



The Shape of Things to Come.TM

The Economic Development Strategy for the
Research Triangle Region, North Carolina

July 2009



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The Research Triangle Regional Partnership (RTRP) coordinates economic development for the Research Triangle Region, which comprises the central North Carolina counties of Chatham, Durham, Franklin, Granville, Harnett, Johnston, Lee, Moore, Orange, Person, Vance, Wake and Warren.

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From the Chairs

The 13-county Research Triangle Region of North Carolina is one of the most economically prosperous regions in the world.

The Research Triangle Region is blessed with unique and powerful assets for competing in today's global economy. Among them, world-leading life science and technology clusters, major research universities, billions in annual research-and-development funding at our institutions of higher learning and federal and private labs, and a superior quality of life that enables our companies to attract and retain the talent they need to compete and grow.

At its heart is the world-renowned The Research Triangle Park™, created 50 years ago by visionary business and academic leaders, the engine that transformed the economic trajectory of our region.

Five years ago, a new generation of visionary business and academic leaders again took bold steps to ensure the prosperity that we have enjoyed continues for decades to come. They launched an unprecedented and now-award-winning economic competitiveness plan, called *Staying on Top: Winning the Job Wars of the Future*, which rallied hundreds of organizations around a single vision and plan to create jobs and enhance the region's competitive position.

The result: more than 100,000 new jobs created in our region during the five-year period and a strengthened and focused economic development infrastructure and leadership network that allows us to identify and respond more quickly and effectively to economic challenges and opportunities as they arise.

Today, we seek to leverage and build on that success with our new five-year plan, *The Shape of Things to Come™*. Now, as five years ago, the economic realities remain clear. We have entered a new era of fierce, global competition for new jobs and investment. There will be regions of the world that win — where standards of living will rise and jobs will be plentiful — and regions that lose. We intend to win.

Our experience of the past five years demonstrates we can ensure our region's chances of future economic success through innovation and action. This new plan takes the name of the region's trademarked slogan to convey the vision we hold for our knowledge-based economy: to be "a world leader in intellectual capacity, education and innovation to enhance productivity and economic growth and achieve a superior quality of life for all our citizens."

We call on all of you – our business, academic, government and institutional partners – to renew your commitment to the regional vision and continue your participation in this plan. Help ensure that the Research Triangle Region remains "The Shape of Things to Come."

Ann Goodnight

Jeff Stocks

Co-Chairs

Strategic Plan Leadership Steering Committee

July 2009

Executive Summary

The Shape of Things to Come™ is a five-year plan to promote the economic competitiveness of the Research Triangle of North Carolina and create jobs in all 13 counties.

The *Shape of Things to Come* will guide the Research Triangle Region's economic development initiatives from 2009-2014. Planners agree that five years is both too long and too short a time frame for planning purposes. We must plan and act with a long-term view for ensuring economic competitiveness while remaining alert to shifts in global market conditions that provide new opportunities or signal trends we can leverage. This plan accommodates both.

The Shape of Things to Come builds on the success of the region's award-winning *Staying on Top: Winning the Job Wars of the Future* plan, implemented during 2004-2009.

That plan resulted in the first-ever comprehensive, region-wide collaboration focused on promoting the Research Triangle Region's economic success. Hundreds of business, academic, nonprofit and government partners voluntarily agreed to align their strategic efforts around a single vision and plan for economic growth.

A 56-member leadership steering committee of regional business and higher education leaders led development of the new strategic plan. The process included:

- ▶ Reviewing literature on global trends and economic development best practices to create a foundation for examining new threats and opportunities.
- ▶ Hosting input sessions with hundreds of institutional partners and community leaders to prioritize concerns and establish regional needs.
- ▶ Convening a 30-member group of best policy thinkers, called the WONK group, who used predictive model

software for scenario planning based on information that had been collected.

- ▶ Engaging 300 stakeholders in a one-day intensive session, called Reality Check, to consider scenarios for best addressing growth issues in coming decades and hosting a public forum of hundreds more who responded to session outcomes.
- ▶ Convening the leadership steering committee to consider the scenario planning work and prioritize opportunities and threats. The resulting action plan grows from the knowledge that the Research Triangle Region's competitive advantage lies in the ability of its companies and people to innovate – to create the "next best thing" – which leads to new products, services, businesses and jobs. The region's superior quality of life and business climate enable regional businesses to recruit the talent and investment they need to innovate.

The Shape of Things to Come calls for three key strategies to continue growing our knowledge-based economy:

- ▶ Expand our world-leading life sciences and technology clusters and selected new, emerging clusters.
- ▶ Enhance and preserve the superior quality of life and competitive business climate that enables us to attract the talent and investment we need to continue to be successful.
- ▶ Engage regional leaders and partner organizations in ensuring our economic competitiveness.

Overview

The Research Triangle Region's vision is to be a world leader in intellectual capacity, education and innovation to enhance productivity and economic growth and achieve a superior quality of life for all our citizens.

The Research Triangle Regional Partnership (RTRP) in 2003 and early 2004 directed the first comprehensive regional economic development strategic planning effort ever conceived for the Research Triangle Region, a 13-county region in north-central North Carolina, home to The Research Triangle Park™ (RTP).

The initiative grew from the findings of the 2002 study, *Clusters of Innovation*, conducted by Harvard University economist Dr. Michael Porter, who predicted that future U.S. competitiveness will hinge on the capacity to foster "clusters of innovation in regions across the country." Clusters are interconnected businesses and support organizations in a specific industry.

Porter concluded that the Research Triangle Region was one of the most economically competitive regions in the nation but required a new economic vision to remain so – one built on the knowledge-based economy sparked by RTP and focused on building and attracting innovative and emerging industry clusters and expanding prosperity to a larger geographic area, including the more rural counties surrounding the urban core.

RTRP convened a 37-member task force of business and higher education leaders who used the results of the Porter study and dozens of others to create an action blueprint. The result: *Staying on Top: Winning the Job Wars of the Future*, a five-year, \$5-million action agenda to generate 100,000 new jobs and increase employment in all 13 counties of the Research Triangle Region.

Implemented during 2004-2009 and recognized by the U.S. Department of Commerce as the best regional competitiveness strategy in the country, the plan called for:

- ▶ Strengthening the region's existing clusters of innovation by improving collaboration among companies and organizations.
- ▶ Diversifying the economy by recruiting a wider array of clusters and focusing on opportunities at the intersection of the strongest clusters ones.

- ▶ Sparking creation of more homegrown businesses.
- ▶ Identifying regional investments needed for competitive advantage.
- ▶ Invigorating the economy across a broader geographic area.
- ▶ Developing the region's capacity to meet its goals.

Five years later, the plan's outcomes demonstrate its success:

- ▶ **Job Creation** – More than 110,000 new jobs created across the region and strong gains in targeted clusters, particularly life sciences and technology.
- ▶ **Strategic Results** – All 30 action items implemented and many institutionalized by partner organizations, including: tight integration of university R&D and technology transfer with regional economic development; expanded community college courses and workforce training to support targeted clusters; expanded air service to priority destinations for businesses; public policy support for innovation, recruitment and infrastructure; more venture capital and technical support for entrepreneurship; and a tax-advantaged network of business parks, called Triangle North, created in a rural part of the region and funded through a first-of-its-kind, cross-county tax-base-sharing agreement.
- ▶ **Regional Collaboration** – In addition to the 90-plus regional organizations that agreed to implement components of the plan and align their resources to support the region's economic strategy, hundreds of business, academic, nonprofit and government leaders provided ongoing financial support, strategic guidance, implementation support, and influence to help the region achieve its economic goals.

Staying on Top represents an unprecedented regional collaboration of business, academic, nonprofit and government partners across the Research Triangle Region focused on a single vision for economic growth and prosperity.

RTRP in 2008 launched planning for the next five-year plan to guide the region's economic development initiatives from 2009-2014. Southern Growth Policies Board and North Carolina's Small Business and Technology Development Center directed the planning process and drafted the plan.

The planning process included:

- ▶ Reviewing literature on global trends and economic development best practices to create a foundation for the examining new threats and opportunities.
- ▶ Hosting input sessions with hundreds of institutional partners and community leaders to prioritize concerns and establish regional needs.
- ▶ Convening a 30-member group of best policy thinkers, called the WONK group, who used predictive model software for scenario planning based on information that had been collected.
- ▶ Engaging 300 stakeholders in a one-day intensive session, called Reality Check, to consider scenarios for best addressing growth issues in coming decades, and hosting a public forum of hundreds more who provided feedback to the session's outcomes.
- ▶ Convening a new 56-member leadership steering committee of business and higher education leaders to consider the scenario planning work, prioritize opportunities and threats, and develop the new plan.

The result is a new five-year plan, *The Shape of Things to Come*. The new plan builds on the success of the last, integrating its strategic initiatives but refining them to respond to current economic realities and incorporating lessons learned from the first five years.

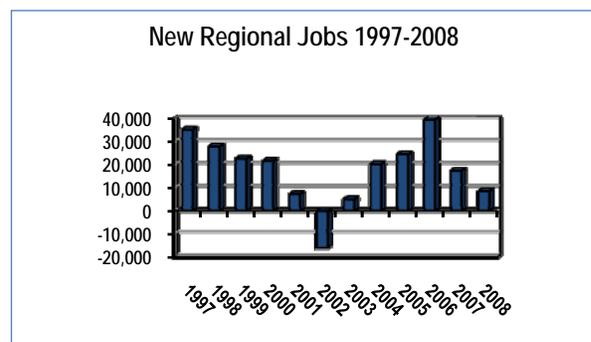
The vision for the region remains the same: to be a world leader in intellectual capacity, education and innovation, to enhance productivity and economic growth and achieve a superior quality of life for all our citizens

Economic and Competitive Realities

"When we look to the future, amidst considerable uncertainty, some economic realities seem clear. We are entering a time of increasing global competition for new jobs and investment. That competition will be fierce, and there will be regions of the world that win – where standards of living will rise and jobs will be plentiful – and regions that lose. We believe that we can improve our region's chances of economic success through collaboration, education, innovation and action."

The global economic realities described in this introduction to the *Staying on Top: Winning the Job Wars of the Future* plan in 2004 hold true today. We face:

- ▶ **Intense global competition** – While the Research Triangle Region is one of the nation's leaders in biotechnology, at least 45 states and 27 countries now target biotechnology for recruitment. Global competition for jobs in computer and communication equipment has resulted in manufacturing jobs transferring to lower-cost parts of the globe.
- ▶ **Fallout of economic recession** -- The *Staying on Top* plan launched as the region began emerging from the last recession. The new plan will launch in a year that has witnessed a global economic meltdown not experienced since the U.S. Great Depression. This year, many of the region's largest employers in core clusters of informatics, pervasive computing and pharmaceuticals have announced layoffs or bankruptcy.



Still, the Research Triangle Region remains one of the strongest economies in the nation. It was one of the last in the recession and, many predict, will be one of the first out of it. Knowledge workers continue to flock here in search of jobs. In the first quarter of 2009, regional economic developers fielded inquiries or hosted site visits from 44 active prospects (companies considering locating within the

region) that represented \$2.5 billion in investment and 15,000 new jobs.

Innovation as Competitive Advantage

Almost all research to date identifies innovation as the key determinant of future success and productivity. North Carolina's Vision 2030 Plan, "Science and Technology Driving North Carolina's New Economy," cites an Arthur Little study in which 84 percent of global executives said innovation is the most critical business success factor.

Innovation guru Peter Drucker outlined seven sources or places to look for innovative opportunities that should be monitored by those interested in starting an entrepreneurial venture. The first four are sources of innovation that lie within the industry. The last three arise in the societal environment. Drucker's work suggests we are experiencing a time when great innovation is possible.

Volatile economic conditions that exist in our nation and the world create industry and market restructuring. An aging and diversifying population, rapid changes in technology and consumer demands, and major changes in political

Peter Drucker's Seven Sources of Innovative Opportunities

- 1. The Unexpected:** An unexpected success, an unexpected failure or an unexpected outside event can be a symptom of a unique opportunity.
- 2. The Incongruity:** A discrepancy between reality and what everyone assumes it to be, or between what is and what ought to be, can create an innovative opportunity.
- 3. Innovation based on process need:** When a weak link is evident in a particular process but people work around it instead of doing something about it, an opportunity is present to the person or company willing to supply the "missing link."
- 4. Changes in industry or market structure:** The opportunity for an innovative product, service or business approach occurs when the underlying foundation of the industry or market shifts.
- 5. Demographics:** Changes in the population's size, age structure, composition, employment, level of education and income can create innovative opportunities.
- 6. Changes in perception, mood and meaning:** Innovative opportunities can develop when a society's general assumptions, attitudes and beliefs change.
- 7. New Knowledge:** Advances in scientific and nonscientific knowledge can create new products and new markets.

Recent Accolades

#1 Region for Biotechnology
Milken Institute

#1 High-Tech Region
Silicon Valley Leadership Group

#1 Business Climate
Site Selection

#1 Best Place for Business & Careers
Forbes

#1 Best Place to Live in the U.S.
Msnbc.com

#1 Pro-Business State
Pollina Corporate Real Estate Inc.

leadership create significant shifts in industry and society, a rich environment for major innovation to occur.

With its ability to innovate and its increasingly diverse, knowledge-based economy, the Research Triangle Region is well positioned to compete in this era of heightened innovation opportunity. Our role as economic developers is to market the region globally – to businesses, talent and entrepreneurs – as a center of innovation while also working with partners within the region to ensure the region's valuable competitive asset remains intact.

While this plan proposes many specific actions to be taken to meet specific objectives, the underlying goal for all of this work is to promote increased innovation among businesses, entrepreneurs and leaders and to make the region more attractive to new and expanding companies that can grow and create jobs.

Well Positioned to Win

The Research Triangle Region is widely recognized for its key competitive assets, considered prerequisites for winning in the knowledge-based global economy. They are:

- ▶ A critical mass of "new economy" companies, including world-leading clusters in life sciences and technology and the nation's largest concentration of contract research organizations.
- ▶ Research and development funding.

- ▶ Internationally renowned research universities.
- ▶ High quality of life that enables the region to attract and retain knowledge workers.
- ▶ Worker training resources, including those from top-flight community colleges.
- ▶ Global reputation of The Research Triangle Park.
- ▶ Relatively low cost of living and doing business compared to other technology regions.
- ▶ Highly educated work force.

Leaders in the region, however, have identified “complacency” as a threat to future economic success. If we accept that we are living in a transitional time of great change, then any complacency about having “reached the top” would be foolish.

The leadership committee that developed the new plan as well as every person who contributed to it answered one survey question the same. The question was: “If we do nothing, will the region be as competitive in 20 years?” Everyone answered, “No.” Their answer brings us to the question of what, then, should we do.

In a report for the Research Triangle Foundation of North Carolina, IBM Business Consulting Services describes four pillars of regional competitiveness: Attractiveness to Companies, Attractiveness to Individuals, Reputation or “Brand,” and Intellectual Interaction.

The IBM report punctuates our experience of the past five years: to be competitive, we must ensure that while we promote the growth of our target clusters through marketing and global branding, we must focus equally diligently on preserving and enhancing our “product” – the quality of life and favorable business climate that makes our region so attractive to the innovative and growing companies that make us successful and the talent they need to compete.

Four Pillars of Regional Economic Competitiveness

Attractiveness to Companies

- ▶ Workforce
- ▶ Business climate (regulation, taxes, incentives, predictability, support services)
- ▶ Physical size (services, size)
- ▶ Idea environment (universities, research, innovation)
- ▶ Economic dynamism (growth, strength)
- ▶ Financial climate (capital, financing)

Attractiveness to Individuals

- ▶ Quality of life (cultural, recreational, convenience)
- ▶ Economic dynamism (job growth, income growth, strength, stability)
- ▶ Climate/geography
- ▶ Cost of living
- ▶ Educational quality
- ▶ Social interaction (quality, availability)

Reputation/Brand

- ▶ Desirability of park (or regional) address
- ▶ Attractiveness of park association
- ▶ Name recognition
- ▶ Marketing prowess
- ▶ Credibility of area as research and technology leader

Intellectual Interaction

- ▶ University-company cross-fertilization
- ▶ Company-company association
- ▶ Entrepreneur-institution interaction
- ▶ Individual-individual connection

Source: IBM Consulting Services for Research Triangle Foundation of North Carolina report

Areas of Opportunity

The Research Triangle Region is home to world-class research and development in a wide range of emerging fields that provide a rich source of innovation for future job creation.

The *Shape of Things to Come* seeks to take the necessary action steps and develop the infrastructure needed to convert the region's vast R&D assets into high-quality jobs for our residents.

In 2004, an extensive research effort revealed eight clusters related to life sciences and technology in which the Research Triangle Region is a global leader or has the potential to be and that have high potential for future job creation. The *Staying on Top* plan identified these eight as targets for business development, both in recruiting new companies and in supporting startups and existing businesses in the region. They are:

- ▶ Pharmaceuticals
- ▶ Biological agents and infectious diseases
- ▶ Agricultural biotechnology
- ▶ Pervasive computing
- ▶ Advanced medical care
- ▶ Analytical instrumentation
- ▶ Nanoscale technologies
- ▶ Informatics

In recent years, several new clusters have emerged at the intersection of those eight in response to shifting consumer and global market conditions. They are:

- ▶ Advanced gaming and e-learning
- ▶ Clean/green technologies
- ▶ Defense technologies

The region strengthened its position in its targeted-clusters during the past five years and learned two valuable lessons. First, clusters, especially companies designated as being in a specific cluster, are not unique. Many of the

targeted clusters overlap and cluster membership morphs from product to product and among applications. The interaction between clusters is a competitive strength and a source of innovation, and must be encouraged. Second, the region has opportunities to compete in emerging clusters and even in areas that do not constitute a single cluster. As regional companies innovate, they transfer existing skills into new products.

According to *New Economy Strategies in Clusters of Industry to Clusters of Knowledge & Competency* (July 2007): "It is no longer about the one or two clusters that demonstrate the largest aggregation of employment and wage growth but the combination of transferable skills, knowledge, talent and competencies across many opportunities that distinguish the technologies and market-makers that define a region's advantage."

Moving forward, the Research Triangle Region's business-development activities should focus on expanding these existing and emerging clusters through recruiting of new companies that work in related areas, promoting new ventures and supporting the growth of existing companies.

In addition, the region should continue the work undertaken in the *Staying on Top* plan to extend the prosperity of the urban core to the outlying 10 more-rural counties of the region. That includes:

- ▶ **Triangle North** – The path-breaking, award-winning rural economic development initiative that created a network of tax-advantaged business parks in four northern rural counties in the region to attract new investment that grows out of the region's R&D.
- ▶ **BRAC Regional Task Force** – The expansion of Fort Bragg in nearby Cumberland County as part of the base realignment process provides significant opportunities for new investment, particularly for the region's three southern counties located adjacent to Cumberland.

Emerging Cluster Opportunities

Advanced Gaming and E-Learning. Wake County has taken the lead on marketing the region as a top national player in the area of interactive computer game development and advanced learning technologies, a burgeoning \$3.8 billion industry where average salaries exceed \$80,000. Its goal is to position the region as the primary East Coast gaming hub.

Computer gaming and advanced learning technologies can include software and hardware products designed as entertainment, as well as simulation applications tailored for the needs of industry training, educational providers and defense agencies. The region began growing its gaming cluster two decades ago. Today, it is home to more than 30 gaming-related firms, which collectively employ more than 1,000 people. That number is growing rapidly.

The region brings key R&D assets to this cluster. N.C. State University's Digital Games Research Center explores digital gaming opportunities with the help of experts from State's engineering, social science, humanities, design and education programs. Wake Technical Community College opened a Simulation and Game Development Lab in 2007. It is considered the most sophisticated digital gaming lab in the Carolinas, built with the financial assistance from the National Science Foundation. The lab's opening coincided with the establishment of an associate degree in simulation and game technology. The University of North Carolina at Chapel Hill Department of Computer Science's Graphics and Analysis Research groups are developing a wide range of technologies and techniques to create and use computer graphics, imaging and virtual environment for simulations and real-world applications.

Clean/Green Technologies. A study by the Research Triangle Foundation of North Carolina identified "clean" technology – a broad range of industries that enable environmental sensitivity – as an up-and-coming sector for which the Research Triangle Region is strongly positioned. No other region currently claims leadership in the clean technology space.

Clean and green technology represents a confluence of the region's competencies in biotechnology, information technology and advanced material sciences. Significant opportunity exists to export knowledge-based products and services in this sector to fast-growing countries, such as China and India, which face serious environmental challenges.

Innovation generators RTI International, the U.S. Environmental Protection Agency and each of the region's research universities are involved in research in this area as is the Biofuels Center of North Carolina, located within

the region in Granville County. The state created the center in 2007 to implement North Carolina's Strategic Plan for Biofuels Leadership, which offers an ambitious goal: by 2017, 10 percent of liquid fuels sold in North Carolina will come from biofuels grown and produced within the state.

Businesses related to this cluster range from enzyme-maker Novozymes North America in Franklin County, which creates enzymes that can catalyze North Carolina-produced feedstocks to create alternative fuels, to Piedmont Biofuels in Chatham County, the nation's primary consulting source for biodiesel plant design and production.

N.C. State University is home to the National Science Foundation's research center working to transform the nation's electric power grid into a "smart grid" that will easily store and distribute energy produced from solar panels, wind farms, fuel cells and other energy sources. The NSF Engineering Research Center for Future Renewable Electric Energy Delivery and Management Systems (FREEDOM Center) operates with support from more than 60 companies involved in electricity production.

The new Institute for Sustainable Enterprise in Orange County aims to become the national center for research, development and application of sustainable business-development practices. Chambers of commerce across the region have signed on as partners, offering members access to services under the brand name Green Plus to help them operate more sustainably – that is, focused on a triple-bottom line of financial profitability, social equity and environmental sustainability. UNC-Chapel Hill's Center for Sustainable Enterprise, part of Kenan-Flagler Business School, is one of the top centers in the nation focused on issues related to sustainable development. It operates the UNC Business Accelerator for Sustainable Enterprise to support the launch and development of sustainable business ventures in the region.

Defense Technologies. The need to combat terrorism and wage 21st-century warfare create significant business-development opportunities for the region's life sciences and technology assets.

Research centers in the region bring extensive experience in invention and innovation to support the national demand for more effective anti-terrorism measures to safeguard the public. Regional universities and private labs attracted nearly \$71 million in biodefense R&D funding during fiscal years 2002-2005. The military complex at Fort Bragg, immediately adjacent to the region, offers an excellent partnership opportunity for expanding opportunities in this area.

The region also is home to the Triangle Center on Terrorism and Homeland Security, which promotes national

security by advancing understanding of terrorism and the means to combat it through research, teaching, and developing partnerships among universities, industry and government.

Existing Regional Clusters

The Research Triangle Region's life sciences cluster is deep, with substantial economic impact. The region is home to a critical mass of life sciences companies, large and small, from Fortune 500 giants, such as GlaxoSmithKline and Wyeth, to multinationals Novo Nordisk and Novozymes North America, to next-generation leaders, such as AlphaVax, Inspire Pharmaceuticals and Serenex.

More than 700 life science companies employ more than 37,000 with annual salaries averaging \$66,751. In addition, more than 151,700 service-sector jobs are generated to support the region's life sciences industry, for a total employment impact of nearly 188,700 jobs. Employees of the region's life sciences firms directly contributed an estimated \$978 million in personal local, state and federal taxes in 2007.

The region also is home to the largest cluster of contract research organizations (CROs) in the United States. CROs employ more than 13,000 in the region. Quintiles Transnational Corp. is the service sector's largest worldwide employer, with sites in 50 different countries. An additional 88 CROs offer services for medical device, agricultural, industrial and environmental R&D. The life sciences industry increasingly depends on CROs to supply outsourced expertise because of growing safety issues, patent challenges, expensive FDA trials and the price of products. Having such a deep and growing component of a life sciences cluster gives the Research Triangle Region a competitive advantage in the growth of life sciences companies.

Life sciences companies, like those in other industries, tend to cluster around essential resources, eventually attracting more of these resources to the region. A cluster is not simply a geographic concentration of companies. Clusters include suppliers, customers, manufacturers of complementary products and even governmental and other institutions, such as universities, standards agencies and vocational training providers. Cluster growth is a self-reinforcing cycle.

These eight clusters draw on the region's most competitive and innovative R&D assets and, with the new emerging clusters, represent the region's best opportunities for continuing strong and sustainable job creation, business investment and growth.

Pharmaceuticals. Pharmaceutical and biopharmaceutical R&D represents the most important research and technology-intensive industry in the Research Triangle Region. The region offers resources to support the complete life cycle of pharmaceutical development, including:

- ▶ Quality university life sciences programs and corporate research organizations that produce discoveries that are transferred to emerging or existing companies, resulting in new therapies and R&D tools.
- ▶ Local research universities, medical schools and nonprofits that provide research services, as well as preclinical and clinical trials in support of drug development.
- ▶ Contract research organizations, which provide pharmaceutical research, testing, development, preclinical trials, clinical trials and associated services to ensure compliance with FDA regulations.
- ▶ Corporate and contract pharmaceutical and biomanufacturing plants.

The Research Triangle Region is one of very few places in the world where such a critical mass exists. Regional research centers receive substantial grant funding from the National Institutes of Health.

Biological Agents and Infectious Diseases. The terrorist events of Sept. 11, 2001, highlighted the nation's basic needs for safety and security. Government funding has stimulated new and targeted R&D, which the Research Triangle Region has worked to leverage with its strengths in the area of biological agents.

The needs and opportunities in this area are not limited to bioterrorism, as disease outbreaks often result from natural causes. Opportunities include not only public health but also protection of the environment, water supplies and food sources from natural or terrorist exposure to biological agents. Infectious disease is back in the spotlight due to a convergence of events and threats, including emerging or re-emerging infectious disease (e.g., swine flu, HIV/AIDS, mad cow disease, West Nile virus, SARS, avian flu), drug resistance across all classes of microbial pathogens and bioterrorism.

Successful solutions to such threats will pull from many technology sectors in which the Research Triangle Region has or can establish leadership, including:



- ▶ World-class public and environmental health research organizations.
- ▶ Discovery and development of new infectious disease therapeutics.
- ▶ Agricultural disaster research, exemplified by recent efforts to create a not-for-profit institute to catalyze the research, development and growth of this industry.
- ▶ Sensors and sensor webs, analytical instrumentation and data mining, which will be critical to monitoring, early detection of outbreaks and characterization of new strains of pathogens.
- ▶ Nanomaterials research, which will provide improved barrier systems for infection control.

Agricultural Biotechnology. Agricultural biotechnology encompasses a set of technologies – genomic science, functional genomics, bioinformatics and genetic engineering technology – that improve yields and enable new agricultural products when applied to crop plants and livestock. Advances in these technologies also enable expansion of agriculture into alternative, non-food and non-fiber products, including pharmaceuticals, chemicals, biomaterials and enzymes. Although the agricultural commodities and alternative product markets have very different structures, the same underlying R&D supports them to a great extent.

The Research Triangle Region is strongly positioned to capitalize on the growth opportunities in both markets. The region has several assets that work synergistically to create biotechnology applications for food and fiber products:

- ▶ N.C. State University's research program in agricultural biotechnology, one of the nation's largest.
- ▶ Strong research programs in statistics, biology, botany, chemistry, genetics, medicine and engineering at N.C. State, University of North Carolina at Chapel Hill, Duke University and others; several programs focused on transferring university R&D to the large agricultural industry in the state; and N.C. State's leadership role in efforts to facilitate commercialization of agricultural intellectual property.
- ▶ Three of the world's largest agribusiness companies: Bayer CropScience, Syngenta Biotechnology and BASF.
- ▶ An entrepreneurial environment and ready access to investment capital and incubator infrastructure, which

combines to nurture startups.

- ▶ A large agricultural industry and leadership in poultry and hog production, providing commercial pathways for launching improved agricultural commodities.
- ▶ Research and product divisions of several major pharmaceutical companies, including GlaxoSmithKline, Wyeth and Biogen Idec.

Pervasive Computing. Pervasive computing is the ultimate embodiment of communication networks. It enables on-demand access to information from anywhere at any time, changing the way information is gathered, stored and shared. Creation of pervasive computing networks involves integrating wireless technologies, optical communications and computational hardware and software – all areas of strength in the Research Triangle Region.

Pervasive computing networks will be accessed by a new generation of electronic devices, including sensors, wearables and advanced handhelds. These devices will deliver a variety of enhanced or new services over the network, such as communications, data retrieval and exchange (including video) and remote monitoring. The creation of pervasive computing networks is currently being driven by open standards created by multinational corporations.

The rise of these networks will create opportunities for the region in new electronic products and services, including:

- ▶ Medical devices that enable monitoring of patients in real-time and improve the quality of health care in rural areas.
- ▶ Wearable electronics that are incorporated into textiles or miniaturized to be worn unobtrusively on the body.
- ▶ Sensor networks deployed at remote locations for various uses, including inventory tracking, precision agriculture and homeland security.
- ▶ Laboratory information management systems, especially to support pharmaceutical/biotechnology research and clinical trials.

By integrating a wide variety of sensors that monitor ongoing research with databases of results and analytical techniques, virtual laboratories can be created that support greater productivity and improved collaboration.

Advanced Medical Care. In the next 10-20 years, combined advances in several fields – medical devices and diagnostics, drugs and drug delivery systems, genomics

and proteomics, biotechnology, telecommunications and informatics – are expected to revolutionize medical care.

An example of advanced medical care is the use of genetic analysis to determine patients' predispositions to certain diseases, design customized wellness programs to counter such predispositions, recommend periodic tests for monitoring their status and develop individualized therapeutic approaches in the event of the early onset of disease. Other examples include:

- ▶ Diagnostic tests to identify early cellular and molecular changes that are characteristic of a given disease.
- ▶ Injectable nanomachines that deliver localized drugs, clean arteries, selectively destroy cancer cells and repair organs.
- ▶ Gene therapy to treat brain tumors or stimulate angiogenesis.
- ▶ Remote, cost-effective monitoring of patient progress during and after treatment using wireless sensors and telecommunications.

The Research Triangle Region offers world-class health care institutions that will continue to lead in the evolution of quality health care. The region also has strong R&D competencies in key fields that support advanced medical care, including therapeutics development, genomics/proteomics, gene therapy, medical devices, medical diagnostics, sensors, informatics, information technology (IT) and communications.

The region offers infrastructure and supply chains across the pharmaceutical, health care services, biotechnology, IT hardware and imaging industries. Leveraging these resources to lead advancements in medical care and establish dominance in personalized medicine will lure life sciences companies and health care consumers to the region, stimulate new investment and foster the growth of new and existing companies.

Analytical Instrumentation. Analytical instrumentation is increasingly incorporating advances in photonics, imaging, combinatorial methods and informatics. The result will be a permeation of sensors and other analytical instrumentation in a variety of fields, including chemistry, civil engineering and security. The Research Triangle Region is poised to contribute to this revolution in three main areas: optics/photonics, combinatorial methods and informatics.

Photonic methods will continue to revolutionize analytical instrumentation by providing new radiation sources and sensors. Tunable lasers will replace traditional

spectroscopic light sources and enable the miniaturization of chemical analysis equipment, such as spectrometers. This trend will promote the rise of advanced, low-cost, lab-on-a-chip technologies that provide point analysis in the field. In addition, sensors made from optical fibers and gratings will be employed in a variety of applications, including corrosion monitors on bridges, chemical sensors in factories and remote monitors for precision agriculture.

The Research Triangle Region's knowledge base in analytical chemistry, particularly high-throughput screening methods, and optical technologies provide a strong foundation for startup companies targeting these applications. Combinatorial methods and high-throughput screening have become commonplace in pharmaceutical and biotechnology laboratories. However, these methods have been slow to progress to other disciplines, such as catalysis, polymer science and nanotechnology. The pharmaceutical and biotechnology industries in the Research Triangle Region provide a strong foundation in combinatorial methods. The region can continue to play a major role in developing and applying combinatorial methods and high-throughput screening to the health industry, and can spearhead the application of these methods to other technologies.

Nanoscale Technologies. Recent advances in chemistry enable molecular-level engineering of complex structures, such as polymers, metals, ceramics, proteins and genes. Novel electrical, mechanical, optical and catalytic properties of nanostructured materials have garnered worldwide attention. Exploration of these capabilities has just begun, but the field has already produced advances in pharmaceuticals, composites and biotechnology.

Nanotechnology is an enabling technology, cutting across many industry sectors and potentially creating new industries. Nanoparticle applications are the nearest to market and the most diverse. The use of self-assembled monolayers, nanoporous membranes and other surface-science nanotechnologies will create a new paradigm in chemistry. These modified materials can serve as molecule-sized chemical factories for creating pharmaceuticals and biochemicals with tailored structure-property relationships (i.e., rational drug design) and optical activity, which will facilitate the creation of medicines personalized to individual DNA structures. In addition, nanoscale technologies will give rise to new composites useful in drug delivery, medical sensors, tumor labeling, cell transport agents, automotive materials, biocompatibility agents and architectural structures.

Informatics. Informatics includes a broad range of information technologies, computer hardware, software and IT services used to manage and analyze data to drive innovation and create business advantage. In the



knowledge economy, competitive advantage derives largely from an organization's ability to make effective and timely use of internally and externally generated data. Informatics is already firmly established in the Research Triangle Region, home of the largest industrial employers of knowledge workers, and should provide sustainable growth into the future. R&D investments in IT provide synergistic, cross-cutting benefits to other clusters. However, future opportunities will increasingly derive from software and related services rather than hardware.

Three areas with significant cross-cutting potential are critical to the continued growth of the region's informatics sector:

- ▶ Distributed computing
- ▶ Analytical software techniques
- ▶ Imaging and visualization systems

Action Plan for 2009-2014

The Shape of Things to Come™ is a five-year plan to promote the economic competitiveness of the Research Triangle of North Carolina and create jobs in all 13 counties.

The new plan will guide the region's economic development initiatives from 2009-2014. It grows from the knowledge that the region's competitive advantage lies in the ability of our companies and our people to innovate – to create the “next best thing,” which results in new products, services, companies and jobs. Our superior quality of life and business climate enable us to recruit the talent and investment we need for that innovation to occur. Based on that premise, *The Shape of Things to Come* calls for three key strategies to continue growing the region's knowledge-based economy.

Strategy 1: Business Growth **Attract, grow and support targeted industry clusters in all 13 counties.**

The Research Triangle Region must continue to create plentiful job opportunities by encouraging the growth of companies and jobs in our world-leading life science and technology clusters and by tapping emerging opportunities in advanced gaming and e-learning, clean/green technologies and defense technology.

The region should pursue a balanced approach of targeted recruitment, existing business retention and expansion, and creation of new ventures in these targeted clusters. It should extend its global brand recognition, support new initiatives that extend the economic prosperity into all 13 counties, including those in rural areas. It should identify and provide the resources that companies need to grow and compete, from worker training to air service to destinations that are priorities for regional businesses.

ACTION STEPS:

1. **Develop and implement a marketing plan to attract new businesses in targeted companies.**
2. **Develop and implement an expanded brand recognition campaign that supports recruitment of targeted companies, entrepreneurs and talent.**

3. **Design methods and leverage institutional partners to support entrepreneurs, startups and existing businesses in targeted clusters and industries.**
4. **Develop community college and university partnerships to ensure curricular support for targeted clusters.**
5. **Collaborate with the Base Realignment and Closure (BRAC) Regional Task Force to leverage military expansion at Fort Bragg to increase business investment in the region.**
6. **Promote Triangle North as a key strategy to extend regional prosperity into rural counties.**
7. **Tightly align regional and county-level economic development strategies and provide services and program for rural economic development partners, including support for key existing businesses, strategic planning, marketing and research assistance.**

Strategy 2: Product Development **Preserve and enhance the region's competitive business climate, infrastructure and quality of life.**

The urban core of the Research Triangle Region is home to one of the most educated talent pools in the world. The success of the region over the past 20 years can be traced to our ability to attract knowledge talent from anywhere in the world. The combination of a moderate cost of living, a high quality of life, and an expanding job market has led to the ultimate competitive advantage: the ability to attract talent.

In coming years, with increasing mobility and competition for that talent, the region must protect the elements that created the advantage. This means growing in ways that are sustainable – economically, environmentally and socially. It also mean making appropriate and strategic



investments in the assets that contribute to our quality of life, from transportation to education, PreK-12 as well as higher education.

Richard Florida writes in *Rise of the Creative Class*, "...geographic place has become the most important economic and social organizing unity of our time. A place provides a thick labor market, filled with opportunities. You pick a place that you want to live in and then you move and change jobs in that place." Tending one of our greatest assets, our region's quality of place, is a regional responsibility that requires collaboration and continuous attention.

Reality Check, a joint effort of the Urban Land Institute and Triangle Tomorrow, a program of RTRP, is focusing on ensuring quality growth in coming, when the region expects to welcome 1.2 million new people. The region will follow the recommendations developed by the Reality Check steering committee over the next 18 months.

ACTION STEPS:

8. Collaborate with key partners to improve and promote quality PreK-12 education.
9. Implement actions recommended by the Reality Check initiative to ensure quality growth in jobs and housing in coming decades.
10. Develop annual regional federal and state legislative agendas to ensure public policy and investments support the region's competitiveness plan.
11. Promote transportation improvements that enhance mobility within the region.
12. Expand air service to destinations that are priorities for regional businesses.

Strategy 3: Regional Collaboration **Engage regional leaders and partner organizations in ensuring our economic competitiveness.**

We have transitioned over the years from hierarchical leadership to grassroots leadership to today's model of networked leadership. Gone are the days when a single leader or organization can address complex challenges.

Indeed, our traditional leadership turns over at an unprecedented pace. Since the 37-member task force created the *Staying on Top* plan, every university president or chancellor on that task force has changed along with top executives from many of our major companies (IBM, BellSouth, Biogen, Duke Energy, GlaxoSmithKline, IBM, Novozymes North America, Progress Energy). New leadership has taken the helm of the Research Triangle Foundation, which owns and manages RTP, as well as the Council for Entrepreneurial Development, Greater Durham Chamber of Commerce, N.C. Biotechnology Center, N.C. Department of Commerce and many of our economic development partners. This does not appear to be an anomaly, but rather the norm for the future.

Today, the successful model is one in which a group of regional stewards from different organizations come together on an episodic basis, to take advantage of one opportunity or address one threat.

To be successful within this model requires the regional capacity to collaborate. One or a group of organizations, usually not-for-profit business organizations, provide that capacity. They identify the issue, listen to the constituents who define the issue, bring stakeholders together, facilitate discussion, develop the actions to be developed, then support the actors until the issue is solved.

This plan recognizes this new paradigm and builds on the successful collaboration of the past five years to lead implementation of the new strategic plan.

ACTION STEPS:

13. Develop a communications plan to promote collaboration, engagement and support for the new strategic plan.
14. Convene business and institutional partners quarterly to report on progress and results of implementing the plan and identify barriers and opportunities that should be addressed.
15. Host an annual State of the Research Triangle Region event to benchmark the economic health and competitive position of the region and update the community on progress and results of the strategic plan.
16. Host a CEO leadership training program to inform new regional leaders about issues and opportunities related to global competitiveness and encourage their engagement.

Measuring Results

Job creation across the region and in all 13 counties is the primary goal of the region's economic development strategy. Employment growth, thus, remains the primary measure of success.

In addition to employment growth, key indicators of economic health and competitiveness will be monitored to help planners assess the efficacy and effectiveness of the regional strategy. Finally, a variety of participation measures will be used as indicators of regional engagement and collaboration.

Economic Measures

- ▶ Employment growth by county and region
- ▶ Unemployment rate by county and region
- ▶ Wage growth by county and region
- ▶ Median household income by county and region
- ▶ Growth in gross regional product
- ▶ Tax-base growth by county and region
- ▶ Business startups
- ▶ Infant mortality rate
- ▶ High school graduation rate
- ▶ Poverty rate

Participation and Outcome Measures

- ▶ Successful completion of action items
- ▶ Number of inquiries received from new company prospects
- ▶ Number of active institutional and business partners
- ▶ Financial support for *The Shape of Things to Come* plan
- ▶ Attendance at the annual State of the Research Triangle Region event
- ▶ Web site visits

Responsibilities and Timeline

ACTION AGENDA FOR 2009-2014			
	Action Item	Lead	Start
STRATEGY 1: BUSINESS GROWTH			
Attract, grow and support targeted industry clusters in all 13 counties.			
1	Develop and implement a marketing plan to attract new businesses in targeted companies.	RTRP	2009
2	Develop and implement an expanded brand recognition campaign that supports recruitment of targeted companies, entrepreneurs and talent.	RTRP	2009
3	Design methods and leverage institutional partners to support entrepreneurs, startups and existing businesses in targeted clusters and industries.	RTRP	2009
4	Develop community college and university partnerships to ensure curricular support for targeted clusters.	RTRP	2010
5	Collaborate with the BRAC Regional Task Force and NC Military Foundation to leverage military expansion at Fort Bragg to increase business investment in the region.	RTRP	2009
6	Promote Triangle North as a key strategy to extend regional prosperity into rural counties.	RTRP	2009
7	Tightly align regional and county-level economic development strategies and provide services and program for rural economic development partners, including support for key existing businesses, strategic planning, marketing and research assistance.	RTRP	2010
STRATEGY 2: PRODUCT DEVELOPMENT			
Preserve and enhance the region's competitive business climate, infrastructure and quality of life.			
8	Collaborate with key partners to improve and promote quality PreK-12 education.	RTRP	2010
9	Implement actions recommended by the Reality Check initiative to ensure quality growth in jobs and housing in coming decades.	TT	2010
10	Develop annual regional federal and state legislative agendas to ensure public policy and investments support the region's competitiveness plan.	RTRP	2009
11	Promote transportation improvements that enhance mobility within the region.	RTA	2009
12	Expand air service to destinations that are priorities for regional businesses.	RDU	2009
STRATEGY 3: REGIONAL COLLABORATION			
Engage regional leaders and partner organizations in ensuring our economic competitiveness.			
13	Develop a communications plan to promote collaboration, engagement and support for the Staying on Top plan.	RTRP	2009
14	Convene business and institutional partners quarterly to report on progress and results of implementing the Staying on Top plan and identify barriers and opportunities that should be addressed.	RTRP	2009
15	Host an annual State of the Research Triangle Region event to benchmark the economic health and competitive position of the region and update the community on progress and results of the Staying on Top plan.	RTRP	2009
16	Host a CEO leadership training program to inform new regional leaders about issues and opportunities related to global competitiveness and encourage their engagement.	LT	2009

These Institutional Partners will lead implementation of the plan's action steps:

- ▶ Leadership Triangle (LT)
- ▶ Research Triangle Regional Partnership (RTRP)
- ▶ Regional Transit Alliance (RTA)
- ▶ Triangle Tomorrow (TT)
- ▶ Raleigh-Durham International Airport Authority (RDU)

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