



Roadmap to a Productive and Sustainable Research, Innovation & Creative Endeavors (RICE) Ecosystem at UPRM



Ubaldo M. Córdova-Figueroa, PhD
Special Assistant to the Chancellor
Research, Innovation and Creative Endeavors
ubaldom.cordova@upr.edu



Value to society, the Puerto Rican economy and the University



Return of Investment (ROI) 10-25% depending of the sector

“Spending on science is one of the best ways to generate jobs and economic growth” (Nature 2010)

Promotes the innovation and knowledge-based economy,
creates startups

ROI in human capital is much higher
(report from CPROST)

Stimulates corporate R&D activity

Undergraduate student-faculty research and innovation partnerships increase student retention rates, outcomes and development of 21st century skills in students



Nagda et al. (1998); Seymour et al. (2003);
Godreau et al. (2015); Collins et al. (2017)

Photo courtesy of NSF CREST

Universities can turn RICE into revenue



International prestige leads to huge endowments

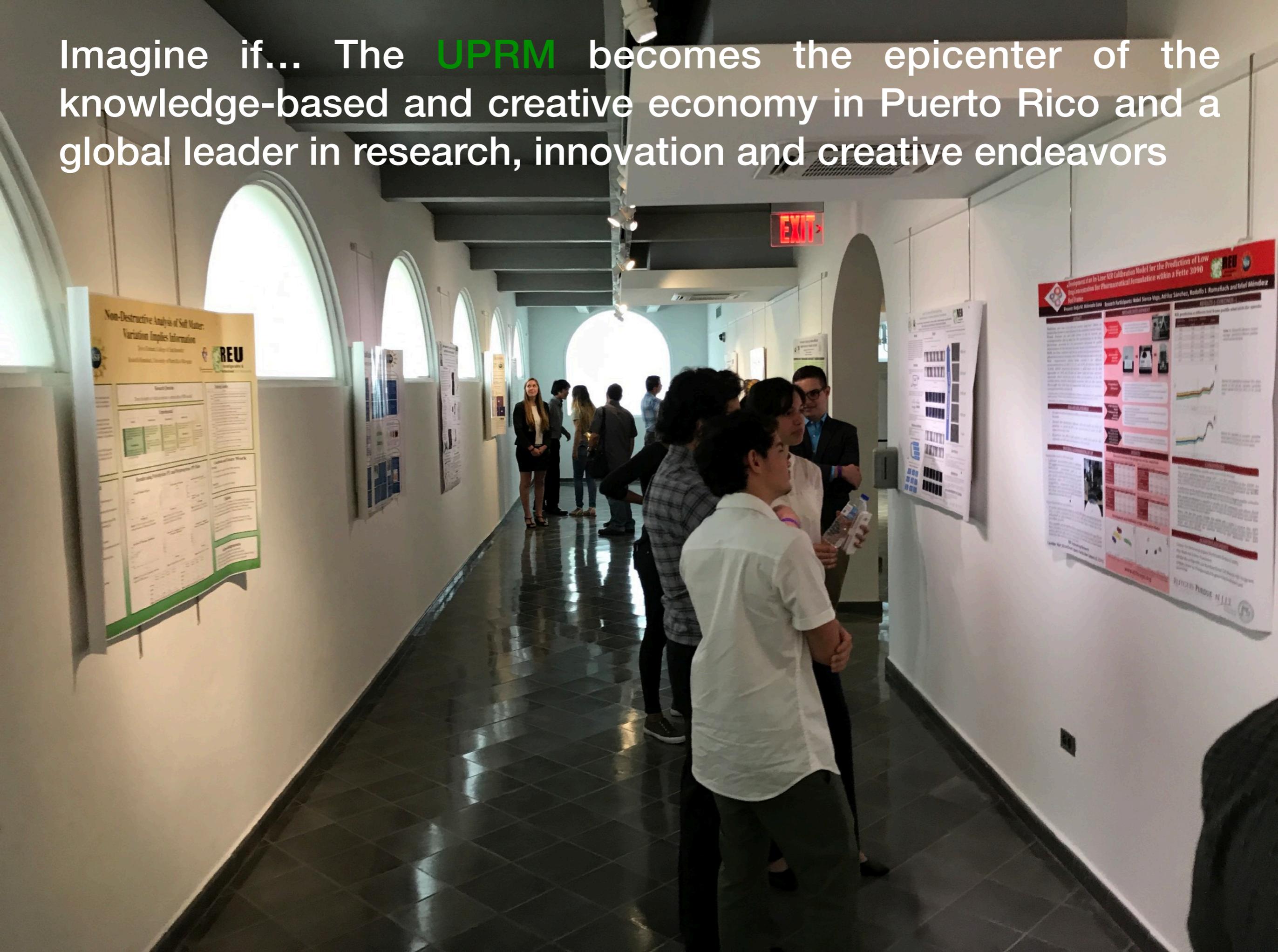
Industry - Government - Academia collaborations

Commercialization of products and services

Patents and licensing

Stakes in startups

Imagine if... The **UPRM** becomes the epicenter of the knowledge-based and creative economy in Puerto Rico and a global leader in research, innovation and creative endeavors



Sample of Success Stories @ UPRM

NSF CREST - Nanotech
\$5M

**NSF SusWEF - Sustainable
Water, Energy, and Food
Nexus**
\$4M

**STEAM outreach to
thousands of K-12
students**

**97 invention disclosures
in 3 years**

**PhD alumni leaders in
industry & academia**

New PhD programs

GRIC

**Grant writing
workshops organized
by PDU**

**Research Academy
mentoring program**

**UPRM E-ship
Network**

Presencias

**Research impact in
communities around
Puerto Rico**

**Increased
interest in SBIR/
STTRs**

MUSA

Photo courtesy of NSF CREST

Current Situation @ UPRM

33% UPRM faculty commits some time to RICE (mostly Junior & Mid-Career Faculty)

283 scientific papers (2013) - **355** in MS, **257** in RP

\$19.2M funds from active grants at the R&DC (**\$1.7M** in indirect costs to UPRM)

9% of students are in grad school

2 postdoctoral fellows

10% of undergrads enrolled in undergraduate research courses

16% of faculty workload dedicated to RICE activities (in average)

40 patents - **none** are commercialized

4-5 recent SBIRs/STTRs

>30 entrepreneurial teams receiving mentoring

25 trademarks (none at USPTO)

4 copyrights

? books

? registered artwork

? research collaborative agreements

Where do we want to go?

In Every Challenge There Lies Opportunity

Faculty hiring freeze
Aging faculty (and retirements)
Tuition increase for students
Difficulties recruiting graduate students
Decreasing population of local students
Deteriorating (or lack of) research infrastructure
Lack of competitive salaries and incentives
UPR fiscal plan projections: **\$20M** in new funds annually
Very high teaching load
Competition in our Jurisdiction is catching up
Ranking of UPRM and academic programs uncertain
Poor visibility of research activity inside and outside campus
Creative endeavors are limited
Impact of Hurricane Maria

Limiting options boots creativity

General Goals: Productivity & Sustainability

1

Institutional Characteristics
that Facilitates RICE
Productivity



2

Sustainability Throughout
an Academic Career



Institutional Characteristics that Facilitate RICE Productivity

Characteristics	Description
Clear coordinating goals	Visible, shared goals coordinate member's work.
RICE emphasis	RICE has greater or equal priority than other goals.
Culture	Members are bonded by shared, RICE-related values and practices, have a safe home for testing new ideas.
Positive group climate	The climate is characterized by high morale, a spirit of innovation, dedication to work, receptivity to new ideas, frequent interaction, high degree of cooperation, low member turnover, good leader/member relationships, and open discussion of disagreements.
Mentoring	Beginning and mid-level members are assisted by and collaborate with established scholars and a supporting network.

Institutional Characteristics that Facilitate RICE Productivity

Characteristics	Description
Communication with professional network	Members have vibrant network of colleagues with whom they have frequent and substantive (not merely social) RICE communication, in and outside of the institution.
Resources	Members have access to sufficient resources such as funding, facilities, and especially humans (e.g. local peers for support, research assistants, technical consultants).
Sufficient work time	Members have significant periods of uninterrupted time to devote to scholarly activities.
Size/ experience/ expertise	Members offer different perspective by virtue of differences in their degree levels, approaches to problems, and varying discipline backgrounds, the group is stable, and its size at or above a “critical mass.”
Communication	Clear and multiple forms of communication such that all members feel informed.

Institutional Characteristics that Facilitate RICE Productivity

Characteristics	Description
Rewards	RICE is rewarded equitably and in accordance with defined benchmarks of achievement; potential rewards include money, promotion, recognition, and new responsibilities.
Assertive participative governance	Clear and common goals, assertive and participate leadership where active participation of members is expected, and effective feedback systems are utilized.

Sustaining RICE Productivity Throughout an Academic Career

“What are the major barriers of performance of research at your institution?”

Academic Excellence: The Sourcebook, A Study on the Role of Research in the Physical Sciences at Undergraduate Institutions, edited by Michael P. Doyle, Research Corporation, Tucson, 2000.

80% of the responses focused on the **lack of time, specifically in terms of the multiple demands on faculty at primarily undergraduate institutions**

heavy **teaching load**

****expectation** by students and administration alike that faculty will provide significant amounts of individual attention to students**

Sustaining RICE Productivity Throughout an Academic Career

“What are the major barriers of performance of research at your institution?”

Academic Excellence: The Sourcebook, A Study on the Role of Research in the Physical Sciences at Undergraduate Institutions, edited by Michael P. Doyle, Research Corporation, Tucson, 2000.

“...research nearly always **detracts from...teaching”**

“In our department...undergraduate teaching is paramount and an emphasis on research nearly always **detracts from the teaching mission...”**

“The desirability of increasing research...is a **self-serving desire”**

“...the perception that after promotion and tenure decisions have been made there are **not clear rewards for continued research activities (nor clear penalties for the lack of such activity)”**

Sustaining RICE Productivity Throughout an Academic Career

Some institutions provide an array of support mechanism for junior faculty

Junior Faculty

**course reduction in the first two years
start-up funding
funding for travel and research assistance
a special assistant professor leave following third year**

**Mid-Career and
Senior Faculty**

**teaching load, added pressure of administrative
responsibilities, university governance, advising duties**

Sustaining RICE Productivity Throughout an Academic Career

Are there other impediments that restrict research productivity?

Main Obstacle:

The perception of a dichotomy in faculty roles between teaching and research

**perpetual tension,
balance between
teaching and research**



Sustaining RICE Productivity Throughout an Academic Career

A balance between teaching and research is possible



Not mutually exclusive outcomes

We should speak of a **dynamic integration of teaching and research**, with each undertaking reinforcing the other.

Research activity at the forefront of a field should continually suggest **new approaches** and **new content** for our courses.

The educational benefit of research extends far beyond the **added technical expertise, enhanced understanding** of disciplinary principles, and further exposure to methods of inquiry gained by students.

Sustaining RICE Productivity Throughout an Academic Career

How would such a philosophy improve sustaining faculty research productivity throughout a career?

Faculty would be expected to **develop the strategies and practices** that will enable them to seamlessly **integrate** teaching and research rather than relying on reduced teaching loads to conduct research.



Sustaining Research Productivity Throughout an Academic Career

No sustained research productivity results from **relying** on summer breaks or sabbaticals

A faculty member must have the **passion** and **discipline** to conduct meaningful research.

Institutions must recognize their **responsibility** in establishing a culture where research not viewed as an activity done in addition to full teaching and service loads.

If research is an **expectation** of an institution, then administrators must provide the infrastructure and resources necessary to make productive research a reality.



Roadmap is Based on...

UPR Strategic Plan - <http://www.upr.edu/plan-estrategico-upr-2017-2021/>

UPR Fiscal Plan (pending)

UPRM Strategic Plan https://www.uprm.edu/oip/docs/Plan%20Estrat%E9gico/Plan_Estrategico_2012-2022-ingles-final.pdf

CEP Research Academy forums and symposiums

Ad Hoc Committee - <https://drive.google.com/open?id=0B4BKV86rCXRhdTVySFlfa2pHdzA>

Research Committee

Report from UPR Delegation to Stanford University- https://www.dropbox.com/s/t0ggylicwmwf6qf/UPR%20Stanford%20report_FINAL.docx?dl=0

National Science Board - Reducing Investigators' Administrative Workload for Federally Funded Research - <https://www.nsf.gov/pubs/2014/nsb1418/nsb1418.pdf>

Studies at other Institutions - http://cep.uprm.edu/documentos_academia

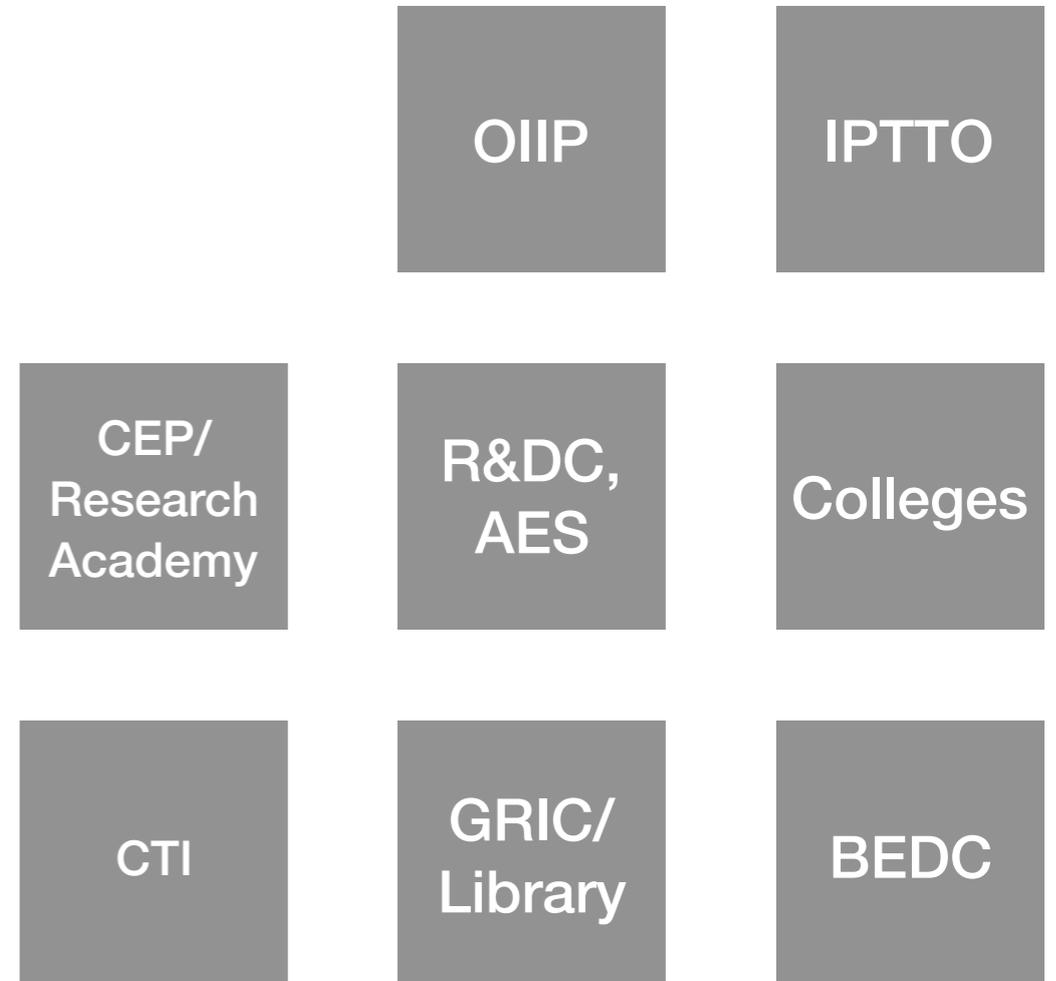
0

Foundation for Long-Term Planning & Sustainability

Develop institutional policy for collecting and managing data of RICE activities at UPRM

“Centralized repository of scholarly and creative endeavors”

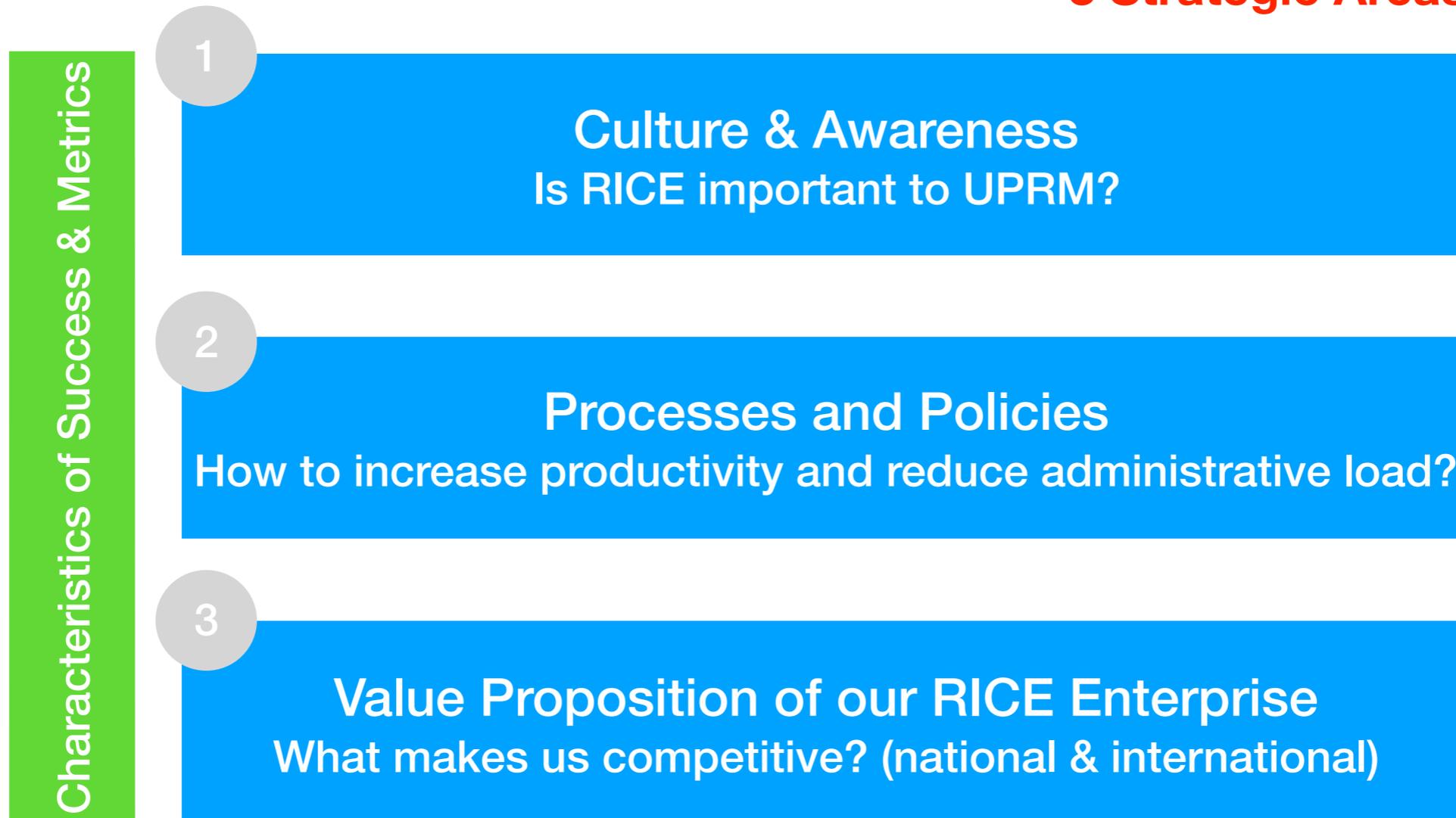
- peer-reviewed publications
- conference proceedings
- books and book chapters
- citations
- invention disclosures
- patents
- technology transfers
- proposals submitted and approved
- acquired funds
- average time per professor dedicated to RICE
- students (graduate and undergraduate)
- students enrolled in undergraduate research
- postdoctoral fellows
- lab technicians (sponsored by external funds)
- Industry R&D and Academia partnerships
- SBIRs/STTRs
- startups
- etc...



**VIVO, I&E Ecosystem Metrics,
Institutional Repository,
Faculty Plan**

Developing a Productive & Sustainable RICE Ecosystem at UPRM... ...for 100 More Years of Success

3 Strategic Areas



identify **high priority tasks** based on a combination of potential impact and ease of implementation

Culture & Awareness

Is RICE important to UPRM?

Task	Metrics	In Charge
Fully implement agreement (MOU) with the Science Trust	All components of the MOU are fully implemented or accomplished	Research Committee
Empower the UPRM Entrepreneurship Network with resources and funds (e.g. Pathways to Innovation)	amount of funds, startups created, SBIRs submitted/awarded, increase awareness	Chancellor, Pathways to Innovation, IPTTO
Award student researcher, innovator & entrepreneur of the year	# of students selected	Dean of Students
Create a system to collect ideas and proposals from community to improve RICE ecosystem	platform works as planned, # of ideas or proposals, increase in community engagement	CTI, Alumni, Research Committee
Include undergraduate research and entrepreneurship as part of the curriculum	# of undergraduate students enrolled in undergraduate research and e-ship courses	Dean of Academic Affairs

Culture & Awareness

Is RICE important to UPRM?

Task	Metrics	In Charge
Organize special events promoting RICE and socials between Chancellor, Deans and faculty	# of events organized, attendance	Research Academy, Chancellor, GRIC
Strengthen the mentoring program of the Research Academy	# of new mentees & mentors, high satisfaction, ratio of awards/proposals, quality & # of high impact publications or products	Research Academy
Discuss and define clear goals and assignments to the Research Committee	# of initiatives accomplished and outcomes based on annual work plan	Chancellor
Institutionalize “Semana de la Innovación y el Emprendimiento Colegial”	increase awareness and visibility of E-ship and innovation programs at UPRM	Chancellor
Create a suggestion digital box at R&D Center (detect problems and make analytics)	# of suggestions, # of problems solved, improve service	R&DC, Science Trust

Culture & Awareness

Is RICE important to UPRM?

Task	Metrics	In Charge
Sustain and empower PDU by (re-)assigning resources to recruit proposal writers for center like, multi-million \$ proposals	# of proposals writers, ratio of approved/submitted proposals, acquired funds	R&DC, Chancellor, Science Trust
Industry R&D - Academia liaison at the mainland (a person or a task force that promotes our capabilities)	# of new connections between industry and researchers, # endowments	Chancellor, Research Committee
Include makerspace and co-working spaces in Student Center remodeling plan and other buildings on campus	integrated into plans, # new venues	Chancellor, OIIP, Library
Consolidate all compliance offices at UPRM	better service and coordination	Chancellor

Processes and Policies

How to increase productivity and reduce administrative load?

Task	Metrics	In Charge
Create an administrative support program to help researchers manage grants	increase number of submitted proposals	R&DC, Chancellor
Digitalization of a simplified Law 101 process, and establish deadlines	more requests, reduce processing time and costs	CTI, R&DC
Digitalization of travel order process	reduce processing time and costs	CTI, R&DC
Request each Dean to prepare a plan to promote competitiveness and acquisition of external funds by faculty	use Strategic Doing, # of initiatives, amount of new funds	Chancellor, Deans
Validate use of electronic signature in all administrative processes	reduce processing time and costs	Legal, Chancellor

Processes and Policies

How to increase productivity and reduce administrative load?

Task	Metrics	In Charge
Promote a culture of innovation of administrative processes	reduce processing time and costs	Students, Chancellor, Administration
Incentivize SBIRs/STTRs	increase number of SBIRs/ STTRs	R&DC, Chancellor, BEDC
Promote coordinated efforts to improve grantsmanship	increase number of submitted grants	R&DC, Research Academy
Find alternatives to provide sabbaticals for RICE activities	increase productivity	Chancellor
Provide administrative support when writing proposals	increase number of submitted proposals	R&DC, Chancellor

Processes and Policies

How to increase productivity and reduce administrative load?

Task	Metrics	In Charge
Evaluate options for seed funds for junior faculty	available seed funds, new faculty with support	Chancellor, Deans
Digitalization of faculty plan, T-002	reduce processing time and costs	Chancellor, CTI, R&DC
Create the UPRM Digital Service - a consultation team and agents of change on information technology	interdisciplinary, include professors, students and alumni	Chancellor
Improve the R&D Center	better services, reduce processing time and costs	R&DC, Chancellor
Help RICE Centers develop a business plan to become sustainable	increase external funds	BEDC, Chancellor

Processes and Policies

How to increase productivity and reduce administrative load?

Task	Metrics	In Charge
Identify alternatives to finance a grants program at UPRM	amount of funds, # of grants	Chancellor
Delegate authorization to sign some MOUs (commercialization, research) to R&DC Director or IPTT Office Director	reduce processing time and costs	Chancellor, R&DC, IPTTO
Seek teaching-research balance and dynamic integration (e.g. consolidate courses, reduce course credits, smart course assigning, research in the classroom, smart use of spaces)	better use of talent pool for activities that generate funds	Chancellor, Deans
Design data management administrative infrastructure	reduce time and effort in archival and long term preservation of raw data and scholarly products	CTI, Library, R&DC
Strengthen RICE collaborations between PR Government agencies and UPRM	increase # of agreements, research and outreach projects, increase of funds	Research Committee, Chancellor

Value Proposition of our RICE Enterprise

What makes us competitive at a national and international level?

Task	Metrics	In Charge
Landscape: Identify interdisciplinary research areas of strength with critical mass at UPRM (based on productivity)	# of areas identified, # of professors in each area, valorization of the area	Chancellor, Research Committee
Create research and creative work thrusts on competitive areas at UPRM	a work plan in each thrust (funding opportunities, areas of collaboration)	Chancellor, Research Committee
Identify services and products, and develop business plans to commercialize them (e.g. equipments)	# of services and products in commercialization	BEDC, Chancellor
Promote development of a Research and Innovation Park at Mayagüez	# alliances and partners, funds, development plan	Chancellor
Empower Viride to become a technology accelerator in the region	# of technologies developed, new IP, commercialization agreements	Chancellor

Culture & Awareness

Is RICE important to UPRM?

**Low
Priority**

Task

Create news content to share globally on RICE efforts at UPRM

Metrics

of news, # of website clicks, # of social media views, press releases

In Charge

Prensa RUM

Empower students to advocate for more research and innovation experiences at UPRM

students conducting research, student organizations & General Student Council fully committed

Dean of Students, Chancellor

Develop official website of research, innovation and creative endeavors

of visits

Research Committee, CTI

Encourage departments with graduate programs to provide extracurricular activities on RICE topics

gains in R&I topics, assistance

OGS

Recap Newsletter of RICE success stories

monthly emails, corroborate engagement and satisfaction with community

R&DC, Research Committee

Culture & Awareness

Is RICE important to UPRM?

**Low
Priority**

Task

Metrics

In Charge

Seek MOUs with local municipalities for regional efforts (economic development, innovation and e-ship)

of agreements signed, amount of funds to UPRM

Chancellor

Include pro-RICE language in all departments and offices

full understanding of R&I activities across the university

Chancellor, Deans

Commission a study to benchmark our situation with respect to RICE at other similar universities

accomplished and use results to prepare better strategies

Chancellor, R&DC

Advise the Acad. Senate to create a committee of researchers on RICE that closely collaborates with the RC

permanent committee is created

Chancellor

Processes and Policies

Low Priority

How to increase productivity and reduce administrative load?

Task	Metrics	In Charge
Salary options for postdoctoral fellows. Use example by RCSE.	provide alternatives, satisfaction from researcher, increase # of postdocs	R&DC
Policy: If requested information is found in the same office or in another office at UPRM, no need to request it to professor	reduce processing time and costs	Chancellor
Provide more funds from the portion that goes to UPRM to the researcher as more patents are commercialized	increase patents, non-disclosure agreements	IPTTO, Chancellor
Evaluate tenure track process and make essential RICE activities	increase productivity, retention	Chancellor
Eliminate bottlenecks in purchasing process (via digitalization, streamlining and innovation)	reduce processing time and costs	Chancellor, CTI

Processes and Policies

Low Priority

How to increase productivity and reduce administrative load?

Task

Determine cost of administrative
bottlenecks

Metrics

reduce processing time and
costs

In Charge

Chancellor,
Administration

Value Proposition of our RICE Enterprise

Low Priority

What makes us competitive at a national and international level?

Task

Study process for appearing in national and international rankings

Position UPRM in the west coast as a strong partner for economic development

Metrics

to appear in best rankings, to identify strengths and weaknesses

participate in meetings with regional partners, # of collaborations

In Charge

Chancellor

Chancellor

Principles of the Roadmap

Technology & Creativity Driven
Facts Driven (Based on Research Studies)
Strategic Doing: Do, Measure & Learn, Refine, Do...
Openness & Transparency
Inclusiveness
Empower Others to Take Action

Time is the most important currency in RICE

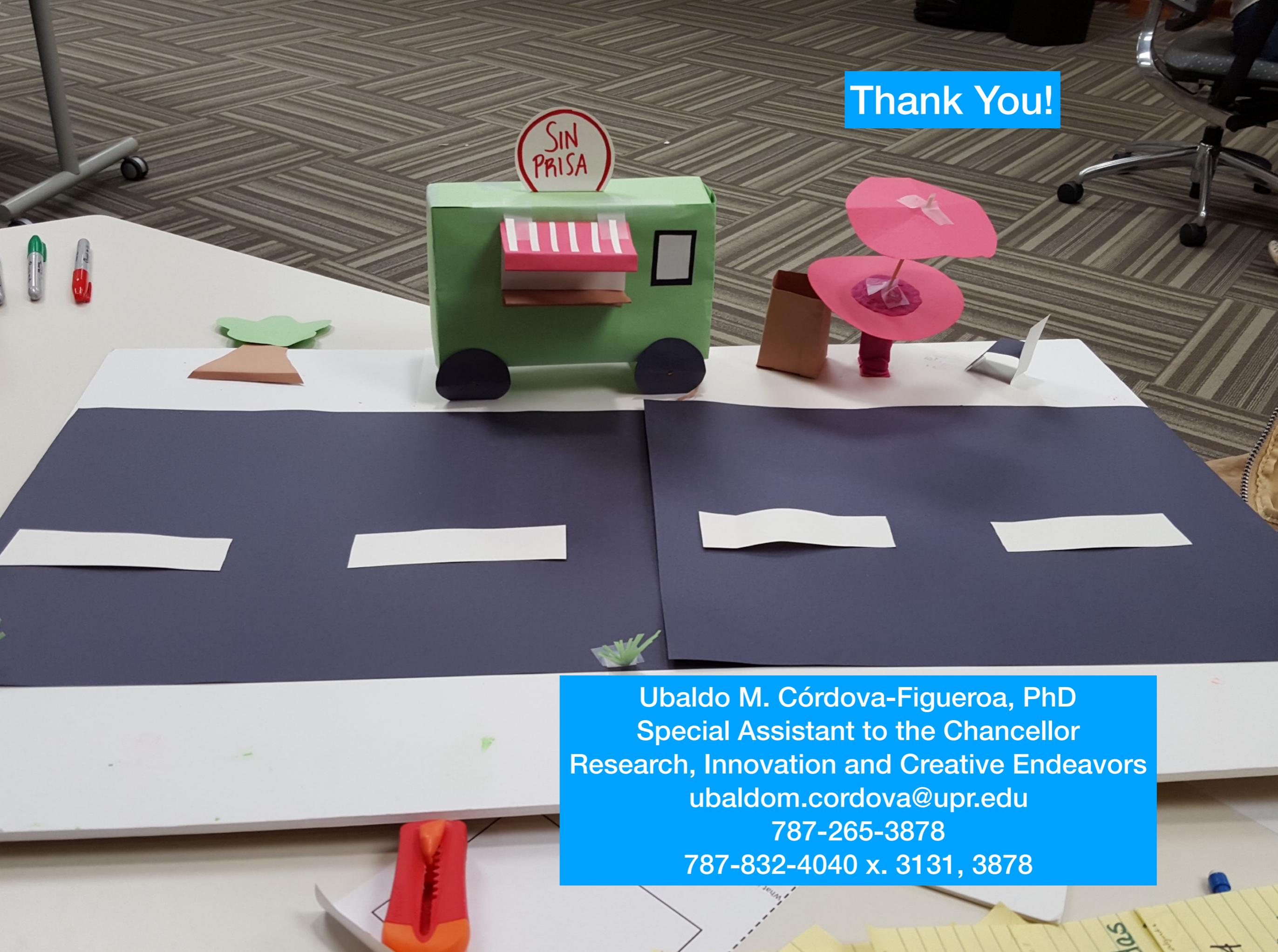


Next steps

**Operationalization
Campus Community Involvement
Project Management**

Photo courtesy of NSF CREST

Thank You!



Ubaldo M. Córdova-Figueroa, PhD
Special Assistant to the Chancellor
Research, Innovation and Creative Endeavors
ubaldom.cordova@upr.edu
787-265-3878
787-832-4040 x. 3131, 3878