Higher Education for Puerto Rico's Future Recovery and Sustainability

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Overall, Puerto Rico's future recovery requires a sustained large-scale strategy that engages multiple sectors, the political establishment and the residents of the Island. Given that Puerto Rico is a territory of the United States, it also requires a bipartisan commitment from the United States Congress to rebuild its future. Rebuilding Puerto Rico will require tens of billions of dollars in new capital investments, which will only be possible with substantial new multiyear resources from the US federal government, as well as funding parity with programs such as Medicaid, education, housing and business development.

These federal funds must be linked to a clear and strategic public re-investment plan that is grounded on a new vison for a stronger economic future for Puerto Rico. The federal government has funds available through entitlement programs, such as the funds that are coming to the Island for disaster recovery through CDBG grants; as well as competitive opportunities for funding innovative ideas that can be turned into advantages for the Island and its people.

Any long-term strategy must include a commitment of the local political and civic leadership for reinventing the approaches to development and for forging a vision that builds on local capacity, is grounded on existing resources already available through the Island's higher education system, capitalizes on the natural resources of the Island, and invests on people and communities. Puerto Rico needs policy advisors and lobbyists to aggressively marshal new immediate resources for comprehensive recovery and transformative development of the island, as well as entrepreneurs that can leverage private funding for transformational initiatives.

The higher education sector represents an important resource and an absolute requirement to advance Puerto Rico towards a new paradigm for economic and social development. Higher education can position itself to contribute in a leading way to address these remarkable and unprecedented challenges in the history of Puerto Rico. Puerto Rico can capitalize on its entrepreneurial spirit, tax incentives, natural resources, and geography to make it an attractive launching pad for opportunity and innovation.

This approach includes placing Puerto Rico in a competitive condition within the global economy. This requires local leadership to integrate into its plan for recovery the concept of "globalization" which is based on the integration of global and local political economic factors into a strategy for development and change. (Swyngedouw, 1997)

There are untapped opportunities for investments in tourism, agriculture, emerging industries, pharma and federally regulated ventures. There are also new opportunities for carving a vision for development that focuses on people and place strategies. These can be grounded on reciprocal and well aligned multisector partnerships with higher education at the forefront as the engine for knowledge creation and knowledge transfer.

The sustainability of the higher education system as a valuable sector for the country is tied to the survival of the economy. The University of Puerto Rico still is regarded as one of the best in the Western Hemisphere with a ranking of 33 from the SCIMAGO Institute Ranking and No. 15 in Latin America and the Caribbean. (SCIMAGO Institute, 2017).

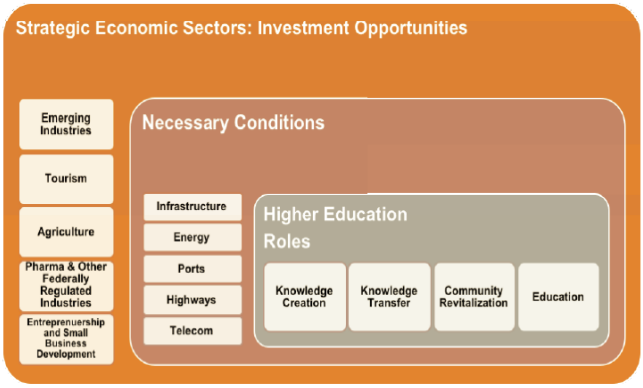
A number of the private institutions, like Interamerican University also ranks well in our region. Therefore, colleges and universities have a determining stake on how Puerto Rico aligns its resources and opportunities to create a new paradigm for development to ignite economic revitalization as a core element in their missions.

The level of multidisciplinarity inherent in higher education institutions and the rich talent of faculty and students create the necessary mix and match of assets and brainpower to engage private and public sectors to innovate and create opportunities. This vision is absolutely essential to create economic revival and attract private investment. There are four core areas of endeavor for higher education. (Shaffer & Wright, 2010)

Core areas for Higher Education

Knowledge Creation • New Technologies • New Processes • New Prodcuts • New Ideas	**Knowledge Transfer** • Worker Training • Management Coaching • Incubation of Start-ups • New/Targeted Academic Programs
Community Revitalization • Local Investments • Cultivation of Third Sector and Non-Profits • Infrastrucutre, employment and business development	**Education** • Undergraduate and Graduate Programs • K-12 Pipeline Development • Career Training • Workforce Training

Higher Education and Economic Investment Opportunities



Core areas for higher education

Core areas include: knowledge creation, knowledge transfer, community revitalization, and education, to set the context for redefining the role of higher education in propelling a new economic model for Puerto Rico and provide the foundation for the recommendations provided below.

The conceptual growth plan anchoring this report focuses on 4 strategic economic sectors—tourism, agriculture, manufacturing, and selected services. The Higher Education sector depends on the viability for developing these strategic economic sectors and the feasibility for such development depends on how well the Higher Education sector connects with them.

Higher education and economic investment opportunities

Innovation and the capacity to connect new ideas to practice is at the core of the work of higher education institutions and is the key for a thriving economic model. Puerto Rico's economic, social and political conditions have

changed. We need an economic model based on global competitiveness and collaboration. Therefore, new solutions are needed to meet an entirely new set of challenges and capitalize on new opportunities that can be created through innovation and people/place-based strategies. With this contextual setting, the following are essential opportunities to re-envision the higher education system in Puerto Rico.

1) Puerto Rico Higher Education System can anchor community development through people and place-based strategies.

As anchor institutions, universities have the capacity and capital to rebuild adjacent communities through investments in education, its workforce, real estate and the physical landscape.

Universities are hubs for learning and social engagement for local residents and businesses that build social capital and connect people to the mainstream society. Faculty and students can work directly with communities on asset-based projects to benefit the residents and neighborhoods, through transforming community spaces into businesses, repurpose communities and educational corridors.

In cities and towns where universities are located throughout the island, the university leaders, faculty, and students can take an active role in uniting residents in shared meaning, learning and dialogue about the future of their communities.

University personnel can serve as facilitators of knowledge to elicit and implement ideas that move the community forward, particularly around rebuilding a pre-K-12 education system aligned with Higher Education, improving value of property, real estate development and developing sustainable systems of energy and water utilization, and identifying methods for small business development and microenterprises.

For example, in Camden, New Jersey, Dr. Gloria Bonilla-Santiago, a Distinguished Professor in Public Policy and Administration at Rutgers University, organized parents, local businesses, local community organizations, university administrators, and New Jersey state legislators to envision and create a new University and Community School Social Enterprise model in the mid-1990s to upend the status quo in urban public education.

The planning group formed LEAP Academy (Leadership, Education, and Partnership Inc.), as a cradle to college public school that families could attend throughout their entire schooling trajectory, starting as infants and toddlers, followed by pre-K, K-12, and then into college, all along an educational corridor in Downtown Camden. The targeted STEM College Access curriculum, Early College, Fabrication Lab for innovation and microenterprise, Parent Engagement and Family Support, and Health and Wellness programs provide a comprehensive and holistic approach to public education that prepares students and their families for college and careers. (Bonilla-Santiago, 2014)

Dr. Santiago received an initial planning grant from the Delaware River Port Authority in 1992 for $1.5 million to organize parents and the community to envision and plan the new school. Over 25 years, she has been able to fundraise over $100 million from public and private sources to create state-of-the art buildings and endowment funds for college scholarships.

2) Universities as a place for access, affordability, quality, accountability, and innovation.

Higher education enrollment outcomes in Puerto Rico reflect poorly on the education investment that has already been made. Because increased demand for higher education has not been matched by increased levels of funding, the quality of higher education in Puerto Rico has been compromised. Higher education systems in Puerto Rico are in need of renewal and its resources need to be strengthened and aligned to the current economic needs of Puerto Rico as well as to the demands from the global community.

The system needs to be structured to capitalize on the diversity of strengths of the various institutions both public and private. A Higher Education Consortium should be in place to facilitate this process. Puerto Rico needs to adopt a new strategic, targeted and differentiated approach to increase enrollment at all levels of the higher education pipeline – undergraduate as well as postgraduate study. It needs to strengthen the quality of teaching and learning in higher education institutions by increasing the qualifications of faculty, producing at least double the number of masters and doctoral graduates, and retaining the best talent within the universities.

A new vision for the higher education sector needs to address two key elements: the first is to strengthen governance, leadership and management, and introduce management information systems to improve the effectiveness of higher education planning and expenditure; and, the second is to strengthen scholarship through interdisciplinary practice and collaboration for innovation. Tuition costs for the public university need revision and adjustment. For the academic year 2016-2017, the average tuition costs for University of Puerto Rico (UPR) is $2,537 for instate and $4,372 for out-of-state students.

Undergraduate & graduate costs for attending a university in PR

Puerto Rico	Undergraduate		Graduate	
Description	In-State	Out-of-State	In-State	Out-of-State
Tuition & Fees p/p	$2,537	$4,372	$4,053	$6,404
Books & Supplies	$1,234		$1,234	
Room & Board	$9,724			
United States	**Undergraduate**		**Graduate**	
Description	In-State	Out-of-State	In-State	Out-of-State
Tuition & Fees p/p	$9,970	$14,620	$25,620	$34,740
Books & Supplies	$1,168		$1,250	
Room & Board	$10,800			

The average cost of tuition and fees for the 2016– 2017 school year in the US is $9,970 for in-state residents at public colleges, and $14,620 for outof-state residents attending public universities. Compared with 2013, university costs have declined for in-state and out-of-state students, but the lowered costs affect the universities' ability to receive enough revenue to operate with enough capital.

PR in-state and out-of-state tuition comparisons

4 Years	Public schools undergraduate tuition	
	In-State	Out-of-State
2013	$3,022	$4,908
2014	$2,503	$4,392
2015	$2,480	$4,193
2016	$2,486	$4,398
2017	$2,537	$4,372

Source: National Center for Education Statistics, College Board, 2017

The concept of internationalizing academia should be a strategic element to raise the level of talent as well as income. This can be done by promoting, marketing and aggressively recruiting international students to come study in Puerto Rico. These students pay a higher tuition rate and cover their costs. Further, partnerships with universities in the US and other countries should be forged to allow for joint academic offerings.

This is a strategy that institutions of higher education in the US and the United Kingdom are implementing. Universities are investing in a concerted effort to attract international students as a strategy to increase revenues, as well as enriching the academic experiences and attract talent for the country. (Universities of UK, 2014)

At the core of these strategies is the crafting of a growth strategy that is inclusive of international student participation in higher education and a marketing effort that sends a consistent message that Puerto Rico welcomes international students, as well as the development of post-study work opportunities for international student graduates. In the United States, efforts to attract international studies are also part of the growth strategy for higher education institutions.

A review of participation patterns of international students in US universities shows that close to half (44 percent) of international students in 2014-2015 were in a STEM field, particularly on five fields of study—math and computer science (24 percent), engineering (16 percent), agriculture (15 percent), intensive English (13 percent), and fine and applied arts (11 percent).

During the same period, international students contributed more than $30.5 billion to the US economy. These are academic areas for which Puerto Rico institutions have strong foundations and there are affiliated research centers. Therefore, these should be areas of focus for attracting more students from foreign countries. (Zong & Batalova, 2016; Ruiz, 2014)

The University of Puerto Rico should offer scholarships to assist the neediest students and cultivate the best talent. However, scholarships should be accompanied by a requirement for students to remain working in Puerto Rico for at least five years.

This a common practice in many public universities all over the world. For example, Paraguay offers scholarships for students with the caveat that they stay working in the country for a period of time after university studies are completed.

3) Universities as partners with choice K-12 Schools.

Higher education can be a catalyst for transforming the way in which preK-12 education is delivered in Puerto Rico in a variety of ways, including: working with the Department of Education in restructuring and decentralizing the department, governance and structure of schools.

The recent call by Governor Ricardo Rossello to establish K-12 charter public schools on the island is a promising initiative to decentralize bureaucracy and establish greater opportunities for families to have a choice in a better-quality education system for their children.

4) Education and Infrastructure.

This must be done in alignment with the Higher Education system to shape and link the new school infrastructure to higher education standards with early learning and K-12 pathways to ensure students are prepared for higher learning and the workforce. The university must utilize its intellectual and Human Capital to redesign and uplift communities in distress due to crises like Maria.

Higher education and secondary education have an obligation to ensure that children have a clear path to college beginning in the stages of early childhood development. With human, social, political, and physical capital, universities can garner influence and resources to affect systems of education for children and families in all of the years of schooling.

The university needs an educated pool of applicants. It must ensure that students are prepared for the college level experience through intentional, targeted college access, and readiness programs, beginning as early as possible. In order to secure the future of higher education in Puerto Rico, universities must ensure that the pipeline of early learning to college is readily flowing.

Higher education is also an important resource in transforming teachers and school leadership preparation. Teachers and principals are at the core of good schooling and hold the keys for transferring teaching and learning. Puerto Rico has an opportunity to adopting programs that place education students in classrooms as part of the required teaching clinical experiences under the supervision of talented faculty and outstanding teacher mentors. Teacher Residencies like the Boston Residencies could serve as models for replication.

5) University as incubators of innovation and startup capital

Higher Education institutions can play a paramount role in advancing innovation through new technologies, new processes, new products, and new ideas that can be catalysts for rebuilding the local economy and for connecting Puerto Rico to the global economy.

University faculty and talented students can leverage their strengths in knowledge creation to generate economic benefits. Attracting transfers and two-year students is critical. Innovation is happening much fastest in the outside world and universities are largely struggling to keep up. The higher education sector can support the private sector through knowledge transfer that is deployed through worker training, capacity building for management, help in incubating startup businesses and development of industrial parks and small business incubators.

The University needs to welcome innovators and entrepreneurs into co-working spaces where they can connect on ideas, build business plans, and access startup capital to implement their projects. Universities can embrace models of university innovation centers, like Pennovation at the University of Pennsylvania or Cornell Tech at Cornell University, where tracts of land and old factory spaces have become tech centers of incubators for new businesses and technology.

With open spaces indoors and outdoors, creative minds unite to design solutions to the challenges of our times, including poverty and climate change. Firms and individuals interested in investing in startup companies should be incentivized to provide funds for these innovations to test, implement, and scale.

The conditions are conducive for a larger increase in startup businesses and opportunities that universities can support through physical and financial means. The innovation centers offer employment opportunities as well for local retail, food, and services.

There are a number of initiatives already in place that should be sustained and expanded. The Puerto Rico Science, Technology, and Research Trust is a leader in fostering startup companies, entrepreneurial endeavors, and groundbreaking scientific research throughout Puerto Rico and the Caribbean, with a vast network of partnerships and access to capital.

It has formalized partnerships with some universities but could expand its resources to undergraduate and graduate students for channeling a pipeline of talent directly from the university. Further expansion into the university ecosystem can open doors and new avenues for student and faculty ingenuity and creativity that will drive the science and technology agenda on the island.

The Puerto Rico Techno Economic Corridor on the West Coast of the island partners with the universities there to build opportunities for business and technology incubation. Capitalizing and investing in these resources is paramount to building a culture of innovation on the island to develop, test, and implement new ideas to create new businesses, sources of wealth and to solve social problems in education, health, and the environment.

6) Universities as research enterprises

Higher education is equipped with the talent and research prowess that is necessary to incubate new knowledge. Since innovation begins with research, how universities secure the resources and develop the conditions and mechanisms to engage its best faculty in purposeful research that leads to business development is fundamental.

Higher education should partner with government and the private sector in Puerto Rico to create business clusters, industrial parks, and build on the concept of "knowledge economies". Four areas of development are at the core of facilitating this transformative change in the role of the university: 1) attracting and retaining a cadre of talented and prominent faculty; 2) engaging university leadership that can think "outside the box" to conceive a university as an anchor for building the future trajectory of the country; 3) the physical infrastructure needed for research and development, such as labs, research parks, and classrooms; and 4) flexibility to facilitative an environment that frees up the university to commercialize research outcomes.

This approach needs to encompass collaboration among all institutions of higher education and therefore, a country-wide mechanism for collaboration and sharing needs to be in place. The Research Triangle Park in North Carolina is one of the leading factors driving North Carolina's economy. It was founded by three universities – NC State, Duke and University of North Carolina at Chapel Hill as an effort to promote education, research and industry collaboration.

Today, this joint effort is the largest research park in the United States and serves as a case study for how to tap on universities as a propellant of jobs and new industries that are aligned to the state's economy. Closely affiliated is North Carolina's Centennial Campus located within the NC State Campus and offering a mix of services, including academic classrooms, labs and classrooms along with space for corporate and government tenants, residential and food

service facilities, a lake, a golf course and a middle public school.

This innovative university-based effort has attracted a number of corporations, including: RedHat, MeadWestvaco, Juniper Networks and Pathfinder Pharmaceuticals. Georgia also offers a good model with the formation of the Georgia Research Alliance (GRA). The alliance was spearheaded by the Governor and was launched as a strategy to retain industry in the state and attract new investments.

The GRA was formed as a non-profit corporation and its Board include the university presidents of the six major institutions of higher education along with industry leaders. A staple of this effort was the Eminent Scholars Program which set the foundation for attracting renowned entrepreneurial researchers to the state to lead research and development projects and attract students to the university.

The key factor in these examples is that government intervened directly to leverage their creation and the universities incorporated them into their growth strategy.

7) Universities as networks of technology and distance learning

Given the decline in human capital from universities both prior to and after Hurricane Maria, universities should invest in technological infrastructure that capitalizes and utilizes cloud computing and networks that allow students and faculty from different campuses, states, and global sites to connect with each other digitally.

Since Puerto Rico is isolated geographically, distance learning becomes an opportunity for other Latin American Spanish countries and Caribbean islands to compete for students in Latin American Spanish countries and Caribbean islands. In addition, public transportation is also a hindrance for local students to travel throughout the island, new opportunities for distance learning can be leveraged.

Faculty from one campus could project their lectures to students at other campuses. This allows greater access of expert knowledge and information across a wider swath of the population. Faculty and students can collaborate on projects together throughout the island to share resources and build coalitions for stronger advocacy programs to change public and economic policy that will improve their social conditions.

The Ana G. Mendez University Online program is the first online distance learning program in Puerto Rico with Master Courses in Human Resources, Agribusiness, and Marketing Sales in Management, amongst others. The InterAmerican University has a plethora of online programs as well in Computer Science and Business. While online programs are beneficial for students with limited time and resources to attend full time and in person programs, universities can boost their levels of technological access, generate source of income to advance collaboration amongst students throughout the world.

There is plethora of good models for launching this kind of effort. New York's Excelsior College is a pioneer in distance learning catering to adult learners with a combination of online courses and small learning centers across the state. Western Governors University operates as a total online virtual university and attracts mid-age adults.

The University system of Georgia offers a program called "Intellectual Capital

Partnership", which functions like a traditional community college-based job training program with a focus on more specialized needs and on for credit college level training. They work with employers in crafting their offerings with the cost for learning shared between the employer and the state.

Universities can foster a network infrastructure that harnesses new technologies in cloud computing and digital learning that sparks new opportunities for students and faculty to work together virtually to conduct research, design new products, and challenge public policy. After Hurricane Maria, the University of Sagrado Corazon employed Dynamic Campus, a Texasbased company, to rebuild its tech infrastructure from cables on the ground to cloud computing to store academic and financial management systems so that students could return to classes immediately. (Schaffhausser, 2017)

This action highlights new investment opportunities for cloud computing so universities, and other institutions, can withstand large scale damages from future natural disasters, and offer cheaper, and more protected administrative and management systems.

8) Universities as global centers of excellence.

Colleges and universities are important assets that can help Puerto Rico actively participate in the knowledge economy. One way the Island can build on these assets is to foster partnerships between private industry and higher-education institutions.

These partnerships tend to offer localized economic benefits by increasing economic activity associated with the creation, development, and commercialization of new products or processes.

The mission is for the government of Puerto Rico, along with the university and non-profit sector, to establish a center of excellence focusing on the development of globally important technologies by providing seed funding and incentivizing industry investment. Major companies have invested in universities throughout the United States to develop product development and research centers to design, test, and implement new technologies. For example, Boeing and Caltech have research agreements to partner on aviation technologies that are jointly patented. Siemens contracts with the University of Tennessee to develop new medical imaging scintillators and scanning tools.

Procter and Gamble built a simulation center at the University of Cincinnati for advancing product and process development (UIDP, 2013). These examples demonstrate new opportunities for businesses invested in research and development to establish a foundational research location within a university setting to improve their market appeal to mass audiences. These programs require almost $1 million annually to fund the facilities, personnel, and equipment for the operations.

9) Universities as workforce development centers.

The higher education sector must be able to adapt and customize its educational range to the needs of the country. Employers are increasingly warning of widening gaps between skills that are in demand and those that are available, highlighting a need to foster more technical talent if countries want to remain competitive.

There is a considerable skills mismatch between university graduates and the needs of employers in most economies. Without adequate modifications to education and training systems, the gap between supply and demand is projected to grow significantly. To address this, it will be critical to re-align global talent pipelines with market demand. (WEF, 2017) Universities need to assess their teaching and learning focus and priorities to ensure that they can align the role of knowledge creation through research and technology transfer with that of knowledge transfer through education and human resource development. Workforce development is crucial and in the spirit of developing a cohesive higher education sector, the role of the junior colleges need to be revisited as they should play an important role in training and developing 2-year programs that lead to certificates and that prepare students to enter the workforce.

Academic program development needs to be aligned to the needs of industry and business to ensure that training leads to jobs and that companies can get the human capital that is necessary to thrive and be competitive in the business sector. Training programs should be consolidated into a single entity to ensure alignment and usefulness. One example comes from Georgia Tech and its Enterprise Innovation Institute.

10) Universities as generators of revenue and capital.

The best universities depend on more than just students for their revenue. They develop endowments, chairs, contracts, patents, and products.

Over the past five years, the Puerto Rico Science, Technology, and Research Trust, in partnership with the University of Puerto Rico, and the PR Department of Economic Development (DDEC by its Spanish acronym) managed to have 20 patents for the UPR with another 41 applications in process.

Though encouraging, these results are not enough. Consider that MIT University has currently licensed 49% of its 2,728 issued US patents to third parties and 32% of its pending US patents. MIT ranks #2 in the 2017 Reuter Report of the Top 100 world most innovative universities. The potential is there for the taking but it must be an agile system.

Universities in the Island need to cultivate and attract new sources of revenue, donors, and innovations to be able to generate new income to become self-sufficient. They need to be growing and diversifying their revenue. The future of universities depends of its ability to replicate and sustain themselves throughout history. The role of the Boards of Governors must focus on putting together an action plan for fundraising and controlling administrative spending. Trustees have a unique vantage point and responsibility to investigate cost and compare them against similar or peer institutions. They need to increase financial transparency, invest and allocate scarce resources responsibly in a highly competitive education landscape.

Moving forward.

Puerto Rico's higher education system needs to make strategic choices about what and who they want to be and serve, what to provide, who to partner with, and how much to change. The outcome of these choices will lead to greater recognition from community, donors, employers, and students. ■

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