RECOMMENDATIONS
OF THE GOVERNOR'S
UNIVERSITY INNOVATION COUNCIL

Science, Technology & Innovation
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Contents

BACKGROUND

Innovation is an essential *process*—a means of creating and implementing unique products, services, or practices that yield value. As the modern economy's fuel, innovation creates new industries, makes existing ones globally competitive, and sustains economic growth and improved societal well-being.[1]

Innovation is also a desired *output*—a product, service, or practice that is unique, valuable, and successfully implemented. As embodied in the modern economy's production and achievements, each innovation makes the world a better place to live, work, and play.

Whether a process or an output, innovation has many sources, and science (the creation and organization of knowledge) and technology (the practical application of knowledge) are its fundamental elements. On those two fronts, studies show that North Carolina has some of the strongest raw materials for innovation, ranking 4th nationally in academic science & engineering research & development (R&D) as a share of gross domestic product.[2]

At the same time, however, North Carolina's R&D commercialization and high-tech business activity rank below the U.S. average and are typically in the second or third quartile among U.S. states in rank order.[3] At a time when the state's private sector investment in, and commercialization of, R&D lags that of its competitors, the potential to capitalize more efficiently and effectively on university R&D is critical to the state's future economic success. North Carolina's translation of its fundamental innovation advantage into follow-on economic advantage can improve. The state has untapped economic potential on this front.

CHARGE

When Governor Pat McCrory took office in January 2013, one of his key goals was to help North Carolina's universities and businesses maximize the economic and social benefits of the state's world-class knowledge creation, technology, and innovation. To do so, he went to the front lines of the economy, both within the state and nationally.

He began by convening North Carolina's venture capital and business investment leaders to hear, first-hand, the challenges they face in commercializing innovations and growing early stage technology based businesses. Based on their input, he followed up by meeting with university, business, and investment leaders in California's Silicon Valley to learn more about their successes and to get their perspectives on North Carolina's challenges and opportunities. The takeaway message from these two listening exercises was clear and direct:

> ***North Carolina has the intellectual and innovative capacity to compete with any state or nation; what it lacks is the optimal mix of processes, resources, and people to convert that capacity into new products and services that lead to increased economic activity and jobs. North Carolina's innovation commercialization ecosystem can be improved.***

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[1] Between one-third to one-half of economic growth can be attributed to innovation (U.S. Department of Commerce. 2012. *The Competitiveness and Innovative Capacity of the United States*. Washington, DC).

[2] National Science Board. 2016. *Science and Engineering Indicators 2016.* Arlington, VA: National Science Foundation (https://www.nsf.gov/statistics/2016/nsb20161/#/stateind).

[3] North Carolina Board of Science, Technology & Innovation. 2015. *Tracking Innovation: North Carolina Innovation Index*. Raleigh, NC: North Carolina Department of Commerce (http://www.nccommerce.com/sti/resources/innovation-reports).

To respond to this challenge, in spring 2014 Governor McCrory convened the leaders of North Carolina's major universities and research organizations, as well as investors and industry representatives, to form an *Innovation-to-Jobs (I2J) Working Group*. He charged the Group with two tasks:

1. Conduct a comprehensive, statewide assessment of North Carolina's innovation-to-jobs challenges;
2. Develop a short list of targeted, actionable recommendations that will effectively address the major challenges in North Carolina's innovation commercialization ecosystem.

The Working Group held several meetings in summer and fall 2014, during which it conducted a detailed statewide survey of more than 500 well-informed, experienced university and business stakeholders and drew upon the in-depth knowledge of its members to identify major barriers to innovation commercialization in the state. The Working Group then went back to the stakeholders and solicited their ideas for how to address these barriers. After receiving more than 60 detailed white papers from those stakeholders, the Working Group reviewed, evaluated, and consolidated these ideas, resulting in six recommendations, one of which entailed the formation of a statewide University Innovation Council (UIC).[4]

The UIC's charge was the following:

> **Define best practices for innovation commercialization at NC universities, promote inter-university cooperation and standardization where possible, and catalyze transformation in culture to encourage the commercialization of innovations.**

In short, The UIC's charge was to increase the efficiency and effectiveness of the innovation commercialization process across North Carolina's universities.

KEY DEFINITIONS

Commercialization: The subset of technology transfer (see below) that focuses on the monetization of intellectual property.

Entrepreneurship: The process of designing, launching, and running a new enterprise for economic gain or social impact, often with considerable initiative and risk.

Innovation: The process of creating and implementing unique products, services, or practices that yield value ***-or-*** a product, service, or practice that is unique, valuable, and successfully implemented.

Innovation Commercialization Ecosystem: The complex and dynamic collection of people, organizations, cultures, policies, and programs that creates ideas and discoveries, and then translates those ideas into innovations.

Technology Transfer: The process of transferring university discoveries (often in the form of university-owned intellectual property) from the university to another organization for further development and commercialization. The process typically includes:

- Identifying new technologies;
- Protecting technologies through patents and copyrights;
- Forming development and commercialization strategies, such as marketing and licensing to existing private sector companies or creating new startup companies based on the technology.

Translation: The process of turning discoveries into commercially viable products, services, or practices.

[4] For more details on each of the six recommendations, see "Recommendations of the Governor's Innovation-to-Jobs (I2J) Working Group," 2014 (http://www.nccommerce.com/sti/resources/innovation-reports). The five other recommendations were either implemented in 2015 and 2016, or are currently being considered for implementation.

PROCESS

Convening in spring 2016 and composed of 24 members representing North Carolina's public and private universities, entrepreneurs, investors, and state government, the UIC (see Appendix for list of members) met 10 times through summer 2016 and undertook the following activities:

- **Reviewed data comparing the technology transfer metrics of North Carolina universities to similar metrics at peer U.S. universities.**[5] The findings varied across universities and metrics, with North Carolina universities as a group performing above average on some metrics (e.g. licenses and options executed per research expenditures) and below average on other metrics (e.g., licensing income per research expenditures). Considering all metrics, the performance of North Carolina universities as a group is similar to the average of all peer U.S. universities. The state's four universities having the highest research expenditures—Duke, NC State, Wake Forest, and UNC-Chapel Hill—typically perform better than the universities having lower research expenditures.

- **Conducted a detailed survey of the UIC members to obtain their assessment of the innovation commercialization challenges in North Carolina universities.** The findings were as follows:

Overall Environmental Challenges			
Environment Lacks:	**University Group 1***	**University Group 2***	**University Group 3***
Incentives for commercialization among faculty & administrators	○	●	●
Mentors to advise faculty on commercialization activities	○	●	●
A culture of commercialization among faculty & administrators		●	●
Program support for commercialization		○	○
Process Challenges			
Process Lacks Procedures, Funding, and Staff to:	**University Group 1***	**University Group 2***	**University Group 3***
Prototype innovations	○	●	●
Find experienced managers for startup companies	○	●	●
Conduct technology validation/proof of concept for innovations	○	●	●
Conduct market validation of innovations	○	○	○
Develop a commercialization pathway for innovations	○	●	●
Enable market actors to find & access innovations of interest		○	●
Identify innovations with commercial potential		○	○
Disclose inventions/innovations		○	○
Enable university faculty to respond to market innovation needs		●	●
Create startup companies from innovations			○
License innovations to companies			●
Pursue intellectual property protections for innovations			○

**Note: Group 1 = Duke, NCSU, UNC-CH, WFU; Group 2 = ECU, UNCC, UNCG, NC A&T; Group 3 = ASU, ECSU, FSU, NCCU, UNCP, WCU, UNCA, UNCW, WSSU.* ● = high challenge; ○ = medium challenge; blank = low or no challenge.

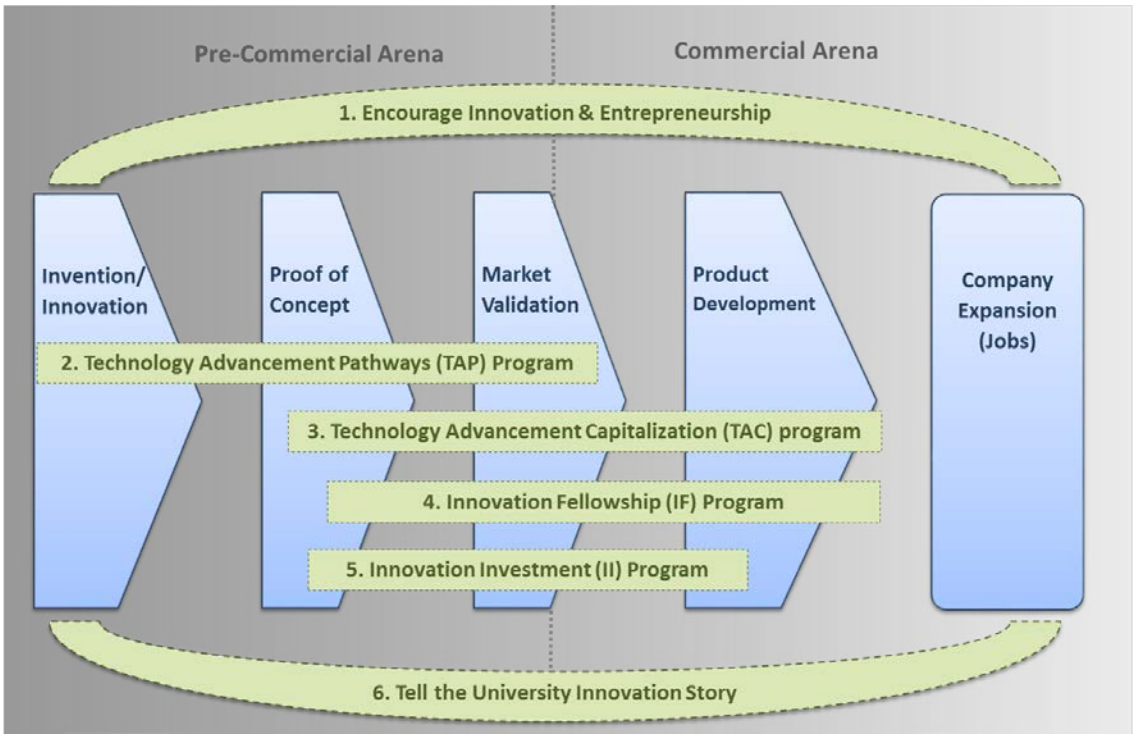
[5] Metrics are from the Association of University Technology Managers (AUTM) *Annual Licensing Activity Survey*, FY 2014. The average referenced in this section is for all universities reporting data to the AUTM survey.

- **Solicited ideas from stakeholders statewide for how to address these challenges.** After receiving nearly 40 detailed white papers from the surveyed stakeholders, the UIC reviewed and evaluated each idea, resulting in a list of six consolidated recommendations, each satisfying the following four criteria:
  - Clearly and directly target one or more of the identified challenges;
  - Build upon the state's existing strengths, in both the public and private sectors;
  - Minimize the creation of new organizations and structures, public or private;
  - Efficiently and effectively use public and private funds to generate impact.

  These six recommendations—displayed graphically in the figure below to show where they fit in the state's university innovation commercialization ecosystem—are summarized in the following table and explained in more detail in the following pages. These recommendations are intended to serve as a substantive "front-burner" action plan to jump-start and improve North Carolina's university innovation commercialization ecosystem.

UIC Recommendations

Sequential Model of Innovation Commercialization Ecosystem



A summary and details of each recommendation follow.

SUMMARY OF RECOMMENDATIONS

RECOMMENDATION	SUMMARY	COST	$ SOURCE
1. Encourage Innovation & Entrepreneurship	All North Carolina universities should be encouraged to expand the definitions of research and service; explicitly define, evaluate, and reward activities in innovation, translation, and entrepreneurship; alter leave policies to "pause" tenure clocks to allow time for researchers to initiate innovation translation activities; and include innovation and entrepreneurship in post-tenure review	None	N/A
2. Technology Advancement Pathways (TAP) Program	The UNC system should develop and implement a collaborative mechanism utilizing the infrastructure at UNC-CH and NC State to provide technology transfer support to other UNC universities on an as-requested, fee-for-service basis, creating multiple pathways for technology advancement by tapping resources at distinct universities; once successful, the mechanism should be broadened to include additional NC universities	Costs proportional to work requested	Requesting Universities
3. Technology Advancement Commercialization (TAC) program	All North Carolina universities should participate in a program for technology commercialization that uses the state's industry and commercialization experts to select university technologies based on commercial potential, create a development plan of activities to make the technologies attractive to investors or companies, and guide implementation of the activities to assure efficient deployment of funds and commercial-quality results	$10-30 million one-time investment; 3-5% of invested capital released annually	One-time state approp.; universities match their respective project investment 1:1
4. Innovation Fellowship (IF) Program	All North Carolina universities should participate in a statewide, competitive fellowship program enabling recent graduates or postdocs who are startup founders or early stage hires to transition to a full-time role in a startup; graduating and recently graduated students and postdocs, would be eligible to apply for a one-year fellowship that provides a stipend of $25,000 (bachelors level) or $50,000 (graduate level or above)	$445,000 per year	50% state approp.; 50% sponsoring university
5. Innovation Investment (II) Program	The state should encourage and stimulate investment in innovative startup businesses by offering tax credits to investors, with larger credits provided for investments in businesses started with technologies developed at North Carolina universities or that conduct business in distressed North Carolina counties	Capped at overall level determined by Governor and Legislature	Tax Credit
6. Tell the University Innovation Story	All North Carolina universities should build awareness of their innovation and entrepreneurship activities by telling stories and sharing statistics about the conversion of university research into products, services, and practices that deliver social and economic value	$100,000 annually	Approp. to NC Dept. of Commerce

1. ENCOURAGE INNOVATION & ENTREPRENEURSHIP

SUMMARY	COST	$ SOURCE
All North Carolina universities should be encouraged to expand the definitions of research and service; explicitly define, evaluate, and reward activities in innovation, translation, and entrepreneurship; alter leave policies to "pause" tenure clocks to allow time for researchers to initiate innovation translation activities; and include innovation and entrepreneurship in post-tenure review	None	N/A

RECOMMENDED ACTION: As the mission and importance of universities continue to grow and expand beyond the traditional activities such as instruction, research, and public service, universities should be encouraged to develop policies and reward systems that recognize achievements in innovation and entrepreneurship. Specifically, universities should be encouraged to:

- Expand the definitions of research and public service;
- Explicitly define, evaluate, and reward activities in innovation, translation, and entrepreneurship among university faculty and staff, and when considering candidates for tenure and promotion;
- Alter leave policies to "pause" tenure clocks to allow time for researchers to initiate innovation translation activities;
- Include innovation, translation, and entrepreneurship in post-tenure review.

***CHALLENGE ADDRESSED*:** With the decades-long decline of in-house industrial research and development in the United States,[6] universities are being asked to play a larger role in the economy by translating and transferring their discoveries into products, services, practices, and companies. Currently, however, innovation and entrepreneurship are infrequently credited in traditional university promotion and tenure policies. As a result, such translational activities are often risky and costly for untenured faculty to undertake, as the activities may take time away from traditional, more-rewarded activities such as teaching, research, publication, and presentations. In recent decades, however, the public, policy makers, and university leaders have begun to acknowledge that technology development and entrepreneurship activities yield far more benefits to individuals and institutions than previously realized. Such activities complement the traditional mission of universities and often generate new knowledge, turn into serial entrepreneurial endeavors that seed professional opportunities for students, attract additional faculty and partner involvement, and invite direct engagement in local or regional economic development. New and broader means of reward and recognition would help acknowledge and encourage these wider impacts. A 2014 report from the leaders of some of America's most prestigious academic institutions[7] recommended that universities formally recognize the value and importance of innovation and entrepreneurship by "expand(ing) their criteria to treat patents, licensing, and commercialization activity by faculty as an important consideration for merit, tenure and career advancement" decisions.

[6] Companies have moved away from the Bell Labs and Xerox PARC model that afforded research scientists in the private sector more time and funding to focus on research that may not have direct application, at least in the short term.

[7] Sanberg, P.R. et al. 2014. "Changing the Academic Culture: Valuing Patents and Commercialization Toward Tenure and Career Advancement." *Proceedings of the National Academy of Sciences*, *111*: 6542–6547.

IMPLEMENTATION DETAILS: [8]

- ***Basics:*** Promotion and tenure decisions are among the most consequential decisions universities make. In many important ways, and for good reasons, they reflect institutional values and the values of the faculty. Recognizing that each institution considers tenure and promotion policies in light of its own mission and history, there are many ways by which faculty can be recognized for their efforts related to innovation and entrepreneurship in addition to their more traditional efforts, including:
  - Expanding the definitions of research and service;
  - Explicitly define, evaluate, and reward activities in innovation, translation, and entrepreneurship among university faculty and staff, and when considering candidates for tenure and promotion;
  - Altering leave policies to "pause" tenure clocks to allow time for researchers to initiate innovation translation activities;
  - Including innovation and entrepreneurship in post-tenure review.
- ***Organization(s):*** All North Carolina universities.
- ***Scope:*** All North Carolina universities.
- ***Timeframe:*** As initiated by universities; ongoing.

RECOMMENDED FUNDING:

- ***Amount:*** None.
- ***Source:*** N/A.

EXPECTED OUTCOMES:

- Increased acceptance, within and outside universities, of the importance and impact of innovation, technology transfer, and entrepreneurship activities by faculty.
- Increased levels of innovation and entrepreneurship at North Carolina universities.
- Improved ability to recruit and retain innovative and entrepreneurial faculty to North Carolina.

[8] Some University of North Carolina institutions have already begun to recognize and reward activities related to innovation and entrepreneurship. For example, UNC Chapel Hill's Eshelman School of Pharmacy recently integrated "The Scholarship of Application" to their promotion and tenure policy, emphasizing the importance of translating theoretical discoveries into practical use. The policy includes patent publication and commercialization of intellectual property as a specific example of this type of scholarly work. Other UNC institutions are making changes to their reward policies on campus levels. Both North Carolina State University and Western Carolina University have integrated principles of innovation and application into their campus-wide reappointment, promotion and tenure guidance. NC State has identified "Technological and Managerial Innovation" as an integral criterion for decisions about faculty reappointment, promotion and tenure, while WCU emphasizes the importance of the "scholarship of application" in their reward policies. These changes emphasize campus-identified goals to provide new products, services, and practices needed by society at a reasonable cost while promoting the importance of innovation as a central mission of the University overall (Source: UNC Office of Research and Sponsored Programs. 2009. *Innovate, Collaborate, Accelerate: The UNC Vision for Innovation and Technology Development*, UNC General Administration). Universities in other states have done similarly in recent years. In 2012, the University of Maryland System changed its criteria and procedures for promotion and tenure, adding "activities that result in the generation and application of intellectual property through technology transfer." The system also changed its policy on sabbatical leave for faculty, allowing leave to engage in commercialization activities. The tenure policy and sabbatical update was part of a multifaceted effort by the University System of Maryland to promote economic growth statewide through its technology transfer activities. That same year, the Texas Tech University System Board of Regents approved revisions to its promotion and tenure policy for its faculty. It updated its policy to place emphasis on areas beyond traditional research-driven incentives such as student outcomes and commercialization. The policy specifically identifies intellectual property activities as faculty contributions to research and creative activity, and allows Texas Tech to reward professors who have made inventions or received patents.

2. TECHNOLOGY ADVANCEMENT PATHWAYS (TAP) PROGRAM

SUMMARY	COST	$ SOURCE
The UNC system should develop and implement a collaborative program utilizing the infrastructure at UNC-CH and NC State to provide technology transfer support to other UNC universities on an as-requested, fee-for-service basis, creating multiple pathways for technology advancement by tapping resources at distinct universities; once successful, the program should be broadened to include additional NC universities	Costs proportional to work requested	Requesting Universities

RECOMMENDED ACTION: Create and implement a streamlined, collaborative program whereby universities within the UNC system with limited or no technology transfer functions could contract with either North Carolina State University (NC State) or the University of North Carolina at Chapel Hill (UNC-CH) to obtain technology transfer support. Once developed and implemented successfully, the program could be broadened to include additional North Carolina universities.

CHALLENGE ADDRESSED: Several universities within the UNC System have nascent or nonexistent technology transfer operations and lack the basic procedures and staff expertise to conduct technology translation and transfer functions. Of the 16 universities within the UNC system, only seven (NC State, NC A&T, UNC-CH, ECU, UNCW, UNCC, and UNCG) have one or more full-time equivalents (FTEs) devoted to technology transfer. An additional three (WCU, FSU and NCCU) have a nascent technology transfer infrastructure in place but lack a full-time employee devoted to supporting this activity. The remaining universities do not have technology transfer operations.

By way of contrast, the UNC system has two universities (UNC-CH and NC State) whose technology transfer offices handle high volumes of invention disclosures per year and execute a high volume of license agreements annually. These universities have strong track records of successfully commercializing university technologies and rank highly among peer U.S. universities on metrics of technology transfer performance.

A streamlined, collaborative, UNC system-wide program would allow UNC system universities requesting technology transfer services ("Requesting Universities") to contract, via a service agreement, with either UNC-CH or NC State ("Providing Universities") for technology transfer support on a case-by-case basis, using a fee-for-service model. The foundation of the collaborative program would be intellectual property management agreements that clearly define the intellectual rights, services, expectations, and costs. The Requesting Universities would retain ownership of their intellectual property. This model would allow the smaller UNC universities to capitalize on both the technology transfer infrastructure and the strong ties with industry maintained by the Providing Universities to support their technology licensing efforts. This service would also allow universities that have a technology transfer office to utilize the specific expertise of Providing Universities to augment their capabilities (e.g., software and ag-biotech licensing expertise at NC State; therapeutic/medical device expertise at UNC; startup expertise at both NC State and UNC-CH).[9]

[9] The Mayo Clinic and the University of Illinois operate similar system-wide technology transfer mechanisms.

An Internet portal would also be established, containing policies and procedures related to technology transfer and industry relations, template agreements, FAQs, training, and other aids, for easy access by North Carolina universities and research institutions interested in building and augmenting their tech transfer operations and community. Any institution within the UNC System and private institutions in North Carolina would be able to access these resources as needed.

IMPLEMENTATION DETAILS:

- ***Basics:*** The Providing Universities could provide the following types of services throughout the technology transfer lifecycle: access to invention disclosure/assessment services, patent protection/docketing services, marketing services, license negotiation/licensing monitoring, and startup company formation/support services. These services could be offered as a bundle, or a' la carte, as desired by the Requesting University. Additional services, such as on-campus office hours or technology transfer/startup workshops, could also be provided.
- ***Organization(s):*** UNC-CH and NC State would coordinate to provide consistency in the services provided to the Requesting Universities. Requesting Universities would market this new opportunity to their faculty and employees. Requesting Universities would designate a Technology Transfer Coordinator, who would be responsible for administrative and financial matters and represent the Requesting University with regard to decision making.
- ***Scope:*** Initially, public universities in North Carolina. Once developed and implemented successfully, the program should be broadened to include private universities in North Carolina.
- ***Timeframe:*** Pilot cases could be launched in winter 2016. The entire program could go live in spring 2017.

RECOMMENDED FUNDING:

- ***Amount:*** Costs would be proportional to the volume of invention disclosures submitted and patent applications filed. No additional cost for the internet portal, which would be developed by staff at ECU and transferred to the Providing Universities or UNC General Administration to maintain.
- ***Source:*** Requesting Universities.

EXPECTED OUTCOMES:

- Increased invention disclosure output, patent filings, license agreements, and startup companies resulting from innovations created at Requesting Universities.
- Increased culture of innovation produced at Requesting Universities as their faculty gain exposure to the commercialization process.
- Opportunity for Requesting Universities to capitalize on the strong industry ties maintained by Providing Universities to support their technology licensing efforts.
- Increased accessibility of resources by research and/or technology transfer offices of the UNC System and North Carolina's other universities and research institutions.
- Greater knowledge and confidence by emerging institutions when assessing new opportunities.

3. TECHNOLOGY ADVANCEMENT COMMERCIALIZATION (TAC) PROGRAM

SUMMARY	COST	$ SOURCE
All North Carolina universities should participate in a program for technology commercialization that uses the state's industry and commercialization experts to select university technologies based on commercial potential, create a development plan of activities to make the technologies attractive to investors or companies, and guide implementation of the activities to assure efficient deployment of funds and commercial-quality results	$10-30 million one-time investment; 3-5% of invested capital released annually	Expanded state appropriations; universities match their respective project investment 1:1

RECOMMENDED ACTION: Provide one-time state funding, so that universities can leverage a successful proof-of-concept capital endowment model for technology commercialization. Universities would match project investment 1:1.

CHALLENGE ADDRESSED: Technology validation is one of the top challenges investors and industry face in funding and acquiring university technologies. Most of these technologies are too nascent to be attractive to investors or companies, as they generally need additional proof-of-concept funding and commercialization expertise to ensure technologies are ready for the marketplace. The technologies may need additional proof-of-concept testing, or the products that could develop or benefit from the technologies may need further definition. Furthermore, the realities of assessing and developing a strategy for introducing and expanding the technologies in the marketplace are best accomplished by people directly familiar with the relevant industries and with strong experience in commercialization.

Despite these barriers, the gap between laboratory technology and truly viable commercial technology can be bridged by targeted strategic activities that intelligently bring promising technologies to private sector investment readiness while the technologies are still owned by their originating university. Other states, including FL, GA, and VA, have provided significant funding and established robust programs to produce effective university-to-market translational services. Investments of these types provide much-needed support and expertise at the most vulnerable phase of university commercialization, greatly increasing the likelihood of a meaningful return on investment in university research.

IMPLEMENTATION DETAILS:

- **Basics:** The Governor's 2015 Innovation-to-Jobs (I2J) Working Group recommended, and the North Carolina General Assembly considered in the 2015 and 2016 legislative sessions, a similar proof-of-concept mechanism. It was not authorized and funded, due in part to State budget constraints and because cost-sharing by universities was not included.

  Technology proof-of-concept capital remains an extremely critical need across North Carolina universities. To meet this need, this UIC recommendation decreases the risk to the State, decreases the amount of State funding required, and increases buy-in and participation by universities. By using an endowment model, where only the investment funds from the endowment are used as matching funds for this program, risk to the state is reduced, and greater leverage is gained. A portion of returns is paid out for high-value, early-stage projects while the principal stays intact. Risk

level and State funding are also reduced by requiring universities to match State investment in their respective projects 1:1 to provide product proof-of-concept capital.

An impact investment model, based on endowment funding of early stage technology, has already been established as a viable capital model for early-stage investments at Duke University, with measurable financial, social, and environmental returns. Initially supported by a one-time grant from the Coulter Foundation, the Duke-Coulter Translational Partnership Grant Program accelerates the development of promising bioengineering research that addresses important unmet clinical needs and leads to improvement in commercial development and clinical practice. The financing aspect of this model would be replicated for use by universities throughout North Carolina.

Operationally, the program would use NC's industry and commercialization experts, organized and funded through two or more nonprofits or other relevant organizations, to: (1) select university technologies based on commercial potential, (2) create a development plan of key activities to make the technologies more attractive to investors or companies, and (3) guide implementation of these activities to assure efficient deployment of funds and commercial-quality results. Development plans would be stage-gated, with smaller levels of funding provided initially. If technologies fail at any stage of a plan, no additional funding would be allocated, thus minimizing the funding outlay by the state and participating university. The nonprofit organizations would initially be selected through a competitive bid process and would have varied substantive expertise (e.g., medical, biological, agricultural, info tech, materials, cyber security) and the ability to work with universities throughout the state. The nonprofits would work with the universities to guide the projects. Universities would originate the technology candidates, and the nonprofits would select and award the funds and monitor milestone progress, with oversight from the NC Department of Commerce. Over time, universities would be encouraged to develop in-house commercialization capacity and expertise.

- ***Organization(s):*** The NC Department of Commerce's Office of Science, Technology & Innovation would conduct the host-organization selection process. The selected nonprofit organizations would then administer the program, thus leveraging existing expertise and minimizing startup costs.
- ***Scope:*** Public and private universities could participate.
- ***Timeframe:*** Ongoing, with periodic review to determine need for continuation. To be recommended for the 2017 legislative session, with implementation to begin in FY 2018.

RECOMMENDED FUNDING:

- ***Amount:*** $10-30 million invested capital. The larger the investment, the larger the payout for high-value, early-stage projects.
- ***Source:*** Expanded state appropriations. The estimated amount of funds paid out would be $300,000 - $1,500,000 annually, to be matched by the universities 1:1 on their respective funded projects.

EXPECTED OUTCOMES:

- Increased follow-on funding from sources such as government agencies, foundations, & businesses.
- Modest returns from an endowment, set up as a perpetual source of funding for 1-4 new projects per year per university.
- 15 technologies per year with advanced commercial development, ready for the marketplace.
- 40 technologies per year with significantly increased commercial development.
- 2-4 new funded company launches per year.

4. INNOVATION FELLOWSHIP (IF) PROGRAM

SUMMARY	COST	$ SOURCE
All North Carolina universities should participate in a statewide, competitive fellowship program enabling recent graduates or postdocs who are startup founders or early stage hires to transition to a full-time role in a startup; graduating and recently graduated students and postdocs would be eligible to apply for a one-year fellowship that provides a stipend of $25,000 (bachelors level) or $50,000 (graduate level or above)	$445,000 per year	50% state appropriation; 50% sponsoring university

RECOMMENDED ACTION: Develop and implement a statewide, competitive fellowship program enabling recent graduates and postdocs who are startup founders or early stage hires to transition to a full-time role in a startup. The program would provide a runway for the fellow to focus on customer discovery, productize a technology, or pursue funding via investors or grants. The fellowship would create a means for training and retaining young entrepreneurial talent, and, by extension, facilitate success of startups in North Carolina.

CHALLENGE ADDRESSED: University spinout companies across the state lack the resources to attract strong executive talent. Typically, early stage startups perform best when one of the innovators is at or near the helm. For university-owned innovations, the best candidate may be a graduate student or postdoc who worked on the technology and who wants to work in industry. For a product or service developed by an undergraduate, the startup is most likely to succeed with the innovator directly involved. In either case, the undergraduate, graduate, or postdoc typically does not have the financial resources to devote full-time effort to the startup. As a result, startups are either abandoned when the student leaves the university, or the innovator gets a separate job and pursues the startup on the side. The result is fewer, slower-growing startups and fewer entrepreneurs. Often, the most entrepreneurial graduates are drawn out of state, to regions where startup capital is more abundant. A statewide program that builds on the successful "Innovation Fellowship" program at UNC-Chapel Hill would address these challenges.[10]

IMPLEMENTATION DETAILS:

- ***Basics:*** Graduating and recently graduated students and postdocs, from any participating NC university would be eligible to apply for a one-year fellowship that provides a stipend of $25,000 (bachelors level) or $50,000 (graduate level). Eligible applicants would be a founder or a key early hire of an existing startup to which they would commit full-time effort upon award. Successful

[10] In the Innovation Fellowship program at UNC-Chapel Hill, recent graduates apply for a competitive fellowship to transition full-time to an early-stage startup. The results have been compelling: the graduates commit fully to being an entrepreneur and the companies grow more rapidly. To date, eight fellowships have been awarded through UNC-Chapel Hill's program. All eight fellows are still at their original companies, they still reside in-state, and their businesses have gone on to attract subsequent financing and create new jobs. The proposed statewide fellowship is designed to give a first-time entrepreneur enough personal runway to launch the venture. The one-year term is long enough to attract subsequent financing from revenue, angel investment, loans (e.g. from the NC Biotechnology Center), or grants (e.g., Small Business Innovation Research (SBIR) or Small Business Technology Transfer (STTR)).

applicants would be able to demonstrate essential entrepreneurial traits, including the ability to communicate vision, attract talent, and produce results. Ideal applicants would have demonstrated these qualities from within their current startup. Solicitations and awards would be made once per year, timed off the academic calendar. Each cohort of up to 10 fellows would receive mentorship and startup training through existing mentorship programs such as Groundwork Labs, Blackstone Entrepreneur's Network, or CED's Venture Mentoring Service. Awardees' activities, goals, and milestones would be monitored by a small oversight panel whose members are unaffiliated with the business. Awardees would be required to remain in NC for at least one year after completion of the fellowship.

- ***Organization(s):*** The program would be administered by an existing nonprofit organization that has the capacity to manage the evaluation of applicants and to provide the necessary financial oversight. The NC Department of Commerce's Office of Science, Technology & Innovation (OSTI) would conduct an open, competitive process to select the nonprofit. An independent committee, composed of members from the NC university ecosystem and selected by OSTI, would draft policies for long-term program governance.
- **Scope:** Statewide.
- ***Timeframe:*** This program builds on existing, successful models at UNC-Chapel Hill. It could be implemented within three months of funds becoming available. To be recommended for the 2017 legislative session, with implementation to begin in FY 2017 and to continue thereafter.

RECOMMENDED FUNDING:

- ***Amount: $445,000 per year***
  - Fellowships: $375,000 per year (5 graduate, 5 undergraduate).
  - Administrative support: $70,000 (1 FTE + overhead).
  - Applicant review: In-kind contribution from governing committee and volunteer reviewers.
  - Awardee compliance: In-kind contribution from governing committee members.
- ***Source:*** 50% state appropriation, 50% university development or sponsorship. Universities would be encouraged to fulfill their obligation through corporate sponsorship and alumni development. Any excess funds raised above the target budget would be set aside with the goal of endowing the program so that state appropriations ultimately become unnecessary.

EXPECTED OUTCOMES:

- Higher conversion of university-born innovations into independently operating startups.
- More in-state talent with real-world experience in an early stage company.
- Faster-growing early-stage companies, fueled by early full-time talent.
- Fewer talented, entrepreneurial graduates leaving the state.
- More startups with lower failure and higher growth rates compared to relevant benchmarks (e.g., previous rates in NC; contemporaneous rates in surrounding states), and greater ability to raise additional rounds of investment.

5. INNOVATION INVESTMENT (II) PROGRAM

SUMMARY	COST	$ SOURCE
The state should encourage and stimulate investment in innovation-based startup businesses by offering tax credits to investors, with larger credits provided for investments in businesses started with technologies developed at North Carolina universities or that conduct business in distressed North Carolina counties	Capped at overall level determined by Governor and Legislature	Tax Credit

RECOMMENDED ACTION: The state should encourage and stimulate investment in innovation-based startup businesses by offering tax credits to angel investors.[11] The credits would apply to investments in businesses registered with the Securities Division of the North Carolina Department of the Secretary of State as a Qualified Business Venture (QBV), Qualified Grantee Business (QGB), or a Qualified Licensee Business (QLB);[12] larger credits would be provided for investments in businesses started with technologies developed at North Carolina universities or that conduct manufacturing, processing, warehousing, wholesaling, or research and development activities in a distressed North Carolina county.

CHALLENGE ADDRESSED: Like many states, North Carolina has significant funding gaps at the seed and early stages of company development. Funding at these stages is essential for launching and developing innovative, high-growth companies. These companies have higher-than-average potential to garner significant follow-on investments and are the primary job generators (particularly high-skill, high-wage jobs), developing and commercializing new technologies, products, services, and practices that create new industries and transform current industries. Grants from government agencies and nonprofits are not enough to keep these companies going; moreover, in recent decades many traditional private sector funding sources have moved upstream to larger deals entailing less risk, thus limiting company formation and growth.

A 2014 survey of more than 500 North Carolina investors, entrepreneurs, and university faculty/staff revealed clearly that this lack of early stage funding is inhibiting technology commercialization and entrepreneurial growth within the state.[13] In addition, because management talent often follows investment, lack of funding means a dearth of such talent for rising technology companies, with many companies and talent initially nurtured within North Carolina eventually moving out of state to pursue later rounds of financing. Typically, only angel investors—wealthy individuals who provide capital for a business startup, usually in exchange for convertible debt or ownership equity—provide the funding that allows a new company to take the initial steps toward becoming a big employer and possibly the

[11] Twenty-two other states offer similar credits, five with rates of 50% or higher. The credits, which are against individual income taxes, stimulate early stage investment in two ways: (1) they keep more money in the pockets of *existing* angel investors—money that can be reinvested into a company an investor has already funded as it continues to grow, or that can help the investor support another company that might otherwise not receive support, and (2) they can help create *new* angel investors—people who otherwise would put their money in financial instruments, real estate, or some other more-proven asset if a tax credit didn't make investing in a start-up worth considering (Weaver, 2012; see full citation below).

[12] For more information regarding these designations, see https://www.sosnc.gov/bustax/overview.aspx.

[13] The NC Department of Commerce's Office of Science, Technology & Innovation (OSTI), on behalf of the Governor's Innovation-to-Jobs Working Group, conducted this survey during August 2014. Survey results are available from OSTI staff.

inspiration for other new businesses.[14] Stimulating additional angel investment helps fill the funding gap between initial government sources and later-stage private sources such as venture capital and banks.

IMPLEMENTATION DETAILS:

- ***Basics:*** The Innovation Investment Program would provide investors a credit of 25% of their investment or $50,000, whichever is less, in qualifying small businesses registered with the Securities Division of the North Carolina Department of the Secretary of State as a Qualified Business Venture (QBV), Qualified Grantee Business (QGB), or a Qualified Licensee Business (QLB) (collectively referred to as "qualified businesses"). To qualify for the credit, a business must have less than $5 million in revenues annually and be organized to engage primarily in manufacturing, processing, warehousing, wholesaling, research and development, or a service-related industry. A 50% credit or $100,000, whichever is less, would be provided for investments in businesses started with technologies developed at North Carolina universities or that conduct manufacturing, processing, warehousing, wholesaling, or research and development activities in a distressed North Carolina county.[15]
- ***Organization(s):*** Individual investors who invest in qualified businesses directly or through angel funds or seed and early stage venture funds.
- **Scope:** To be eligible, investors must file North Carolina tax returns.
- ***Timeframe:*** To be recommended for the 2017 legislative session, with implementation to begin in FY 2018 and to continue thereafter.

RECOMMENDED FUNDING:

- ***Amount***: Annual overall cap at level determined by Governor and Legislature, with a $10 million cap recommended here by the UIC.[16]
- ***Source:*** Tax credit.

EXPECTED OUTCOMES:

- Demonstrates North Carolina's commitment to innovation-based small business startups.
- Stimulates angel and other early stage investments that are critical to moving new technologies from universities and other research laboratories to commercialization, particularly in distressed counties.
- Boosts economic development and creation of more jobs through increased investing.
- Encourages the creation and growth of companies that will attract follow-on investments, and subsequent taxable gains from acquisitions, initial public offerings (IPOs), and other follow-on public equity markets.[17]
- Increases movement and agglomeration of capital and investors to the state.

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[14] Weaver, David. 2012. "Should Angel Investors Get Tax Credits to Invest in Small Businesses?" *Wall Street Journal*.

[15] As defined annually by the North Carolina Department of Commerce; see: https://www.nccommerce.com/research-publications/incentive-reports/county-tier-designations.

[16] If the total request for tax credits exceeds the overall annual cap on credits, then all requests are allocated in proportion to the size of the credit claimed by each taxpayer.

[17] The 2011 *Bridging the Gaps report* by the NC Biotechnology Center reported that between 2007 and 2010, with $26 million in similar credits supporting $161 million invested in qualified business ventures, 2,355 jobs were created at qualified business venture registered companies—i.e., the program potentially was responsible for roughly one new job for every $11,000 in tax credits.

6. TELL THE UNIVERSITY INNOVATION STORY

RECOMMENDATION	COST	SOURCE
All North Carolina universities should build awareness of their innovation and entrepreneurship activities by telling stories and sharing statistics about the conversion of university research into products, services, and practices that deliver social and economic value	$100,000 annually	Appropriation to NC Department of Commerce

RECOMMENDED ACTION: Build awareness of university innovation and entrepreneurship by telling stories and sharing statistics about the conversion of university research into products, services, and practices that deliver social and economic value.

CHALLENGES ADDRESSED: North Carolina's innovation and entrepreneurship story must be told to gain national and international recognition for (1) being one of the leaders in research and development funding and (2) accelerating the conversion of that R&D to products, services, and practices that deliver social and economic value. At a minimum, the following points should be included in this narrative:

- North Carolina is home to universities and research institutes that rank among the highest recipients of research funding in the country. The combined figure for 2015 was nearly $3 billion.
- North Carolina universities are committed to commercializing their intellectual property and are eager to work with partners and investors to take ideas to market, through licenses to both startup and existing companies, and by creating startup companies.
- North Carolina universities have compelling examples of how their researchers have converted knowledge into benefits for the public. These stories need to be told within the universities to encourage more faculty members to engage in commercialization as well as externally to engage the resources needed for translational work.
- North Carolina reaps tremendous economic value from the very presence of universities. Every dollar of research funding has a multiplier effect in terms of economic impact, in which ratios can range from $1:$3 to $1:$7.[18] Between 2011 and 2013, North Carolina universities were awarded 467 patents and received more than $153 million in licensing gross income.[19] Licensing income is reinvested in the universities, and startups create jobs and bring new products to market. In addition, North Carolina's universities are large organizations that employ thousands of people, buy goods and services within their regions, and draw students who spend considerable sums locally while pursuing their studies.

Since 1980, 3.8 million jobs were created nationwide because of U.S. university and nonprofit patent licensing. From 1996 to 2013, the economic impact of all U.S. university and nonprofit patent licensing was $518 billion on the U.S. gross domestic product and $1.1 trillion on the U.S. gross industrial output. And in 2014 alone, 965 new products based on U.S. university discoveries were introduced to the market. The role North Carolina's universities have played in spurring this economic activity and

[18] Umbach, Tripp. 2011. "The Economic Impact of Publicly Funded Research Conducted by AAMC-Member Medical Schools and Teaching Hospitals." Washington, D.C.: Association of American Medical Colleges (AAMC).

[19] Association of University Technology Managers (AUTM), FY 2014 Licensing Survey.

improving people's quality of life needs be shared more broadly so that it can be better understood, appreciated, valued, and supported.

IMPLEMENTATION DETAILS

- ***Basics:***
  - Each university would identify its own stories and tell them using its own communication strategies, with the idea that the stories would be shared in multiple ways, such as print media, online media, and social media.
  - Existing advocacy and leadership groups (e.g., NC Biotechnology Center, NC IDEA, Small Business & Technology Development Center (SBTDC), UNC General Administration (UNC GA)) would work with university communication staffs to repurpose stories to reach additional audiences.
  - News outlets would be encouraged to set up storylines similar to "Made in North Carolina" and "Nothing Compares" to highlight university research and commercialization in ways that demonstrate the social and economic value.
  - Communication efforts of the Association of University Technology Managers, on behalf of North Carolina's universities, would be leveraged.
  - The NC Department of Commerce's Office of Science, Technology & Innovation (OSTI) would maintain and provide a comprehensive list of, and access to, all the stories.
- ***Organizations:*** All universities with commercialization activities, North Carolina Biotechnology Center, SBTDC, UNC-TV, NC IDEA, NC Department of Commerce's OSTI.
- **Scope:** All universities.
- **Timeframe:** To be recommended for the 2017 legislative session, with implementation to begin in FY 2018 and to continue thereafter.

RECOMMENDED FUNDING

- **Amount:** $100,000 annually for part-time OSTI staff to coordinate activities. Universities would absorb costs into their communications budgets.
- ***Source:*** New appropriation, which would leverage higher education organizations like individual universities, UNC GA, and the Association of University Technology Managers (AUTM).

EXPECTED OUTCOMES

- Increased understanding of the breadth and impact of university innovation and entrepreneurship.
- Increased funding for research and development.
- Increased investment in university-derived commercialization efforts.
- Increased value creation and societal impact.
- Enhanced capacity to recruit faculty, staff, and students.
- Enhanced capacity to attract startup and management teams to NC.

NEXT STEPS

During the coming months, the UIC Co-Chairs and members will work directly with state policy makers, higher education leaders, business leaders, investors, and others to enact, fund, and implement each of the six recommendations outlined above.

Every day, other competing states and countries are producing similar recommendations because they recognize and want to capitalize on the tremendous economic and societal value of innovation. In light of this increasing global competition and the large-scale investments that other countries and states are making in their innovation frameworks, North Carolina must continue to increase its innovation-focused investments in programs such as these.

When it does, North Carolina will be the go-to place for innovation, the place where the world looks to create the "next big thing" and to solve its greatest problems, a state thriving with innovative people, companies, organizations, and culture. It will be a great place to live and work, to start and grow an organization: a place where innovation is embraced and championed and where people come to make their innovation dreams come true.

APPENDIX:
MEMBERS OF THE GOVERNOR'S UNIVERSITY INNOVATION COUNCIL

Karen LeVert (Co-Chair) President Southeast TechInventures, Inc.	**Chris Brown (Co-Chair)** Professor Plant and Microbial Biology NC State University	**John Hardin (Co-Chair)** Executive Director Office of Science, Tech. & Innovation NC Department of Commerce
Jeffrey Brennan Vice President, Center for Technology Innovation & Commercialization Wake Forest Baptist Medical Center	**John Cambier** Founding Managing Partner IDEA Fund Partners	**Judith Cone** Vice Chancellor, Innovation, Entrepreneurship & Econ. Development UNC-Chapel Hill
Craig Galbraith Director Office of Innovation & Commercialization UNC Wilmington	**Phil Hodges** Serial Entrepreneur Founder and retired CEO Metrics, Inc.	**Undi Hoffler** Interim Vice Chancellor Research & Economic Development NC Central University
Daryush Ila Associate Vice Chancellor for Research Technology Transfer Officer Fayetteville State University	**Staton Noel** Director Innovation Commercialization UNC Greensboro	**Art Pappas** Managing General Partner Pappas Ventures
Kelly Sexton Assistant Vice Chancellor Tech. Commercialization & New Ventures NC State University	**Richard Spero** Co-founder, CEO Redbud Labs	**Wayne Szafranski** Assistant Vice Chancellor Outreach & Economic Development NC A&T State University
Clay Thorp General Partner Hatteras Venture Partners	**Eric Toone** Vice Provost & Director Innovation & Entrepreneurship Duke University	**Marti Van Scott** Director Office of Technology Transfer East Carolina University
Ken Tindall Senior Vice President Science and Business Development NC Biotechnology Center	**Jesko von Windheim** Professor of the Practice Innovation & Entrepreneurship Duke University	**Melissa Waller** Chief of Staff NC Department of State Treasurer
Paul Wetenhall President & Executive Director Ventureprise, Inc. UNC Charlotte	**James Woods** Director Entrepreneurship Incubator UNC Pembroke	**Edward Wright** Director Entrepreneurship/Innovation Program Western Carolina University

Convener and Leader

Thomas Stith, Chief of Staff to North Carolina Governor Pat McCrory

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