GFCC

Global Federation of Competitiveness Councils

Talent–Driven Innovation

Best Practices in Competitiveness Strategy

2013

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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 the 2013 report, *Talent-Driven Innovation: 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 organizations and initiatives around the world.

GFCC members have repeatedly cited talent-driven innovation as a, if not the, critical driver of competitiveness. People are a nation's most important asset. The investments countries make in people and ideas are key indicators of a country's economic potential.

This year's report offers valuable insights from six countries—Brazil, Chile, Korea, Mongolia, the United Arab Emirates (UAE) and the United States—on how to nurture our talent resource to bring about economic growth, prosperity and an increase in the standard of living.

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

Sincerely,

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

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EXECUTIVE SUMMARY

Building Talent for an Innovation–Based Creative Economy

In today's fast-paced knowledge-driven world, countries are striving to develop the creative, skilled talent needed to compete and grow their economies. This report offers a look at different strategies and programs in six countries: Brazil, Chile, Korea, Mongolia, the United Arab Emirates (UAE), and the United States. The diversity of approaches described reflects differences in the countries' stage of economic development, industrial base, specific domestic challenges, the opportunities they see and their goals for the future. Themes explored include: talent for innovation, the need to strengthen formal education, and training for a changing economy.

Innovation and the Need for Highly Skilled Creative Talent

Countries are embracing innovation as a driver of economic growth, and focusing attention on developing human resources for innovation, entrepreneurship, and industries of the future.

Brazil's Rio Grande do Sul developed industrial sectorial programs based on innovation theory and competitive strategy, using Michael Porter's "diamond model" for the competitive advantage of nations. The goal is to stimulate development of different industries with innovation and technology as central drivers.

In Chile, the National Council of Innovation recognized the challenge of developing a long- term strategy for innovation—goals, objectives, and a linear program to achieve them—in a world of accelerating change. This led the Council to imagine and anticipate future waves of change, and identify "strategic orientations," areas of caution and opportunity that may help create a framework for actions in the present. This exploration identified several areas of inquiry and opportunity related to talent. For example, the advancement of digital technologies offers opportunities to reduce the costs and improve the quality of education, but also prompts questions concerning the purpose of education and, especially, how educational quality should be defined.

Recognizing the potential transformative effects of the biological revolution, the Council observed that the emergence of new forms of medicine and related technologies is creating a scarcity of professionals and technicians in fields such as biology and medicine, engineering and materials science, clinical services, etc. The Council considered the opportunity to develop quality technical and professional training in these fields as a way to capture high-level jobs in the global labor market. Also, the biological revolution is likely to increase life expectancy, prompting questions about the role in society of those over 65 years of age. The Council imagined that senior citizens have characteristics that qualify them more for certain jobs; for example, they may have a role as guides or mentors for children, youth, and adults.

Korea sees the content industry—based on software, imagination, and creativity—as a new growth engine for its economy. When it comes to the number of jobs created by every one billion won in government funding, the content and tourism industries employed 12.11 and 15.5, respectively; in contrast, the manufacturing industry employed 9.2 persons. Young professionals are the driv-

ing force behind the content industry's long-term growth, and industry employment has been on the rise. In its Creative Mentoring Program, Korea is focused on developing these professionals to meet the needs of the industry. In addition to training and mentorship, mentees participate in the Project Pitching Day for Investment and Creative Achievement Conference, and can turn their projects into moneymaking ventures.

Knowledge-driven industries are increasingly important as the UAE diversifies its economy and seeks to turn its resource-based competitive advantage into a human capital-based advantage. For example, the UAE is developing the talent base needed to become a frontrunner in clean energy and sustainability. Through the Masdar Institute, it is developing specialists for the green economy. The Institute's rich R&D environment is drawing some of the brightest minds to the UAE. Offering Masters and PhD degree programs, the Institute has an explicit focus on sustainable energy studies. Harvard Business Review identified Masdar as a world best practice in developing the clean technology industry.

Also in the UAE, the Khalifa Fund was launched to create a new generation of Emirati entrepreneurs by instilling a culture of investment among young people, and supporting entrepreneurial projects. To strengthen the capacity of entrepreneurs, the Fund has a system of support services such as training and consulting services. UAE also launched the Sheikh Mohammed Bin Rashid Establishment for Young Business Leaders, with a vision of nurturing business leadership, and entrepreneurship in small and medium enterprises.

The United States has emphasized building scientific and engineering talent to boost the country's innovation capacity. The America COMPETES Act includes several provisions to strengthen U.S. science, technology, engineering, and mathematics (STEM) education and to develop future STEM talent, for example, by increasing the number of teachers qualified to teach high level STEM courses, and increasing the participation of minorities underrepresented in STEM.

In the United States, the Council on Competitiveness—along with Lockheed Martin Corporation—launched the National Engineering Forum (NEF) to address the future of engineering as a driver for the U.S. innovation economy. NEF is holding a series of regional dialogues with academia, business, government, the media, and students to discuss issues such as: how to develop American engineers skilled in multiple disciplines, re-thinking industry-university-labor-national laboratory collaborations to create a more capable cadre of engineers, developing new education paths for students who want to study engineering, and better leveraging of regional resources to cultivate engineering talent.

Similarly, Chile's National Council of Innovation also identified the need for a new type of engineer—a "designer-engineer" or "designer as engineer"—and the need to incorporate design into other disciplines to educate individuals to better synthesize, in a back-and-forth process, the world they seek to affect and the components and tools they have to do it. The Council also identified the importance of entrepreneurial disposition and entrepreneurs as transformers in a world of change, not just in the ability to invent

and develop companies, but also in renewing social lives through a product or service, political achievement, an institution, or cultural event.

The Need to Strengthen Formal Education

Some emerging economies have embarked on long-term efforts to build-out their education infrastructure, but rapid progress can be made.

The UAE's leaders have worked tirelessly to expand access to education, launching ambitious investment and programs. Efforts have included teacher training, and establishing permanent classrooms, computer laboratories, and modern facilities. Higher education has been a strategic priority with the establishment of UAE University's nine colleges, higher colleges of technology, a medical school, and other specialized education institutions. In 2013, investment in education accounts for the largest share—22 percent—of the Federal budget. Development of the UAE's education system started in 1962, with a base of about 20 schools in which fewer than 4000, mostly male, students studied. Today, public education in the UAE is provided for all male and female citizen children, all the way through the university level at the expense of the state.

In Brazil, between 2000-2011, public investment in higher education rose 93 percent and rose 200 percent in secondary education. The growth of higher education has been remarkable. Since 2003, 14 new Federal universities have been founded as well as 100 new campuses. The number of courses, candidates, places, freshmen, enrollments, and bachelors is roughly 2.5 times those of 2000. The number of higher education candidates grew 350 percent between 2000-2011, while the number of students in secondary education grew from about 3.8 million in 1991 to 8.4 million in 2011, reaching 89 percent of the 15-17 year old population. The number of professional or technical education students in Federal institutes has also grown dramatically from 34,105 in 2008 to 453,744 in 2012. In general, the number of students enrolled in professional education courses rose 75 percent between 2002-2010, totaling 1.14 million students in the latter year.

Countries find value in international education assessments for benchmarking student performance relative to other nations and gauging the progress of education improvement efforts.

Brazil is striving to improve student performance on international tests such as the PISA (Program for International Student Assessment). While it scored 401 on PISA 2009 (for comparison, the best-performing country, Finland, scored 543 points), Brazil was one of the fastest improving countries; its score increased 16.76 points between 2006-2009 and, over the decade (2000-2009), the Brazilian score increased by 9 percent.

The UAE has recently begun participating in international assessments such as Trends in Mathematics and Science Study (TIMMS), Progress in International Reading Literacy Study (PIRLS), and PISA. In 2011, the UAE participated in TIMSS and PIRLS, and Abu Dhabi and Dubai were benchmarked. Dubai was a benchmark participant in the 2007 TIMSS, performing best regionally. Dubai's PISA results in 2009 also ranked best regionally.

Adopting global best practices, raising higher education in global rankings, and giving students a global perspective.

In 2008, the UAE launched a Mentoring Program to bring international principals to 50 of 735 public schools across the UAE, in an effort to modernize instructional practices and implement Western methods of learning.

Ten years ago, none of Brazil's universities were in top 200 lists. Now, the University of São Paulo is in almost all of these lists and, in most cases, the federal or state universities of Rio de Janeiro, Campinas, Minas Gerais, Rio Grande do Sul, and Brasilia also appear. Also, the Brazilian Government established a program called Ciência sem Fronteiras (Science without Borders), aimed at sending Brazilian students (both graduate and undergraduate) and professors abroad, as well as attracting foreign professors to Brazilian universities.

Training for a New and Changing Economy

Sectoral approaches to training meet specialized needs.

In Korea, the content industry has grown steadily, and employment has been on the rise. There is a need to equip young people with the level of knowledge and skill required for work in the field. Korea's Creative Mentoring Program for Young Professionals is an apprenticeship program that seeks to cultivate innovative individuals who will lead the content industry in the future. In addition to offering courses, the program matches two or three young mentees with highly qualified veteran specialists in fields ranging from general content to storytelling. Mentees learn from their mentor's expertise by taking part in projects in such fields as broadcasting, movies, cartoons, storytelling, and music.

In 1983, to fill an urgent need in the UAE for locally educated banking and financial service practitioners, the Emirates Institute for Banking and Financial Studies was established to provide world-class education in banking and finance. The Institute offers a Higher Banking Diploma Program and an Islamic Banking Diploma Program, as well as a host of other training and executive education programs in the area of banking and insurance. Similarly, through its Masdar Institute, the UAE is developing a highly skilled workforce with expertise in a range of clean technologies, and an understanding of finance for the field of renewable energy.

In the United States, the Council on Competitiveness Energy Security, Innovation, and Sustainability Initiative developed a set of recommendations aimed at developing skills that would increase U.S. workers' competitiveness as clean energy, energy efficiency, and sustainability rise on the corporate agenda, and become greater factors in global hiring and investment. These included: recommending that the U.S. Department of Energy establish an early career research program, allocating 20 percent of any revenue from carbon pricing to workforce training initiatives, providing financial aid to U.S. students pursuing education in energy disciplines, and tax incentives for businesses that provide mentoring, internships, and on-the-job-training for new entrants into clean energy careers.

Economic and industrial shifts reverberate in the labor market, and need to be addressed in the skill base.

In the United States, the shale oil and gas boom has driven rapid employment growth. From 2007-2012, employment in the oil and natural gas industry increased by 40 percent. Employers have concerns about meeting staffing needs in areas ranging from engineers to the piping trades. The UA Veterans in Piping Program can help meet some of these needs.

In Korea, content industry employment has been on the rise, but highly qualified workers are in short supply in areas such as planning, creation, production, and technology. Korea has developed a program to train and mentor new job entrants for the creative industries.

In Brazil, the expansion of secondary education was biased towards the secondary school, and insufficient attention was paid to professional education until very recently, contributing to a shortage of workers such as welders, electricians, and technicians. The expansion of the Brazilian economy has demanded these kinds of workers, who now earn wage premiums due to scarcity.

Also in Brazil, throughout the 2000s, the 35-59 age range declined in relative proportion within the population pyramid. As the 1980s and 1990s were decades of modest economic growth, and large infrastructure projects were stopped, engineering courses lost their attractiveness, and many engineers migrated to other professional fields (finance, government, etc.). When the economy gained momentum in the 2000s and the demand for engineers grew, there was not enough supply of experienced engineers in the labor market, those who should have concluded their engineering education in the 1980s and 1990s. The current deficit of engineers perceived by some companies may not be a result of a quantitative shortage of engineers. Instead, it may be due to a perceived difficulty in finding experienced engineers (between 35 and 59 years of age) to manage and lead projects in construction, manufacturing, and services.

The Mongolian economy has grown rapidly in recent years driven by the huge expansion of its minerals sector, with China's thirst for natural resources pushing this development. Mining companies and businesses that support the mining sector are attracting and retaining Mongolia's most experienced and skilled workers by offering significantly higher salaries than other sectors. This has drained capable workers and skills from other parts of the economy, leading to a shortage of labor in non-mining firms. The Beehive Program was established to attract Mongolia's diaspora community back home, who are believed to be better educated and have better skills on average, with many Mongolians living overseas having attended foreign universities. The program, for example, is providing Mongolians living abroad with information about jobs in their homeland. The Beehive Program has been largely unsuccessful in its goals. The Economic Policy and Competitiveness Research Center is stepping in to conduct an investigation to better understand the diaspora community and the policies needed to attract Mongolians back home.

Education and training benefit from links to the labor market and employer needs.

There is a shortage in the kind of creative individuals needed in Korea's growing content industry. At the same time, college graduates and aspiring young people who have the potential to lead the content industry in the future are unable to get jobs. One reason for the mismatch between labor market demand and the supply of workers is the content industry's preference for hiring experienced people. The Creative Mentoring Program is aimed at addressing this mismatch by providing participants mentoring by seasoned professionals, practical working-level training, and internships with "platform agencies" ranging from content-related education institutions to business associations and production companies. These platform agencies manage activities of the program, helping ensure it is driven by employer needs.

In the UAE's Masdar Institute focused on clean energy and sustainability, student training includes an emphasis on industry and entrepreneurship. In addition, increasingly, students and faculty secure R&D grants from industry, giving the program a strong industrial, demand-driven focus.

In its Technology Leadership and Strategy Initiative, the U.S. Council on Competitiveness has been engaged in a dialogue with America's Chief Technology Officers, and their peers at research universities and national labs. These leaders point to the slow U.S. response to the rise in multi-disciplinarity as a competitive challenge with a human dimension. Most corporations have moved to multidisciplinary research and innovation teams, because the problems faced by their customers and opportunities in the marketplace require it.

The Council advocates training U.S. scientists and engineers beyond a traditional single discipline to produce more inter- and multi-disciplinary STEM professionals. This includes: establishing reward structures to encourage cross-disciplinary interaction among students; organizing more university R&D, and scientist and engineering training around grand challenges; and introducing scientists and engineers to knowledge in areas such as design, manufacturing, business, entrepreneurship, finance, and marketing.

In the United States, welders trained in the latest technologies are in demand, but many welding-oriented companies report difficulty in finding properly skilled welders who are reliable and committed. UA's Veterans in Piping Program has trained hundreds of military veterans with a job placement record of more than 80 percent. With their new skills, and military mindset and skillset, employers find these new welders are great employees—technically proficient, work task efficient, with the ability to work in teams and a drive to get the job done right.

The U.S. Council on Competitiveness has promoted strengthening and more widespread availability of technical training to meet the demand for workers in middle skills jobs such as mechanics, technicians, welders, and machine operators. This includes strengthening training programs through partnerships with business and labor. The Council has encouraged increased high school student participation in engineering and manufacturing projects, programs that expose high school and college students to opportunities in the skilled trades, and vocational and technical training to prepare students for apprenticeships.

BRAZIL

Preparing Human Resources for an Innovation-Driven Future

Introduction

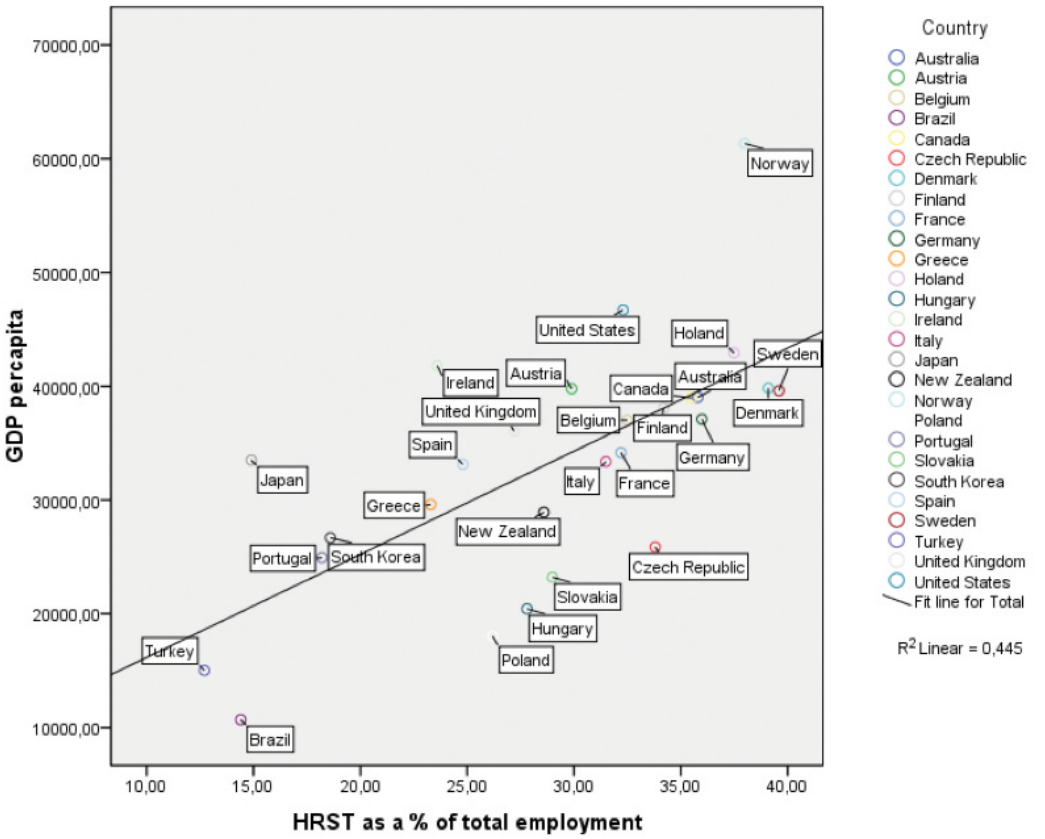
Since 2004, Brazil has been explicitly engaged in an innovation-based industrial development strategy. Several policy instruments to foster in-firm innovation have been improved or released—such as grants, credit and tax incentives—but education has also received special attention. This case study provides a brief overview of the evolution of human resources for innovation in Brazil, especially in the fields of engineering, manufacturing, and construction. It describes how Brazil's expansion of tertiary education provides a sound base for an innovation-driven future, although some additional challenges still remain. The Brazilian Government is aware of these challenges and governmental actions to overcome them are briefly described in the last part of the article.

Human Resources in Science and Technology: Why Are They so Important?

Human Resources in Science and Technology (HRST) careers comprise engineers, physicists, mathematicians, life scientists, and health and education professionals. Graph 1 shows that there is a positive correlation (67 percent) between GDP per capita and the proportion of total employment in science and technology fields. Even when fixed effects are taken into account—that is, when the regression model is controlled for time-invariant idiosyncrasies of countries—the correlation persists.

Although it is clear that correlation is not the same as causality, this kind of statistical test shows that the growth of GDP per capita bears some relationship to science and technology careers worldwide. These science, engineering, mathematics, and technology (STEM) professionals are very important for innovation, not only because they may conduct research and development (R&D) activities, but because they are also responsible for technology adoption and technological knowledge spreading, affecting the productivity of the economy. Hence, long-term growth involves the strengthening of these careers and the STEM talent pool in general.

Graph 1. The relationship between GDP per capita in 2008 (in USD of 2012) and the Percentage of HRST in total employment (2007-2008)
Source: OECD, ABDI analysis.



Human Resources Training in Engineering and Manufacturing/ Construction

Technology in Brazil

In this section, attention is turned to engineers and technologists in manufacturing and construction, all of them henceforth denominated as "engineers."

Graph 2 depicts the evolution of supply and demand for college/university education (i) in the fields of engineering and manufacturing/construction technology, and (ii) for higher education in general, from 2000 to 2011, having 2000 as the baseline (2000=100).

First, it is worth noting the impressive growth in higher education in general, throughout all indicators. Keeping in mind that total GDP growth in the period was 47 percent, it is remarkable that, in 2011, the number of courses, candidates, places, freshmen, total enrollments, and bachelors is roughly 2.5 times those of 2000. In 2011, Brazil had 6.7 million tertiary-level students, and 865,000 students concluded their higher education courses.

In local currency[1] (Brazilian Real – BRL), total public investment in higher education rose 93 percent between 2000-2011. In 2011, the Brazilian Government at all levels spent 25.76 billion USD on higher education. This amount corresponded to 1.04 percent of GDP in 2011 (up from 0.93 percent in 2000), and average expenditure per tertiary-level student was 12,359 USD/student/year in 2011 (14.6 percent increase between 2000 and 2011 in local currency).

Second, the growth in engineering tertiary education was even steeper than the growth in higher education generally. Although the number of bachelors in engineering followed the overall trend (2.5 times the number of 2000), it is important to remember that this figure results from decisions made 5-6 years before. In 2011, there were 44,500 new engineers. Indeed, other indicators suggest that the number of bachelors will rise steadily in the next years because in 2011 total enrollments were 3 times higher than in 2000, for example.

Interestingly, the number of candidates—a demand indicator—was the fastest growing indicator; between 2000 and 2011, the number of candidates grew 350 percent, although most of this growth occurred between 2009 and 2011. A similar level of growth occurred in courses and places—a supply indicator.

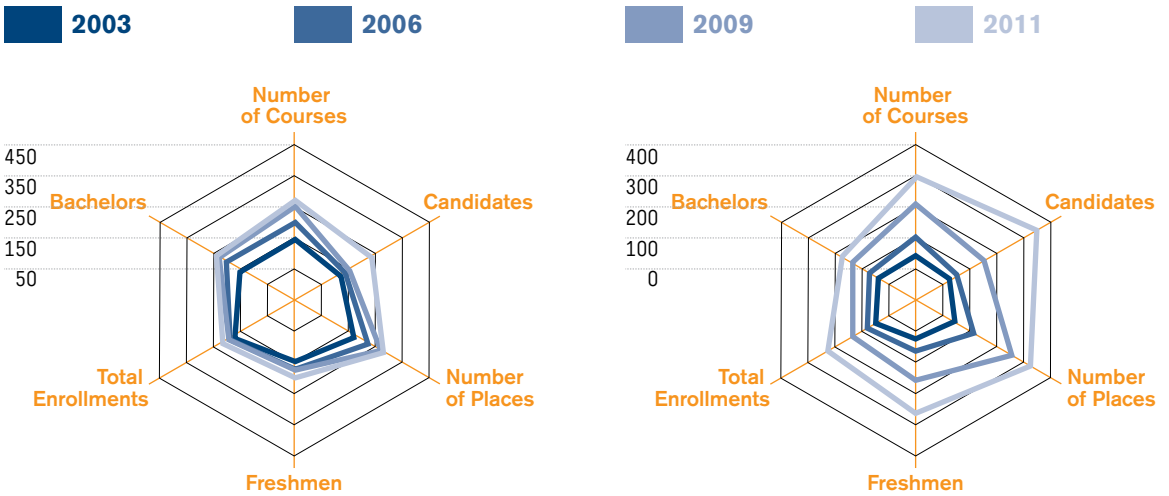
Which factors lie behind the growth of college/university education in Brazil?

- **Economic growth combined with income redistribution:** The compound average growth rate of GDP between 2000 and 2011 was 3.6 percent a year; however, much more significant is that this economic growth was accompanied by income redistribution. For example, the Gini index fell 8 p. p. between 2001 and 2011. But besides poverty alleviation—the poverty level was reduced from 35 percent in 1992 to 12.9 percent in 2011—the most significant driver of the increasing demand for tertiary education was the emergence of the new middle class during the decade. In the 2003-2011 period, the "C" class (middle class) grew by 39.6 million people, a 60.1 percent

1 All growth rates in local currency were deflated according to the IPCA, the official inflation index.

Graph 2. The evolution of tertiary education in Brazil: All courses (left) and Engineering & technology courses in construction and manufacturing (right)[1]

Source: GUSSO, D. A.; NASCIMENTO, P. A. M. M. A evolução da formação de engenheiros e pessoal técnico-científico no Brasil entre 2000 e 2011. Brasília: Ipea. Texto para Discussão (Working Paper). In press, 2013.



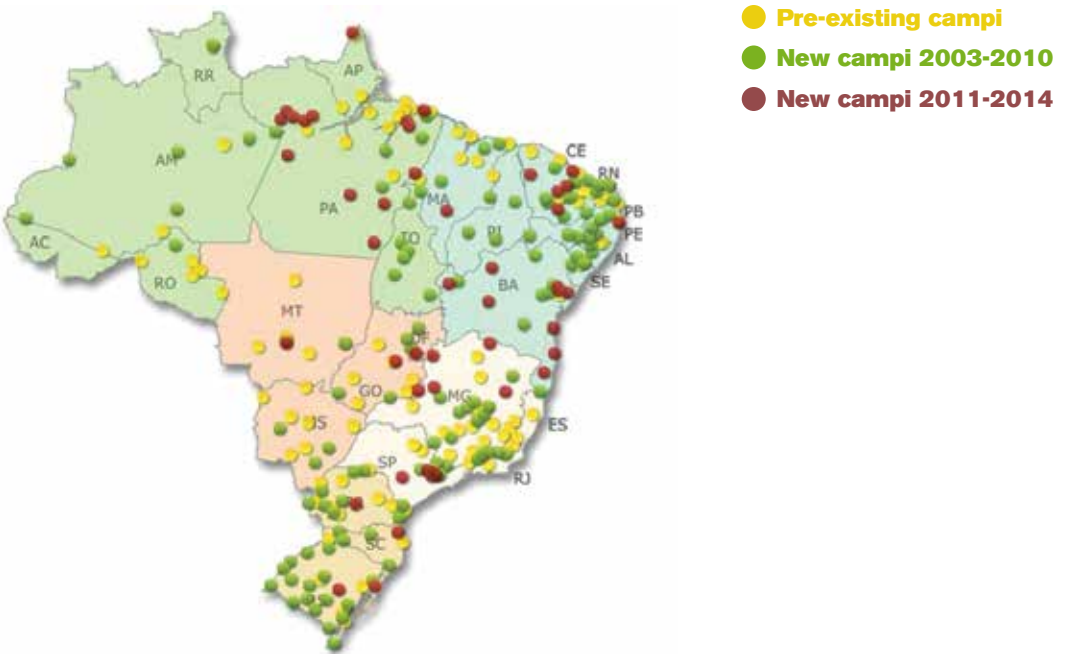
1 In this paper "number of places" refers to the number of students education institutions can accommodate.

increase, reaching a total of 95 million people or roughly half of the Brazilian population. The new demand for tertiary education comes from this emergent middle class, in which young people typically study much more than their parents did.

- **The Support Program for the Restructuring and Expansion of Federal Universities—REUNI:** Initiated in 2003, this program aims at expanding the number of places and campi of Brazilian Federal Public Universities, as well as diminishing the evasion rates in tertiary education. Indeed, since 2003, 14 new federal universities were founded, as well as 100 new campi. Most of these new universities and campi were established in medium sized cities in the countryside, as depicted in Figure 1.
- **The PROUNI Program—Universidade Para Todos ("University for All"):** Prouni was started in 2005 with the goal of expanding the number of higher education places for students from less wealthy families in Brazil. PROUNI's basic mechanism is exchanging scholarships in private higher education institutions for tax exemptions. Although participation is voluntary, most private higher education institutions have adhered to the program. Despite the importance of the REUNI in opening places in Federal Universities, most of the expansion of higher education in the last decade was due to private institutions; currently, they account for 72 percent of total enrollments in tertiary education.
- **The reformulation of FIES (Student Financing Program):** Although the program began in 1999, it underwent important changes in 2010. Currently, 760,000 students are FIES beneficiaries, 11 percent of students. FIES allows the financing of 100 percent of educational fees, at an interest rate of 3.4 percent a year (which is low for Brazilian standards, even below inflation). Students pay a fixed amortization during the course, and up to three years after its conclusion. Then, after these three years, students may pay the loan up until three times the number of years of the course. These incentives are very strong, since the economic returns to tertiary education in Brazil are very high in the form of higher wages and low unemployment probabilities.
- In addition to REUNI, PROUNI and FIES, Brazil adopted a unified admission system for higher education (SISU), which allowed for the reduction of the idle capacity of educational institutions.

There is an ongoing debate regarding a possible shortage of skilled professionals in Brazil, especially engineers. Data on tertiary education attainment suggests this is not the case, at least not in the medium-long run, and this is true for tertiary-level graduates in general and engineers in particular. Indeed, in Brazil the number of engineering bachelors is rising at a much faster rate than GDP, a proxy for demand for engineers. Moreover, the number of candidates and freshmen in engineering courses indicate that this trend will be maintained in the next years. Whether it is the case that Brazil is facing a shortage of engineers in the short run—as expressed by rising wages, low unemployment, and difficulties firms face in hiring engineers—it is reasonable to assume that this shortage will be overcome in the near future.

Figure 1.The expansion of Federal Universities in Brazil
Source: Ministry of Education of Brazil



On the one hand, one may reasonably argue that there will not be a quantitative shortage of engineers in Brazil in the medium run. However, on the other hand, the aggregate figure does not tell the whole story; analysis of Census data from IBGE (The Brazilian Institute for Geography and Statistics) shows an imbalance in the age structure within this occupational category. Throughout the 2000s, the 35-59 age range declined in relative proportion within the population pyramid, while the top and especially the bottom of the pyramid widened. A possible reason for this is a generational gap; since the 1980s and 1990s were decades of modest economic growth, along with the stoppage of large infrastructure projects, engineering courses lost their attractiveness, combined with the fact that many engineers migrated to other professional fields (finance, government, etc.). When the economy gained momentum in the 2000s and the demand for engineers grew, there was not enough supply of experienced engineers in the labor market, those who should have concluded their courses in the 1980s and 1990s. Thus, the current deficit of

engineers perceived by some companies may not result from a quantitative shortage of engineers. Instead, it may be due to a perceived difficulty in finding experienced engineers (between 35 and 59 years of age) to manage and lead projects in construction, manufacturing, and services.

The Evolution of Secondary Education in the Last Decade

Some specialists point out that the Brazilian shortage of workers actually lies in the secondary rather than the tertiary level. Brazil invested hard in the past in building its university system and, during the 1990s, the focus was directed towards basic education. At the beginning of the 2000s, there were relatively few secondary-level students, which would eventually lead to few tertiary-level students or secondary-level workers.

This situation began to change during the last decade. Public investments in secondary education rose even more steeply than in higher education. In local currency, they rose 200 percent between 2000 and 2011. As share of GDP, these investments rose from 0.62 percent to 1.06 percent over the same period. In 2011, the Brazilian Government at all levels spent 2,516 USD/student/year in secondary education—a 170.4 percent rise in the decade.[2]

In Brazil, as in many other countries, there are two types of secondary education: the secondary school, and the professional or technical school. In the latter form, students may learn an occupation while they attend regular secondary school (in the same institution or in another one) or even after having concluded the regular secondary school. As shown in table 1, Brazil had a total 8.4 million students in secondary education in 2011. This table also shows that secondary education is largely a State-level responsibility, since 85 percent of students are enrolled in State institutions.

These data suggest three findings. First, secondary education has risen steadily in the last 20 years, which clearly has made the expansion of tertiary education in Brazil possible. Second, the current number of students in secondary education (8.4 million) is 89 percent of the estimated 15-17 years-old population of 9.4 million, which represents a great improvement not only in the number of secondary-level students but also in the coverage of the target population in the last two decades. Third, in spite of this evolution, the expansion of secondary education was biased towards the secondary school, and little attention was paid to professional education until very recently. That is why many specialists argue that the actual shortage of workers lies in the secondary level. Today, secondary-level workers such as welders, electricians, labor-security technicians, and many other professional categories clearly earn wage premia due to scarcity. The expansion of the Brazilian economy has demanded this kind of worker, whose development has typically received little attention.

2 It should be noted, however, that there was also a sound rise in primary education investment – they rose 120% in local currency and 0.7 p.p. as a share of GDP during the decade (from 2.7% in 2000 to 3.4% in 2011). Since investments in primary and secondary education grew more rapidly than in tertiary education, the investment/student/year ratio relating tertiary to basic education (primary plus secondary) fell from 11.1 in 2000 to 4.8 in 2011. Combining all levels of education, Brazilian public investment corresponded to 6.1% of GDP in 2011 (4.7% in 2000).

The Brazilian Federal Government has invested heavily in the establishment of Federal Institutes of Technology, which provide mainly but not only professional and technical education (some of them also provide tertiary and even graduate education). As a result, the number of professional or technical education students in these Federal institutes rose from 34,105 to 453,744 between 2008 and 2012. In general, the number of students enrolled in professional education courses rose 75 percent between 2002 and 2010, totaling 1.14 million students in the latter year.

The Remaining Challenges

Despite the remarkable improvements in education in Brazil, some important challenges still remain.

One such challenge is retention. Only 50.2 percent of enrolled students conclude their secondary education, and there are still almost 1 million 15- to 17-year-olds who are not attending secondary education. Secondary education competes with the labor market and, inversely to what happens in basic education, there is no enforcement to attend secondary education induced by conditionality from income transfer programs, such as the Brazilian Bolsa Família. The Brazilian Government is aware of this problem, but attention to secondary education is rather recent. Only in 2009 did secondary education become compulsory. Moreover, Federal transfers to States and Municipalities aimed at improving education (the Fundeb—Federal Fund for Maintenance and Development of Basic Education) included funds for secondary schools only in 2007.

Retention is also a problem in tertiary education. Only about 50 percent of new students conclude their courses, and this ratio is a bit lower (about 45 percent) among science and technology students. Part of this problem is explained by economic factors, such as competition between education and the labor market, and difficulty in paying

Table 1. Number of Students in Secondary Education, 1991 and 2011, by Level of Educational Institutions
Source: Ministry of Education of Brazil.

LEVEL	1991	2011
Federal	103,092	115,069
State	2,472,964	7,183,345
Municipality	177,000	80,906
Private	1,019,374	1,022,509
Total	**3,772,330**	**8,401,829**

private university fees. This latter factor has been partially alleviated by programs such as FIES and PROUNI. Another part of this problem is related to students' poor educational background, especially in sciences and mathematics, which makes it very difficult for some students to keep up with engineering, science and technology courses.

Another challenge is related to quality. The expansion of secondary and tertiary education must be carried out with special attention to this aspect. Since 2004, the Brazilian Education Ministry has assessed the quality of universities on a yearly basis through the ENADE (National Exam of Students' Performance). The ENADE assesses the quality of one-third of tertiary education fields each year, in such a way that engineering courses, for example, are assessed every three years. Entrants and concluding students take a test comprised of a general part and a specific part; it is expected that the performance difference between the entrants and the concluding students on the specific part of the test may be attributed to what students learn at the university. Based on the students' grades, institutions are rated according to a 1-5 scale, based on quintiles of the distribution of grades. This institutional grade is very important to institutions, since a course with a grade of 1 or 2 for two consecutive rounds of ENADE may be shut down by the Ministry of Education. Moreover, students can be denied FIES funding for courses with grades 1 or 2.

Regarding secondary education, Brazil has assesses its quality since 1998, through the ENEM (National Exam of Secondary Education). Today, 4.2 million students take the test, because it is used as an entry exam in many universities. Between 2000 and 2010, the average score increased by 10 points (scores range from 0 to 100).

According to international standards, Brazil is not yet a good performer on international tests, such as the PISA (Program for International Student Assessment). In fact, Brazilian students' score on PISA 2009 was 401 points; for comparison, the best-performing country (Finland) scored 543 points. It should be noted, however, that Brazil was one of the fastest improving countries in this regard; the Brazilian score increased 16.76 points between 2006 and 2009. Over the decade (2000-2009), the Brazilian score increased by 9 percent. Interestingly, this increase was driven basically by the improved performance of poorer students.

Lastly, our tertiary education is perceived as scarcely internationalized. Nevertheless, this is also a changing picture. As with the economy, Brazilian universities are becoming global players. During the last decade, the Brazilian share of the world's indexed academic articles roughly doubled, from 1.35 percent in 2000 to 2.69 percent in 2009, according to the Thompson/ISI indicator. Ten years ago, none of Brazil's universities were in top 200 lists. Now, the University of São Paulo is in almost all of these lists and, in most cases, the federal or state universities of Rio de Janeiro, Campinas, Minas Gerais, Rio Grande do Sul, and Brasilia also appear.

Aware of this low internationalization level, the Brazilian Government established a program called Ciência sem Fronteiras (Science without

Table 2. Number of grants from the Science without Borders program until April 2013
Source: Ministry of Education of Brazil.

Sandwich undergraduate courses	31,745
Sandwich Doctorate	4,385
Post-Doctorate	2,883
Full Doctorate	1,502
Young talented researchers/visiting professors	618
Total	41,133

Borders), aimed at sending Brazilian students (both graduate and undergraduate) and professors abroad, as well as attracting foreign professors interested in coming to Brazilian universities. The program has distributed 41,133 grants, most of them (31,745) to undergraduate students. With respect to countries of destination, most students go to the United States (8,378), followed by the United Kingdom (5,865) and Canada (4,385).

Conclusion: The Best is Yet to Come

Today, Brazil recognizes that innovation is the main long-term development driver, and education is key to improving innovation capacity and boosting productivity. After taking special care of primary education in the 1990s, now it is time to improve secondary and tertiary education. On the one hand, Brazil is aware that the country is living a demographic bonus—a situation where 15- to 19 year-olds are at their maximum historic share in the demographic pyramid. In other words, there has never been (and there will not be) so many young people in Brazil. On the other hand, taking care of this generation will warrant a better future for the whole of Brazilian society.

Brazil is aware of the challenges of education and is tackling them. Improvements have been relatively recent, and most of their positive effects are about to unfold in the next years.

KOREA

Developing Talent to Drive the Creative Industries: South Korea's Creative Mentoring Program for Young Professionals

Background

In the 21st century, the content industry—based on software, cultural imagination, and creativity—is at the core of the creative economy. Rapidly developing in both global and domestic markets, this new growth engine is fueled by high value-added activities driven by technology, imagination, and innovative ideas.

Given that creativity is the source of the content industry's value-added, its competitive edge depends on the cultivation and employment of creative individuals who can bring about innovation and infuse creativity throughout the field. The key to the industry's success is its ability to attract a high number of individuals with creativity, skill, and ability.

Korea's digital natives of the younger generation prefer content-related jobs in such fields as movies, games, mobile content, and tourism. According to a survey of young job seekers, the content industry is the preferred and most promising field.

In Korea, the content industry has grown steadily, employment has been on the rise, and various related human resource policies have been implemented since 2000. The young professionals who are the driving force behind the industry's long-term growth have been the beneficiaries of these policies. Yet, despite the industry's growth and these policies, college graduates and aspiring young people who have the potential to lead the content industry in the future are either unable to get jobs or are limited in their creative activities by poor working environments and structural barriers to employment.

At the same time, there is a shortage in the kind of creative individuals needed in the field. This has persisted despite the high number of college graduates seeking work in the industry and vari-

Figure 1. Scarcity of Human Resources in the Content Industry (Per 100 people)

	Creation	Planning	Production	Technology	Office Work	Total
Lack of Workers	7.1	5.9	6.2	6.7	2.7	5.9

ous kinds of policy support. One reason for the mismatch between labor market demand and the supply of workers is the content industry's preference for hiring experienced people. Both planning and creative abilities are essential to forge new and expand existing markets through creative convergence, but highly qualified workers have been in short supply for Korea's content industry.

With consideration for the distinctive characteristics of each genre—such as cartoons, scenarios, musicals, and movies—there is a rapidly growing need for support programs for young professionals, including financial support, improved infrastructure, and on-the-job training. Until now, education programs related to the content industry have provided basic courses. However, it has been suggested that more professional and practical education programs are needed to equip young people with the level of knowledge and skill required for work in the field. Also, there has been criticism about the indiscriminate creation of jobs without providing the necessary training for them and the lack of attention given to the issue of job mismatch. In response, innovative policies such as practical industry-academia cooperation and a mentoring program are being implemented to develop creative workers for the content industry and connect them to jobs.

The Ministry of Culture, Sports and Tourism (MCST) and the Korea Creative Content Agency (KOCCA) have been seeking a new approach to nurture creative individuals. Taking into account the needs of the content industry, they have introduced several pilot programs ranging from practical fieldwork to one-on-one mentoring. Also recognizing the importance of creative talent, the Ministry of Strategy and Finance (MOSF) has financially supported MCST and KOCCA with a budget of 5 billion won annually since 2012.

The distinguishing feature of the MCST 2012 content industry promotion budget was its emphasis on job creation in the creative industry. When it comes to the number of employees created by every one billion won in government funding, the content and tourism industries employed 12.11 and 15.5, respectively. In contrast, the manufacturing industry employed just 9.2 persons. Therefore, with the content industry as the focus of its job creation efforts, the MCST is enthusiastically promoting 15 key projects.

Among the various programs for nurturing creative talent, one of the most exemplary is the Creative Mentoring Program for Young Professionals, an innovative apprentice/mentoring program to help bridge the gap between unemployed graduates and the demand for talent in the field. In Korea, it is the only innovative model covering the full spectrum from mentoring to job placement.

2. Program Overview

Since 2012, KOCCA has carried out the Creative Mentoring Program for Young Professionals, an apprenticeship program with highly qualified specialists in fields ranging from general content to storytelling. By matching two or three young mentees with one veteran specialist, the program seeks to cultivate innovative individuals who will lead the content industry in the future. "Traveling Together Toward a Dream" is a catchphrase that captures the aims of the Creative Mentoring Program.

The value of the Creative Mentoring Program was demonstrated in a pilot program in 2011. The following year, the Korean Government allocated 5 billion won to carry out this program in earnest. It offers young people well-organized apprenticeship courses in which they are matched with platform agencies and mentors. Young mentees can learn from their mentor's expertise by taking a direct part in projects in such fields as broadcasting, movies, cartoons, storytelling, music, and performances.

Figure 2. Basic Structure of the Mentoring Program for Young Professionals

Roles in the Mentoring Program for Young Professionals

- **The Ministry of Culture, Sports and Tourism (MCST)** is the government ministry charged with carrying out policies in the fields of culture, art, sports, tourism, religion, and media. For this program, MCST serves as the director of human resources policy related to the content industry.
- **The Korea Creative Content Agency (KOCCA)** is a government-affiliated organization. It plans and manages the Creative Mentoring Program from the selection of platform agencies, mentors, and mentees to the supervision of all programs conducted by the platform agencies. Also, it is in charge of follow-up programs for sustainable growth.
- **Platform agencies** range from content-related educational institutions to business associations. As the bridge connecting mentors and mentees, they manage overall activities of the program. KOCCA and content specialists select eight platform agencies representing key content fields such as movie production companies, storytelling associations, or musical foundations. The platform agencies proceed with all activities with funds provided annually by the Government.
- **Mentors** are creative specialists who have worked in the field for more than 10 years. After signing an agreement with a platform agency, mentors share their distinct know-how and field experience with mentees.
- **Creative Mentees** are the beneficiaries of this program. They are prospective employees under the age of 35, who have creative minds and professional skills, and are eager to work in the creative industry. After making agreements with a platform agency and mentors, they are given practical working-level training. They can work on the staff of their mentor's project or get their mentor's practical advice for their own individual project.
- **The Steering Committee** is composed of specialists from academia, industry, and the Government. A broad variety of ideas are taken into consideration in order to determine the best direction for the Creative Mentoring Programs.

Figure 3 shows how the annual Creative Mentoring Program for Young Professionals is carried out.

A platform agency plans various mentoring training courses and other project activities. The Creative Mentoring Program starts out with selection of qualified platform agencies. Any organization can apply for the program as a platform agency as long as it is capable of providing facilities, personnel, and various training programs.

Platform agencies that have participated in the program have been influential production companies or associations in the content industry. Most of them have been in the field for more than 10 years. They have well-trained veteran specialists with long careers and good reputations. While some of these veteran specialists do serve as mentors, most of the mentors are outside specialists specifically invited to participate in the program.

Figure 3. One-Year Program

Selecting Platform Agencies	Public announcement ▷ Program presentation ▷ Accepting applicants ▷ Evaluation (document review and interview) ▷ Program expenses confirmed ▷ Agreement
Selecting Mentors	Platform agencies: Finding mentors in the creative content industry ▷ Finalization by the Steering Committee
Selecting Mentees	Platform agencies: Selection of qualified mentees ▷ Finalization
Orientation	Opening ceremony ▷ Orientation for platform agencies, mentors and mentees
Training	One-on-one mentoring program, educational program for all mentees, Big Think (monthly lectures), creative lunch (networking), Dream Workshop
Presentation of Achievements	Presenting and exhibiting the mentees' achievements, Dream Festival

Every year, about 100 **mentors** such as playwrights, movie directors, broadcasting producers, and cartoonists take part in the Creative Mentoring Program. They have several different motives for participating, but the biggest reason is "to personally train young mentees for the future" (71 percent), and they think it is a mutually advantageous way to grow together (41 percent).

The beneficiaries, **mentees**, are selected after consideration of comprehensive factors such as passion and potential for the content industry. They are usually young people with exceptional ability and potential, who could not pursue their dreams for various reasons, including structural barriers to employment. Anyone between the age of 18 and 35 can apply for the Creative Mentoring Program as a mentee, as long as they are not a student of a mentor or other interested party such as a business partner or family member; the main beneficiary of the program should be mentees who have few chances to get practical advice and mentoring.

Like mentors, mentees also have different motives for applying to the program. The biggest motive is "to acquire professional knowledge and practical skills" (61 percent), followed by "to promote self-development" (57.5 percent), "to find a job or start a business" (52.2 percent), and "to widen networks" (51.8 percent).

Every year, about eight platform agencies, 100 mentors, and 240 mentees are selected for a 10-month mentoring program. Enlisted mentees can participate in one-on-one apprentice mentoring, content production projects, and the mentor's special lectures. To strengthen network ties between participants, KOCCA organizes events such as a starting ceremony and orientation, monthly lecture workshops, and networking parties. All mentees make full use of these opportunities to share their experiences and discuss future collaborative projects.

The Creative Mentoring Program also focuses on helping participants complete substantive projects. Through the Project Pitching Day for Investment and Creative Achievement Conference, mentees can turn their excellent projects into a moneymaking venture and advertise it with various marketing services.

All mentees are paid 1 million won per month for nine months. In addition, the program covers four kinds of national insurance (e.g., medical, employment, workers compensation insurance, and national pension). In short, all mentees get the best quality mentoring while receiving the benefits of employment. They gain the benefit of their mentors' advice while simultaneously taking part in internships offered by the platform agencies. They can focus on their creative work without financial problems.

There are additional support programs for job searching. For example, mentees can access high-quality career counseling and comprehensive follow-up support for job placement.

The existing training programs have provided only uniform curricula, so it has been difficult for trainees to establish a close network with experts in the field. However, the Creative Mentoring Program makes it possible for mentees to build a network with a wide variety of other mentees, mentors, and platform agencies. This practical and multilateral program helps them get jobs.

Top left: Opening Ceremony
Celebrating the beginning of this program and gathering all participants for orientation.

Top right: Monthly Lecture
Holding monthly lectures of veteran specialists working in various fields and having different stories.

At left: Workshop
Building close relationships between participants through creative programs.

3. Program Achievement (2012)

The Creative Mentoring Program is the first attempt to offer an apprenticeship program that connects young creative mentees with specialists in the content industry, while helping with job placement. It is being heralded as an exemplary program in terms of nurturing close partnerships and arranging practical internships, as well as providing pay and insurance.

KOCCA is consistently analyzing overall results such as mentees' career tracks and plans for the future. The 2012 mentees completed 463 projects, including 213 individual projects and 250 collaboration projects. The mentees won 21 awards, including 18 domestic content-related contests and three international contests. Additional results pointing to the program's effectiveness include official debuts as writers and TV producers. After

Figure 5. Project Achievements

Total	Project Portfolio (Cases)		Contest Awards (Cases)		Job Placement (Mentees)	
	Individual	Collaborative	Domestic	International	Employment	Contract
240	213	250	18	3	90	31

completing the 2012 program, 121 mentees (41 percent) started on a substantial career. Ninety mentees are employed in content-related companies and 31 won contracts with their projects. The rest of the mentees are consistently following up on their creative work.

One aspiring musical writer, Han Jungsuk, met a famous producer of hits, Jo Sungwon, through this program. He completed the script and lyrics for the musical, "The Goddess Is Watching You" with his mentor's full assistance. His musical was a big hit when it premiered in 2013. It is having repeat performances and is also being performed in local theaters. He plans to take the musical to Japan next year. In addition, his musical won the top prize in the 1st Seoul Musical Festival and the 2013 Korea National Assembly-Best Musical of the Year.

Han said he was lucky to participate in the Creative Mentoring Program because he could build a great network with mentors and get helpful advice and ideas related to his work. Although he was not sure he could write for a living before this program, it gave him the confidence to be a professional writer. It was also helpful to get other kinds of advice on topics such as content industry trends, the proper attitude of content creators, and content-related laws.

The first movie Shin Sojung directed, Strangers, is the result of constant interaction with her mentor, Oh Dongjin, a famous movie critic. She won the best student director in the Japan Sapporo International Short Film Festival. She is sure that the key to success is to communicate with a lot of influential mentors in the film industry. She said that she was honored and happy to be able to discuss her movie part-by-part with them.

Park Geunmo produced a short film, The Night of the Witness, which is the result of a great combination of the apprenticeship program of a contents production company and the Creative Mentoring Program. He won the Sonje Award for best Korean short film at the 2012 Busan International Film Festival. The film was also invited to several international film festivals, including the Clermont-Ferrand International Short Film Festival.

Lee Oksup's mentor is Park Bongnam, who has won many authoritative film awards such as the award for best mid-length documentary at the International Documentary Film Festival Amsterdam. He supported Mr. Lee so that his documentary RAZ on Air was also shown in that film festival. In addition, Lee was invited to compete in the Seoul Independent Film Festival and received an enthusiastic response at the Gwangju Human Rights Film Festival.

Kim Minji also made a successful documentary. Her mentor is Han Jisu, who is an authority on creative documentaries. With the full support of her mentor, her documentary, The Way to School, has won awards and attracted much attention at many film festivals such as the Seoul Independent Documentary Film & Video Festival and the DMZ International Film Festival.

Figure 6. Mentees' Achievements

Musical: *The Goddess Is Looking at You*

Short Film: *Strangers*

Short Film: *The Night of the Witness*

Musical: *Focus*

Kim Dongho and Kim Yaerim met and became friends though the Creative Mentoring Program. Before that, they had not been able to decide what to do in the three years since graduating. Working as a team, Mr. Kim wrote the story and lyrics, and Ms. Kim composed the music for their creative musical, Focus, a great model of collaboration for future mentees. They said that the Creative Mentoring Program was an opportunity for them to crystallize their vague dreams of being a songwriter and composer.

Three mentees, An Shinhong, Shin Myungjin, and Lee SeoungA, have found full-time employment at Nexon Korea Corporation, a developer and publisher of video games founded in Seoul in 1994. Nexon went public in 2011 with the second largest initial public offering by a technological company in that year. They are now expanding their business abroad to create additional unique games.

Many other mentees also have tangible results such as winning in domestic and international contests, signing contracts, and working on the staff of their mentor's projects

What happens after the program ends is vital to ensuring prolonged success rather than temporary gains. The Creative Mentoring Program is a way for mentees to build their careers, and for the content industry to expand its talent base and provide an environment where the creative occupations can flourish.

It is critical to make a virtuous cycle of this program—building creative abilities of its participants so they can secure jobs and, in turn, become mentors. MCST and KOCCA will strive to strengthen follow-up support programs to create this virtuous circle. In addition to mentoring and internship programs, follow-up programs that provide business opportunities and assist with pitching and funding will be carried out to help mentees promote their projects in the content market.

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UNITED ARAB EMIRATES

Seeding Innovation through Education and Entrepreneurship

Talent is the Critical Resource Fueling the Knowledge-Based Innovation Economy

The world is in the midst of a major transformation—shifting from an economy driven by natural and physical resources to an innovation economy driven by people's talent, creativity, and knowledge. Capabilities in science and technology are growing globally and increasingly distributed around the world. Today, advanced technology does not necessarily come from only the West; Brazil, Russia, India, China, and many other countries are catching up. This is an inspiring era of opportunity because, today, there is no economic asset greater or more widespread globally than human knowledge, creativity, imagination, and talent.

A talented, competitive workforce—working within a robust innovation ecosystem—is at the heart of any country's ability to bring innovations to market, fueling a nation's competitiveness, productivity, and prosperity. A well-functioning innovation ecosystem fosters knowledge exchange and linkages among universities, R&D centers, research parks, and firms, which provide the context for creating new products and services, and for developing industry-relevant workforce skills. Knowledge economies make the best use of their talent and knowledge assets where these links are the strongest.

Since the UAE was established more than 40 years ago, the country has witnessed an incredible transformation, not overnight, but through steady progress over time. The UAE continues to build itself as a competitive nation. Innovating

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enterprises and knowledge-driven industries are increasingly important as the country diversifies its economy and turns its resource-based competitive advantage into a human capital-based advantage. Looking to the future, over the next eight years, the country will strive to achieve an historic objective: become a world-leading economy and nation, as envisioned by the *UAE Vision 2021*.

UAE Government Invests Heavily in Building its Knowledge and Talent Capacitie

To thrive in this new economic age driven by human capital, the UAE must develop the creative industrial designers, managers, geneticists, academics, financiers, clean energy professionals, aerospace engineers, intellectual property lawyers, philosophers, nanotechnology engineers, and artists—knowledge professionals of all stripes—that will enable the country to shape a globally competitive economy.

Cultivating such world-class talent takes time to bear fruit, sometimes decades of vision and investment. The road to such excellence is full of challenges that require hard work, commitment, and dedication to overcome. Significant long-term investment in education to develop the UAE's talent base is crucial in fulfilling the ambitions of *Vision 2021*.

Building UAE's Education System

The development of UAE's education system started in 1962. At that time, there were about 20 schools, in which fewer than 4000, mostly male, students studied. The infrastructure needed for education was often unavailable in many social service venues.

With the discovery of oil fueling economic development, the country focused significant attention on education. His Highness Sheikh Zayed Bin Sultan Al Nahyan, the late UAE President, considered education among the priorities for progress, and stated openly that the youth are the real wealth of the nation. He was generous in support of projects to improve education in order to prepare a new generation capable of contributing to the country's progress.

When the Federation was established in 1971, enrollment in education had grown to nearly 28,000 thousand students. But educational services were still immature and inaccessible to many cities and villages. Higher education was unavailable locally, so students had to travel abroad to pursue higher education (on the government's expense). State leadership worked tirelessly to expand access to education, launching ambitious investment programs to develop the local education infrastructure.

Education Development Strategy

The Ministry of Education adopted *Education Vision 2020*, a series of five-year plans designed to introduce advanced education methods, improve innovation skills, and encourage the self-learning abilities of students. As part of this program, an enhanced first-grade level curriculum for mathematics and science was introduced in all government schools for the 2003–2004 academic year.

In February 2006, His Highness Sheikh Mohammed Bin Rashid Al Maktoum, UAE Vice President, Prime Minister and Ruler to Dubai, directed the Ministry of Education to take bold steps toward improving the quality of education, including establishing permanent classrooms, computer laboratories, and modern facilities.

In 2008, the Ministry of Education launched a *Mentoring Program* to bring international principals to 50 of 735 public schools across the UAE, in an effort to modernize instructional practices and implement Western methods of learning. The program emphasizes the need to shift from traditional methods of passive memorization and rote learning, to encouraging active student participation.[1]

The *Teachers of the 21st Century* initiative and a two hundred million dirham share of the federal budget are aimed at training 10,000 public school teachers,[2] while also pursuing the goal of reaching 90 percent "Emiratisation" of education staff by 2020.[3]

1 UAE Ministry of Education official site, February 2008; http://www.moe.gov.ae/English/Lists/Interviews/Display.aspx?ID=29.

2 UAE Ministry of Education, September 2008; http://www.moe.gov.ae/English/Pages/h250908_2.aspx.

3 http://www.uae.gov.ae/Government/education.htm.

The UAE launched ambitious campaigns to implement high-quality education standards, and to emphasize the importance of "modern curricula with assorted and non-monotonous means of training and evaluation."[4] Investments in support of these efforts included 7.4 billion dirhams ($2 billion) earmarked in 2009, as well as increased teacher training.[5]

In addition, the UAE government believes that a poor grasp of the English language is one of the main employment barriers for UAE nationals; as a first remedial step, the Abu Dhabi Education Council developed the New School Model, a critical-thinking oriented curriculum modeled on that of New South Wales. This program was unveiled in September 2010.

In 2012, the UAE marked a milestone in digital education when the Ministry of Education unveiled an application for both smart phones and tablets that holds all books that are part of its curricula from first to tenth grade, as well as various smart functions to aid students. Books can be downloaded and accessed at any time to study.[6] The unique application includes several in-app functions in addition to reading, such as sticking and writing notes on any page of a book, practicing, researching, and referring. Named 'Al Manhaj Al Madrasiyah,' the app helps students study textbooks and, based on student and parent feedback, the app will be modified and loaded with extra features.

In 2013, the AED 9.9 billion ($2.69 billion) investment in education accounts for the largest single share—22 percent—of the federal budget. To complete implementation of the country's Education Development Strategy, AED 6 billion ($1.63 billion) is allocated to support development initiatives, and to introduce advanced learning technologies and methods in government schools.

The higher education sector has received AED 3.9 billion ($1.06 billion) as part of a national strategy to further enhance higher education, promote scientific research, send more Emirati students abroad for study, and establish more buildings and facilities in government universities and colleges.[7]

Today, public education in the UAE is provided for all male and female citizen children, all the way through the university level at the expense of the state (education is compulsory through ninth grade). The UAE enjoys one of the lowest student-to-teacher ratios (15:1) in the world.

Commitment to Global Standards

Benchmarking students' achievement against their counterparts locally, regionally, and globally can have a significant effect on both the quality of education, and the ability of nations to compete. Since most countries believe that educational achievement is the key to economic success, the rank ordering of countries based on student test performance can have wide reaching effects on education policy.

The UAE has participated in international assessments such as Trends in Mathematics and Science Study (TIMMS), Progress in International Reading Literacy Study (PIRLS), and the Program for International Student Assessment (PISA). All three assessments claim to have educational policy uses. Their rank ordering causes public debate that can lead to curricula reforms and a strategy to improve education outcomes.

The UAE's participation in TIMSS, PIRLS, and PISA has been relatively recent. In 2011, the UAE participated in TIMSS and PIRLS, and Abu Dhabi and Dubai were benchmarked. Dubai was a benchmark participant in the 2007 TIMSS, performing best regionally. Dubai's PISA results in 2009 also ranked best regionally.[8]

4 AME Info, January 2008 http://www.ameinfo.com/144655.html.

5 Arabian Business.com November 2008; http://www.arabianbusiness.com/538482-uae-education-chief-reveals-2bn-strategy.

6 "UAE Education Initiative" Gulf News Feb 12, 2012 http://gulfnews.com/news/gulf/uae/education/uae-education-initiative-textbooks-online-1.987949.

7 http://gulftoday.ae/portal/923246e8-c1cd-425f-9bc2-fa40943bba67.aspx.

8 http://eprints.ioe.ac.uk/14256/.

UAE Aims for Even Higher Education

Development of the higher education sector is critical to fostering innovation in any economy. Today's competitive economies that develop and produce sophisticated, value-added products and services are distinguished by their creativity, and anchored by high quality tertiary education systems that develop world-class talent and drive innovation. Moreover, the combined experience of theoretical instruction and applied practices paves the way for future entrepreneurs and innovators, and prepares them for entry to the job market.

High quality tertiary education will help achieve a critical goal of UAE's policymakers—build capacities and talents at the individual level, enabling the people of the UAE to pursue good quality, happy, fulfilled, and successful lives. This includes having best-in-class skills to engage with local, national, and global economies, and play an important part in shaping society as creative, reflective, thoughtful citizens within just, equitable, and ethical frameworks.

World-class higher education is a key component of the UAE government's federal policy and competitiveness strategy, and the country has made significant progress in establishing an advanced higher education system in a short period of time. These achievements are credited to the visionary leadership of His Highness Sheikh Zayed Bin Sultan Al Nahayan who recognized, from the dawn of the UAE Federation, that science and knowledge are the cornerstones of progress and development. Today, the UAE is home to more than 100 accredited institutions of higher learning—37 of which are satellite campuses of overseas universities. The country's strong education sector is diverse, ranging from large public research universities and R&D-intensive centers, to teaching colleges and vocational schools.

His Highness Sheikh Khalifa Bin Zayed Al Nahayan has made higher education a national strategic priority, seeking to support advanced education capacities in all areas until the UAE has become an attractive environment for students from all over the world.[9] Respectively, UAE students studying abroad are benefiting from their experiences in other countries in the interests of the future of the UAE and meeting the needs of the labor market.

While establishing a K-12 education system was an immediate priority following December 1971's founding of the UAE, shortly there after in 1976, the United Arab Emirates University was established in Al Ain in Abu Dhabi. Consisting of nine colleges, it is considered by the UAE government to be the leading teaching and research institution in the country.

In 1983, to fill an urgent need for locally educated banking and financial service practitioners, the Emirates Institute for Banking and Financial Studies was established to provide world-class education in banking and finance. The Institution has two campuses, one in Sharjah and another in Abu Dhabi, and a third state-of-the-art campus will be opened in Dubai. Currently, the Institute offers a Higher Banking Diploma Program and an Islamic Banking Diploma Program, as well as a host of other training and executive education programs in the area of banking and insurance.[10]

The UAE's first four Higher Colleges of Technology (HCT) were opened in 1988. Today, 12 campuses offer more than 75 programs, with a combined enrollment of 20,000 men and women. The Centre of Excellence for Applied Research and Training, the commercial arm of the HCT, provides allied multinational companies with training courses and professional development.

The American University in Dubai opened its doors in 1995, followed shortly by the American University in Sharjah, marking a new milestone in higher education opportunities for students in the UAE and around the region. In 1998, Zayed

9 UAE Ministry of Higher Education https://www.moe.gov.ae/English/Pages/UAE/UaeEdu.aspx.

10 http://www.eibfs.ae/eibfs/eibfsoverview.aspx.

University was opened to women with campuses in Abu Dhabi and Dubai. A new US$100.7 million campus in Dubai opened in 2006.

In 1998, the UAE's first medical school—Gulf Medical University (formerly the Gulf Medical College)—opened for both genders and all nationalities. In 2008, it expanded its campus and programs to include dentistry, pharmacy, and other programs in association with the Royal Australian College of General Practitioners. Gulf Medical University is based in the Emirate of Ajman.

Several international universities enjoy a presence in the Emirates, including Tufts University in Ras Al Khaimah; Michigan State University and Rochester Institute of Technology in Dubai; and New York University in Abu Dhabi. In 2006, after a distinguished 700-year history, the Sorbonne established its first campus abroad in Abu Dhabi, focused largely on the arts and humanities.

Also in 2006, Masdar Institute of Science and Technology became the world's first graduate-level university dedicated to providing real-world solutions to the challenges of sustainability. The Institute's goal is to become a world-class research-driven university, focusing on advanced energy and sustainable technologies.[11]

Developing Entrepreneurship in the UAE

Entrepreneurs, and small and medium enterprises (SME) are among the main pillars of any thriving economy and the UAE, and its success as an economy and a community, is no exception. Entrepreneurs are the driving force behind the UAE's growth and sustainability, and one of the strongest forces behind its role as a regional powerhouse on a global stage. Over the years, various initiatives and institutions have been established to develop and support young business leaders and entrepreneurs.

Khalifa Fund for Enterprise Development

Khalifa Fund was launched in June 2007 to help develop local enterprises in Abu Dhabi, with a total capital investment of AED 2 billion. The Fund aims to create a new generation of Emirati entrepreneurs by instilling a culture of investment among young people, as well as supporting and developing entrepreneurial projects and small to medium-sized enterprises.

Khalifa Fund operates a comprehensive program to meet the needs of investors seeking to establish or expand entrepreneurial projects and enterprises. To create a favorable investment environment and strengthen the capacity of entrepreneurs, the Fund has a system of support services. These include training, development, data and consulting services, in addition to marketing-focused initiatives. Financing is offered for viable projects, which helps feed the national economy. The Khutwa, Bedaya, and Zeyada financing programs cover all project segments.

Other Khalifa initiatives include Sougha for heritage handicrafts, Al Radda for correctional centre inmates, and Ishraq for those who have recovered from an addiction at the National Rehabilitation Centre. The Amal initiative targets special-needs Emiratis.[12]

The Sheikh Mohammed Bin Rashid Establishment for Young Business Leaders

His Highness Sheikh Mohammed Bin Rashid Al Maktoum, UAE Vice President, Prime Minister and Ruler of Dubai established the Sheikh Mohammed Bin Rashid Establishment for Young Business Leaders (Dubai SME) with a vision of nurturing business leadership, and developing entrepreneurship in small and medium enterprises. One of the major goals for Dubai SME is implementing strategies and plans to promote innovation and business leadership in accordance with the UAE Vision 2021, which foresees an economy that encourages creativity and translates ideas into successful businesses.[13]

11 http://www.masdar.ac.ae/aboutus.html.

12 http://www.khalifafund.ae/En/AboutUs/Pages/Overview.aspx.

13 http://www.sme.ae/en/aboutus/Pages/default.aspx.

Support for Entrepreneurs and SMEs

In 2012, the UAE Cabinet approved a federal law to streamline the entrepreneurship sector; boost Emirati citizens' participation in starting SMEs; encourage innovation, creativity, and research; and move towards a knowledge-driven economy. The SME law also aims to increase the UAE's competitiveness, and enhance its regional and international status as an entrepreneurial center.[14]

In further support SMEs, in June 2013, the Federal National Council passed a draft law requiring federal departments to award at least 10 percent of their purchases of goods and services to micro, small, and medium enterprises. The bill also provides that companies, in which the government holds at least 25 percent of equity, award not less than 5 percent of their purchases of goods and services to SMEs.[15]

UAE's Long-term Investments Drive Steady Progress in Building a Knowledge-Based Economy

We are already seeing the fruits of foresighted policymaking and our investments in the country's knowledge infrastructure. The UAE is one of the most developed countries in West Asia and ranked highly in various economic development indices alongside some of the most R&D-intensive nations.

Currently, the UAE ranks 19th out of 148 countries in the World Economic Forum's Global Competitiveness Report 2013, and is classified in the innovation-driven stage of development. The country has maintained its status as innovation-driven for eight consecutive years—the only Arab country to do so. This categorization places the UAE alongside countries such as the United States, Singapore, and Germany, indicating a sufficiently diversified economy and ability to compete in the innovative sectors of the economy.

In another competitiveness ranking, the INSEAD Global Innovation Index places the UAE at 38th out of 142 countries for innovation across all sectors.

While we have made substantial progress, we cannot lose sight of the fact that other countries are bolstering their knowledge capacities as part of their competitiveness strategies; Singapore, India, China, and a host of emerging economies are augmenting their higher education institutions in a bid to compete with more established innovation-driven economies.

The Future

Realizing the UAE's vision of building our talent and knowledge-based economy requires the engagement of government, businesses, and individuals:

- For its part, the government continues its on-going effort to build a tertiary education system and larger knowledge infrastructure that rival the best in the world.
- UAE's companies can play a greater role in capacity building of Emirati youth, including developing internship, training, and hiring programs. On-the-job training goes a long way in developing a workforce that is more responsive to the needs of the private sector. In turn, companies' linkage to academic institutions strengthens their competitive advantages.
- For individuals to compete in a globally competitive economy means developing a range of skills that respond to global conditions. These span areas of science and technology, the arts and humanities, being multilingual, and being entrepreneurial.

With a focus on the country's vision and active engagement of different stakeholders, the UAE is well positioned to leap forward from vision to actualization, and become a global leader as an innovation-driven knowledge economy. While the shift in the global economy is turbulent and

14 http://gulfnews.com/news/gulf/uae/government/uae-cabinet-approves-law-on-smes-1.1116368.

15 http://www.zawya.com/story/UAE_FNC_passes_SMEs_draft_law-GN_25062013_260630/.

dramatic, it is also a source of opportunity and inspiration as there is no greater resource than human creativity and knowledge to create a more prosperous nation.

CASE STUDIES: Leveraging the Shift to Clean Energy to Drive Innovation and a Knowledge-Based Economy

Masdar: A Clean Energy Innovation System

The growing global challenge of energy supply, security, and sustainability has created a complex and uncertain energy environment. The UAE has responded by establishing a unique initiative called Masdar, developed as a cluster[16] to "advance renewable energy and sustainable technologies through education, research and development (R&D), investment, commercialization, and adaptation."[17]

The economic progress of the past decades has provided hundreds of millions of people with major improvements in their material wellbeing, particularly in the emerging economies. While globalization and market liberalization have underpinned these developments, the energy sector has played a crucial enabling role. Without heat, light, and power, you cannot build or run the factories and cities that provide food, jobs, and homes, nor enjoy the amenities that make life more comfortable and enjoyable. Energy is the 'oxygen' of the economy and the life-blood of growth.[18]

As the world's seventh largest producer of petroleum, the UAE's rich hydrocarbon resource base has given it tremendous advantage in a global economy driven by fossil fuels. With a per capita GDP of $38,389 and a national GDP of $362 billion (current dollars)[19] in 2012, it is among the richest countries in the world. Its entry into the volatile, dynamic, and intensely competitive renewable energy arena is therefore a bold move.

Masdar is a frontrunner in clean energy[20] and sustainability, addressing issues such as technology, human capacity building, and investment in renewable energy. This ambitious multi-billion dollar renewable energy initiative of the Abu Dhabi government's Mubadala Development Company creates a system of innovation with the key elements of knowledge, technologies, actors (such as entrepreneurs, firms, government, and other organizations), networks, and institutions.[21]

16 A business or industrial cluster is a concentration of businesses and institutions in a particular sector that are closely interconnected. Typically these firms and institutions are physically located in close proximity, allowing networks to develop with opportunities to share knowledge and create value added goods and services. See Porter (1990).

17 Masdar mission statement. Available from www.masdar.org.

18 Adapted from Peter Voser, Energy for Economic Growth: Energy Vision Update 2012, World Economic Forum.

19 Emirates Competitiveness Council (ECC) estimates.

20 Clean energy can be defined as sources of energy that lead to lower carbon footprints than is possible with conventional fossil-fuels. The MIT Clean Energy Prize defines clean energy solutions as involving products or services, which promote, enhance or advance diversity of supply sources/transmission, efficiency in use, reduced negative environmental effects such as greenhouse gas emissions. This can include but is not limited to renewable sources (e.g. solar, wind, fuel cells, biofuels, geothermal and hydrotechnologies), conservation and demand response (e.g. grid management), enabling technologies (e.g. storage systems), more efficient and effective use of hydrocarbons (e.g. hybrid cars and carbon sequestration) and integrated systems (e.g. sustainable design). Clean technologies are those that make clean energy possible.

21 Vidican et al. (2012).

In such an innovation system, the value-creation process is systemic, the result of a complex set of interactions among actors. Coalitions of firms, industry, associations, and research communities are integrated in networks, facilitating the dynamic exchange of knowledge and creating possibilities for commercialization of new products and services.[22]

With a model based on these principles, Masdar aims to create strategic partnerships, foster collaborations, and build synergies among private firms, government entities, financial institutions, and academia to advance the renewable energy industry, both nationally and internationally. Through its support of Masdar, the UAE is developing novel approaches for generating a highly skilled workforce, gaining expertise in a range of clean technologies, and developing an understanding of finance for the emerging field of renewable energy. Masdar provides a valuable model for an emerging sector-based approach to innovation and moving up the value chain toward high value activities. Highlighting this system-based approach, *Harvard Business Review* identified Masdar as a world best practice in developing the clean technology industry.

MASDAR Institute, Laying the Foundation for a Knowledge Economy

A central feature of Masdar's model advances the UAE's competitiveness objectives of developing talent at the individual level and accumulating human capital at the national level.

Through Masdar Institute, its academic and R&D arm in Abu Dhabi, Masdar is building a cadre of specialists for the green economy.

Developed in collaboration with the Massachusetts Institute of Technology (MIT), Masdar Institute's rich R&D environment is a magnet drawing some of the brightest minds to the UAE. Offering Masters and PhD degree programs, the institute has an explicit focus on sustainable energy studies, the first of its kind in the region. By playing a dynamic role in contributing to the UAE's long-term strategy for knowledge creation and human capital development, the Institute serves as a source of competitive advantage in the transition to a green economy.

Students learn in a stimulating academic environment taught by 60 leading faculty and top-tier researchers recruited globally. Faculty and students devote about 60 percent of their time to R&D (an unusually high proportion of time by international standards), seeking solutions to the challenges of clean energy and climate. Students receive training as specialists in renewable energy, integrating theory and practice, with an emphasis on industry and entrepreneurship. Increasingly, students and faculty secure their R&D grants from industry, giving the program a strong industrial, demand-driven focus.

Working in specialized labs, currently 337 students conduct research on: water, health and environment, energy systems, micro-systems, and advanced materials. Project areas include: biomass-derived fuels, smart grid applications,

22 Ibid.

saltwater desalination, and energy efficient technologies. By 2018, the Institute aspires to host up to 800 graduate students, mostly UAE nationals, and 200 academic staff.

Similar to MIT, whose alumni have founded more than 6,900 companies with worldwide sales of approximately $164 billion (26 percent of sales of all Massachusetts companies), Masdar Institute aspires to generate economic benefits for Abu Dhabi and the region. In its first five years, the Masdar Institute has been recognized many times for the quality of its R&D, its patent applications, and its publications and citations by professors and students at various global forums and in renowned journals. Several local and international firms have entered into R&D contracts with Masdar Institute.

Masdar Institute catalyzed the University Leadership Council in the UAE, in cooperation with five universities. The council provides a platform to share knowledge and spearhead new ideas for entrepreneurial innovations, and transfer technology in the region.

UNITED STATES

U.S. Council on Competitiveness Leads on the Changing Landscape for Talent

Radical Changes in the Landscape for America's Workforce

The United States has been focused on the economic crisis and high levels of unemployment over the past several years. However, longer-term trends are also affecting the American workforce in fundamental ways. U.S. workers are caught up in a turbulent economy being transformed by globalization, shifts in the drivers of the economy, and the rapid advance of digital technologies. Up and down the career ladder, and across the workforce landscape, mega trends are affecting U.S. labor markets, the occupational mix in the country, what people do on the job, and the skills they need to compete and succeed.

Many Americans are facing these competitive realities lacking the level of education and skill that would allow them to thrive in today's complex, knowledge-intensive economy, threatening greater income inequality and a persistent high rate of unemployment. In a world of rapid, continuous, and unpredictable change, highly educated workers are better able to work productively in many different types of jobs than those with less education.

Economic Drivers Have Changed

The primary drivers of the U.S. economy have radically changed. In the 19th century, agriculture and mineral extraction drove prosperity based on natural resources. Mass production drove 20th century America with machinery and capital. In the 21st century, innovation drives the economy and intellectual capital—talent—is the most important resource for production. For example, 35 ago, about 80 percent of the market value of the S&P 500 was represented by tangible assets—brick, mortar, equipment, and inventory. Today, about 80 percent of the value is represented by intangible assets—patents, trademarks, brands, research, and software.[1] Increasingly, competitive and market success depends on people working with these intangible idea-based assets, and the technologies and management systems used to create value from them.

This shift in economic drivers has placed a premium on workers who possess the high skills, knowledge, and know-how that drive service and product innovation, and who can perform complex work. As we move from a brute force to a brain force economy, the markets for this intellectual capital are growing, and employers look regionally, nationally, and globally for top talent, top project teams, and top locations for talent for their business investment.

1 http://www.oceantomo.com/about/intellectualcapitalequity.

Hyper Labor Competition to Perform the World's Work

Riding the tidal wave of transformation brought about by globalization and the digital revolution, billions of people in emerging economies have entered global commerce and swelled the global labor pool. The effective global labor supply quadrupled between 1980-2005, with most of this increase occurring after 1990.[2] For example, the four BRIC nations—Brazil, Russian, India, and China—now represent 45 percent of the world labor supply, compared with less than 20 percent for the OECD countries.[3]

Today, many educated and skilled people in emerging economies are competing to perform the world's work, often for lower wages than their counterparts in advanced nations such as the United States. Employers access this global labor pool through many channels, such as offshoring or establishing new foreign operations, moving routine rule-based work that can be digitized over telecommunications networks, assembling global project teams, and through temporary immigration. Companies have found outsourcing overseas attractive primarily for jobs involving routine tasks. However, most high-value work requires creative interaction among employees, in which physical proximity and personal contact are needed, and closeness to customers is also important.

The United States has benefitted from offshoring, providing high-value financial, legal, engineering, and software development services to customers overseas. A study of twenty-one occupations likely to be affected by overseas outsourcing found that net job losses were concentrated in lower-wage occupations and strong employment gains were found in occupations that pay the highest wages.[4]

Rise of Machines

Machines, autonomous systems, sensors, and software are increasingly capability of doing routine tasks that have made up jobs for millions of Americans. For example, Internet systems provide customers with account information and payment processing. Tax preparation software carries out work once performed by accountants. Computers, sensors, and imaging technologies perform security functions once carried out by people. In manufacturing, labor's share of inputs to multifactor productivity has been dropping for the past 20 years, while purchased business services and capital investments—such as information technology—have risen. Manufacturing is reorganizing production—becoming less labor intensive and more capital intensive—shedding jobs along the way.[5] As the cost of labor rises, and the cost of automation declines, it becomes more attractive to automate work and eliminate some jobs.

2 World Economic Outlook, Spillovers and Cycles in the Global Economy, April 2007, International Monetary Fund.

3 Globalisation, Jobs and Wages, Policy Brief, OECD, June 2007.

4 Embracing the Challenge of Free Trade: Competing and Prospering in a Global Economy, Chairman Ben S. Bernanke, at the Montana Economic Development Summit, 2007, Board of Governors of the Federal Reserve System, May 1, 2007.

5 The Compensation-Productivity Gap: A Visual Essay, Monthly Labor Review, January 2011.

In contrast, technology tends to favors those with higher skills.[6] High-skill workers use technology to enhance their capabilities, for example, using computers to write, perform research, design products, and deliberate with others. Lower skilled workers perform tasks easier to automate, or tend to use technology that reduces the skills needed on the job.[7]

Labor Market Polarization

The U.S. labor market is becoming polarized—demand grows for high-end workers for jobs involving non-routine cognitive tasks and for low-skill/high-touch workers, but is weak for many middle-skill workers. Some economists attribute this gap to "skill-biased technological change,"[8] for example an increase in the value of workers whose performance is enhanced with information technology (e.g. workers who perform non-routine abstract-thinking and creative tasks which computers complement). Non-routine manual jobs require little formal education but require skills for in-person interactions and hands-on tasks. These are hard to outsource or automate. As a result, the demand for these workers is generally high. In the middle are those with intermediate skills performing procedural rule-based tasks subject to both offshoring and automation. The shift from routine jobs to non-routine jobs is spreading across the economy, intensifying the polarization of employment opportunities in the United States.

Rise of Multi-disciplinarity

Today, the development and application of many new technologies, development of many new products and services, and many emerging fields such as bioinformatics, agro-energy biotechnology, and digital animation are multidisciplinary in nature. In addition, many of the global challenges that must be addressed—global food, clean water, energy security and sustainability—require interaction among multiple fields such as multiple engineering disciplines, economics, environmental science, and social and behavioral science. For example, innovation in new media may require a broad skill base such as IT workers, business process and service delivery designers, marketing personnel, entertainers and artists, and social scientists. Developing innovations for today's market opportunities and challenges requires people trained to travel across diverse fields of knowledge and technology. Many corporations have already moved to multidisciplinary innovation teams, because the problems faced by their customers and opportunities in the marketplace require it.

6 How Computerized Work and Globalization Shape Human Skill Demands, by Frank Levy, MIT, and Richard Murnane, Harvard University, May 31, 2006.

7 The Missing Middle: Aligning Education and the Knowledge Economy, by Anthony Carnevale and Donna Desrochers, Educational Testing Service, April 2002.

8 Technical Change and the Relative Demand for Skilled Labor: The United States in Historical Perspective, Lawrence Katz and Robert Margo, January 2013; Routinization-Based Technical Change and Globalization: A Theoretical Exploration of Labor Market Polarization, Jaewon Jun and Jean Mercenier, February 2013.

Top left and right: *Photographs courtesy of United Association of Plumbers and Pipefitters.*

At left: *Mr. Tim Marks, President, Ecotech Marine; Mr. William Bohnett, President, Whitecap Investments LLC; Terri Kaufman, Executive Director, South Central PA Workforce Investment Board; and Dr. Carol Puryear, Assistant Vice Chancellor for Instruction and Special Projects, Tennessee Technology Center at Murfreesboro; and Mr. Joseph M. Pietrantonio, Vice President, Environmental Health, Safety and Quality, and Corporate Chief Engineer, Air Products, discuss how to create the future innovation skills pipeline at the "Leveraging the Talent Development Process to Drive Innovation" dialogue co-hosted by the U.S. Council on Competitiveness, Lehigh University and Air Products, October 2012.*

Rapid Technological Change

As so dramatically illustrated by the digital revolution, disruptive technologies and innovations can drive a reordering of production at every level of the economy—from the workplace to the labor market to the mix of industries in a country or community—creating new opportunities but also hardships for some workers. The process of reorganization may create new jobs while eliminating others, and can change the occupational mix, tasks to be performed, and the skills in demand. For example, digital technologies not only provided workers with better tools, they allowed companies to fundamentally change the way production in both manufacturing and services takes place. In the process, digital technologies created new industries and many new jobs, but also undermined jobs in other industries and occupations. For a country to achieve the greatest gains in productivity and growth made possible by revolutionary technologies, businesses must operate in an environment that allows this essential transformation to occur. Labor markets must be flexible to allow for the rapid reallocation of human capital in response to changes in demand.[9]

Council on Competitiveness Workforce Initiatives

The Council on Competitiveness is the only group of corporate CEOs, university presidents, and labor leaders committed to enhancing U.S. competitiveness in the global economy. The Council carries out its mission by articulating forces of change and analyzing emerging challenges, convening leaders who can create visions and develop and implement solutions, and by developing and promoting agenda for change.

Talent is a major component of the Council's mission to improve U.S. competitiveness. In the groundbreaking *National Innovation Initiative*—which sought the input of hundreds of the Nation's business, academic, and labor leaders—innovation was determined to be the single most important factor in determining America's success in the 21st century. Talent was identified as one of three fundamental pillars of innovation, including knowledge creation, education, training, and workforce support. Similarly, the Council's *Global Manufacturing Index* reports on the views of more than 550 global CEOs and senior executives, who identify "talent-driven innovation" as the No. 1 driver of competitiveness in manufacturing.

As a key driver of U.S. competitiveness, talent issues permeate the Council's work, in stand-alone initiatives focused exclusively on talent, and as a component in other Council initiatives ranging from manufacturing to energy.

9 How Economies Grow, The CED Perspective on Raising the Long-Term Standard of Living, Committee for Economic Development, May 2003; International Capital Flows and the Emerging Market Economies, Speech by Governor Randall Kroszner, (at the Central de la Pepublica Argentina Seminar), Board of Governors of the Federal Reserve System, May 15, 2007.

National Innovation Initiative (NII): Among key goals set in the NII's *Innovate America* agenda is taking steps to build the base of scientists and engineers to boost America's innovation capacity. This includes investing in and enhancing math and science education in the United States. In August 2007, President George W. Bush signed the America COMPETES Act into law, which finds its roots in the NII's *Innovate America* agenda and recommendations. The Act was reauthorized in 2010, and signed by President Obama in January 2011. The Act includes several provisions to strengthen U.S. STEM education and develop future STEM talent, for example, by increasing the number of teachers qualified to teach high level STEM courses, and increasing the participation of minorities underrepresented in STEM.

Technology, Leadership, and Strategy Initiative (TLSI): For the past four years, the Council has engaged in a dialogue with America's Chief Technology Officers, and their peers at research universities and national labs. These leaders point to the slow U.S. response to the rise in multi-disciplinarity as a competitive challenge with a human dimension. The Council advocates training U.S. scientist and engineers beyond a traditional single discipline to produce more inter- and multi-disciplinary STEM professionals. This includes: establishing reward structures to encourage cross-disciplinary interaction among students and in the development of STEM professionals; organizing more university R&D, and scientist and engineering training around grand challenges; and introducing scientists and engineers to knowledge in areas such as design, manufacturing, business, entrepreneurship, finance, and marketing.

National Engineering Forum (NEF): The Council—along with Lockheed Martin Corporation—launched the National Engineering Forum to address the future of engineering in the United States. NEF is holding a series of regional dialogues with academia, business, government, the media, and students to address issues such as how to develop American engineers versed and skilled in multiple disciplines, and to work with national leaders in shaping U.S. engineering for the 21st century. Participants have focused on a wide range of topics such as: promoting engineering within the creative context of innovation, problem solving, design, and development, rather than as an act of technical analysis; re-thinking industry-university-labor-national laboratory collaborations to create a more capable cadre of engineers; linking engineering to solving global challenges; developing new education paths for students who want to study engineering; better leveraging of regional resources to cultivate engineering talent; and ensuring that undergraduate curricula nurtures both deep technical skills and skills in areas such as finance, entrepreneurship, project management, business development, and com-

munications. The regional dialogues will culminate in a major national event in Washington, D.C.

Workforce for Clean Energy and Sustainability

Energy Security, Innovation and Sustainability Initiative (ESIS): The United States needs to strengthen its workforce capabilities to meet the growing demand for sustainable energy systems and energy efficiency innovations. This includes developing skills in sustainability to increase U.S. workers' competitiveness as clean energy, energy efficiency, and sustainability rise on the corporate agenda, and become greater factors in global hiring and investment.

In the ESIS, the Council examined how to mobilize a world-class energy workforce required in a transformed energy system, and offered recommendations in *Drive: A Comprehensive Roadmap to Achieve Energy Security, Sustainability, and Competitiveness.* These included: recommending that the U.S. Department of Energy establish a early career research program, allocating 20 percent of any revenue from carbon pricing to programs such as state and regional workforce training initiatives, providing financial aid to U.S. students pursuing education in energy disciplines, a national youth energy corps, and tax incentives for businesses that provide mentoring, internships, and on-the-job-training for new entrants into clean energy careers.

Mature Workers

Aging Worker Initiative: The U.S. workforce is not only graying, but workers are increasingly choosing to delay full time retirement. These mature workers are a tremendous source of knowledge, skill, experience, and work ethic. The Council, in partnership with the Council for Adult & Experiential Learning, undertook an initiative to highlight a wide range of programs that connect mature workers to skills training and work opportunities; connect them to new career pathways in high demand, high wage jobs; and programs that provide training and assistance to mature workers who want to start their own businesses. Recommendations to better leverage America's mature talent include: lifting taxes that penalize older Americans for re-entering the workforce; revising the National Workforce Investment Act to establish a public-private partnership to provide skills assessments, training, and career advisory services to mature job seekers; and designing job training programs to support mature workers in the workforce, including offering training and job placement services at times and in places that are accessible to mature people who are working full time.

The Aging Worker Initiative also highlighted regional strategies. Regions are often places that can connect mature workers to new career pathways in high-demand, high-wage jobs, in addition to general training and work opportunities. The Council has advocated that regional workforce entities should offer advice, networking events, and services to mature workers; develop new information tools and improve existing systems that connect older adults to employment opportunities; and raise awareness of the benefits of hiring older adults to improve employer perceptions of mature workers.

Technical Training

From its U.S. Manufacturing Competitiveness Initiative to its *Thrive* Agenda, the Council has promoted strengthening and more widespread availability of technical training. Such training helps meet the demand for workers in middle skills jobs—such as jobs for mechanics, technicians, welders, and machine operators—which do not always require a college degree, but require training, technical sophistication, and initiative.

The Council has advocated for elevating career and technical education and training programs, and strengthening them through partnerships with business and labor, and partnerships in which community colleges collaborate with local industry to create degree programs essential to economic development efforts. As the U.S. government drives development of a national network of advanced manufacturing clusters, the Council urges Congress, the Administration, industry, academia, and labor to form partnerships to establish a manufacturing skills training capability in these clusters. The Council has encouraged increased high school student participation in engineering and manufacturing projects, programs that expose high school and college students to opportunities in the skilled trades, and vocational and technical training to better prepare students for apprenticeships and other employment opportunities as they enter the modern manufacturing or high wage service sector workforce. This includes development of state-of-the-art apprenticeship programs for 21st century manufacturing, maintained and operated through shared staffing and financial contributions from both labor and industry.

Veterans in Piping Program A Case Study

The Council has promoted efforts to create new pathways for America's military veterans to skill up for the manufacturing and technical workforce. The Veterans in Piping Program is an outstanding example, operated by Council member the United Association of Plumbers and Pipefitters (UA), whose President William Hite, serves as the Council's Labor Vice Chair. The UA is a union representing 370,000 plumbers, pipe fitters, welders, and other trades workers in the United States, Canada, and Australia. To ensure its members' knowledge and skills keep pace with rapid advancements in technology and the way businesses operate, the UA has one of the most extensive training programs of any union in the world, investing more than $1 million weekly to ensure that members are prepared for the future. UA operates five-year apprenticeship programs, extensive journeyman training, and certification programs.

UA Veterans in Piping (VIP) Program Addresses Two National Needs: Plagued with a high rate of unemployment, America's young military veterans returning from the wars in Iraq and Afghanistan need skills to get jobs in the civilian economy. At the same time, many employers report difficulty finding skilled welders. Launched in 2008 in partnership with the U.S. military, the UA's VIP training program has proven to be a solution to these two national needs.

In the decade since the 9/11 terrorist attacks, more than two million Americans have been deployed to Iraq and Afghanistan.[10] Although many of these soldiers are still active in the military, thousands have completed their service commitment. Many of these young veterans return home only to face a new challenge: getting a civilian job. Veterans returning from the Iraq and Afghanistan wars have an unemployment rate of 10 percent, significantly higher than their civilian labor counterparts.[11]

In the United States, welders trained in the latest technologies are in demand, for example in the defense industries and for repairing the aging U.S. infrastructure. The U.S. Bureau of Labor Statistics projects that, between 2010-2020, there will be an average of more than 14,000 job openings annually for welders, cutters, solderers, and brazers due to employment growth and to replace workers exiting the occupation, for example, due to retirement; the average age for current welders is 54.[12] Many welding-oriented companies report difficulty in finding properly skilled welders who are reliable and committed.

Job prospects for welders with top skills are good. The basic skills of welding are the same across industries, so welders can shift from one industry to another, depending on where they are needed most. For example, welders laid off in the automotive industry may be able to find work in the oil and gas industry, currently booming in the United States. Top wages for these occupations can reach as high as $60,000–$70,000 annually.

UA VIP Creates a Win-Win Solution: Recognizing the value of attributes the military fosters in its personnel—discipline, hard work, commitment, and respect—the UA saw the return of young veterans as an opportunity to increase the pool of workers in the skilled trades and meet the needs of employers for welders.

The UA VIP program offers high quality training to U.S. veterans and active duty military personnel preparing to leave the service. The 18-week VIP program trains veterans to enter the pipe trades, such as welding and HVACR service. Since UA's local partners administer VIP, training can be accessed in many locations across the country. Veterans bear no cost to participate in VIP; the training is fully paid for by UA and its industry partners.

In the first two-weeks of VIP, trainees are provided counseling services to help them reintegrate into the civilian workforce. After this period of counseling, the veterans participate in both classroom and hands-on training. Upon completion of the program, veterans receive valuable industry-recognized certifications and an offer of direct entry to a UA apprenticeship. As part of

10 Tan, Michelle. 2 million troops have deployed since 9/11, *Marine Corps Times*, December 18, 2009.

11 Table A-5. Employment status of the civilian population 18 years and over by veteran status, period of service, and sex, not seasonally adjusted, Bureau of Labor Statistics, U.S. Department of Labor; Gulf War-era II are veterans that served during the period September 2001-present.

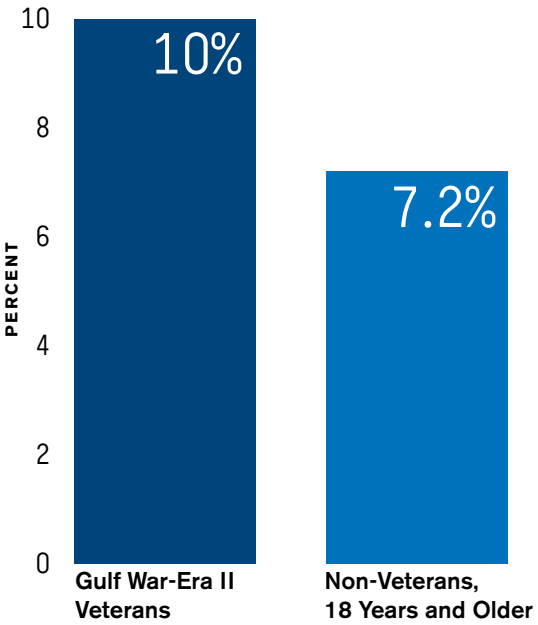
12 Hire Returning Veterans UA Veterans in Pipefitting." UA's Veterans in Piping. N.p., n.d. Web. 28 June 2013.

their training, participants learn about new green technologies and receive a Green Awareness Certificate. By the end of the program, veterans have acquired the skills to become successful in the welding and piping industries.

The VIP has been a success. The program has trained hundreds of veterans with a job placement record of more than 80 percent. With their new skills, and military mindset and skillset, employers find these new welders are great employees—technically proficient, work task efficient, with the ability to work in teams and a drive to get the job done right. With opportunities for advancement in the field, veterans stay motivated to work hard and learn more. Achieving professional accreditation through UA's certification program helps provide employment security, because employers see welders with certified skills as more attractive and lower risk job candidates.

The UA has established one of the best veterans employment assistance programs to date, which should serve as a model for other industries. Success lies in the win-win nature of VIP—all parties to the program benefit. Veterans benefit from successful careers with good pay and advancement opportunities. Companies and contractors who employ VIP graduates benefit from having efficient and reliable high quality welders. The UA gains from adding talented and hardworking welders to their membership base. Finally, VIP plays a part in satisfying the increased demand for highly trained welders contributing to the national economy.

Unemployment Rate, August 2013



CHILE

When the Best Practice is to Take Innovation as an Adventure

Is it possible for anybody who is involved in recommendations about innovation to design a strategy or a process of planning? Is it in a world of accelerating changes like the one we are living in, where the future appears more and more uncertain?

These were the first questions we asked ourselves in the middle of 2010 at the beginning of our period in the National Council of Innovation for competitiveness. The answer for us was no, it is not possible. What, then? In that situation, what could happen with a Council that has a formal mandate to propose a strategy? Silence. And, when you open the door to nothingness, right away, other questions come up: What is really innovation? Is the traditional formula of "Science + Technology + Creativity = Innovation," a good lead? How does innovation occur, and how does it become part of our daily lives? What and who must interact for innovation to happen? Why are we concerned with innovation today, why is it part of our speeches and exigencies today and not before? What conditions facilitate the emergence of something new? How much depends on the culture, history, or attitudes of various individuals, groups, and countries? Are there places that are more favorable to the emergence of innovations?

All of these questions placed us on the path of adventure.

The adventurers—not the rash or the reckless—begin by acknowledging, to a certain extent, their ignorance. They do not know where and how they will arrive. But they have purposes; in a certain way, they take charge of some concerns or dreams shared with other people. They are attentive to what appears on the horizon, they are sensitive to conversations that open new possibilities and to events that disclose new worlds for them to reach, to achieve, what they are looking for. But, even though they arrive at some ports, they continue to live their lives in a Beta version. They keep on exploring, and adjusting themselves to events and diverse situations. For them, human beings inhabit worlds disclosed by their own relationships, practices, acts, and affective dispositions. For them, therefore, affectivity and the ways we treat each other are as important as rationality.

This sense of adventure pushed us to open several conversations, and also helped us become more sensitive to conversations taking place elsewhere and that are not happening in our country. It also drove us to explore some experiences and workshops from which new practices in some fields could emerge, particularly in education and regional development.

On this path, innovation for us begun to appear as a phenomenon that has to do with something much broader than science, technology, research and development. Innovations begun to appear as the spaces and processes of responses that we human beings are involved historically to deal in and with a life and a world that challenges us. Since we are human beings—and even before, in the process of hominization—these responses have been technical and technological, and certainly the sciences have played an important role. Only them? No, certainly not. The philosophies, the arts, politics, the spiritualties, the normative and laws, etc. have also played a role.

Innovation seems to be the emergences of diverse phenomena as new ways and manners to take charge of shared concerns, challenges, and anomalies in all the fields of our lives. As such, even if innovations come from the sciences, they are, or they offer, narratives and senses to our lives. That is why innovations always seem to carry questions about their contributions, about their qualities, and their value to our lives. Historically, we evaluate the new that emerges but we have no control of it, the processes (or the waves) are always bigger than us as individuals or group of individuals, even as communities and countries. And some of these waves, new technologies, political or economic events, etc., might change our practices, beliefs, and the ways in which we relate to each other.

If innovations appeared like this to us, what could we do as National Council? What recommendations could we offer if we had the conviction that, in a world like the one in which we live today, it is impossible to predict and establish a strategy of long term because the future has become more uncertain than ever?

History, as a discipline, helped us to understand what we could do.

We tend to believe that History is a reconstruction of past events. We must acknowledge, however, that historians write accounts that are created in the present and addressed to future generations. Historians, like the rest of us, live in the present and move between the conversations of their profession and the concerns of their times. With this perspective, they look at the past and make an effort to explain what—as far as they can tell—are important anomalies or explanatory gaps regarding events or processes that happened years or centuries ago. In doing so, historians have one fundamental restriction: they must be respectful of the artifacts, documents, or other pieces of evidence that have survived from the past. Their job is not to tell us about the past "as it was," but to imagine how historical events were related to one another, to weave together events and consequences until they can produce an explanatory account of the past—one that is, in a sense, invented, since its protagonists did not necessarily experience it exactly as historians describe it.

Historians' works are about the past. Our work is about the future. How can we talk and write about the future, understanding that we do not want to do it as science fiction or futurology? We can do it like historians do: imagine and anticipate future waves of change, being respectful of the "artifacts" of the future that speak to us in our present—tendencies, insinuations, avalanches

that have begun to softly break the ledges of the traditional mountains. We realized that we could do so, as some of the most prominent visionaries of our times are doing today. And we could do it because these men and women are not super human beings; even more, the ability to anticipate by imagining and taking care of the tendencies is part of the human condition.

We chose then not to offer our country a Strategic Plan for Innovation, but rather a Strategic Orientations for Innovation. What is the difference? The first one presupposes establishing goals, objectives, and a coherent linear program to achieve them. But that does not work because the task of innovating as a country is more like a search or a quest. In contrast, with the strategic orientations, we seek to face the future by discovering areas of caution and opportunity that may help create a framework for actions in the present. With the strategic orientations, we seek to uncover some spaces of concern, offering narratives whose purpose is to take care of these spaces of social worrying.

Do these spaces belong only to Chile? Certainly not in a world where planetary concerns affect all countries and every human being. Actually, in our world today what seems to be crucial is the adventure of the whole of humanity. With the world being so definitely this way, we chose a broad horizon for our strategic orientation: 2050.

If we focus on 2050, a horizon that appears to be so distant and difficult to sketch out, we must challenge our present views and distance ourselves for a moment from short-term concerns in order to concentrate on movements that may appear marginal today, but may powerfully affect our society (or the entire planet) in the long term. Our purpose was not to paint a picture of what the world will look like or what events will occur towards the middle of the century. Our intention was not to make predictions regarding the future, although looking towards 2050 may imply being able to express certain conjectures, to venture a few hypotheses, or to project trends based on the dynamics we watch today.

i) **Globalization**, understood as the economic, social, and technological processes that are creating a more interconnected and interdependent world. The world appears to be in the first phase of a much larger transformation and an even greater integration, driven by new communications technologies and new forms of production. The phases that lie ahead will bring the disappearance and emergence of entire productive sectors as well as the creation of new markets, new trade partnerships, and new alliances. Design, raw materials, components, assembly, and commercialization of any product may come from fifty different countries around the world, and the distinction between competition and collaboration will start disappearing.

ii) **Demography**, understood as the growth, composition, and movement of the world's population. It is estimated that, towards the middle of this century, the population will grow to more than 9 billion people, before tending towards stabilization as it reaches 10 billion. In 2030, the world will need to produce about 50 percent more food and energy, along with 30 percent more fresh water.

iii) **The increasing human demand** on the Earth's natural resources, natural "services," and gene pool. Some estimates predict that if the level of material consumption in the developing world rose to the current level of North American, Western European, Japanese, and Australian citizens, global consumption would increase eleven fold. It would be as if the world population had grown from 7 billion people today to 72 billion. Where would all that meat, fish, water, energy, plastic, metal and wood—required to satisfy their demands—come from? The gene pool, meanwhile, is the diversity of genes carried by all living organisms on Earth; these are the building blocks for our food, but recently have also become raw materials in the biotechnology and pharmaceutical industries.

iv) **Global climate change.** The projected potential impacts of this situation indicate that, towards the middle of the century, the planet would be facing an ecological and social crisis that would force us, among other things, to implement severe adjustments to our energy system, changes in our productive and transportation systems, and an unprecedented displacement of human settlements.

v) **The New Biology.** We are experiencing a true revolution in biology. But it is probably more appropriate to say this is a revolution led by biology, which joins a list of disciplines that, under the general category of life sciences, is growing day by day. Faced with multiple human concerns, life sciences may provide answers resulting from a greater understanding of the biological processes that are common to (or very similar in) all living systems. But its cumulative power may also bring new problems, unforeseen effects, and changes that may radically challenge our legal, ethical, or cultural limits, because we are even facing the possibility of changing human beings in ways that could even blur the boundaries between what is human and what is not human.

These dynamics gave us four areas of concern regarding the future:

1) Global Viability Challenge
2) Redefinition of Life and Death
3) Emergence of a New Way of Being
4) Demand for a New Education

Having these (as one of the treasures of our adventure) as an understanding framework, we proposed three exercises related to Strategic Orientations for Chile. These exercises echo the 2050 horizon's dynamics and areas of concern: **Energy; Education; and the opportunities and threats of new biology.** So we treated them on the 2050 horizon, but also on the 2025 horizon because the Council's mandate requires that we deliver our proposals with a 12-year perspective. These exercises did not intend to predict the future or be exhaustive, but rather to provide responsible, committed narratives that try to anticipate and help us reflect on the present, opening up new conversations and concerns, and preparing us to "surf the waves of history."

Chile has access to large amounts of a non-conventional renewable energy resource: the sun. Our country's northern region is a true natural laboratory for the development of this energy resource. Chile has some of the best solar radiation in the world, with a margin of at least 30 percent above Spain, 10 percent above Nevada in the United States, and more than 100 percent above Germany (one of the leading countries in the use of solar technologies). And the presence of abundant solar radiation comes along with hundreds of kilometers of coastline. In this scenario, could we imagine what would happen if we invest in a marginal solar energy application that would address another problem in northern Chile: the availability of water? What world would be disclosed if it is feasible to consider desalinating seawater to produce fresh water, an increasingly scarce resource in these regions?

Today, there is a rapidly emerging new space of possibilities that is suggesting new practices and new styles in higher education. In a certain sense, we could say this is the result of efforts to "capture" and "domesticate" the technological advances of the digital world, using them to satisfy the demand to reduce the costs and improve the quality of education. The horizons for the changes that are emerging are very short. This can be explained by several factors, including the rapid pace of changes in digital technologies, the growing interest of venture capitalists who wish to invest in education-related technologies, the openness of large universities to experiment with new platforms, and the increasing preoccupation with reducing costs in educational systems manifested by both citizens and governments, as well as international agencies such as the Organization for Economic Cooperation and Development (OECD) and the United Nations Educational, Scientific and Cultural Organization (UNESCO). We believe this avalanche is an opportunity to once again ask ourselves: what is the purpose of education, and especially how should we define quality? And although the danger of trivialization is always present, we see more opportunities than threats in this revolution of technologies and practices. One question keeps coming up: how can we anticipate the future to take advantage of these opportunities?

In terms of technology, the era of the 19th and 20th centuries was the era of engineering as the manufacture of tools and as a provider of tools for technological systems. Today we require the emergence of a new type of engineer, one that we would like to call the "designer-engineer" or the "designer as engineer." But it is not about engineers only; design should be also present in other disciplines to educate individuals who not only observe components, but who are constantly in a back-and-forth synthesis between the world they will affect and the world of the components they use to make meaningful proposals, such as products, services, or solutions to problems. Education should also train entrepreneurs as transformers. In a world of accelerating changes, we need an entrepreneurial disposition capable of helping us to better navigate this adventure. And, although this includes the ability to invent and develop companies, it is far more than just the business realm, because it involves renewing our social lives through a product or service, or through a political achievement, an institution, or a cultural event.

The practices of designers and entrepreneurs may be embodied in different individuals or they may be present in the same person. What is important is that both dimensions are required for innovation to achieve its full potential.

What about teenagers? We want to state very clearly that the main problem or gap between students and the educational system is motivation. And our young people are desperately crying out to be rescued. And emotional dispositions cannot be transformed through cognitive, psychological, or moral discourses, but rather through spaces that help young people perceive a richer and more dynamic world than they have known, one which is constantly opening and closing possibilities. That is where they will have to build their lives, deal with contingencies, and invent a career and an identity for themselves, which must never remain isolated from the concerns of others. In the constantly changing world in which we live, a main goal of education should be to prepare students for the adventure that we always embark on with others. And we know it is possible to create this kind of space, which is emerging as an increasingly relevant conversation.

In short, in the 21st century we require an education for surprise, commitment, innovation, and the creation of identity; an education capable of building a life that is committed to the world in which we live; and an education that, by doing all of this, may become a promise of fulfillment for our children and young people.

The revolution led by the new biology could become a big avalanche that will transform our ways of life. Let us consider three dimensions of it,

useful for illustrating the type of transformations we can expect: aging, new forms of medicine, and the use of microorganisms in many other domains.

Life expectancies have been increasing over the past century. The current life expectancy is more than twice what it was 150 years ago, and it is expected to continue to rise in the coming decades. This increasing life expectancy undoubtedly may be considered as something very positive, but it may also generate problems and challenges that are already advancing inexorably. If we look towards the future, our challenge is both cultural and economic because, if those over 65 years of age do not have a place in society that differs from the one we assign them today, it will be difficult for us to meet the challenges of an increasingly older population. To begin with, are we going to continue speaking of senior citizens at age 65 when life expectancy is more than 90, 100, or 120 years?

From a labor perspective, we can imagine that senior citizens will have some characteristics that qualify them more for certain jobs; for example, they may have a role as guides or mentors for children, youth, and adults, giving them the wisdom—as Reinhold Niebuhr suggested—to build new worlds or learn to live in the ones we have. The full integration of senior citizens into all social domains will contribute to their welfare, and therefore to everyone's welfare, insofar as it is a fact that psychological aging is exacerbated when individuals have little social contact or remain inactive.

In the wide-open world of new biology, one of the most relevant avalanches is **personalized medicine**, which implies a revolution in medical practices and health care in general that will allow us to live longer and healthier lives. Meanwhile, this biological revolution, combined with engineering and other disciplines involving materials, should allow physicians to harness the power of **regenerative medicine**, focused on repairing or replacing damaged, diseased, or metabolically impaired organs, tissues, and cells. This includes the possibility of growing organs outside of the body or repairing damaged tissue from diseased organs by inoculating stem cells (not necessarily embryonic ones), or even inducing one type of differentiated cell to become another type of cell.

New diagnostics possibilities and new therapies will redefine the roles of hospitals and physicians: on the one hand, because some diseases that are lethal or disabling today might become chronic and bearable; and on the other, because the effectiveness and lower cost of the treatments now being developed may reduce the need for expensive long-term care for some of today's most widespread illnesses. Along with this, health care—as well as prevention—must also change drastically, contributing to transform the cost structure of a medical model currently based on curing people. In fact, alternatives being explored to improve health and extend life even include producing foods that have certain molecules with anti-aging properties, or inducing bodily processes to attack aging cells and stimulate their replacement with younger ones.

Although the possibility of using biological processes for practical purposes is ancient—like the yeast used for beer fermentation—the concept of synthetic biology is recent, and refers to designing and building a completely functional biological system or device with a useful purpose, taking advantage of modern biotechnology practices that allow us to work at the molecular level with DNA, proteins, and other fundamental organic molecules.

The promise is to accelerate the development of new, optimized biotechnologies that may be applied in many aspects of industry and life, and therefore efforts are focused on manufacturing cells and microorganisms that are capable of performing a specific function. For example, these synthetic organisms could be used as factories to transform cheap nutrients into high-value products, such as biofuels, with better properties than those achieved through fermentation, or chemicals produced for medical purposes.

What about our country? We can observe, for example, that the appearance of new forms of medicine and related technologies are creating a global scarcity of professionals and technicians in various fields, for now, in large fields such as biology and medicine, engineering and materials science, robotics, and clinical services. Also, in all of these fields, markets are becoming more and more globalized thanks to online networking (within the continually expanding capacities of the Internet) and, as has already occurred with drug trials and other stages of medical and pharmaceutical research and development, many of these services are provided by different places around the world. India has specialized in capturing these types of opportunities in recent decades. If we, as a country, are capable of developing quality technical and professional training, in a short period of time and in fields related to those opening up in medicine and biology, Chile could capture a good number of high-level jobs in this global market.

We do not know how the world will be in the future, nor do we have any capacity to predict about it. All we know is that innovations are a big adventure that has to be with our lives on this planet. In this strategic review, we have chosen some specific fields—energy, biology, and education—to conduct an initial exercise that brings more depth to our Strategic Orientations for Chile. As we conclude this exercise, we would like to reiterate our concern for cultural change, integrated conversations, the orchestration of moods, and the development of issues that gather Chileans around a view of the future with broad horizons. All this could help and encourage us to live the adventure of our lives in collaboration with the other human beings with whom we share our destiny.

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MONGOLIA

Attracting the Mongolian Diaspora Back Home

The Boom and the Brain Drain

The Mongolian economy has grown rapidly in recent years driven by the huge expansion of its minerals sector. With China's thirst for natural resources pushing this development, this pace of growth has reached dizzying heights over the past two years - real GDP grew by 17.4 percent in 2011 and 12.6 percent in 2012 according to the National Statistical Office of Mongolia.[1]

Although the Chinese economy has moderated recently causing a decline in Mongolia's exports and foreign investment, the Mongolian economy has continued to expand and is expected to keep growing strongly over the foreseeable future. The IMF is currently projecting real GDP to expand at 11.8 percent in 2013 and about 8.5 percent on average over the next five years.[2]

Alisher Ali, Chairman of Silk Road Finance, predicts that GDP per capita in Mongolia will grow to $10,000 by 2017. That would make Mongolia Asia's fifth-richest country after Singapore, Japan, Brunei and South Korea. By 2030, Ali expects GDP per capita to reach $60,000, which would make Mongolia Asia's richest nation.[3]

With the extractive sector booming, other parts of the economy are experiencing a brain drain. Mining companies and businesses that cater for the mining sector are attracting and retaining Mongolia's most experienced and skilled workers by offering significantly higher salaries than other sectors. This has drained capable workers and skills from other parts of the economy, leading to a shortage of labour in non-mining firms.

Over the long term, Mongolia will need to invest in its education system to train more skilled workers locally. But if growth continues at its current pace, Mongolia needs to be able to fill these recruitment gaps quickly. One recent study estimated that, if the Mongolian economy maintains GDP growth of 17.5 percent over the next five years, Mongolia will need 60,000 foreign workers to fill skills shortages.[4] Furthermore, the Executive Opinion Survey included in the EPCRC's Mongolia in World Competitiveness 2012 report shows that Mongolia faces a human resources shortage. Private sector representatives expressed that good ICT and finance skills are not readily available, and that finding and hiring qualified engineers and competent senior managers is difficult.[5]

1 National Statistical Office of Mongolia. (2013). 1212 Database, http://www.1212.mn/en/.

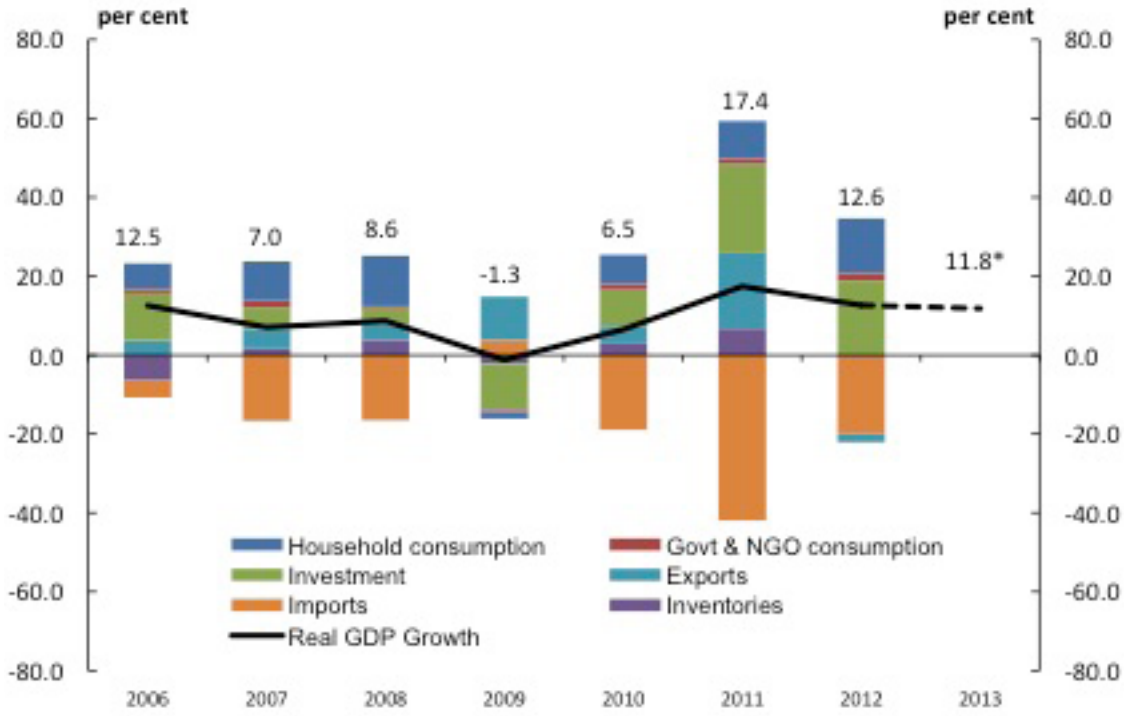
2 International Monetary Fund (2013), World Economic Outlook, October 2013.

3 Shari, M. (2012). Salon: Alisher Ali, Mongolian Growth, Global Finance May 2012.

4 Seaborn, A. (2013). *A.Urangoo–Bringing Mongolia's Talent Back Home.*

5 EPCRC (2012), Mongolia in World Competitiveness 2012.

Mongolia's stellar growth driven by investment into mining sector
Source: National Statistical Office of Mongolia, 1212 statistical database.



*IMF Real GDP Forecast, IMF World Economic Outlook, October 2013

The rapid expansion of the economy and wage increases in in the mining sector is also fueling inflation. The annual increase in the consumer price index reached 15 per cent in 2012, and is projected to be 9.7 per cent in 2013.[6] These price rises are exacerbating problems of income inequality and poverty in Mongolia's most vulnerable communities as incomes for Mongolia's poorest communities have not kept up with the pace of inflation.

Sustained inflation has also contributed to volatility in Mongolia's currency, the Tugrik, and the domestic financial system. The Tugrik has depreciated around 27 percent against the U.S. dollar in the past two years, decreasing Mongo-

6 International Monetary Fund (2013), World Economic Outlook, October 2013.

lia's attractiveness to overseas investors.[7] Rapid decreases in the value of the Tugrik have in turn exacerbated the inflation problem further by increasing the costs of imports. Inflation is likely to be an ongoing problem if growth continues at its current pace, creating a difficult cycle for the Mongolian economy.

An Untapped Source of Labour

One underutilized source of foreign labour is Mongolia's diaspora community. According to the Mongolian Census of 2010, about 100,000 Mongolian nationals were reported to be living abroad for more than six months.[8] But other studies suggest that as much as 10 percent of Mongolia's total population or about 300,000 Mongolians work overseas.[9] The community is spread throughout the world with significant populations living in South Korea, the United States, Germany, Great Britain, Canada, Australia, and New Zealand. Recent U.S. Census figures recorded the number of Mongolians in the United States at about 15,000, with Los Angeles hosting the largest Mongolian community in the country, roughly 5,000 people.[10]

It is suspected that Mongolians living overseas would be perfect candidates to fill the increasing number of skills shortages in Mongolia. Their sense of belongingness and desire to stay connected to Mongolia are demonstrated by the many diaspora associations that exist to enhance communication within the community and organize national celebrations. These organisations teach children about Mongolian traditions, history, and the Mongolian language in order to preserve the national heritage. Many Mongolians living overseas send back remittances to family and friends, purchase real estate properties in Mongolia, and maintain their cultural identities.[11] Thus, it can be assumed that many Mongolians living abroad are keen to participate in the country`s development.

It is also suspected that the diaspora community tends to be better educated and have better skills on average, with many Mongolians living overseas having attended foreign universities and speaking several languages. Returning diaspora would therefore provide an excellent labour source for Mongolia's economy as it continues to expand. However, research on the exact size of the Mongolian diaspora community, its characteristics, or the policies required to attract Mongolians back home has not yet been thoroughly conducted.

The Beehive Project

The Government of Mongolia has recognized the potential of the diaspora community to contribute towards national development. The four year action plan of the Government for 2008-2012 set a platform to develop, adopt, and implement programs and laws concerning rights and social problems of Mongolian nationals working, studying, and living in foreign countries. Within this framework, the Commission of Cooperation with Mongolians Abroad within the Mongolian Prime Minister's office was established.

In order to address these issues, the previous Government established the 'Beehive Project' in September 2010. The purpose of the Beehive Project, called that because bees always return to their hive, was to:

- Provide Mongolians living abroad with information about jobs in their homeland;
- Conduct comprehensive research on Mongolians living abroad with details about their education, professional experience, and skills;
- Use this information to create a database which will be an ongoing information collection tool;

7 National Statistical Office of Mongolia. (2013). *Monthly Statistical Bulletin*, August 2013.

8 National Statistical Office. (2010). The 2010 Housing and Population Census of Mongolia.

9 Aghajanian, L. (2013). *Mongolia: Immigrants in Los Angeles Feeling Economic Pull of Homeland.* EurasiaNet.org, August 13, 2012.

10 ibid.

11 In 2010 Mongolia was included among the top 10 remittance recipient countries according to the World Bank.

- Provide entrepreneurs and businesses with information about Mongolians abroad; and
- Set up a system for creating a flexible legal environment for Mongolians who are abroad to work with Mongolia in starting businesses, and developing collaboration between these Mongolians and domestic enterprises and organizations.[12]

The program was designed to collaborate with colleges and universities, research institutions as well as NGOs, to provide them technical and financial assistance.

To achieve these goals, the Beehive Project convened three conferences overseas with members of the diaspora community. These were held in Chicago, United States in 2010; Seoul, South Korea in June 2011; and Berlin, Germany in September 2011.[13] These events provided attendees with a wide range of information regarding the current status of the Mongolian labour market including recent improvements in salaries and the most in-demand employment opportunities. These events were also designed to energise the Mongolian diaspora to participate in their country's development and encourage them to return home.

On June 29, 2011, the Prime Minister of Mongolia at the time, S. Batbold, held an online conference with Mongolians living overseas. During the conference, current levels of workforce demand and the requirements for skilled specialists were discussed.[14] There was also a "Mongolian Professionals Abroad Summer Lecture" with various speakers representing the diaspora community held in Ulaanbaatar on July 23, 2010, as well as various other events held in Ulaanbaatar for recently returned overseas graduates.[15]

Organisers speak at a Beehive event held for foreign graduates in Ulaanbaatar in October 2010.

However, despite hosting these events, the Beehive Program has been largely unsuccessful in its goals. Despite the positive intentions of using government resources to recall Mongolians from abroad, the Government has not made significant headway on this issue because it has been unsuccessful in developing policies to attract the diaspora back to Mongolia. Although the Beehive Project is still ongoing, there are still no records concerning the education, occupation, and other characteristics of Mongolians who are studying and working abroad.

The EPCRC's Research Plan to Investigate the Mongolian Diaspora Community

Since the failure of the Beehive Project, there are now no ongoing studies concerning the Mongolian diaspora. It remains unknown what Mongolian expatriates can do for their home country, nor is it known what the Mongolian government can do to attract them home.

12 Mongolian Economy (2010), *Beehive Program Approved*, Jul 22, 2010.

13 InfoMongolian.com (2011). *Mongolians in Germany Return to their Homeland*, August 8 2011.

14 InfoMongolian.com (2011). *The Prime Minister of Mongolia Calls for its Citizens Abroad*, July 1 2011.

15 Office of the President of Mongolia. (2010). *Mongolian professionals abroad summer lecture-2010 successfully began.*

The Economic Policy and Competitiveness Research Center (EPCRC) is stepping in to conduct an investigation into Mongolia's diaspora community and the policies needed to attract Mongolians back home. This research will assist government, business, and research organizations in Mongolia in understanding the diaspora community and how to attract Mongolians living overseas back to Mongolia to fill skills shortages as the economy continues to expand. This research will also assist Mongolians living overseas by providing information about the opportunities available back home.

There are three goals of our research:

1. **Understanding the Mongolian diaspora community:** Our first objective is to conduct a comprehensive online survey of Mongolians living abroad. This will investigate the size of the community, where they live and their characteristics, including details about their education and professional experience, and why they chose to be diaspora. This information will then be used to form a database of the Mongolian diaspora community, which can be used as an ongoing information collection tool and as the basis for future government policy decision-making. This would also help Mongolian businesses fill skills shortages through locating suitable Mongolian professionals living abroad.
2. **Engaging the Mongolian diaspora community:** We will engage Mongolians living abroad and diaspora who have returned to Mongolia by providing them with an opportunity to share information on why they have chosen to live overseas and their potential role in the development of Mongolia. By conducting a series of interviews and workshops with diaspora who have returned to Ulaanbaatar, we will give returned diaspora the chance to comment on current and potential diaspora policies, and barriers to contributing to national development. This information will be documented and used as feedback for the Mongolian government, adding qualitative information to the statistical data gathered in the diaspora database. We will provide the diaspora with information about the ways in which they can contribute to the development of Mongolia, including current labour market shortages and salary levels, so they can better understand the possibilities of returning home.
3. **Developing policies to attract the diaspora community back home:** Our final aim is to help policy makers find effective ways to recall Mongolians from abroad by forming recommendations that would incentivize Mongolians to return home and fill labour shortages. These policies will be formulated on the basis of both quantitative information gathered in the Mongolian diaspora community database and qualitative feedback in the form of diaspora opinions. Ultimately these policies will support the sustainable development of Mongolia through an increased engagement of the skills and experience of Mongolian labour abroad that is currently underutilized.

Once commenced, we expect this research to be finished in seven to eight months. While our research is currently in the preliminary stages, we hope that once complete it will serve as an important tool for policy makers to support the Mongolian diaspora community and attract Mongolians living abroad back home.

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BRAZIL

The Rio Grande do Sul State Industrial Policy: A Collaborative Process

Introduction

The challenge of developing a public policy program can be better faced by involving talented people in a broad process of consultation. In developing the Rio Grande do Sul State Industrial Policy, a new methodology was used to ensure the policy was informed by the expertise and insight of people from different departments in government, entrepreneurs, professionals directly related to the industry sectors, and university researchers.

This article presents the methodology and results achieved in the first year after implementing the Rio Grande do Sul Industrial Policy. A brief description of the State's economic characteristics is presented, followed by a description of the Development System, the Rio Grande do Sul State Industrial Policy, and the Sectorial Programs–the core of the collaborative process.

Rio Grande do Sul State

Rio Grande do Sul is the southernmost state of Brazil, located on the border with Uruguay, Argentina, and Paraguay. The State has a diversified and competitive industry, including the first industrial park for automation equipment, transport equipment production, agricultural equipment, leather, and footwear. The State also has the second industrial park in Brazil for electro-electronics, furniture, beverages, machines and equipment, chemical products, metal products, rubber and plastics, and biodiesel.

AGDI
Rio Grande do Sul
Development Agency

Economic information about Rio Grande do Sul State:

- Population: 10,755,799 (5th in Brazil)
- Average age: 34.9
- Area: 281,730 km2 (9th)
- Coastline: 620 km
- GDP/PPP (2012): USD $139 billion
- Per capita GDP (2012): USD $12,917
- Unemployment rate (June 2013): 6.6 percent

The Development System

In 2011, the Government of Rio Grande do Sul State adopted economic development as the core of government strategy, and established the State Department of Development and Investment Promotion (SDPI). SDPI's goal is to create an environment that stimulates GDP growth, making the State a more significant part of Brazil's GDP. It also fosters the State's production chains, with emphasis on strengthening business groups and the cooperative system, and promoting investments in regions of lower relative income. The State Development and Investment Promotion Agency (AGDI) is the executive agent of the development strategy.

The Development System of Rio Grande do Sul State (SDRS) is based on three principles:

1. **Sustainability:** economic development should pursue a path of sustainability in three dimensions: economic, social, and environmental;
2. **Planning:** development requires an orientation to the planned development of the economy;
3. **Governance:** the success of an economic development policy depends on effective coordination among governmental entities.

The SDRS is coordinated by SDPI, including the AGDI and the two state development banks – BADESUL and BRDE. The strategy involves participation of a wide range of institutions related to industry's development, innovation, and promotion of international trade. These include the whole State Government, including all State Departments, and representatives from the Federal and Municipal Governments; private and cooperative sectors; educational and technology institutions; institutions representing employers, unions, and workers; and other civil society institutions.

The SDRS brings together these actors to coordinate their efforts to stimulate economic development in the State; SDRS's effectiveness will be directly proportional to the degree of coordination between government and these main actors. SDRS's structure allows the State Government to collaborate with people from different areas with different perspectives, enabling better formulation of actions to promote economic development, as well as a critical analysis of their effectiveness.

Rio Grande do Sul Industrial Policy

The formulation, adoption, and institutionalization of the SDRS, and alignment of the State economic development strategy with the Federal Policy "Brasil Maior," underpin the Industrial Policy: Development of Rio Grande do Sul (2012-2014). This policy has five distinct but interrelated core axes:

- Axis I: Sectorial Policy
- Axis II: Policy of Economic Cooperation
- Axis III: Policy of the Firm
- Axis IV: Transversal Tools
- Axis V: Infrastructure for Development

Two linkages are critical for SDRS's success. One is the relationship between SDRS and international institutions, especially those involved in investment attraction, trade promotion, and internationalization of companies. The other involves relationships with federal institutions, especially those connected to the "Brasil Maior," and those involved in infrastructure and energy policies.

The Sectorial Policy includes the Sectorial Programs and the International Actions Program. The Sectorial Programs were developed based on Innovation Theory and Competitive Strategy, especially on Michael Porter's "diamond model" for the competitive advantage of nations.

Sectorial Programs

The Sectorial Programs seek to stimulate the development of different industries—whether they are traditional industries or part of the new economy—acting on the determinants of the industry's competitiveness, with innovation and technology as central drivers of this competitiveness. They stress the presence of companies in domestic and foreign markets, and expanding the productive structure of the industry located in Rio Grande do Sul.

The State's highly diversified industrial base presented a challenge to government in establishing a policy to increase development of these industrial sectors, and also create an environment for new ones that could be attracted to the State. This policy should also consider all links of the value chain, and reflect Zero Emission Research and Initiatives concepts. Based on these premises, the state government started developing the Sectorial Programs with the objective of creating action plans to strengthen the competitiveness of the strategic sectors of Rio Grande do Sul's economy, and promoting social and economic development in the State.

The first phase of the Sectorial Programs was identifying strategic sectors. The selection of 22 sectors was based on a multi-criteria analysis including: raising salary effect (income growth), profitability, state revenue, tax credits to other states of the federation, level of investments, alignment with the state government plan, alignment with the Federal government ("Brasil Maior"), value aggregation for Rio Grande do Sul's existing industry, potential for geographic de-concentration and allocation in depressed areas of the state, state competitiveness, future potential, and external dependency. Each sector was analyzed using these criteria, and six different scenarios were simulated based on contributions from representatives from different levels and areas of the State Government.

The industrial and agro-industrial sectors identified in the analysis are classified in two categories: Traditional Economy and New Economy. They are grouped into three levels – Priority, Preferential, and Special. The Traditional Economy category includes sectors historically constituted and strongly rooted in the state economy. The New Economy category includes those sectors connected to broader development of the country, such as the marine and wind energy industries, as well as those driving the future, but show a Brazilian deficit in trade balance and technological modernization (e.g., semiconductors, medical devices and medicine). The 22 sectors are presented in Figure 1.

Each Industry Sector has an executive coordinator and sponsor. All are members of the State Government working at the State Department of Development and Investment Promotion (SDPI), at the Development and Investment Promotion Agency (AGDI), or at one of the State Development Banks (BADESUL and BRDE).

The Sectorial Programs were developed through a broad consultation process driven by clear technical criteria, and involving entrepreneurs and professionals directly related to the industrial sectors, university researchers, and members of State departments and associated agencies. A work group was formed for each sector during 2011. One hundred seventy meetings were held involving 516 participants, 51 percent of them from productive sectors (business, worker, and cooperative representatives); 11 percent from educational, science, and technology institutions; and 38 percent from the government.

Each work group analyzed their sector's industry competitiveness based on Porter's Diamond Model. Since some of the Diamond Model's factors could not be the focus of State policy (since they were Federal related), the model was adapted to the Rio Grande do Sul State industries analysis.

Figure 1.

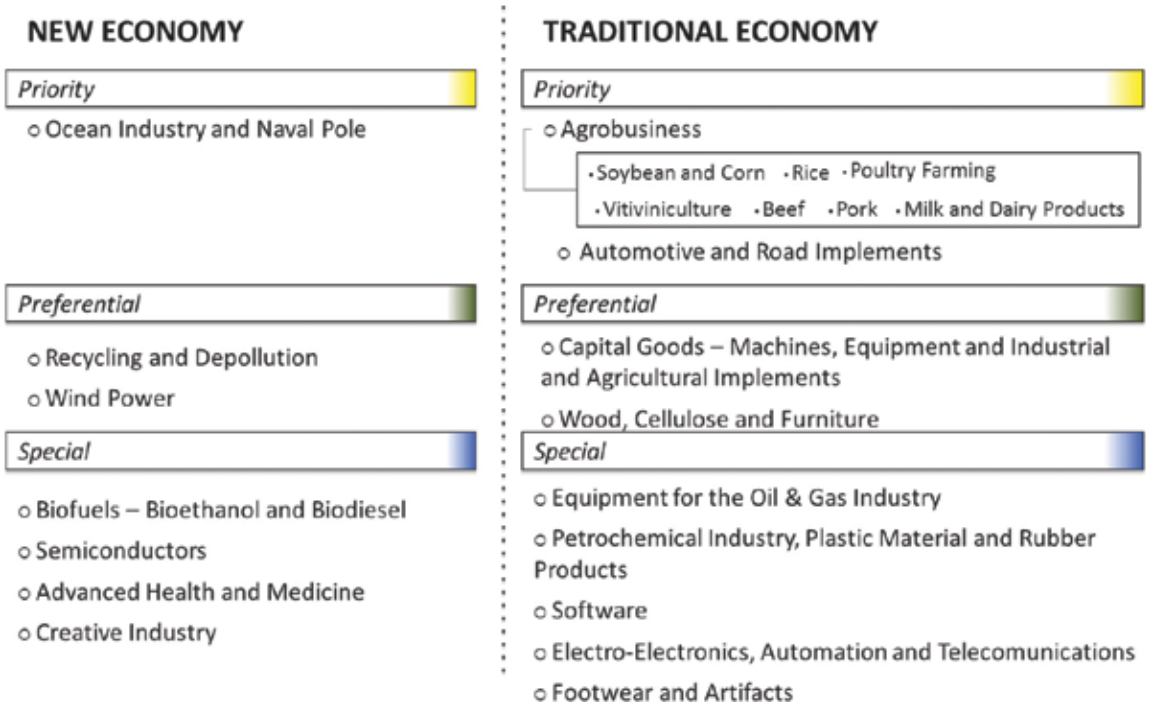

Figure 2 presents the modified theoretical model. This analytical process resulted in 22 competitiveness matrices, and an equal number of sectorial technical notes were prepared.

The work groups identified the most critical factors driving the competitiveness of each sector; those factors, in turn, were studied in light of the current performance of Rio Grande do Sul, and national and international benchmarks; and, finally, measures were suggested to support leadership positions and fill performance gaps.

Participating State Departments and public offices contributed directly to the development of the Sectorial Programs, identifying and suggesting subprograms, projects, actions, and tools that would embody the Industrial Policy. The work groups proposed 442 actions. These were sorted according to and analyzed by the 13 State Departments potentially responsible for their implementation, and 284 actions were adopted. The *Industrial Policy of Rio Grande do Sul State* is the implementation plan for these actions.

Two types of actions are being implemented: transversal actions, which focus on the strategic sectors as a whole (and beyond these), and actions focused on specific sectors. By the end of the plan's first year, 110 actions were completed and 174 actions were in progress. In 2012, 51 transversal actions and 218 actions specific to the 22 sectors were launched. With revisions after the launch in 2012, the total reached 284 actions. Most of these actions, approximately two-thirds, had already started.

In 2012, the State Government published the 22 Sectorial Programs in Portuguese, English, and Spanish. These documents are available at http://www.saladoinvestidor.rs.gov.br/

To review the Sectorial Programs for 2012 and 2013, a meeting was held with 211 representatives from all sectors; of these, 41 percent were related to entrepreneurial, worker, and cooperative entities; 9 percent to educational, science, and technology institutions; and 50 percent to the government.

Bringing different talents to the table to collaborate, formulate, implement, and continuously review the Sectorial Programs' action plans, and the Rio Grande do Sul Industrial Policy are key success factors. The government, and especially the SDRS, would not have had such a broad view of the State industrial economy without this rich contribution. This contribution was also essential for developing the best action plans aligned with the companies' needs on one side, and the capacity of the government on the other side. The union of these two forces allowed the SDRS to develop effective programs that could bring results in the short and long term, reshaping the economy of Rio Grande do Sul State and making it more competitive.

Figure 2.

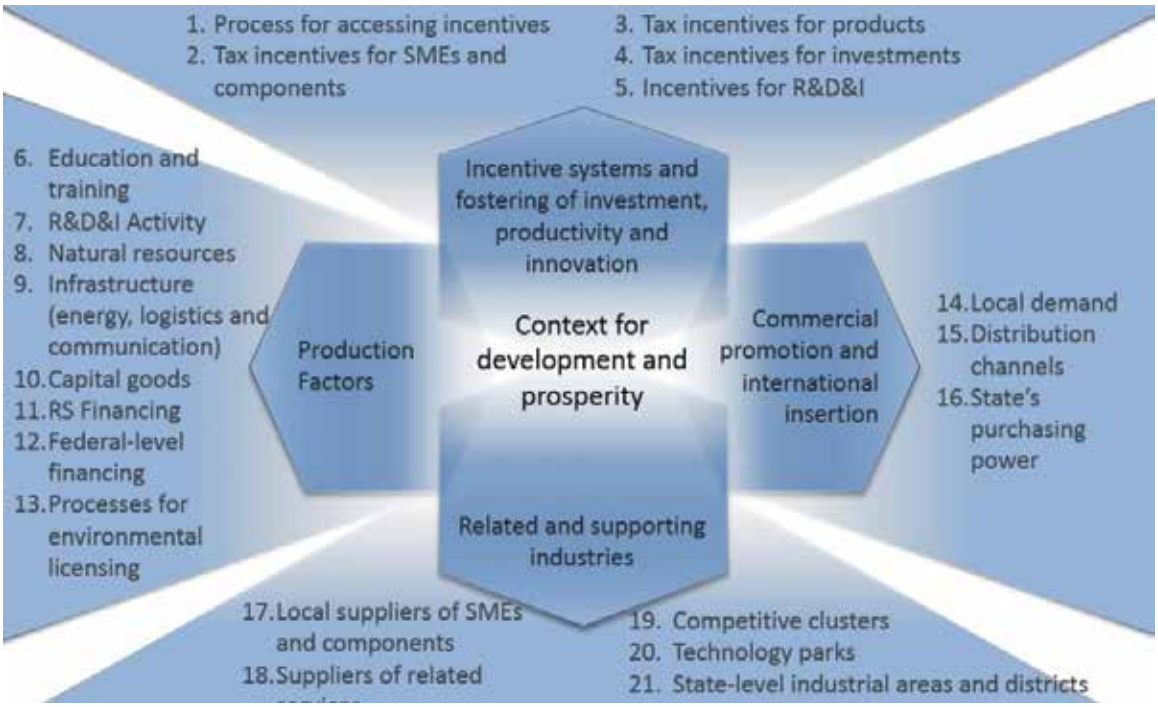

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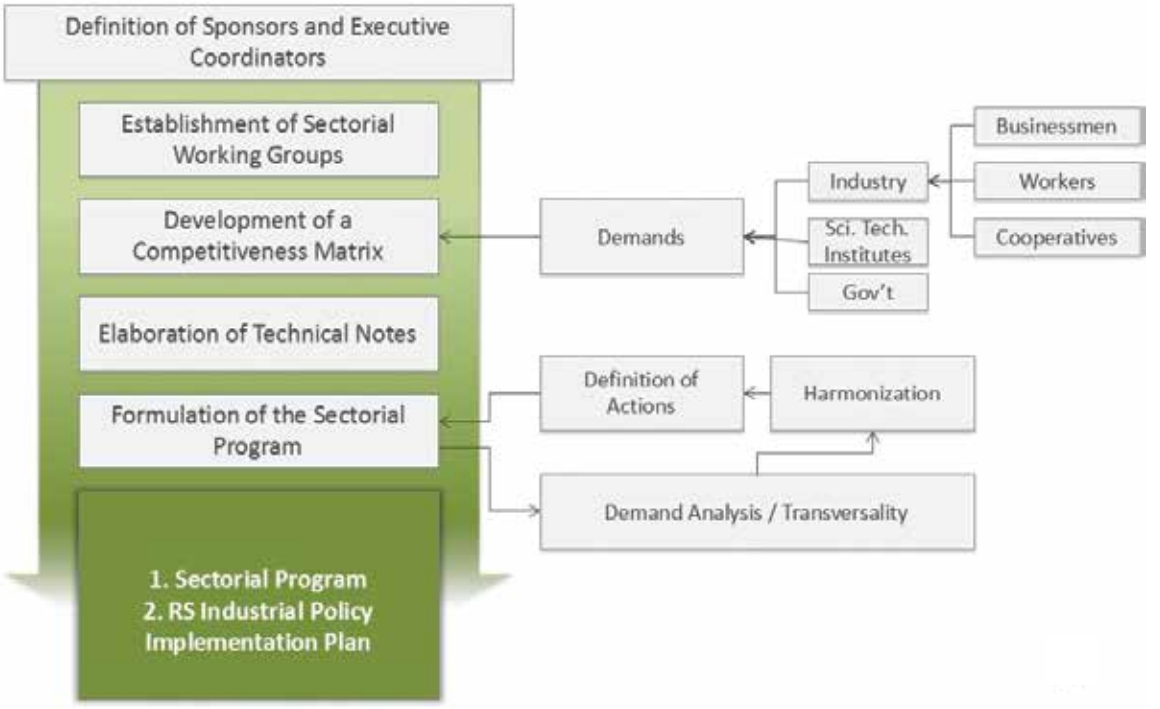
Figure 3.



GFCC

The Global Competitiveness Principles

Each year, the Global Federation of Competitiveness Councils (GFCC) produces the annual Global Competitiveness Principles, which the GFCC and its network of more than 30 national competitiveness organizations have unanimously deemed essential for every country. First released in 2010, these foundational principles offer an overarching framework for national policies and programs aimed at fostering innovation, competitiveness, and prosperity in the 21st century global economy. They emphasize key drivers of competitiveness such as investment in research and development, education and training for all citizens, sustainability and responsible development of natural resources, strong intellectual property rights, open trade, and a stable transparent, efficient and fair environment for business investment, formation, and growth.

Pioneered by the GFCC, the Global Competitiveness Principles represent ideals that can serve as a beacon for economic progress around the world. The foundational principles have been recognized as a best practice by other nations and emulated, for example, in the 10 General Competitiveness Principles of the Americas adopted by the Inter-American Competitiveness Network comprised of public and private institutions that promote competitiveness from the 34 OAS member countries. The GFCC Principles have also been referenced by organizations such as the World Economic Forum.

To ensure they remain current and relevant to the ever-evolving global economy, each year the Principles have been refined to reflect the changing global competitive landscape and to highlight new critical priorities, while keeping their foundational roots.

The Foundational Global Competitiveness Principles

Ensure Fiscally Responsible, Transparent and Ethical Governance. National fiscal stability, discipline and certainty foster private sector and foreign direct investment, economic expansion, new business formation and job creation. Transparent regulations and tax rules enable market efficiency and reduce the cost of doing business. Government corruption reduces the productivity and performance improvements that come from fair and open competition.

Fulfill Human Potential. All nations should educate and train their citizens without regard for gender, race, religion, age, ethnicity or economic status. Worker safety and international labor standards also are important underpinnings for individual and national success.

Invest in Research Technology and Innovation. As the driving force of innovation, nations should increase investment in research and development, coupled with the domestic deployment of new technologies, to stimulate increased productivity, standards of living and leadership in global markets.

Ignite Entrepreneurship. Supporting entrepreneurs—who are the source of new ideas, new products and services, new companies and new industries—is essential to economic vitality and improving productivity, competitiveness and economic performance.

Improve Infrastructure. Investment in a modern, well-maintained resilient infrastructure—transportation, energy, digital networks and telecommunications—is critical to encourage domestic and foreign investment, support modern commerce and grow an economy. Cybersecurity is essential to the performance and safety of all economic activity, consumer access to the marketplace and personal privacy protection.

Establish Public-Private Partnerships. Collaboration between the public and private sectors is essential to drive innovation, economic growth and job creation. Private sector leadership is vital in developing national policy initiatives to address short- and long-term competitiveness challenges and opportunities.

Foster Regional and Metropolitan Centers of Innovation. Regional clusters and metropolitan areas connect talent with science, technology, manufacturing and service resources, fostering the creativity, idea generation and innovation that drive competitiveness.

Encourage Sustainable Growth. Sustainable growth and responsible development through increased natural resource productivity, energy efficiency, and access to or development of critical materials will foster innovation, increase standards of living, help ensure food security and access to clean water, improve health and enhance national security.

Protect Intellectual Property. Strong intellectual property rights are a prerequisite to attract high-value investment and innovation in new technology, new product development and creative works such as software and entertainment.

Expand Access to Global Market Opportunities. Open and transparent markets expand global trade and investment, and drive economic growth around the world. Protectionist policies hinder innovation, growth and business performance. Well-defined international standards are essential to facilitate global commerce.

A Pathway to *a Creative Economy*

Release of the Global Competitiveness Principles is a highlight of the Competitiveness Summit and Annual Meeting of the GFCC. This year, the Summit and GFCC Annual Meeting—*Enhancing Sustainable Prosperity through Creativity and Innovation*—are focused on the nexus between creativity, imagination, innovation, and competeveness to build a "Creative Economy."

In recognition of people as the wellspring of creativity, imagination, and ideas, the GFCC is releasing *A Pathway to a Creative Economy*, focused on the fundamental role of people in innovation. These recommendations highlight the human dimension of the foundational principles, for example, education and training to advance human creativity and economic potential, the need for a broad and creative skill base and infrastructure that supports a "Creative Nation," leveraging creative talent in metropolitan areas and regions, collaboration between researchers and industry to better connect R&D to economic engines, and encouraging entrepreneurs and helping ensure they are rewarded for their effort, investment, and risk taking by protecting intellectual property.

Promote Economic Freedom and the Freedom to Create. All citizens should be free to pursue their economic interests and apply their creativity through entrepreneurship, invention and innovation, and be fairly compensated in a competitive marketplace.

Advance Human Creative and Economic Potential through Education. To build a strong economy, drive its growth, and improve productivity, empower all people regardless of gender, race, religion, age, ethnicity, or economic status, with the education and training necessary to attain the skills and capabilities for life-long learning and employment.

Drive Innovation with a Broad and Creative Skill Base. Melding science, mathematics, engineering, and technology with the creative arts and design drives innovation. Countries should support creative arts to help foster a nation of "makers and innovators," world class product and service design, and a workforce infused with creativity, ideas and insight, problem-solving, and cross-disciplinary teamwork.

Build Infrastructure that Enables A Creative Nation, Ignites Entrepreneurship, and Fosters Competition. Ensure that regulatory, financial, and legal systems; physical and digital infrastructure; and organization and management systems empower citizens to reach their full potential as creators and entrepreneurs, and bring new products and services to the marketplace.

Connect Solution Seekers with Problem Solvers. Public-private partnerships increase access to knowledge, technology development, advanced computing, and manufacturing resources to promote creative collaborations and multidisciplinary teamwork.

Leverage Creative Talent in Metropolitan Areas and Regions. Metro areas and regions must nurture and attract highly educated workers and entrepreneurs who share knowledge and form networks of ideas, creativity, and economic potential that spur innovation. Regional leaders must collaborate and leverage regional assets, including talent, technology, and capital to foster a thriving and dynamic local economy.

Link Research, Science, and Technology to Economic Engines. Research and development should be informed by the pull of needs, challenges, economic opportunities, and the potential for societal impact so that it is better connected to the downstream innovation process that involves investment, entrepreneurship, and the skills sets and assets of the private sector.

Protect Intellectual Property. Strong intellectual property rights are essential for encouraging the endeavors of creators, innovators, entrepreneurs, and businesses helping ensure they are rewarded for their effort, investment, and risk-taking.

Ensure Fiscal Responsibility. Investments in research and development and education and training must co-exist with fiscal discipline. Excessive levels of government debt and deficit can drag down an economy and crowd out economically stimulating investments.

Enhance Stability and Reduce Uncertainty. Political instability and unrest disrupt economic activity, deter economic development, and damage national competitiveness. Policy, legislative, regulatory and financial certainty, coupled with government transparency, can increase domestic and foreign investment, reduce business risk, and encourage new business formation and expansion needed to create jobs.

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

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