

**AC 2007-1260: THE CAROLINAS INNOVATION COLLABORATIVE: A  
TRANSFORMATIONAL INITIATIVE IN HEALTHCARE AND AGING IN PLACE**

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## **The Carolinas Innovation Collaborative: A Transformational Initiative in Healthcare and Aging in Place\***

### **Overview of the Situation**

In 2004 the *Council on Competitiveness* issued its final report on the National Innovation Initiative called “Innovate America.” Clearly America’s focus must change from optimizing and incremental improvements to mobilizing our whole society for innovation. The future of America is in returning to the core capabilities: freedom and exploration, in essence, return to what we do best. The Council made recommendations in three broad categories: talent with the creation of a culture of collaboration and “symbiotic relationship between research and commercialization,” investment seeking “to give innovators the resources and incentives to succeed,” and infrastructure with the creation of “new industry-academia alliances . . . and flexible intellectual properties regimes”<sup>6</sup>. The program set up at Western Carolina University is in full alignment with these recommendations and forms part of the transformation of rural Western North Carolina into this new economic model.

Western Carolina University (WCU or Western), a regional comprehensive institution, has begun the process of alignment with this new reality. Western Carolina University has launched an initiative to engage the resources of the university, its faculty, students, and facilities in the economic growth of the region. At a regional summit held at Western in February 2003, the university was asked to explore engagement in non-traditional and creative ways<sup>20</sup>. Since that time, numerous initiatives have been launched to stimulate this engagement in new product development, in broadband communications, in adaptive devices, and in rapid prototyping. In a recent conference, the *i7 Futures Forum* held in April 2005 ([www.wcu.edu/crd/](http://www.wcu.edu/crd/)), the excitement was palatable and the enthusiasm electric for this engagement process to proceed and flourish. The conditions are primed for innovative initiatives to convert this enthusiasm into reality.

The stimulation of innovation in Western North Carolina builds on the foundations of active engagement of the university with the community and collaboration across a broad sector of our community. Healthcare and aging are critical issues for the region. The successes of the university’s Center for Rapid Product Realization and the North Carolina Center for Health and Aging (now under construction) have galvanized the attention of the university, government, and business communities on the potential that adaptive technologies have when aimed at solving the serious challenges of healthcare and aging.

Our purpose was to create an environment that will be inviting to the injection of new ideas, an environment that will nurture new product ideas from diverse sectors of the region and will mature promising ideas into actual business propositions. The *Innovation Collaborative for Adaptive Technology in Healthcare and Aging* opens a new avenue for access of the region to the knowledge and capability of Western Carolina University, excites community college and the university students from multidisciplinary fields in the promise of innovation, and creates a new infrastructure to handle intellectual property that respects new ideas and in which long term innovation can flourish. The longer range goals of this *Collaborative* are to serve as a model that

can be replicated in other technological sectors and to serve as a platform for the economic development in Western North Carolina.

## Background

The Western North Carolina region is made up by the 23 western-most counties of North Carolina (shown in red in figure 1). This region is larger than eight U.S. states and is approximately the size of Maryland. The demographics of the region are largely rural with a rural population of almost 60% as compared to the entire state ratio of 39.8% (North Carolina ranks the highest in rural population among the twenty most populous U.S. states). As a reference the highest percentage of rural population in any U.S. state is 61.8%<sup>16</sup>. Thus, Western North Carolina finds itself in the unique position of having a large rural contingency while being part of one of the 20 most populous states in the nation. With that situation comes the long list of challenges that face rural regions including lagging infrastructure, isolation by distance, and weak economic competitiveness

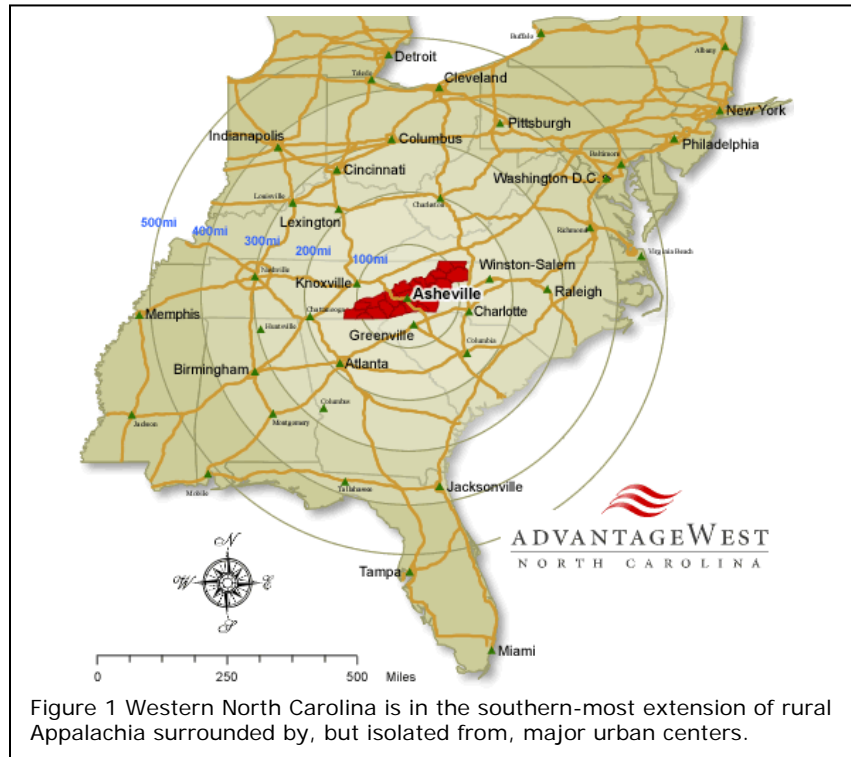


Figure 1 Western North Carolina is in the southern-most extension of rural Appalachia surrounded by, but isolated from, major urban centers.

Western North Carolina has a rich history in manufacturing — primarily furniture, textiles, and paper. Over the past 20 years, however, and particularly in the recent 2001-02 economic slowdown, these industries have been decimated, losing jobs to off-shore-competition and changing market conditions. Sixty nine percent (69%) of textile industry layoffs in 2001-02 occurred in rural North Carolina communities<sup>12</sup>. The manufacturing base of the region is predominantly small businesses and manufacturing units. While small businesses are well recognized to be the strongest source for economic growth, they often have only limited resources to apply to new product development.

Western North Carolina is additionally experiencing major demographic shifts that are having a strong influence on the challenges it faces. Young adults are continuing to migrate to the urban areas and thereby increasing the average age of rural counties. Large numbers of older adults are retiring to the region. The impact of these shifts is two-fold: increased demand for healthcare services for an aging population and decreased availability of intellectual resources to address the challenges.

Finally, the rising cost of healthcare is a national problem. Projected healthcare costs will consume 15.5% of the GDP according to the Adaptive Business Leaders Organization or \$1.9 trillion annually<sup>8</sup>. Advances in technology through new treatments and particularly diagnostic imaging are estimated to have contributed 10% to 40% of the cost growth during the 1990s, and technology is expected to continue to be a cost driver<sup>4</sup>. An aging population is also expected to contribute to the overall cost of healthcare. A factor that increases healthcare cost and decreases the quality of life for the elderly is the progressive relocation from home to apartment to assisted living to nursing care. The health of elderly people has been shown to be enhanced by aging in place and remaining in their neighborhoods<sup>11</sup>. The cost savings to family and society are substantial. In an MIT study, the cost of home care was reported to be 25% less than nursing home care<sup>10</sup>. Despite significant research in adapting technology to enhance aging in place, the challenge of economical solutions in the form of commercialized products remains a fertile ground for innovation and exploration.

In the face of these challenging circumstances, the state of North Carolina, Western Carolina University, and the business community of the Western North Carolina region have responded. In his inaugural speech on January 6, 2001, newly elected Governor Michael Easley created the vision for One North Carolina: “We are one state, one people, one family, bound by a common concern for each other. Our economic and educational development must reflect this common spirit of purpose as we build our future.”<sup>7</sup>. This commonality of purpose offers the opportunity for a high quality of life, a good job, and a good education for all, including the rural people of North Carolina.

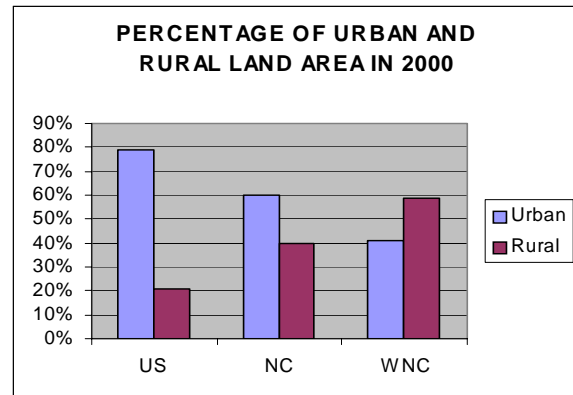


Figure 2 Western North Carolina is rural in one of the nation's most populous states. (NC Division of Aging and Adult Services)

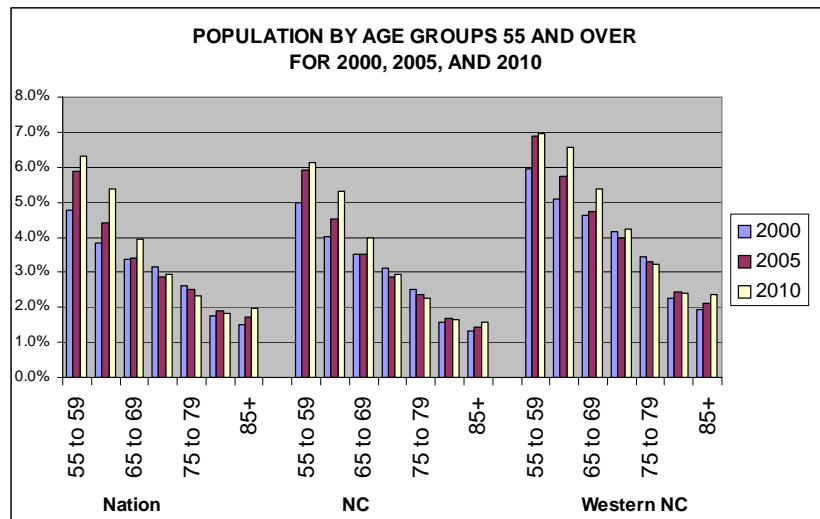


Figure 3 The Western North Carolina region leads the nation in the growth of elderly populations. (NC Division of Aging and Adult Services)

This vision is particularly important and supported by the NC Board of Science and Technology<sup>14,15</sup> which, in its “Tracking Innovation: The North Carolina Innovation Index” reports for 2000 and 2003, recognized that, despite the State’s ranking in the top five in the nation on technology development, patents, and startups, the benefits of this growth do not translate into uniform benefits for all its citizens. This growth remains largely concentrated in the Research Triangle and the Charlotte area. Two of its key findings in the 2003 report were that North Carolina needs to strengthen the training of its citizens for the knowledge-based economy and needs to enhance intellectual property and technology transfer in the marketplace.

The Board of Governors for the University of North Carolina (BGUNC) system echoed the awareness that the UNC system must play a “more direct, active role in economic development” in the state in its 2004-2009 Long Range Plan<sup>17</sup>. In a study for the UNC system by the Research Triangle Institute on technology transfer capacity, it was noted that some campuses lacked the infrastructure to support the process of bringing technology to the commercial stage. Among its action steps to improve outreach and engagement, the BGUNC identified the need to foster an enterprising university culture. In July 2000 the North Carolina General Assembly gave the BGUNC the authority to designate areas of campus land as Millennial Campuses which are to be university, government, and private sector partnerships focused on economic development.

Concurrently with this increased UNC awareness of the role that the North Carolina higher educational system should play in regional development, Western Carolina University, under the leadership of Chancellor John Bardo, has championed the engagement of the WCU faculty, students, and resources in the economic growth of Western North Carolina. Western Carolina University is a regional comprehensive institution founded in 1889 with a distinguished history of teaching and learning for the region. Since research and development were not within the institution’s initial areas of focus, the infrastructure for knowledge transfer is limited. In a Regional Summit entitled “Meeting Western North Carolina’s Needs through Higher Education,” one of the recommendations was to explore “engagement in non-traditional and creative ways” providing new access by regional entities to the resources of the university<sup>20</sup>.

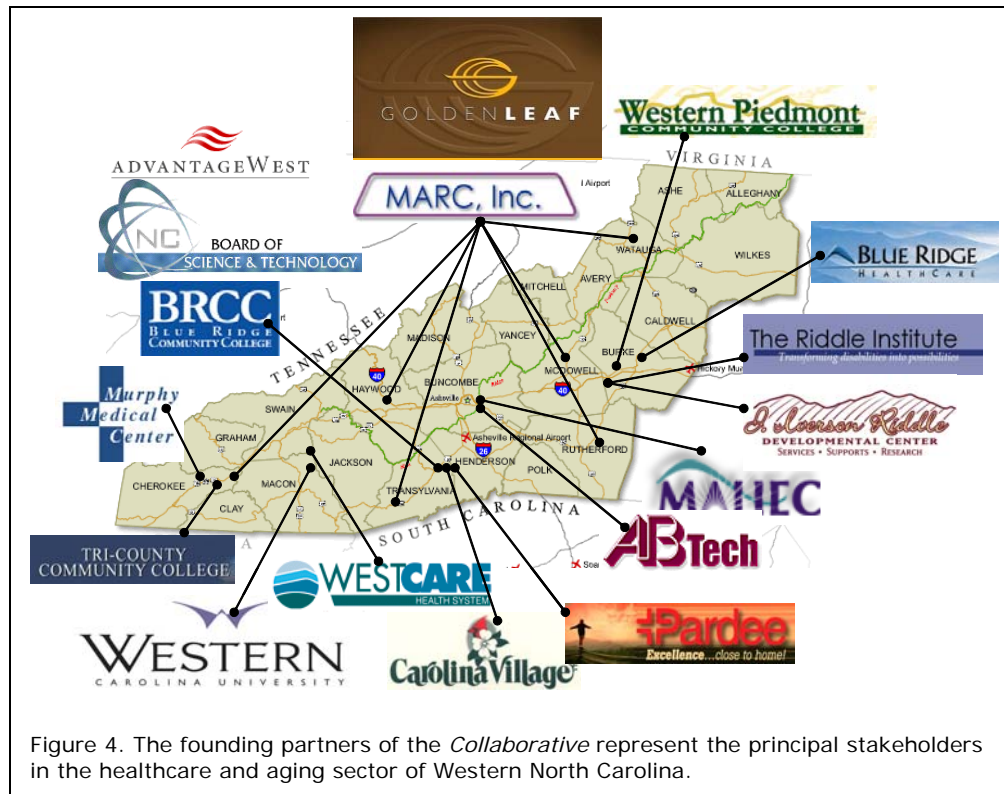
### **The Innovation Collaborative for Adaptive Technology in Healthcare and Aging**

In response to these compelling needs, the Kimmel School of Western North Carolina established in the fall of 2006 the *Innovation Collaborative for Adaptive Technology in Healthcare and Aging (Collaborative)* to stimulate innovative solutions for healthcare and aging needs for adaptive technologies and to generate new business opportunities for the Western North Carolina region. The *Collaborative* created an infrastructure in which new ideas are welcome and promising ideas can be cultivated and developed into attractive business opportunities for the region. The *Collaborative* enhances the limited technology transfer infrastructure of WCU and provides a mechanism to access WCU resources and create new wealth and a strong Western North Carolina economy. Above all, it stimulates innovation in the faculties and students of WCU and its partner community colleges and reignites the innovation process in our elderly citizens. It provides an opportunity for all age groups of our region to see innovative and creative ideas become reality, improving their lives and providing challenging and stimulating careers for the people of WNC.

Our partners, shown in Figure 4, represent all the human and institutional resources needed to be successful in this challenging initiative: academic, technical, healthcare and aging care providers as well as business and entrepreneurial connections.

The goal of the *Collaborative* is to collect needs and product ideas from our members including students, faculty, healthcare providers, and elderly retirees and develop them into viable business opportunities solving problems faced in healthcare and by aging citizens. The building of the business

opportunity package is undertaken by multidisciplinary student teams (primarily WCU) mentored and supported by WCU faculty and external experts. The product development process fits extremely well with the two semester senior design engineering project in engineering and



engineering technology curricula. These capstone projects are accomplished by engineering teams. The constitution of these teams is now being expanded to be multidisciplinary including entrepreneurship, marketing and health scientists. The curriculum allows for enriched activities such as attendance in a full day Boot Camp for Entrepreneurs seminar provided by Blue Ridge Entrepreneurial Council, one of the Collaborative partners. This building of a business opportunity from an idea may require one or more of the following activities:

- Problem identification through focus groups of elderly people and healthcare providers,
- Patent searches, provisional and final applications,
- In-depth market research,
- Development of commercialization market entry strategies,
- Manufacturability assessment and production cost estimates,
- Design of prototypes and testing, and beta testing,
- Business opportunity package assembly for investors and entrepreneurs.

The *Collaborative* infrastructure stimulates the diverse adult groups of Western North Carolina from the students of WCU and the community colleges to healthcare workers and the elderly members of our community. The *Collaborative* organizes focus groups with elderly people from communities of the region and those living in continuing care retirement communities like Carolina Village. Brainstorming and innovation sessions involving the elderly as well as students will be included as part of the *Great Life Series* of the *Initiative for Integrative Aging*. Problem identification and solution development (as appropriate) sessions are held at member healthcare facilities reaching from the far western counties in Murphy to the far eastern counties near Morganton (over 165 miles apart). Similar sessions are held at several of the MARC facilities and the Riddle Institute, both serving people with disabilities. Annual innovation challenges are being organized for student/faculty teams at our partner community colleges. These challenges have been expanded to include a business plan competition in addition to the

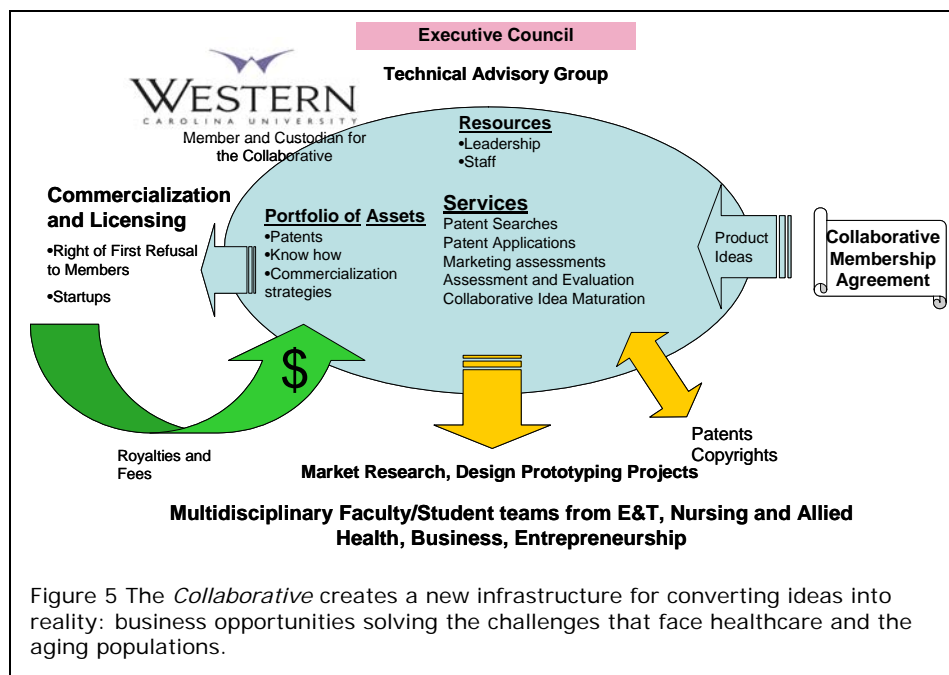
technical prototype competition. Winning efforts from these challenges will be invited to join the Collaborative and to be developed into business opportunity packages.

Ideas are given a preliminary evaluation by the Technical Advisory Group (TAG) to

prioritize collaborative resources. As part of the membership agreement, contributors assign a portion of their IP ownership in exchange for assistance in development of the idea. If and when the idea results in a viable business opportunity, members would receive a variety of benefits: (a) first opportunity to submit a proposal to license the product or service from the *Collaborative* based on the requirements set out in the business opportunity. Membership in the *Collaborative* is open to all, including students and people from outside of the university. Students will be eligible to retain limited ownership in the intellectual property.

### Progress and Status

The Collaborative effort was launched in the fall semester of 2006 and the results are encouraging while being preliminary. So far three focus groups have been held with healthcare providers, residents in independent living centers and faculty members. Three more have been



scheduled in the spring of 2007. In addition the Collaborative has created a buzz within the WNC healthcare community and requests for brainstorming session from others groups have been received. Over 20 problems have been identified and are undergoing evaluation. They have been grouped into six general categories: mobility, patient monitoring, electronic home care, transfer devices, home self care and rehabilitation. During these sessions some problems were identified that already have solutions available. We then have passed back to the groups these existing solutions for their evaluation. In many cases the issue is cost. Devices cost more than many of WNC rural clients can afford. In some cases the team has taken on the task of function-reduced solutions that are affordable.

One of the goals of the Collaborative is to provide access to the University resources to external inventors. Three agreements have already been signed with WNC inventors.

The launching of entrepreneurial engineering teams began simultaneous to the problem identification activity. As described above, the teams launched projects that go beyond the technical solution. Project documentation includes market research, patent searches, product requirements, work breakdown structures and project schedules. One of the projects directed at a rehabilitation device for patients who have undergone total knee replacement is described in a companion paper.

An additional dimension to the Collaborative is the stimulation of innovation in community college students. The goal is to launch annual innovation challenges for community college student/faculty teams to develop products to address one specific healthcare problem. A competition will be held in the spring of 2007 as pilot for a complete launch of this activity in the fall of 2007. One of the goals of the evaluation of problems is to identify problems that would be suitable for the 2007-2008 innovation challenge.

## **Summary**

The Innovation Collaborative is a unique structure to stimulate the development of new products capitalizing on the broad resources of Western North Carolina. The *Collaborative* presents cultural transformation and an attempt to transform the region's economy from one of mass manufacturing to a culture of continuous innovation and new product generation. The initial results suggest that this transformation resonates with the region and we are looking forward to the successful launch of many business opportunities in coming years.

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