full functionality-and returns on investments, although far-reaching, do not fit within traditional timelines. A more proactive, long-term infrastructure outlook is essential for the continued productivity of all sectors.

Currently, there is no clear path forward on national infrastructure policies. Some of this uncertainty is due to a lack of government research into what sectors need the most improvement, as well as a general lack of public funding for improvement projects. Greatly expanding public-private collaboration on infrastructure issues is needed. The lack of maintenance and failure to modernize has left much of the physical infrastructure outdated and crumbling. Systems crucial to manufacturing—aviation, roads, rails, ports, hazardous waste and wastewater—are in poor condition. An estimated \$2.2 trillion will be needed over five years to bring U.S. infrastructure to good condition, yet current spending is about half of what is needed.¹³

America's rapidly expanding telecommunication and data networks are inextricably linked to the successful daily operation of its businesses and, by extension, its economic security. These networks govern the nation's transportation, water and power systems; govern the transmission of critical financial, health and legal data; and afford Americans a lifestyle of convenience. Alarmingly, these critical infrastructures are increasingly threatened by malicious cyber activities. America's intellectual property, banking institutions and health data are being pillaged on an unprecedented scale. America's vulnerability to cyber attacks and the consequences for breaches of security continue to increase, even as its information systems become more extensively networked through common and often unsecured systems. To combat these threats, new and effective solutions must constantly be identified, developed and deployed throughout the nation's cyber infrastructure.

The Past, Present and Future of the USMCI

This strategy recognizes that, as part of a highlyconnected global economy, America's economic health is not immune from the debt struggles of Europe or from the strength of emerging economies that are increasingly a destination for American exports and investment. The Council harbors no illusions about America's daunting economic challenges, but believes steadfastly that the challenges are solvable and that Americans and their leaders will summon the will to act decisively. As a result, the USMCI—driven by these challenges and the importance of discovering solutions—has become increasingly involved in many facets of manufacturing policy within both the public and private sectors.

The USMCI worked to make 2012 an impactful year for the industrial sector. President Barack Obama's State of the Union address drew heavily on the language in *Make*, and the Council's manufacturing efforts have significantly influenced the resulting public policy conversation. The Council briefed several Congressional Committees on the strategy's recommendations, and Council members worked in conjunction with both political parties to elevate the discussion to national prominence during the recently completed presidential campaign season.

In addition to working with policymakers, the Council continued to host its "Out-of-the-Blue" manufacturing dialogues in order to keep abreast of the policy needs of manufacturers. Throughout 2012, USMCI dialogues have touched upon key topics, including supply chain logistics, accelerating and innovating workforce development, advanced manufacturing collaboration and talent driven innovation. These dialogues will carry into 2013, with further conversations on critical issues like smart and additive manufacturing; cyber security and innovation clusters; and advanced robotics and strategic materials, among others. The Council is extremely grateful to our members who have hosted these dialogues, as well as to those who will host them in the coming year.

The USMCI, and the Council as a whole, remain focused upon ensuring that the recommendations and concerns of our members are heard and implemented to sustain and grow the country's manufacturing base, enhance national standards of living and increase global competitiveness.

¹³ American Society of Civil Engineers, 2009 Report Card for America's Infrastructure, March 25, 2009.

JAPAN

The Great East Japan Earthquake

The Role of ITS and Private Sector Automobile Probe Data in Natural Disaster Crisis Management

Introduction

The Council on Competitiveness Nippon (COCN), in close collaboration with government and academia, aims to strengthen the international competitiveness of key technology-based industries. Since it was established in 2006, COCN has been engaged in a wide range of innovation-based projects surrounding environmental technology, social infrastructure technology and high-technology, among others.

One of COCN's initial projects in 2006 was the "Traffic and Physical Distribution Renaissance Project," which looked for solutions in sustainable mobility, halving traffic congestion and CO_2 emissions, and eliminating traffic fatalities through the use of Intelligent Transportation System (ITS) technology. The COCN presented the conclusions of this project to the government, which recognized their impact and value, and resolved to make ITS a national project with the support of the Cabinet Office.

ITS Japan has played a pivotal role in public and private promotion of verification testing and technology development; and, following the 2011 disaster in Japan, the investments and efforts made in ITS helped facilitate and expedite rescue operations and restoration efforts.

Background

Many lives were lost in the Great East Japan Earthquake and tsunami that occurred on March 11, 2011, and, in September of the same year, Japan was also hit by a very large typhoon. ITS Japan, which promotes the research & development and practical use of this technology, provided automobile traffic record information to support onsite recovery activities.

COCN Council on Competitiveness-Nippon

Before examining the role ITS and probe data played in relief efforts, one must first understand the development of both ITS and ITS Japan. Intelligent Transport Systems (ITS) technology was defined in 1996 through the "Comprehensive Plan for ITS" by government offices as an: "Integrated system for people, cars and roads...using cutting-edge information and communication technology, and support for safe driving, optimization of traffic control, and increasing efficiency in road management."

The development of ITS Japan was driven by international processes. In 1994, the 1st ITS World Conference was held in Paris, and, based on bi-annual meetings held around the world, in 1995 the decision was made to hold the ITS World Conference in Yokohama, Japan. However, before this decision, the Vehicle, Road and Traffic Intelligence Society (VERTIS) was established in Japan in January of 1994 as a voluntary organization, supported by five related ministries (National Police Agency, The Ministry of International Trade and Industry, The Ministry of Transport, The Ministry of Posts and Telecommunications, and The Ministry of Construction), to promote commercialization and research and development in the ITS field. In June 2001, VERTIS changed its name to ITS Japan.

To illustrate the multi-faceted impacts of this technology, this case study focuses on two examples of how ITS Japan was used to assist in natural disaster recovery efforts.

The Case of the Great East Japan Earthquake

The earthquake on March 11, 2011 was measured at a magnitude of 9.0 on the Richter scale, the largest earthquake in the history of Japan. The quake reached the maximum seismic intensity of 7 and the hypocenter was very wide, 500km north and south, and 200km east and west, along the shores of the lwate and Ibaraki prefectures. As a result of the earthquake, tsunamis up to 10m high caused severe pacific seashore damage in the Tohoku and Kanto areas.

Together with the tsunami, tremors, landslides and dam failures, etc., caused further widespread damage in broad expanses of these areas, and many escape routes and methods were cut off. The death toll from this disaster totaled more than 13,000 people, with more than 14,000 missing and more than 60,000 buildings completely destroyed (as of April 12, 2011).

During the disaster, ITS Japan received anonymous, statistically collected "probe" data from Honda Motor Co. Ltd., Pioneer Corporation, Toyota Motor Corporation and Nissan Motor Co. Ltd, and began offering "automobile traffic record information" on the ITS Japan home page on March 19. This allowed recovery workers to determine road conditions ahead of time through the use of automobile probe data. In the road traffic field, probe data is defined as traffic condition data from onsite running automobiles—various sensors on vehicles are considered to be probes.



In 2010, over the course of three months, COCN compiled and consolidated probe data (originally from seven separate organizations) into a database and evaluated traffic patterns.

The graphic below shows normal vehicle movement for one day.

The objective of this data was to distribute extensive transportation information, by unifying and integrating each data set, for those within and attempting to reach devastated areas. This data compilation also reflects the willingness of involved parties to work together in times of natural disaster, as this was the first ever attempt by competing companies to manage/display/offer probe data voluntarily. Under normal conditions, most roads can be utilized, and traffic information is important for the purpose of ensuring smooth transportation. During natural disasters, however, the most important piece of information becomes road accessibility or the ability to reach affected areas. Such information changes daily, reflecting adjustments like roads opening that were unable to be accessed, and roads closing due to aftershocks or re-construction.

After the Chuetsu Offshore Earthquake in 2007, the decision was made to renew this data every 24 hours—rather than recalculating the links (section-based road measurements) of traffic records—using the case by Honda Motor Co. Ltd and Agency on *Promoting Disaster Mitigation and Damage Reduction*. Each company involved



in the effort was asked to make a list of those links that collected automobile sensor probe data over the previous 24 hours, and that data was then provided to ITS Japan. The range was set to a wide area, not only where there was severe damage from the earthquake and tsunami, but also close to the Sea of Japan, which became the site of possible detour routes.

ITS Japan was able to compile traffic record data from four companies by 10:00 a.m. on March 11, and speedily transmitted updated traffic information every day following the disaster. These activities were made possible by the efforts of each company's team, working day and night to create the reporting mechanisms, and also by overtime personnel efforts.

ITS Japan was in close communication with various ministries and government offices directly following the Great East Japan Earthquake. The most up-to-date "closure and obstacle information" was provided daily by the Geospatial Information Authority of Japan, which ITS Japan then combined with traffic record data. The creation of a public-private partnership in support of devastated areas was a step in the right direction. Application procedure arrangements started immediately, and the delivery of "traffic data & closure and obstacle information" started approximately 1 month later. The "closure and obstacle information" utilized at the time was integrated into a "Map of road regulation information in Tohoku region" by the Geospatial Information Authority of Japan. This map was created using data from each damaged region and the road data system of the Tohoku Regional Bureau.

Diagram 1 shows the roads in the area, and ITS Japan superimposed the road closure information onto the existing government map. Through this closure and obstacle information, one can clearly see that roads and areas of the country are impassable for both drivers and recovery workers. Such "closure and obstacle information" is very important, and it assisted greatly in the publicprivate partnership for disaster area support after the Great East Japan Earthquake. A certain level of accuracy in gathering and executing data, and appropriate time for confirmation, was required to ensure the availability of information. In times of natural disasters in Japan, it is important to expand these public-private partnerships utilizing flashing traffic record data, allowing for the gathering of more accurate information as time progresses.

The Case of the 2011 Typhoon

In September 2011, a large typhoon (Typhoon #12) hit Japan and blocked traffic in a large area of the Kii peninsula. Following the experience during the Great East Earthquake, on September 22nd ITS Japan began providing "Traffic records and road regulation information" in cooperation with road management agencies. On the same day, ITS Japan distributed "Traffic records and road regulation information of passenger cars and trucks" with data gathered from Isuzu Motors Limited's advanced traffic information service system.

Traffic guidance for trucks in normal conditions is issued for daily report management, safe driving, and eco driving, etc.; detailed movement tracking is unnecessary, therefore location information is only recorded approximately every 10 minutes. The importance of trucking data is the overall service management information gathered in a daily report at the end of each route. There are cases where truck-based data is sent in real time, however, the data is often only available after the truck returns to the office.

When unifying traffic record data for passenger cars and trucks, it is more useful if the data from passenger cars are divided between the links that trucks did and did not travel, and it is indicated in different colors. However, for example, it is difficult to specify which road was used if a truck ran at an average of 30km/h for 5km, and the information

Diagram 1. Traffic Record Information



is recorded every 10 minutes. Therefore, traffic record of trucks is indicated in dots. The traffic record data for passenger cars and trucks near Owase City in Mie prefecture on September 24th is detailed in Diagram 2. The traffic records from passenger cars are the blue lines, from large and mid-size trucks the light blue circles, and from small trucks the green circles. With this system, information about roads only traveled by passenger cars as well as about roads travelled by both passenger cars and trucks became more easily discernible.

Diagram 2. The Traffic Record



Future Challenges

From the above examples, it becomes clear that if each automobile sensor probe data is bundled in volume and united with field sensor data with high reliability, the following three proven values are created, not by mere research, but by real-life crisis management and problem solving:

- Prompt disaster crisis management power for the good of society with speed and "resiliency" function.
- 2. Useful automotive probe data provides insight into the territory where coverage and immediacy emergency needs are high.
- 3. Joint optimization of community and individual value by auto-user and citizen participation.

ITS-Japan proposed the installation of a regional ITS information center with collection from fixed sensors united with probe data. In normal circumstances, the public sector is provided with an eco-driving map, "Hiyari-Hatto (near miss)" map; however, during emergencies, this information can be switched to relay urgent information.

To further current achievements, ITS Japan cooperated with cities and different public and private sector agencies, and began operating through the system detailed in Figure 2.



FIGURE 2. System Framework

Conclusion

The efforts of ITS Japan following the Great East Japan Earthquake proved that innovative information integration by several corporations was more useful than that of a single company. Combining the data from both automobile probe information as well as field investigation by the government and prefectures led to more practical assistance in recovery efforts and support for victims. On the occasion of Typhoon #12, the use of truck probe data allowed for the transmittal of traffic information from large vehicles transporting relief in combination with that of regular passenger vehicles.

Through these situations, ITS Japan recognized once again the importance of such information, as well as the necessity for systematic and speedy ITS system and probe promotion. Most importantly, it became clear that ITS plays a critical role, for both automobiles and communities, in supporting the functions of everyday life, and protecting lives and properties in times of need and crisis management, especially during natural disasters.

Finally, although this case study focuses on the importance of probe data, COCN and ITS Japan would like to offer heartfelt sympathy to those affected by the catastrophic earthquake, and would deeply like to appreciate the cooperation and many recovery efforts of overseas countries during these disasters.

About the Author

In 2001, Dr. Watanabe was made a senior managing director of Toyota. In 2005, he became a senior technical executive, and since 2009, he has served as the chairman for ITS-Japan. He is also a member of the COCN Working Committee.

MONGOLIA

Innovation Capacity Building in Mongolia

Mongolia, with a population of just below three million people and landholdings that make it the 19th largest country in the world, is entering into a new stage of development after 20 years of transition from a centrally planned communist system to a free market economy. Vast mineral resources, especially copper and coking coalcrucial for neighboring China-attract extensive foreign direct investment (FDI) in mining, something that Mongolia has never experienced. The economy has grown significantly during the past several years-in 2011 Mongolia experienced GDP growth of 17.3 percent-a trend that is projected to continue well into the future. However, economic growth and economic development are different concepts, and the key to economic development lies in adopting a knowledge-based economy.

As of today, the mining sector constitutes 30 percent of the country's GDP, 90 percent of its exports and 80 percent of its FDI, and these shares are only likely to increase. As of 2010, 83 percent of the total products exported from Mongolia are produced with non-technological content, while only 0.02 percent are produced with high-tech content. In other words, Mongolia is exporting low-priced mineral resources and importing high-value finished products. Multiple factors—such as globalization, rapid economic growth, and increased mining activities—have driven the development of a legal environment more conducive to innovation.



Current Situation

Global trends and experiences show that the key driver of a country's competitiveness is innovation. However, Mongolia's current innovation infrastructure is weak and has limited capacity. Though total expenditure on R&D has increased significantly since the 2007 adoption of the Law on Science and Technology, it only consists of US\$11 million, or 0.26 percent of GDP in 2011. This is not substantial enough to support and grow the 65 scientific and research institutions in Mongolia, which employ more than four thousand people.

The number of registered patents per year range from 120 to 160, but very few of them are commercially licensed. The fact that the government becomes the owner of inventions developed with public funding worries scholars and researchers, who must invest their time and energy to come up with new technologies. The science and technology sector activities of Mongolia are funded solely by the state budget, and it is extremely difficult for Mongolian researchers to raise money as venture capital is not available. The government, with the support of the United Nations Educational, Scientific and Cultural Organization (UNESCO), has adopted the Master Plan of Science and Technology 2007-2020. However, the science and technology sectors' contribution to the country's development is still unsatisfactory, and the aforementioned Master Plan needs to be implemented. There are several challenges:

- The importance of the innovation process for socioeconomic development is not fully recognized by the government and society;
- Research organizations lack laboratory facilities, equipment and tools;
- All science and technology sector activities are funded solely by the state budget;
- Private sector participation in innovation development is weak;
- Innovation funding mechanisms are not developed;
- Activities to commercialize R&D results are inadequate;
- A lack of international cooperation on science and technology exists; and
- Scientists and researchers' salaries are low.

On the other hand, there have been some favorable improvements in the sector. Due to rapid economic growth and the mining boom, financial resources are expanding, and the basic science sectors are developing. Moreover, conditions are becoming favorable for innovation development as knowledge and technology imports from foreign investment are increasing. Mongolia's economic diversification efforts seeking to decrease dependence on mining and enhance value-added sectors also require innovation development. It is obvious that the government is paying more attention to this issue than ever before. In order to create a legal environment that would enable better innovation capacity building, and successful implementation of related initiatives, the Parliament of Mongolia approved the Law on Innovation on May 22, 2012. This law aims to promote innovation by:

- Creating funding mechanisms, such as venture capital and innovation funds;
- Creating the infrastructure for a national innovation system, such as science parks, incubators and technology transfer centers;
- Supporting scholars and researchers by enabling them to pursue ownership of inventions;
- Supporting research institutions by enabling them to establish start-up companies and profit from ideas; and
- Making research results profitable by meeting market demand.

As Mongolia is rich in natural and agricultural resources, the innovation, science and technology sectors must play an important role in their utilization. The National Development and Innovation Committee, the government agency responsible for innovation activities, has set priorities and directions for the Mongolian science sector. These priorities include medicine, energy, construction, agriculture, information technology and deep processing of raw materials.

Wake up Society

"Mentality is a big problem when it comes to intellectual property," said Dorj Nergui, a primary leader in Mongolia Innovation Commons Partners (M-ICP). "We [Mongolians] need to touch and to see to make a decision." Nergui, and many other innovation specialists, feel that this perspective has been changing dramatically since the transition away from communism, with each generation demonstrating more motivation and entrepreneurship in the private sector. With time and further support for innovation, Mongolia could one day become a successful knowledge-driven economy. However, much needs to be done. Increasing the awareness among economic stakeholders of the necessity for technology, and improving the participation of the private sector in innovation activities, are both important steps forward.

The Economic Policy and Competitiveness Research Center (EPCRC), Mongolia's preeminent think-tank, formally established in 2010, aims to increase the country's competitiveness. As innovation must play an important role in Mongolia's development, the EPCRC is fully committed to increasing public awareness, especially among policy makers, business owners and civil society. For instance, in collaboration with our partner organization, M-ICP, we organized an international meeting entitled "Innovation and Technological Policy, Development Trends" on September 30, 2012. Also, in our recently published guidebook Mongolia's Competitiveness: Where Are We Heading? we highlight the significance of the innovation process for socioeconomic development. It is important that policymakers and society recognize the critical importance of innovation for the future of the country.

Mongolia is a country with a great history. At the time that the Great Mongolian Empire was established, Genghis Khan took the disjointed and languorous trading towns along the Silk Route and organized them into history's largest free trade zone. He established a regular census and created the first international postal system. The Mongolian army conquered culture after culture, collected and passed entirely novel products from one civilization to the next. Therefore, the future of innovation in Mongolia cannot, and should not, follow the same path as the Western model. Hundreds of years of trial and error have helped created the modern innovation systems in the developed world, but Mongolia can circumvent much of that history by learning from the examples they provided. With a market system barely leaving its infancy, system-wide support for innovation has yet to reach full maturity. Though the recently passed Law on Innovation has not yet given much support for research and development, associate professor B. Enkhbaigal of the Management Academy believes that the future of Mongolia rests on cultural, not governmental incentives. Just as Singapore, Japan and China found success in their unique societal approaches to innovation and development, so too will Mongolia find its future in its cultural unity and collaborative mindset.

"Capital and labor intensive industries are not suitable for a scarcely populated country like Mongolia" said B. Ganbat, Director of Department of Innovation Policy of the NDIC. Countries such as Israel, Singapore, Norway, South Korea and Finland showed that developing knowledgebased industries can drive a country to sustain its national security, increase competitiveness and globalize in 20 short years. "I believe we can also do the same in the coming two decades."

UNITED KINGDOM

Smart Grid Ireland

A Private Sector Led Collaborative Network as an Enabler for Jobs & Wealth Creation on the Island of Ireland

Background

The binding EU legislation 3rd Energy Package, introduced in 2009, has set strict targets for energy efficiency and renewables integration. Meeting these targets, and supporting Ireland's economic development in a sustainable manner, is absolutely dependent on robust electricity systems delivering continuous, reliable and quality supply while managing the challenges introduced by variable renewable generation.

The Centre for Competitiveness initiated an Ireland and UK "first mover strategic initiative" by carrying out a scoping study on the implementation of an intelligent electrical grid for Northern Ireland. This was achieved in partnership with a cluster of multinational companies operating in Ireland. This strategic initiative followed an earlier scoping study in 2007/8, when the Centre developed a road map for the establishment of a renewable wind energy sector that subsequently became the Northern Ireland Global Wind Alliance. It soon became apparent that the current network infrastructure was incapable of managing and controlling multiple renewable energy sources, and this would become a barrier to investment and the development of renewable technologies. While there currently exists two separate regulatory systems in Ireland for each of the jurisdictions, there is a single electricity network under the corporate ownership of the Electricity Supply Board, Dublin.





Smart Grid Ireland – Why?

Smart Grid Ireland would provide many industry, environmental, and societal benefits, including:

- 1. Meeting our **environment and climate change** obligations;
- 2. Ensuring security and consistency of supply and incorporating local sustainable energy resources;
- 3. Providing **informed consumer choice** based on real-time energy usage, efficiency options and energy market pricing preferences;
- 4. Providing enhanced system efficiency and reliability; and
- 5. Meeting the growing 'clean' electricity demand—including for heating & transport.

White Paper & Business Plan

Centre for Competitiveness provided strategic leadership for the corporate business entities, and a collaborative network was formed under the title "Smart Grid Ireland." This was followed by a series of progressive dialogues between industry, the network operator and government including Invest Northern Ireland and the Sustainable Energy Authority Ireland. The Smart Grid Ireland private sector network was initially comprised of N.I. Electricity & ESB; General Electric; British Telecom; Oracle, Silver Springs, Calif.; Scottish & Southern Electricity / Airtricity (SSE); Vodafone; IBM; Ericsson; Gridline EU; Qualitrol; Cisco; Google; Powerline; University Of Ulster; Queens University; Utility Regulator; SAP; Glen Dimplex; and the Wright Group, with other members joining at a later date.

A strategy white paper was developed by Smart Grid Ireland, followed by a business plan for a pilot project for the Northern Ireland electricity network. The business plan highlighted the vital role that an innovative, efficient and effective electricity system would play in supporting sustainable economic development, bolstering employment and competitiveness, as well as demonstrating functionality using new state of the art technologies. The development of a Smart Grid in Ireland was going to be essential in achieving the above, supporting the country's climate change commitments and realizing our opportunities to become a global leader in the renewable energy sector.

Innovation

Smart Grid development meant innovative planning, operation and management of electricity networks, facilitating the connection of distributed generation, deploying new electrical application technologies, optimizing existing networks, reducing distribution losses and facilitating bi-directional power flows in the most efficient and cost effective manner. The smart grid of the future would be dependent on robust communications and information technology layered over the electricity grid, enabling real time visualization and control for every part of the electricity system, and allowing monitoring and active management of the networks. The end user would also be a key player in network development, and the Smart Grid would assist in meeting energy efficiency targets in the most cost effective manner.

In short, the network would:

- Harness renewable generation resources;
- Empower customers to actively manage their electricity use;
- Improve security and efficiency of the electricity system;
- Provide for a new electricity network and communications technologies;
- Deliver climate change targets; and
- Increase the country's competitiveness and provide for sustainable jobs.

Strategic Focus: 3-5 Year Timeline

The strategic focus was on future energy networks, incorporating renewable generation sources with related communications and IT applications, cyber security and cloud computing processes.

Recognizing the significant strategic challenges that lay ahead, the Smart Grid Ireland network focused their 3-5 year time horizon on R&D, technological and innovative challenges and global business opportunities. The way electricity is generated, distributed and consumed is changing, driven by environmental, security and supply concerns, legislation and an ever-increasing global appetite for energy. This led European countries to move away from large central fossil fuel power generation to more distributed and sustainable supplies. These new sources, by their very nature (i.e. dispersed, mostly intermittent and variable in their availability), required a more active management system to cope with dynamic and responsive demand and supply factors. This convergence of Information Technology Communications with the energy network was the basis for the development of an intelligent network, or "Smart Grid."

FIGURE 1. A Broad-Based Timeline for Smart Grid IT Implementation

Source: IEEE's Smart Grid-Putting it All Together, IEEE power & energy magazine.



In order to create and deliver the enablers for job and wealth creation on the island of Ireland, a strategic shift within business and the utilities network was required. This shift included greater focus on new research & development in technological innovations supporting the current and future economic achievement of sustainability, rather than simply serving existing customer needs and wants. This was especially relevant considering the new interfaces between traditional technologies and participants, with new entrants leveraging their own expertise in communications, software and security.

The complete concept of Smart Grid encompasses a wide array of necessary technologies and the innovative interaction of these in a researched and proven manner so that:

- · Interoperability is addressed earlier;
- Developments will be more deployment ready; and
- End users will have a strong degree of confidence in their technology selection.

Research and deployment has to have a broad holistic approach aligned with future market needs defined by the key industry participants, utilities and the government.



61







Advanced Communications

Data Capture, Management, Analysis & Distribution

Interface Software

Platform Specific Application Software

Commercial Opportunities Identified		
Simulation	Testing, Development and Roll Out	Plug-in Hybrid Electric Vehicles (PHEVs)
Plug and Play Devices	Grid Sensing, Control and Management	Skills and Capability Development
Energy Application and Services	Communications	Consumer Engagement
Smart Homes	Infrastructure Upgrade	Consultancy

Challenges & Opportunities

By 2020 Ireland will have the highest wind penetration in the EU. While the strategic windpower initiative offered a unique opportunity for Ireland to become a world leader in the renewable energy sector, it also posed new challenges in the management of electricity networks originally designed for large scale, controlled generation rather than distributed, variable generation. Ultimately, to promote economic development, using this initiative, these challenges needed to be met within an extremely secure system delivering high levels of high quality electrical energy. Achieving this requires new policies in planning and operations, innovation and active network management, and forecasting along with communications and control capabilities.

During the first phases of the project, work carried out by ESB Networks illustrated how R&D promotes indigenous entrepreneurship as they work in collaboration with SME's, such as Shannon based FMCTech, in developing and demonstrating their smart fault passage indicators. Quickly following this collaboration, FMC Tech was purchased by the world-leading General Electric, a step towards worldwide deployment of this technology. Meeting efficiency and renewable energy targets is dependent not only on electricity infrastructure, but also on the efficiency of its use. This delivers a wide range of development opportunities including:

- National building insulation upgrades.
- Development of building energy management systems, an area where Dublin based Cylon Controls is already becoming a world leading implementer of energy management solutions.
- Electrical heating solutions, as being designed, developed and produced by Glen Dimplex in Northern Ireland.

Regulatory Opportunities-Moving Forward 2012

In its 2011 Communication on Smart Grids, the EU Commission highlighted the need for regulatory incentives to support smart grid investment and deployment. In early 2012, the Commission extended the mandate of its Smart Grid Task Force, recognizing the vital role of smart grid development in network management to integrate renewable generation, and the need for regulatory guidance in its delivery. The UK government regulator Ofgem established a low carbon network fund of Stg 500 million, to which companies could bid in order to develop and pilot network innovations.

The regulator has a key role to play in the development of Smart Grid and new technologies. The development of active networks, wind and wave generation, and other technologies can be accelerated through the involvement of utilities and field demonstration where the regulator supports R&D.

Similarly, the development of new services and solutions, including demand-side management and storage, will require new regulatory and business models that recognize the operational requirements of these systems, network implications, and market operation. Innovation needs incentivization based on its potential to deliver societal benefits, with these services delivering new opportunities to customers when the market becomes available. The cross-jurisdictional nature of Smart Grid would imply some harmonization of regulatory outlook and greater alignment of regulatory models.

The R&D allowance allocated by the Irish Regulator has facilitated vital developments, and these are already informing future network policies and technological solutions. It must be said that there is still regulatory tension between the need to represent consumer interest, and the longer-term national economic and societal benefit; generally, the regulatory framework inhibits innovation and investment.

The Electrical Power Research Institute, USA, May 2011 (EPRI) estimates that the average electricity bill will likely increase by about 50 percent by 2050 if the smart grid is deployed; if deployment does not happen, the average electricity bill could go up by almost 400 percent.

Benefits of Smart Grid for Consumer

The consumer will be the ultimate beneficiary of smart grid development. Regular, increased levels of more accurate information empower the customer to take control of their energy use, and going forward will allow them to capitalize on demand response services, profiting from their own flexibility. The customer will also benefit from system savings, realizable through reduced distribution losses and internal efficiencies of smart metering combined with in-home displays. Additionally, the customer will benefit from new technical developments, including voltage optimization that could allow end user devices to operate at higher energy efficiency levels.

Smart Grid development will also facilitate micro generation, allowing consumers not only to control their use, but generate their own energy. New smart appliances and electric transport will all be enabled by smart grid development.

Giving Ireland a Competitive Advantage

Given Ireland's size, its unique geographic electricity infrastructure, and the large investments already made in smart technologies embedded in the network, it has the distinctive opportunity to be a global test bed for innovation in developing Smart Networks, harnessing renewable generation, and encouraging end user electrical technologies to de-carbonize the heating and transport sector.

Given Ireland's ability to attract high technology FDI into the country, e.g. Intel, IBM, Google, Cisco, GE, etc., there is another prime opportunity for new and existing Irish companies and academia to leverage relationships with these large multinationals to develop programs and joint ventures.

The high level of renewable generation already being harnessed is higher than any other island system with limited interconnection. The single All-Ireland electricity market (SEMO), the single Transmission System Operator (SONI and EirGrid), the single Distribution System Operator (ESB Networks and NIE), coupled with a supportive regulatory environment for the development and trial of new technologies, can place Ireland at the leading edge for the development of Smart Grid networks.

The abundance of natural resources, such as wind and wave assets, offer the Irish Government the vehicle to deliver its CO_2 Emissions Targets for fossil fuel heating and transport, which can

be displaced by electric heating—no longer part of these targets, as CO_2 emissions from electricity are covered by the EU Emissions Trading Scheme.

The existing governmental targets for renewable resources, and those that encourage the development and early utilization of new technologies, will enable Ireland to experience and learn from related technology and society challenges well before many other nations.

Job Estimates from the Renewable Energy Sector–Island of Ireland

The following is a summary of published data from sectoral representation bodies:

• Irish Wind Energy Association / Northern Ireland Renewables Interest Group

28,000 jobs—An IWEA/Deloitte Study showed that more than 10,000 jobs can be created from simply meeting our targets. An additional 18,000 jobs could be created by developing an export industry, and integrating enterprise policy with energy policy.¹

National Offshore Wind Association

60,000 jobs—The construction of wind farms offshore of Ireland and the UK has the potential to create an estimated 60,000 jobs over the coming decades. Irish companies need to act now to capitalize on this opportunity, according to the National Offshore Wind Association of Ireland (NOW Ireland) and Enterprise Ireland. (2010) Pro rata per population Great Britain/Ireland is ca 5500 jobs or 5200 pro rata GDP annually.

Marine Renewables Industry Association

69,000 jobs—The Marine Renewables Industry Association (MRIA) point to a recent report by SQW consultants, commissioned by Sustainable Energy Authority of Ireland and Invest NI (2010), which indicates that by 2030 it is possible that the island of Ireland wave energy industry could produce at least 17,000-52,000 full-time jobs. Similarly, the tidal industry may deliver 8,500-17,000 FTE jobs by 2030.

Construction Industry Federation

40,000 jobs—In April 2011, the CIF and the country's leading manufacturers of green technology and materials, including Kingspan and Glen Dimplex, presented a plan to the Minister for Energy, Communications and Natural Resources, Pat Rabbitte aimed at creating 40,000 construction jobs.

The CIF's proposal includes a national program of "deep energy retrofitting" across Ireland's residential, commercial and public buildings.

International Job Market Projections

The European Commission estimates an additional 1.4 million renewable energy jobs by 2020–if Europe makes the necessary investment decisions now.²

About half of the power engineers in Ireland, Europe and the United States are due to retire in the next 10 years. So not only must we replace that experience, there will also be significant global demand for these skill sets as well as a new generation of engineers, technicians, ICT specialists, etc. This is reflected in further EU projections that utilities spending on ICT will double to €352Bn by 2030.³

² EmployRES-The impact of renewable energy policy on economic growth and employment in the European Union, 2009.

³ EU High-Level Advisory Group on ICT for Smart Electricity Distribution Networks, 2009.

¹ IWEA Manifesto, 2011.

Urgent Action Needed by Government

Industry is waiting on a signal from government that Ireland is open for the accelerated deployment of renewables with the development of a Smart Grid infrastructure.

- Regulatory framework must do more to encourage innovation and investment.
- Investment is needed now to release longterm benefits. Regulators need direction on how to share the investment burden imposed on utilities to develop a fair cost-sharing model and determine the right balance between short-term investment costs and long-term profits.
- Smart Communications are essential to the delivery of Smart Networks-a national communications infrastructure rollout is required to fully develop SmartGrid.
- Up-skilling opportunity for workforce, with training in new skills and technology.
- Challenges in Cyber Security/Data Privacy provide opportunities for innovation.
- The possibility can be explored to defer traditional infrastructure investment through the substitution of investment in alternative new technologies, which are more economic.
- Avoid missed opportunities for early mover advantage.

The Centre for Competitiveness is the secretariat for Smart Grid Ireland, and the content of this paper has been developed by the Centre for the network. Employment forecasts have been extracted from published reports by the relevant organizations. With the heavy lifting completed, and the proverbial train now leaving the station on smart grid implementation through the procurement process, the Smart Grid Ireland network has been downsized to incorporate the following members: General Electric, IBM, Qualitrol, Ericsson, Vodafone, SSE, ESB, NIE, SEIA, BT, Silver Springs Networks, Oracle and Gridline EU.

About the Author

Bob Barbour is the Director and Chief Executive of the Centre for Competitiveness and Smart Grid Ireland Secretariat.

Appendix

Centre for Competitiveness / Smart Grid Ireland Collaborative Network Initial Strategy Group.



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Submissions from our Partners

THE INTER-AMERICAN COMPETITIVENESS NETWORK

A Regional Approach to Promote Competitiveness and Innovation in the Americas

Competitiveness authorities and councils of the Americas work together through a regional initiative called The Inter-American Competitiveness Network (RIAC), which supports the implementation of a regional competitiveness agenda and the organization of the Americas Competitiveness Forum (ACF).

The Americas Competitiveness Forum (ACF) is a unique event in the Western Hemisphere. Every year, thousands of representatives from the public, private and academic sectors participate in a continental dialogue on competitiveness. The main objective of the ACF is to promote the exchange of knowledge and experiences, the consolidation or strengthening of partnerships, and business development, so that the countries of the Americas can be more innovative, productive and competitive.

Founded in 2009, the Inter-American Competitiveness Network (RIAC) brings together highlevel competitiveness authorities and public/ private competitiveness councils of the region to strengthen the competitiveness of countries in the Americas through public policy dialogue, the exchange of experiences, and the adoption of joint initiatives. RIAC is also supported by several institutions, including the Organization of American States (OAS) as Technical Secretariat, multi-lateral organizations like the United Nations Economic Commission for Latin America and the Caribbean (ECLAC), development banks such as the Inter-American Development Bank (IDB), the Latin American Development Bank (CAF), the Central American Bank for Economic Integration (CABEI), the World Bank, the Global Federation of Competitiveness Councils (GFCC), and other regional and academic institutions, including the



Compete Caribbean Program, International Training Center for Local Authorities (CIFAL), and the Monterrey Technological Institute.

The importance of RIAC and the ACF, as mechanisms to promote regional cooperation and competitiveness, was acknowledged by a political gathering of some of the highest Heads of State and government leaders from the Western Hemisphere. In the Sixth Summit of the Americas held in Cartagena, Colombia on April 14-15, 2012, leaders highlighted the *VI Americas Competitiveness Forum: Innovation for Prosperity*, encouraging all states to participate in the ACF and RIAC activities through their highest competitiveness authorities.

RIAC Main Results to Date

2011: Approval of the "Consensus of Santo Domingo" and Ten General Competitiveness Principles

Representatives from 30 countries in the Americas, including 11 Ministers and 7 Vice-Ministers, approved the Consensus of Santo Domingo at the 2011 RIAC Annual Meeting in Santo Domingo, held in conjunction with the V Americas Competitiveness Forum in the Dominican Republic.


Launching of the first "Signs of Competitiveness in the Americas" report at the Inter-American Competitiveness Network annual meeting during the VI Americas Competitiveness Forum October 24, 2012, in Cali, Colombia.

The Consensus of Santo Domingo provides a regional vision for implementing a 2020 Competitiveness Agenda for the Americas, based on ten guiding principles toward a more competitive, innovative and prosperous region. The document was subject to a cooperative consultation and drafting process with the public and private representatives of member countries and multilateral institutions. These principles cover the main issues identified as competitiveness priorities and serve as a guide for policy makers and others in the implementation of regional programs and projects.

The ten principles seek to, among other notions: advance high-quality education; establish and strengthen effective institutions responsible for promoting competitiveness; promote transparency in government administration; prioritize human capital development; drive the development of a modern and efficient infrastructure; position innovation and entrepreneurship as determining factors for competitiveness; improve access to capital for economic stakeholders; foment social entrepreneurship, social corporate responsibility and gender equity; stimulate commerce and integration; and, promote efficiency and energy sustainability. The process leading to the Consensus of Santo Domingo, and the ten competitiveness principles, was carried out under the leadership of the Executive Director of the National Competitiveness Council of the Dominican Republic, Mr. Andres van der Horst, RIAC's Chair Pro Tempore for 2011.

2012: Launch of the First Signs of Competitiveness in the Americas Report



In 2012, as RIAC members carry out the implementation of the Consensus of Santo Domingo, competitiveness authorities and councils from 31 countries gathered in Cali, Colombia, to present progress and programs on their selected competitiveness priorities among the ten principles in the VI Americas Competitiveness Forum. RIAC members shared more than 50 successful experiences profiled in the first *Signs of Competitiveness in the Americas Report*, which also provides an overview of the innovation landscape in the Americas with contributions from multilateral institutions, thinkers and experts in the fields of innovation and competitiveness.

The Report is a forward-looking tracking tool, which provides up-to-date information and functional expertise for RIAC's on-going consultations and regional projects on competitiveness. It facilitates the identification of country-priorities, the demand for and offers of cooperation, and seeks to foster idea exchanges and replication of successful experiences. Through the first installment of the report, countries shared experiences and provided useful guidelines to facilitate and support the implementation of similar efforts in other countries. In general terms, the report is a mechanism that strengthens horizontal and triangular cooperation mechanisms in the Americas. The "Signals of Competitiveness in the Americas"

RIAC Members Showcase 2012 Experiences and Institutional Practices



Barbados

1. National Sustainable Energy Policy: Principle 10



1. Start-Up Chile: Principle 6



Colombia

- 1. "Buy Colombian" Program: Principle 2
- 2. Formalizing Colombia: Principle 3
- 3. Good Governance, Ethics, and Sustainability for the Public and Private Sectors: Principle 3
- 4. Construction, Launching, and Operation of the "Valle del Pacífico" Events Center: Principle 5
- 5. Fondo Emprender: Principle 6
- 6. iNNpulsa Colombia: Principle 6
- 7. Productive Transformation Program: Principle 9

Costa Rica

- 1. Competitiveness Model of the Brunca Region: Principle 2
- 2. Digital Review of Construction Plans: Principle 2
- 3. National Procedures Catalogue: Principle 2
- 4. "Crear Empresa": Principle 3
- 5. National SME Fund Program: Principle 6
- 6. Financing Public Transportation Micro-Enterprises (Taxis): Principle 7



Ecuador

- 1. Design of the Production, Trade, and Investment Code: Principle 3
- 2. "InnovaEcuador": Principle 6
- 3. "EmprenEcuador": Principle 6



El Salvador

- 1. "MiEmpresa"-Online Services: Principle 2
- 2. Productive Development Fund: Principle 2
- 3. Sectoral Cells Program: Principle 2
- 4. Innovation, Science, and Technology Policy: Principle 2
- 5. Business Innovation Award: Principle 6



United States

- 1. Business Ethics in Sectors of Export Interest to APEC SMEs: Principle 3
- 2. Global Center for Medical Innovation: Principle 6
- 3. Central American Border Management Reform: Principle 9



- 1. Literacy Program: Principle 1
- 2. Improving Competitiveness Program: Principle 2
- 3. Improving Competitiveness-Business Climate Reform: Principle 3
- 4. National ISO Quality Management System Certification Project: Principle 3

Report was developed under the leadership of the Minister of Trade, Industry and Tourism of Colombia, who is serving as RIAC Chair Pro Tempore for the period 2011-2012.

2012: Year of Innovation for **Competitiveness in the Americas**

RIAC members declared 2012 as the "Year of Innovation for Competitiveness in the Americas" as they undertake efforts to promote innovation as a fundamental factor to increase the productivity of enterprises and to improve the competitiveness of the countries of the Americas. Based on a proposal by Colombia, as Chair pro Tempore of RIAC, representatives from 31 countries agreed that "innovation should be regarded as the best means to enhance the long-term competitive-

ness of a country, to ensure sustainable economic growth, and to close the gap between developed and developing countries." The principle of innovation is being promoted through programs featured in the Signs of Competitiveness Report such as Start Up (Chile), INNpulsa (Colombia), Innova and Emprende-Ecuador, the Business Innovation Award (El Salvador), the Global Center for Medical Innovation (United States), Mexico Ventures, the Georgia Tech Logistics Innovation and Research Center (Panama), FINCYT (Peru), Idea 2 Innovation (Trinidad and Tobago) and Strategic Sectors Terciary Education Program (Uruguay). These programs are all aimed at promoting innovation and entrepreneurship through new ideas and paradigms based on public-private partnerships.



Mexico

- 1. Public-Private Partnerships for Road Development in Mexico: Principle 2
- 2. Zero-Based Regulation and Regulatory Reform: Principle 3
- 3. National Market Leaders Program: Principle 9
- 4. "Mexico Ventures": Principle 6



- 1. Digital Colleges-SENACYT: Principle 1
- 2. National Competitiveness Forum: Principle 2
- 3. Georgia Tech Panama Logistics Innovation & Research Center: Principle 4
- 4. "Infoplazas": Principle 5



- 1. The 2012-2013 Competitiveness Agenda as a Tool to Promote Competitiveness Reforms: Principle 2
- 2. Science and Technology Program FINCYT (Financing for Innovation, Science and Technology): Principle 6



- 1. 2nd Congress Dominican Industry: Principle 2
- 2. More SME Project: Principle 3
- 3. Quality to Compete Program: Principle 9

Suriname

- 1. Task Force Education Innovation: Principle 1
- 2. Preparation and Start-Up of Project Framework for Private Sector Development: Principle 2



Trinidad Y Tobago

- 1. Establishment of the Economic Development Board and Council for Competitiveness & Innovation: Principle 2
- 2. Idea 2 Innovation Competition: Principle 6



Uruguay

- 1. Support for Priority Technical Tertiary Education Programs: Principle 4
- 2. Traceability in the Beef Cattle Sector: Information System for the Beef Cattle Industry: Principle 5
- 3. Internationalization of the Productive Sector Specialization: Principle 9

CARIBBEAN **Compete Caribbean Program**

1. Compete Caribbean Program



Latin American Development Bank-CAF

1. Competitive Cities Program

WORLD ECONOMIC FORUM

Global Agenda Council on Competitiveness: Putting National Competitiveness on the Global Agenda

The importance of enhancing national competitiveness has moved up on the agendas of many countries over the past decade. During this same period, traditional cornerstones of globalization have shifted and changed the framework within which national policies operate. The global financial crisis of 2007-2008, the lack of clear progress on the Doha Development Round and the rise in preferential trading agreements are some developments that have shaped the global context of national economic growth. The jobless recovery and the Arab Spring movements moved employment and social cohesion to the core of many national economic policies in industrial, emerging and developing economies alike. And worsening climate change and environmental damage highlight the interrelation between economic progress and the environment.

The Global Agenda Council (GAC) on Competitiveness is a multi-stakeholder group formed to further knowledge on, and collaboratively develop solutions to, the most crucial issues related to competitiveness at the global level. The GAC on Competitiveness monitors key trends, identifies global risks, maps interrelationships and addresses knowledge gaps. Equally important, the Council also puts forward ideas and recommendations to address global challenges. The Council website is: http://www.weforum.org/content/ global-agenda-council-competitiveness-2012.



COMMITTED TO IMPROVING THE STATE OF THE WORLD

Against this background, during the 2011-2012 term, the GAC reiterated the importance of productivity for fostering competitiveness. It also identified the following items as the key issues to be addressed in the area of national competitiveness:

- 1. Sustainable Competitiveness
- 2. Institutionalizing Multi-stakeholder Discussions on Competitiveness
- 3. Analyzing Competitiveness
- 4. Competitiveness at the Sub-National Level
- 5. New Models of Governance

Sustainable Competitiveness

Competitive economies have traditionally been viewed as those that are most productive and provide high and rising living standards for their citizens. However, past models do not always benefit future societies, and augmented competitiveness models are necessary for continued growth, ensuring inclusive and sustainable development. Annual growth rates and conventional measures of competitiveness (e.g. governance, education, market efficiency, and innovation), while important, do not account for the some elements of the evolving landscape of development in the 21st century. Economic performance is now viewed as part of a long-term ecosystem, one in which issues such as social inclusion and environmental responsibility play a larger role than ever before.

The Council supports the work of the World Economic Forum on sustainable competitiveness (which can be accessed at: http://www.weforum. org/content/pages/sustainable-competitiveness). This new analytical framework will complement existing measures of core competitiveness, such as the Global Competitiveness Index. It is being developed to shed light on the interaction between economic, social and environmental sustainability and their importance for long-term economic performance. Council members contribute to the ongoing work related to the development of this framework.

Institutionalizing Multi-stakeholder Discussions on Competitiveness

Competitiveness is not the product of solely the private or public sector, but rather of actions taken by both sectors to advance economic growth and make progress in critical areas. Sustainable growth, economic prosperity and social change should be understood from the perspective of all societal sectors; therefore, bringing all parties into the dialogue is imperative to a well-rounded discussion of national competitiveness. One mechanism for institutionalizing such multi-stakeholder competitiveness discussions at the national level is the creation of National or Regional Competitiveness Councils (NCCs).

With a cohesive membership, representing all sectors of society (private, public, business, labor, academia, etc), NCCs provide a combined voice, speaking to the present challenges, and necessary solutions, in bringing about a reformed and renewed interest in the promotion of competitiveness policy. Involving the key players in technology, education, business, trade and many other facets of development is critical to revising and reinvigorating the discussion about national competitiveness

However, this dialogue cannot remain solely at the national level.

Innovation, sustainability and resilience—increasingly recognized as foundations for national competitiveness alongside basic factors like education, macroeconomic stability, and infrastructure – are now global platforms for prosperity. Therefore, all NCCs should strive to fully immerse themselves on the international stage. The primary course of action should be to join the Global Federation of Competitiveness Councils (GFCC), a network of competitiveness councils from around the world, predicated on the belief that sharing of best practices among NCCs and nations would provide benefits to all interested parties.

The GAC has updated the Forum's guidelines on the creation of National Competitiveness Councils. These updated guidelines provide input on basic characteristics of councils such as membership, funding, transparency, legitimacy and convening power, while also acknowledging the effectiveness of other models.

Analyzing Competitiveness

Globalization, fueled by rapid technological change, shrinking economic distance, and sweeping liberalization, has led to an increasingly complex competitiveness landscape. Policymakers are struggling to find ways to manage present economic challenges: developed economies worry about maintaining their technological lead and staying ahead of lower wage entrants, while less developed economies worry about reviving their economies and diversifying their activities so they can challenge mature industrial countries. National competitiveness reports are an important tool to identify and overcome these challenges. As a non-partisan public service, they create an informed dialogue for policy makers attuned to enhancing the economic performance of nations and regions.

Traditionally, the purpose of a National Competitiveness Report (NCR) is to inform national discussions by analyzing a region or nation's current economic standing and assessing how it performs relative to other countries in selected criteria and measures of competitive prowess. NCRs also raise public awareness about the critical link between a nation's competitiveness and its public wellbeing. Over time, the scope of NCRs has evolved significantly, from a simple global benchmarking tool into an agile tool kit for NCCs to influence policy and steer initiatives.

National Competitiveness Reports are valuable reference documents often cited in developing policy, and as such serve as a platform for NCCs to make both specific policy recommendations and clearly articulated broad goals, such as social inclusion and sustainability, to improve national wellbeing. Additionally, NCRs play an important role in guiding the types of activities in which NCCs might want to participate by giving perspectives and guidance on existing initiatives, and by incubating new projects focused on a nation's productivity drivers. NCRs also serve as a tool for measuring the impact of a council's work to help build credibility and formulate a convincing case for its recommendations.

The GAC has established some practical guidelines for producing NCRs including section by section explanations of how and why specific routes may benefit a report, while also leaving room for non-traditional approaches. These reports can be seen as deeper-dives into the competitiveness landscapes of countries, and provide a useful counterpart to the annual Global Competitiveness Report.

Competitiveness at the Sub-National Level

While the discussion of competitiveness is often focused on the national stage, regional and even city-based competitiveness analysis can provide a more comprehensive lens through which to observe the issues facing a country. Obstacles can vary from region to region as widely as they do from country to country. Resource requirements, talent-pools, technology advancements and comparative indicators do not conform to geographical boundaries, and these divides do not necessarily present themselves in nation-wide analysis.

Regional competitiveness can be instrumental in highlighting the challenges a country is facing on a micro level. Just as productivity is not equal across all sectors, it is not always comparable from region to region. To this end, it is extremely important for NCCs to take an in-depth look at regional competitiveness, whether through individual studies or in the process of forming the very agenda that will drive the council. For NCCs to have a country-wide impact through policy recommendation, implementation may prove easier at the regional level, as governors, mayors and local organizations can often have more success in execution at scale. The GAC recognizes the usefulness of taking this analysis to the sub-national and sometimes sub-regional levels for many countries in order to encourage effective pro-competitive actions. This could be presented as part of an NCCs competitiveness report or as an entirely separate study of specific regions as issues and attributes become more apparent.

New Models of Governance

There is a need for better implementation of existing approaches and for new models of governance for accountability, transparency and organization across both business and government. In particular, there is a desire to address the misalignment of short-term incentives versus longer-term goals by government and business. This is a prerequisite to supporting the long-term competitiveness vision articulated above. Countries and industries must stop thinking in terms of the next election or the next fiscal quarter, and begin to think in time frames that will map the future decades of progress.

For governments, models must be more aligned with the needs of society and those of markets, producers and consumers. For business, models are required that create financial and social incentives for longer term planning and thinking by business leaders. Along the same lines, new models of innovation will be important to support sustainable competitiveness. It is critical to bring together ecosystems of business, government and academia, as these innovation strategies will vary from one country to another and must be defined by key stakeholders in competitiveness.

The Way Forward

The Global Agenda Council on Competitiveness will continue to carry out awareness raising activities about the importance of these issues—and of competitiveness overall—for stabilizing the global economy and putting countries on more sustainable growth paths. The Council and the World Economic Forum will continue to work with the Global Federation of Competitiveness Councils in this context.

This short contribution is based on the annual report of the Global Agenda Council on Competitiveness 2012.

About the Authors

This article was written by the Global Agenda Council on Competitiveness; Jennifer Blanke; and Margareta Drzeniek Hanouz, World Economic Forum.

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The Global Federation of Competitiveness Councils (GFCC) is a global network of leaders from competitiveness organizations around the world. The fundamental drivers of national competitiveness are being knitted together in networks that now underpin global economic growth. Innovation, sustainability and resilience–once the foundation for national competitiveness advantage–are now global platforms for prosperity. Acting globally is now a prerequisite to economic competitiveness nationally.

For more information, please visit www.thegfcc.org.

