Advanced Integrated Manufacturing Center

Thomas Nelson Community College

Interim Report
March 2014

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THOMAS NELSON COMMUNITY COLLEGE

Overview

In response to identified needs and major opportunities for manufacturing on the Virginia Peninsula, in greater Hampton Roads, and throughout the Commonwealth, an Advanced Integrated Manufacturing (AIM) Center at Thomas Nelson Community College is proposed for design and construction. Based upon a planning grant of $125,000, specified for Thomas Nelson Community College, that was included in the Governor’s Workforce Development Agenda and approved by the General Assembly in the FY 2014 budget amendment, the AIM Center is envisioned to be a catalyst to propel the region and the state to the forefront of modern global manufacturing through innovative curriculum and workforce development practices.

Specifically, the AIM Center will produce a significant number of multi-skilled technicians and technologists who have the capacity and adaptability to perform the variety of functions required in a highly automated and digitally controlled manufacturing environment. Functioning as critical members of a team that may include engineers, scientists and researchers, these technicians and technologists will have both specialized technical skills and broad-based understanding of the total manufacturing process that allow them to directly perform and manage complex procedures and, as needed, supervise the production workforce. The availability of significant numbers of such multi-skilled technicians and technologists has been repeatedly identified by regional and statewide industries as their most critical need.

The distinctive quality of the AIM Center is integration:

- **Integration in terms of what is taught.** The innovative curriculum will cover the total manufacturing process, beginning with computer-aided design, moving through rapid prototyping, into production using robotic and automated control systems, problem solving, and ending with quality assurance, distribution and product life cycle management.

- **Integration in terms of how it is taught.** Students will learn in a production-based environment, operating state-of-the-art equipment both at the AIM Center and in actual employer settings, to include rotational internships and structured apprenticeships. Applied academics will be combined with education in technical areas and taught, where appropriate, through a team approach.

- **Integration in terms of how the AIM Center operates.** The AIM Center’s educational mission and workforce development focus will be meshed with the economic development needs and goals for the region. Corporate and agency partners will have a significant role in the governance of the Center.

The AIM Center is to be located within the Thomas Nelson service region where population and manufacturers are most predominant. The building is envisioned to be 65,000 square feet based upon guidance and information provided by the National Coalition of Advanced Technology Centers.

The total amount of funds needed for the next Commonwealth budget cycle (2-year Biennium FY15 and FY16) is $1.2 million for planning, programming and preliminary design components. Additional funding will be needed in later years for the final design/construction management, construction, furniture, fixtures and equipment.
Demand for a Qualified Workforce

Advanced manufacturing in the U.S. is growing and verging on the next industrial revolution, according to an August 22, 2013, report in the Wall Street Journal. The report, Facts about Modern Manufacturing, produced jointly by the Manufacturing Institute, the Manufacturers Alliance for Productivity and Innovation, and the National Association of Manufacturers, states:

- In 2012, manufacturers contributed $1.87 trillion to the economy, up from $1.73 trillion in 2011. For every $1.00 spent in manufacturing, another $1.48 is added to the economy, the highest multiplier effect of any economic sector.  
- Manufacturing supports an estimated 17.5 million jobs in the United States—about one in six private-sector jobs. Nearly 12 million Americans (or 9 percent of the workforce) are employed directly in manufacturing.
- In 2011, the average manufacturing worker in the United States earned $77,060 annually, including pay and benefits. The average worker in all industries earned $60,168.
- Manufacturers in the United States perform two-thirds of all private-sector R&D in the nation, driving more innovation than any other sector.
- Taken alone, manufacturing in the United States would be the 10th largest economy in the world.

Advanced Manufacturing is also a critical and evolving component of Virginia’s economy. It is the state’s 5th largest private employment sector with over 332,700 workers, ranking 8th in average monthly earnings. In November 2013, the Virginia Chamber of Commerce released Blueprint Virginia: A Business Plan for the Commonwealth, which highlighted the need for a highly talented and educated workforce to maintain and elevate Virginia’s economic competitiveness, with Virginia needing 2 million new workers to support the state’s economic growth over the next 10 years. On the Greater Peninsula, manufacturing accounts for 13.4% of the employed workforce with wages that are 37.5% above the regional average. According to a February 13, 2014 article in the Daily Press, the City of Newport News alone, with 28,228 manufacturing jobs, saw an 11% increase in manufacturing employment on a year-to-year basis, representing the largest increase in the state.

It is envisioned that while the AIM Center will be located in the Thomas Nelson Community College service region, the Center will have an impact on developing the Advanced Manufacturing workforce for the entire Hampton Roads region and the Commonwealth. The region, with a combined population of 1.67 million, represents one of the largest concentrations of manufacturers in Virginia, with 20 large firms and over 250 small and medium sized companies including Alcoa-Howmet, Catalina Cylinders, Liebherr Mining Equipment, Anheuser-Busch (AB InBev), BASF Corporation, Canon Virginia, Smithfield Foods, and Unilever Lipton Tea Company. Advanced Manufacturing represents a regional workforce of over 68,000, with a turnover rate of only 5.3%. The Peninsula also hosts two international leaders in research and development - NASA Langley Research Center and the Jefferson National Accelerator Laboratory. Partnership and collaboration with these major research labs will allow the AIM Center to be on the

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4 National Science Foundation (2008).
5 Bureau of Economic Analysis, Industry Economic Accounts (2011) and International Monetary Fund (2011).
6 Virginia Employment Commission Community Profile, Commonwealth of Virginia (2013)
7 Virginia Employment Commission Community Profile, Greater Peninsula Local Workforce Investment Area XIV (2013)
8 Virginia Employment Commission’s Quarterly Census of Employment and Wages, 2013
cutting edge of advanced manufacturing technologies. Examples of the past partnerships include additive manufacturing (E-Beam free form fabrication, additive or 3D printers, etc.), high speed machining, and sensors embedded into structures. According to a February 11, 2014 article in the *Daily Press*, NASA Langley is taking the lead in the Advanced Composites Project and this fall will be bringing online its own industrial robot, known as the Integrated Structural Assembly of Advanced Composites (ISAAC), which will enable engineers to digitally model and simulate composites production "from end to end" with high precision. Future efforts may include next generation additive manufacturing strategies, composite structures and materials, product cycle time reduction and other manufacturing technologies and processes yet to be developed. These large, medium and small sized manufacturers and research labs are growing and require a qualified workforce to stay competitive in the global economy.

According to Old Dominion University’s *State of the Region 2013* report, in 2012 the region added approximately 10,000 private-sector jobs, with 28% of that being in Manufacturing. A recommendation from the same report stated that “an important regional economic development objective ought to be support of short-source, certificate and associate degree programs that are closely attuned to job markets.” Another report produced by Chmura Economics stated that the occupations utilized in Manufacturing are changing rapidly over the next 10 years and likely to favor occupations that are skill and education intensive (*Driving Hampton Roads Competitiveness 2012*).

In a 2012 Advanced Manufacturing employer survey conducted by the Peninsula Council for Workforce Development, 14 manufacturing companies, representing 89.5% of the private sector manufacturing workforce on the Peninsula, reported that 11,150 manufacturing jobs will open through 2016. More than half of the surveyed companies expect to increase business by 8% to 25%, while 43% expect to maintain business at the same level. Businesses report they are transitioning to new materials and new technologies. While employers expected to increase business, 64% of those surveyed described the applicant pool as deficient in applied technical skills. In an Executive Leadership Think Tank held in August 2013 at Thomas Nelson, industry leaders re-confirmed this issue and stated that many of the middle skilled positions in their organizations, especially technicians and technologists, are unfilled due to the lack of candidates with sufficient technical training and broader employability skills. Companies present reported that the need for skilled advanced manufacturing technicians will outpace engineers 8 to 1, and that the majority of these jobs require less than a bachelor’s degree. This recent information mirrors studies at the national level. A 2011 study, *Reclaiming the American Dream*, by the American Association of Community Colleges, reports that community colleges produced 23,652 advanced manufacturing technicians in 2010, but the demand exceeded 47,900.

With a qualified workforce, the advanced manufacturing sector shows great potential for growth. The Hampton Roads Economic Development Alliance (HREDA) reports that a majority of companies announcing openings in the last year were in advanced manufacturing technologies. “An Advanced Integrated Manufacturing Center on the Peninsula would be a valuable resource for both existing manufacturing companies looking to expand, but also new prospects who see a well trained workforce as key to their growth and success,” according to Steve Cook, Vice President with HREDA. Both Hampton and Newport News Economic Development Departments have announced plans to establish “Science and Technology Parks” in their respective localities. According to an October 26th, 2013 article in the *Daily Press* discussing the Hampton Science Park, “The latest plans call for a high capacity computer cluster that could exceed the processing power of the Virginia Modeling, Analysis and Simulation Center in Suffolk and a fully equipped prototyping facility for product development as part of a $1 million regional project.” The Newport News’ Tech Center is a proposed mixed-use development at the corner
of Oyster Point Road and Jefferson Avenue in Newport News. The Tech Center is adjacent to one of ten U.S. national science laboratories, the previously mentioned Jefferson National Accelerator Laboratory, including the continuous electron particle accelerator and free electron laser facility. The Tech Center will also leverage the presence of the Jefferson Laboratory's high-tech scientific and technical workforce and the international user community it serves. The AIM Center would provide the trained multi-skilled technicians and technologist who possess the competencies and adaptability to bridge the technology readiness level (TRL) gap between research, papers and patents, and actual production that both “Science and Technology Parks” would require to be successful.

Initial Planning Results

As a result of the investment by the General Assembly in FY 14, Thomas Nelson commissioned the National Coalition of Advanced Technology Centers (NCATC) to conduct a planning study based on their experience working with colleges and their communities to develop plans for the ten most recent Advanced Technology Centers across the United States (See Appendix A – Advanced Integrated Manufacturing Center Findings and Recommendations Report). NCATC conducted seven meetings with constituent groups in the region, including the Peninsula’s major businesses, chambers of commerce, small manufacturing businesses, the localities, and the region’s public schools and universities to ascertain demand, skill gaps, and high growth career pathways. In its report, NCATC recommended that the AIM Center produce engineering technologists in Applied Integrated System Technologies - Mechatronics, Rapid Prototyping Technologies/Additive Manufacturing, Integrated Advanced Manufacturing/Computerized Machining, and Integrated Personal Fabrication (FAB Labs for entrepreneurs). Beyond the innovations in the AIM Center itself, it was recommended that instruction include well-designed experiential opportunities in actual employer settings. Models such as "rotational internships", with students moving through a series of carefully coordinated workplace experiences with different employers, will be essential to creating the required workforce that employers need.

In addition, NCATC representatives led stakeholder teams of education, industry and economic development on visits to seven model centers of newly developed advanced manufacturing centers based at community colleges. These site visits were targeted to identify best practices, lessons learned and examples to achieve the goal of a truly integrated advanced technology center (See Appendix B – Site Visit Summary Reports). Primary areas of focus on these site visits were Programs and Technologies used in the Learning Process, Partnerships, and Facility Design and Operations. Specifically, the following were the key lessons learned:

- **Examples of Programs and Technologies used in the Learning Process**
  - Curriculum should be based on agreed-upon competencies and provide options for stackable credentials
  - Industry Advisory Boards guide the applied learning methodologies
  - Open-entry, Open-exit; Flexible scheduling; Replicate the work environment
  - Team approach to learning with accelerated certificates and degrees imbedding work experience
  - Work Experience – Industry sponsored cooperative education, internships, apprenticeships
  - Defined career pathways between high school, community college, university and industry
  - Technology must be state of the art and meet industry standards and needs
  - Learning methods will include simulators, real and virtual trainers, quality production equipment and Innovation Centers or Fabrication Laboratories (FabLabs)
Examples of Partnerships
- Business and industry partners of all sizes will assist with curriculum development, sponsorship for facilities and equipment, cooperative education, apprenticeship, and rotational internship opportunities, and hire graduates
- Economic and workforce development partners assist with planning, industry recruitment and coordination, and forecasting
- Education partners assist with dual enrollment, early college, articulation, and co-location of instruction and faculty

Examples of Facility Design and Operations
- AIM Center must replicate industry with flexible space and simulated production capabilities
- Strategic location with open laboratory space, manufacturing floors, and classrooms
- Public/Private funding and operation model

Proposed Programs of the AIM Center
In the way that Netflix transformed the video industry, social media revolutionized marketing strategies and the cell phone changed daily life, new technologies in manufacturing significantly improve products and processes that enhance profitability and global competitiveness. The AIM Center at Thomas Nelson, through partnership with industry, will utilize new technologies and manufacturing processes to transform the development of a highly skilled workforce in manufacturing into an evolving and dynamic model that addresses future needs.

The uniqueness of the AIM Center will be the partnership between education and industry that develops technologists who are innovative and capable of embracing evolving technologies. Current educational models frequently lag behind industry’s advancements and workforce requirements. Workforce development training and credit programs have evolved as needs were identified, but often could not be responsive to existing demands for qualified technicians because of the time required to develop courses and programs, and then recruit, educate and graduate a highly skilled individual -- a process that could take many years. The learning environment of the AIM Center will develop individuals who are successful contributors on a team of researchers, engineers and technologists all of whom individually and collectively are capable of developing solutions to manufacturing’s challenges and quickly moving concept to reality. By working hand-in-hand with industry partners to develop evolving and dynamic curricula and to utilize apprenticeship and intern experiences, the time required to develop a highly trained technician at the AIM Center will be reduced significantly. Developing a culture in the technician workforce that embraces new technologies and integrates these innovations into the manufacturing environment will improve industry’s ability to advance with new technologies. As a result, the region’s highly skilled and innovative technician workforce will greatly enhance manufacturing capabilities and improve the region’s economy.

An existing and successful model is Thomas Nelson’s partnership with NASA Langley and the National Science Foundation’s National Resource Center for Aerospace Technical Education, SpaceTEC. The partnership was developed in 2007 to initiate a co-op and apprenticeship program for hiring new technicians at NASA Langley who would earn the National Aerospace Technician Certification upon completion of their associate’s degree and would have the skills to meet the emerging needs for technicians of the future. Combining classroom instruction with on-site experiences in 15 technical areas and industry mentors, 100% of the graduates successfully completed the certification exam to become Certified Aerospace Technicians and were offered apprenticeship positions at NASA Langley or hired by
The Advanced Integrated Manufacturing (AIM) Center

The time required to complete the academic program and apprenticeship was approximately 50% of previously utilized strategies. This partnership between education and industry to develop highly skilled technicians who are successful in an environment of innovation and emerging technologies is a model that will be utilized to develop new partnerships and educational outcomes for the AIM Center.

A priority focus of the AIM Center will be the increased training capacity and development of new and replicable methods of learning that integrate academic discipline, knowledge and technical competencies for advanced manufacturing. The instruction will be piloted at the AIM Center, working in collaboration with state entities such as the Commonwealth Center for Advanced Manufacturing. The Center will develop and graduate multi-skilled technicians and technologists for industries in the region and beyond who possess the competencies and adaptability to bridge the technology readiness gap between research, papers and patents, and actual production. The AIM Center will encompass the technician skill set and education outcomes of the future, constantly evolving to remain cutting edge in its focus. The Center will focus on a vision for the future that develops technologists who bridge the gap between the technician and the engineer and are an integral part of a team capable of critical thinking, problem solving and future product and process development which will ultimately enhance the economic development of the region.

The AIM Center’s programs will have levels of competencies that can translate into industry-recognized certifications, certificates and degrees along the lines recommended by the National Association of Manufacturers. In addition, students with prior skills and knowledge would be able to enter courses and programs at an appropriate level to advance their qualifications. Consolidation of learning and performance would be achieved through internships and apprenticeships, possibly in a variety of companies, to provide in-depth, practical experience. Thus the AIM Center will have three outcomes:

a. Increased capacity of laboratory- and workshop-based training facilities and integrated curriculum that is competency- and project-based and builds upon current programs at Thomas Nelson.

b. Technologists who are in high demand by existing employers and future employers attracted to the Peninsula as a result of this enhanced workforce.

c. Certificates developed for components or subsets of the AIM Center’s curricula that are stackable and can be used for shorter-term goals of existing industry partners, displaced workers and exiting military.

The distinctive quality of the AIM Center is integration:

- Integration in terms of what is taught. The curriculum will cover the total manufacturing process. Starting, for example, with computer-aided design (CAD), it would take students through rapid prototyping, into production planning and operations using robotic and automated control systems, problem solving, and end with quality assurance, distribution and product life cycle management. The structure of the learning will be tiered in such a way that after each level, or tier, the student has a comprehensive and integrated set of knowledge, skills and attitudes (KSAs) and is capable of performing satisfactorily at that tier. He or she could then move to the next tier, or into the workplace. Only the necessary content will be delivered in each tier. For example, in a tier for rapid prototyping, the student may be required to have KSAs in CAD, electricity, internet searching and mathematical ability, but only as they relate to that tier. The intent is to provide a familiarity with all aspects of modern manufacturing processes while facilitating the opportunity for the student to acquire in-depth competencies in specific areas such as additive manufacturing, production planning, robotic systems or composites. This gives the graduate the capability to recognize the
systems overall, a capacity to be flexible, to be a problem-solver as well as a team-player and an innovator. The integration of subject matter, along with dynamic and flexible scheduling and course delivery techniques, releases creativity and innovation in development. It also allows the curriculum to be flexible and responsive, encourages links between faculty and employers, and supports quality instruction by adapting learning to the student through incorporating technology and workplace requirements.

- **Integration in terms of how it is taught.** Working in teams, students will learn using a project-based approach wherever possible, along with team-teaching, in a simulated production environment, operating state-of-the-art equipment at the AIM Center and with employers. Experience will be enhanced through rotational internships and structured apprenticeships. Unlike traditional academic programs that tend to teach theory first and follow-up with application, theory and skills will be integrated in a just-in-time manner. Students will work as much as possible in teams across the various skill areas, to identify and solve problems as they develop competencies. Throughout the training, they will be encouraged to seek out solutions while being guided by instructors. Wherever possible instructors will operate in teams to facilitate the development of competencies in this interdisciplinary environment. To embed competence, students will be provided rotational internships. Students will attend a series of internships in a variety of companies to develop and apply their abilities in a real-world setting. Work-based learning, either at the AIM Center or in a company’s location, allows for the development and assessment of personal, “soft” skills as well as technical skills and knowledge, thus developing the “complete package” of a multi-skilled worker. Apprenticeships will be developed to enable graduating technologists to further their careers. Performance standards will be set using college-based, faculty-developed assessments and national, professional or industry certifications as appropriate. The integration of what has to be taught and how it will be taught will result in qualifications that satisfy the requirements of the community, the technologist, certificates, degrees and industry credentials.

- **Integration in terms of how the AIM Center operates.** The Center’s educational mission and workforce development focus will be meshed with the economic and workforce development needs and goals for the region. Corporate and agency partners will have a significant role in the governance of the AIM Center and the Center Director will report directly to the President of Thomas Nelson. In addition, the Director will coordinate extensively with industry and the divisions within the college as programs come on line.

**Strategic Partners**

To ensure success and a solid return on the Commonwealth’s investment, Thomas Nelson has collaborated with regional and statewide organizations, businesses and educational institutions to develop the AIM Center plan. The following is a partial list of engaged and proposed partners of the AIM Center:

- The Peninsula Council for Workforce Development
- The Hampton Roads Economic Development Alliance
- The Virginia Peninsula Chamber of Commerce
- The Virginia Peninsula Advanced Manufacturing Collaborative
- The Commonwealth Center for Advanced Manufacturing
Target Populations

- **Community college students** pursuing associate degree and certificate programs related to advanced manufacturing and engineering technologies
- **High school graduates** who are interested in pursuing education and careers related to advanced manufacturing and the associated technologies. Also high school Career and Technical Education students taking related dual enrollment classes.
- **Current employees** of companies seeking to move their workforce into advanced technologies, as well as adults with degrees seeking further credentials for advancement.
- **Military veterans** – the region anticipates 10,000 veterans in the next five years. The community is home to the highest concentration of unemployed veterans in the Commonwealth. The AIM Center will offer credentials that award credit for A-school and related experience, as well as provide accelerated career paths to employment in well-paying technology careers.
- **Dislocated workers** – the college provides rapid response services to the region and will offer individuals who have lost their jobs multiple opportunities for careers in advanced manufacturing.
- **Underemployed and underserved** – the region has a high percentage of underserved adults, including some 40,000 without high school credentials and for whom a Plugged-In program in advanced manufacturing would provide a pathway to a future.
- **Entrepreneurs** – Those who seek to enter small production markets with advanced technologies, and entrepreneurs seeking credentials for government/industry contracts.
Projected Annual Output

At full operation, it is envisioned the AIM Center will graduate up to 200 skilled advanced manufacturing workers with associates degrees, certificates or industry certifications annually.

Location

The AIM Center will be strategically located in the Thomas Nelson service region where population and manufacturers are concentrated, for major access, visibility, and utilization on a major thoroughfare. Thomas Nelson is currently exploring potential sites with the localities it serves.

Leadership and Management

Thomas Nelson is a comprehensive community college, one of the 23 colleges of the Virginia Community College System, enrolling over 16,000 credit and 10,000 workforce students annually. It is governed by the State Board for Community Colleges, and advised by a local College Board appointed by the localities. The AIM Center will be guided by an Advisory Board of corporate and agency partners who are vested in the programs and in the hiring of graduates. It will operate in collaboration with the Peninsula Council for Workforce Development, which is the regional workforce development organization and staff to the Workforce Investment Board for the Virginia Peninsula and a consulting partner in the development of the AIM Center. The AIM Center Advisory Board will assist with curriculum development and evaluation, provide paid internships for students, and support investments in machinery and consumables. The AIM Center will be managed by Thomas Nelson Community College.

Track Record of Success

Thomas Nelson has a strong history of success in building business partnerships in manufacturing and raising the monetary and in-kind donations required for equipment and workforce training and development. The College raised more than $7 million in grants and private support for the Advanced Manufacturing Pipeline, the Precision Welding Center, and the Marine Electrician Lab.

The College has also been successful in building facility partnerships, including the construction of the Peninsula Workforce Development Center (PWDC), a $22 million integrated service center which opened in 2001 and is funded through a 20-year agreement of state, federal, local, and private entities.

Next Steps

Building upon the successful outcomes of the first planning grant in FY 2014, Thomas Nelson has requested additional funding in the FY2015/2016 biennium budget to support the following activities:
The Advanced Integrated Manufacturing (AIM) Center

- Consultation for a sustainable business model for construction and operation with combined funding from various sources, to include corporate, state, local, federal, grants and philanthropy
- Engagement with strategic partners for funding commitments
- Detailed programmatic planning, to include structured internships and apprenticeships in partnership with industry
- Preliminary planning for site determination
- Preliminary planning for facility and associated equipment / technology

Additional funding will be needed to conduct the following activities deemed essential for the continued planning and execution of the AIM Center at Thomas Nelson:

- Engagement of architect/engineering firm for comprehensive detailed facility pre-planning and design
- Site determination in consultation with involved localities
- Programmatic leadership for advanced manufacturing curriculum and instruction delivery

Discussions with industry and community stakeholders will continue in an effort to garner support for the AIM Center. In addition, industry input will be used to develop programs and establish effective work-based learning opportunities.

Summary

The Advanced Integrated Manufacturing Center located at Thomas Nelson Community College will be a Human Capital Accelerator. Students from varying socioeconomic backgrounds will master advanced technologies and qualify for well-paying jobs without incurring the burden of years of debt. The AIM Center will help to decrease unemployment rates, facilitate the rapid re-employment of veterans and dislocated workers, assure the current labor force has a means of advancement in new technologies, and provide a pathway to family-wage jobs for low-skilled workers in the region. It will be a regional and state resource for new ways of preparing students for the 21st Century. The presence of a showcase AIM Center on a main thoroughfare will attract equipment donations, and a state-of-the-art Center will serve as a magnet to attract young people into new careers in advanced manufacturing. The AIM Center will be a beacon to commerce in an age of innovation, encouraging more businesses to expand and invest in Virginia.
Advanced Integrated Manufacturing Center

Thomas Nelson Community College

Attachment A: National Coalition of Advanced Technology Centers Report and Recommendations
Advanced Integrated Manufacturing Center Site Review - Final Report & Recommendations

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PURPOSE AND PROCESS

The overall goal of this project is to support Thomas Nelson Community College in its endeavors to create a world class Advanced Integrated Manufacturing Center (AIMC) to serve the workforce and economic development needs of key areas in the Virginia Peninsula and greater Hampton Roads region.

MAP Purpose

- Guide the orchestration and fleshing out of the vision, development, positioning, framing, and materializing of the desired Advanced Integrated Manufacturing Center (AIMC) and its role in advancing the economy of the Virginia Peninsula in advanced manufacturing: from such sources as global networking, research reports, national trends, and recent expansion announcements in the region: e.g. Most recently, Canon, Virginia, Liebherr Mining, and the Jefferson National Accelerator Laboratory.

- Coordinate with Thomas Nelson and the Peninsula Council for Workforce Development in its facilitation of three Leadership Think Tank and six community roundtable discussions with key stakeholders, including the Thomas Nelson Leadership, the Thomas Nelson Corporate Advisory Board, Canon, Newport News Shipbuilding, NASA Langley, Continental, Alcoa/Howmet, Liebherr Mining, Ferguson, as well as Siemens and Jefferson National Accelerator Laboratory, Commonwealth Center for Advanced Manufacturing, and numerous small companies, government, and education to review present and emerging needs for technicians in advanced integrated manufacturing. The Think Tanks will clarify the concepts for an innovative postsecondary education and training center focusing on current high demand and emerging STEM disciplines in advanced manufacturing. The AIMC should feature integrated design and automated production machinery and processes, and team-taught interdisciplinary postsecondary curricula leading to well paying jobs with long-term career opportunities on the Virginia Peninsula.

- Develop recommendations on the instructional model, including the role of the project based learning, experiential and work-based learning including apprenticeships, team-teaching, and accelerated career pathways for different populations, fostering thoughtful discussions on recent research reports on advanced manufacturing and technologies including:
  - *The Skills to Succeed Inventory: Virginia Peninsula Career Pathways in Advanced and Precision Manufacturing Technologies*, 2011, Peninsula Council for Workforce Development
  - *Pathways to Prosperity: Meeting the Challenge of Preparing Young Americans for the 21st Century*, 2012, Harvard University
• The model should describe in particular the relationship to industry, secondary, and/or university partners for different pathways. The population would include traditional students and nontraditional students including veterans, dislocated workers, underemployed, and underserved populations, and other adults seeking high paying careers.

• Assist in defining how the AIMC should be organized to deliver instruction and learning, how the corporate partners are connected, what models of governance should we consider to engage industry while operating a true college, how to partner with industry to deliver state of the art content on state of the art equipment, to include more work-based experience and credentials, including apprenticeship and cooperative education, with a focus on “Gold-Collar Workers” and technicians, and accelerate noncredit and credit program graduates into employment upon program completion.

• Assist the Thomas Nelson Community College leaders in developing a feasibility plan for the future Advanced Integrated Manufacturing Center (AIMC) and validate the current plans to become a hub of World Class advanced manufacturing processes and production in areas that include modeling and simulation, robotics, composites, additive manufacturing, product life cycle management, integrated process production, etc.
The NCATC Team will utilize the Peninsula Council for Workforce Development (PCFWD)-facilitated think tanks with major stakeholders, Planning Team site visitations and review of pertinent documents for gathering information and conducting the study. At a minimum, it is expected that the team will focus on the following in gathering key strategic planning information for the AIMC:

- **Benchmarking** – Identify and plan site visits to at least five advanced technology centers at community colleges that are delivering on a part of the vision and arrange tours of these for a Task Force of Key Stakeholders, representing industry, the schools, workforce board, and local government economic development.

- **Leadership Brief** – Review existing national, state, and regional economic development surveys, research reports, and related information from regional chambers of commerce and colleges and workforce boards to identify current and future opportunities and gaps for a briefing with Thomas Nelson Leadership and the Planning Team.

- **Business and Community Leadership Think-Tanks** – Coordinate with the internal and external communities to actively participate in discussions and fact-finding on industry and community current and future needs.

- **Organizational Models** - Review community college-based ATCs for organizational national industry organizations, models that have been successful in delivering on the vision and producing an industry responsive program of qualified technicians.

- **Governance Structures** – Review existing ATC governance and operational structures that ensure the meaningful engagement and ownership of business and industry partners while ensuring the ability of the college to effectively manage operations across college divisions and departments to meet community needs.

- **Business and Strategic Plans** – Review existing strategic and tactical (operational) planning documents to identify opportunities and gaps; provide direction using best, most promising practices, sustainability, and other key financial elements and develop and recommend business and strategic plans for the center.

- **Curriculum Plan** – Review existing ATC related curriculum documents to identify opportunities and gaps and to include apprenticeship and other forms of work-based learning; provide direction using best and most promising practices across the NCATC network. Working with the Thomas Nelson Planning Team, and based on the outcomes of the think-tanks, develop a recommended curriculum plan.
• **Facility Design Concepts and Equipment Technology Integration** – Benchmark facility space, size, and location as well as hands-on training equipment. Review existing or planned facility design concepts with training equipment and compare to existing state-of-the-art ATC designs to identify gaps. Assist in coordination of at least five (5) ATC benchmarking site visits recommended by NCATC, including, but not limited to: Cuyahoga/Lorain CC (OH), Gateway TC (WI), Edmonds CC (WA), and Ogden CC (UT).

• **Marketing** – Review marketing and outreach strategies used for both industry and community audiences by the college. Identify opportunities and gaps within existing marketing activities regarding both audiences.

**Interviews**: Meet with and interview the college leadership as coordinated by the Vice President for Workforce Development. These meeting times and durations will be arranged by staff of Thomas Nelson Community College prior to the team arriving in Hampton, VA.

**College Site Visits**: Perform site visits to facilities of Thomas Nelson Community College and tour the campus credit and non-credit manufacturing program facilities. Review appropriate systems, budgets, and college planning documents as made available by the college.

B. As practical, documents subject to review will be supplied to the consulting team prior to the team arriving in Hampton, VA.

C. The NCATC Team will spend a total of 3.5 days at Thomas Nelson Community College in Hampton, VA to gather the necessary information to prepare the required review and report, to include 1 day with Business Executive Leadership and 2.5 days meeting with small business representatives, K-12 and university education, localities and community and college leadership.

• The NCATC Team will prepare and submit a final report of their findings that addresses the above stated purpose as well as any resultant recommendations.

• A draft report will be prepared and filed with the VP, Workforce Development three-four weeks following the conclusion of the NCATC Team visit.

• A final report will be prepared and submitted five-six weeks after feedback from VP, Workforce Development and following the site visit.
1. Welcome and Vision – Dr. John Dever, President, Thomas Nelson Community College
2. Project Overview – Dr. Deborah Wright, Vice President, AIMC Project Lead
3. Advanced Manufacturing Worldwide and U.S.—Diane Dostie, NCATC, President Central Maine Community College, Auburn, ME
   b. Workforce Development – Advanced Manufacturing Centers nationally and globally
4. Advanced Manufacturing on the Virginia Peninsula – Steve Cooke, HREDA; Shawn Avery, PCFWD
   a. Economic Development, Strength and Growth, Expansion Announcements, Opportunity
   b. Workforce Development, Strength, Demands Present and Future, Opportunity
5. Diane Dostie, NCATC
   a. Programs—How ATCs organize to deliver instruction, what are models of innovation in instructional delivery, work-based learning/coop/apprenticeship; interdisciplinary/applied, team teaching; project based instruction
   b. Governance—How do ATCs engage industry, apprenticeship, copy & operate true college with work-based credentials; what models of governance
   c. Funding, Public and Private—What ATC models exist for engaging stakeholder funding
6. Think Tank Roundtable
7. Open Discussion
EXECUTIVE SUMMARY

On August 23, 2013, NCATC consultant Diane Dostie conducted an Executive Leadership Think Tank with leaders of the corporate community and faculty and administrators of the College. The essential need was identified by industry:

Technicians and Technologists

- High Level: Engineers: MAT, MEC, MFG, ELEC, DESIGN, CHEM, SOFTWARE.

- Mid-Level: With Cross Training and Experience: Electrical, software with 5-10 years of experience in the area between Engineer and Technician.
  - Technician of the future will have specific engineering skills and will work with Jr. Engineers.
  - Electrical, mechanical, hydraulics – 2 techs per Engineer to be eyes, ears, hands – to be the practical; college technical preparation, but less than bachelors.
  - Process Operators, Machinists, Technicians with broad skills, not just one specialization – Agile & flexible – composite to process operating to build facility.

- Low Level: Skills and capacity to be trained in Math and Communications, up to college entry.

- All Levels: Soft Skills: Teamwork, Respect, Get Along, Writing, Problem Solving, Trouble Shooting.

Industry Engagement

Integral industry role in advising programs and curriculum improvement, providing rotational internships, apprenticeships, and cooperative education, and job placement of graduates, as well as providing financial and in-kind support for state of the art equipment and materials

On September 04-06, 2013, Craig McAtee and Paul Pierpoint made a two-and-a-half-day, intensive site visit to Thomas Nelson Community College (TNCC) located in Hampton, VA. This NCATC MAP visit included conversations with the college leadership, economic development, K-12, Post-Secondary Education, community leaders, business/industry leaders, and technical faculty and staff focused primarily on programs offered at Thomas Nelson Community College in the advanced manufacturing and technology related areas.

The goal of this project is to support Thomas Nelson in its efforts to create a world class Advanced Integrated Manufacturing Center (AIMC) to serve the workforce and economic development needs of key areas in the Peninsula region.
The NCATC team fully supports the plan to build a new ATC / AIMC to serve the employers of the VA Peninsula area and we recommend that Thomas Nelson proceed with plans as quickly as possible. We believe that building a comprehensive AIMC is critical to achieving the region's goal of becoming a strong manufacturing center.

Some key advanced technology opportunities that we identified include, but are not limited to:

- **Applied Integrated Systems Technologies** – Mechatronics, Multi-Skilled Industrial Maintenance Technology, etc.
- **Composites / Rapid Technologies / Additive Manufacturing** – 3D Printing
- **Integrated Advanced Manufacturing / Computerized Machining (CNC)** – digital manufacturing and computer numerical controlled machining.
- **Integrated Personal Fabrication** – FabLab, Maker Space, etc.
- **Design Technologies** – CAD/CAM/Rapid Prototyping
- **Green Building and Alternative Energy** – Residential & Commercial
- **Building Automation / HVAC** – Residential & Commercial
- **Supply Chain Management** – Distribution, warehousing, etc.
- **Welding and Fabrication** – many existing and future jobs in The VA Peninsula.

**INTRODUCTION**

This report represents our suggestions and recommendations concerning the planning and development of an Advanced Technology Center on the Virginia Peninsula. Thomas Nelson Community College, an institution with a strong reputation for high quality workforce development services and programs for the region, is proposing this center. The purpose of the proposed Advanced Integrated Manufacturing Center is to be the catalyst to propel this region to the forefront of modern global manufacturing through innovative workforce development initiatives and to create a community culture that values and promotes advanced manufacturing as a critical element to its future.

**What we have learned**

From information gathered from the major manufacturers in the region in the Executive Think Tank with Diane Dostie and from our meetings with municipal leaders, economic development professionals, educators, small business representatives, and Thomas Nelson's own leadership team, we conclude the following:

The Region is ready to invest in an Advanced Integrated Manufacturing Center at Thomas Nelson, and that this facility will, indeed, be a powerful agent for economic development and community advancement well into the future.

**Assets** - The College enjoys very good support from local and regional officials and has excellent relationships with many employers, economic development organizations, and other key partners. The region is experiencing some significant economic growth and recovery – especially throughout the manufacturing sectors of the area.
The College is located in the heart of Hampton Roads, the nation's 37th largest region with a population of 1.7 million. Hampton Roads comprises 17 cities and counties and supports a manufacturing sector that produces over $13.5 Billion in shipments annually.

The region has a strong manufacturing history anchored by the shipbuilding and repair facilities. Beyond shipbuilding, the area's manufacturing base is diversified with a significant presence of aerospace, automotive, digital control, energy and turbine, food products, metals and composites, mining, sensors, robotic equipment manufacturing and other advanced technology industries. There are a small number of larger manufacturers but the region is primarily characterized by small to mid sized companies.

Employers in the region possess a reserve of expertise that can be invaluable in the design of the center, the selection of technology, and the development of curricula. (For example, NASA Langley is a world leader in composites, additive manufacturing, and robotics, Jefferson Labs – in nano-tubes, etc.)

While not located on the peninsula, the region's manufacturers benefit from the Commonwealth Center for Advanced Manufacturing (CCAM), which provides applied research for developing new, advanced manufacturing technologies and processes. This key resource will be pivotal for area manufacturers to be at the leading edge of competitive technologies. The importance of the AIMC to train the workforce for the new technologies and applications cannot be overstated.

Unlike many regions of the country, the community here has a generally positive perception of apprenticeship models of training primarily because of the long positive history of the Apprenticeship School at Newport News Shipbuilding. This program is so successful that applicants exceed openings.

Local Government Collaboration – The College’s immediate service area comprises a population of 500,000 in six localities—these are the Cities of Hampton, Newport News, Williamsburg and Poquoson, and the Counties of York and James City. Although the localities operate independently for the most part, with separately elected boards and taxing authority, they have established a “best practice for Local Government Collaboration” in the Commonwealth to co-fund Thomas Nelson and related education, economic and workforce development initiatives. The long history and success of these initiatives gives strong evidence of the ability of these localities to form the regional collaboration needed to support the Advanced Integrated Manufacturing Center. For example:

1. Thomas Nelson Site Improvements Budget - For forty years, the six localities annually agree and co-fund proportionately a Local Funds Budget for the College’s campus site improvements. The fund is administered by the College’s Local Board. This last year that funding from the six localities amounted to $528,000.
2. **Peninsula Workforce Development Center** – The six localities partnered with VCCS. The state and our businesses to fund a $22 million, 92,000 sq ft facility which opened October 18, 2001. This last year that fund totaled $219,000. The Center staff provides services throughout the Virginia Peninsula and offer classroom trainings that serve the lower Peninsula.

3. **The Thomas Nelson Workforce Center at Williamsburg** – The six localities have further contributed to the cost of leased space for a workforce center in New Town that serves the Upper Peninsula with classroom space available for just in time and customized training for businesses. This last year the combined funds totaled $110,000.

4. **Peninsula Worklink**. The six localities and City Gloucester to the North collectively contribute to the funding of the Peninsula Council for Workforce Development and the operation of the regional one-stop, Peninsula Worklink; which Thomas Nelson operated for ten years and for which Thomas Nelson is one of four organizations serving as consortium operator.

5. **New Horizons Regional Education Center** – For thirty years, the five school boards serving the six localities also contribute to co-fund the region’s technical high school.

6. **The Hampton Roads Economic Development Alliance: Northside** – For six years, the six localities have partnered together with Gloucester to co-fund their economic development marketing and business recruitment efforts 2000-2006. Since 2006, the six Northside Hampton Roads localities (the Virginia Peninsula) have partnered with seven localities of the Southside of Hampton Roads for a single Hampton Roads business recruitment effort.

The region includes a very large number of veterans due the sizeable present of the military on multiple bases in the region, who, with proper training, often make ideal employees for manufacturers.

Area leaders in government and industry provide data and financial support for economic and workforce research and share a very strong commitment to addressing workforce development challenges regionally.

**Local Challenges** - Although the six localities that make up the Thomas Nelson service region have a history of strong collaboration with Thomas Nelson and their combined economic and workforce boards, the separate government and taxing districts causes a lack of a shared focus for significant economic expansion as a region and challenges efforts to promote the Virginia Peninsula and the Hampton Roads Region nationally and globally as a good place to locate businesses.

While the region’s manufacturing base is diversified, it remains largely dependent upon federal funding. The vagaries of federal spending create cycles of growth and retraction that need to mitigated with a more diversified manufacturing base that is less impacted by federal fiscal policy.
A common challenge to all manufacturers in the region regardless of size is obtaining the quality workforce they need in the modern manufacturing operation.

The need in this region is for employees with skills higher than those of a technician but less than an engineer. These ‘multi-skilled technologists’ will be the eyes, ears, and hands of the engineers.

There is a large part of the population that did not finish high school or obtain a GED. This population lacks the skills necessary for a family sustaining job and cannot contribute significantly to the economic vitality of the region without additional education and training.

The current workforce development system has many strengths but a clear weakness is its inability to consistently provide the skilled workforce that modern manufacturing must have to remain competitive.

**Opportunity for Unity** -- An Advanced Integrated Manufacturing Center at Thomas Nelson presents an historic opportunity for a shared regional vision to partner to create a STEM-prepared population at all levels. The Center would benefit dual enrolled high school students, postsecondary technical students, large underserved adult minority populations, unemployed military veterans and dislocated workers opening opportunities for them as community-college prepared technicians and technologists, and students articulating into university engineering and related programs in advanced technologies.

**How can an ATC help?**
The main goal of the ATC / AIMC is to reverse the weaknesses in the Workforce Development (AIMC) system and, in fact, to make the local workforce a major positive asset to the region. It can also be a catalyst for greater regionalism - especially in terms of economic development.

The center's mission will be not only to produce highly qualified manufacturing technologists, but to help shape the values of the entire community to create an ecosystem that is supportive of modern advanced manufacturing as an agent for personal career success and a strong economy, and as a vehicle for community development and regional cooperation.

**Suggestions, recommendations and issues** - To fulfill its primary mission of developing a world-class workforce for the manufacturing sector, the center will require the full participation of all major segments of the community.

**Civic and political leaders** will be called upon to provide support for both the creation of the center and for its on going operations.

**Employers** will be integral partners throughout the planning and development of the center but their most critical involvement will be as fully integrated partners in the training and education of students at the center. (More on this below.)
K-12 educators will be called upon to work closely with the center to align curricula and create seamless pathways for students to enter the AIMC programs with strong basic skills as well as foundational work ethic.

The local **Workforce Investment Board** will be called upon to help qualified adults obtain the resources to allow them to seek training or retraining at the center.

Area **philanthropists, foundations, and organizations** will be solicited for their financial support for the creation of the center and to help provide access to more students through scholarships.

**Economic Development** leaders will be expected to demand the best from the center and also in return to lobby vigorously on its behalf. All community leaders will be expected to advocate for the center as a crucial element in the region's future. Without broad and deep buy-in for the center, its ability to achieve its full potential as an agent for purposeful change in the community will be limited.

**CONCEPTS TO CONSIDER**

The facility and equipment will be state of the art but the true innovation in WFD must be in the design and delivery of instruction. The center will provide the opportunity for the College to create groundbreaking new learning models with academic and technical content fully integrated in problem based learning pedagogy. More importantly, the close partnership with employers will allow the problem-focus of the curriculum to be based on real challenges faced by manufacturers.

**Rotational Internships** - Beyond innovation in the center itself, learning will include well-designed experiential opportunities in actual employer settings. During the Think Tanks, employers of all sizes, large and small, expressed a desire for partnership and co-investment in paid rotational internships as a part of credit and noncredit certificates Models such as "**rotational internships**" with students moving through a series of carefully coordinated **workplace experiences** at different employers will be essential to creating the workforce employers need. The center creates the opportunity to eliminate the social, cultural and physical walls that separate traditional education and training from the workplace.

**Business Partnerships** - The expectation is that manufacturers will be partners with the college throughout all phases of workforce development. They will work together to change perceptions of children, parents, teachers and counselors about manufacturing. They will help the college develop curricula, and recruit and develop instructors, (probably provide their own staff as adjuncts). They will provide extensive workplace experiential learning for students that will be fully integrated with the learning occurring in the AIMC. **Project mentors** would from industry are encouraged to work with Thomas Nelson students and programs is encouraged.
It is this very close and extensive partnership between the college and the manufacturers that will be the key to the success of the center in creating the workforce the region needs to be a world leader in manufacturing.

**Governance** - Governance of the AIMC should be broad and deep. All key sectors of the community should feel a sense of responsibility for the success of the center. This means a strong advisory council invested with meaningful authority over the operations of the center. The Council should be active in all of the employer engagement scribed above - curriculum design and development, equipment identification and procurement, workplace experiences for all students, placement of graduates and ongoing advocacy for the center. How members of this council are appointed will be an important decision that we defer to the local leaders. One recommendation we make, however, is participation on the council should come with substantive support for the center in the form of financial or political value.

**Integration** - If this project is to be characterized by any single word, it would have to be "Integration." everything about the center will be integrated. Governance will integrate political, economic, and educational sectors.

The curriculum will be fully integrated with academic and technical learning melded into a common educational experience. Employers must be fully integrated partners throughout all aspects of the center from recruiting through placement and beyond. The old model whereby employers view the College as a supplier of trained employees instead of as a partner in creating trained employees will not work.

Delivery of education and training itself will be integrated with the workplace. The center will recognize the kinesthetic learning strengths of the most successful technology students.

The center will also be a vehicle to integrate the academic core of the college with the workforce development arm of the college to create a highly responsive curriculum that maintains the academic integrity of the college.
ATC DEFINITION

Community colleges have added Advanced Technology Centers (ATCs) to their community outreach tools in concerted efforts to address the needs of business and industry. There is no definitive model of an ATC; rather they have been developed to meet the unique requirements of a particular district or region. The most common elements of ATCs across the country are an entrepreneurial spirit and a business approach to education and training.

An ATC is a commitment of people and resources in the effort to reach, enhance, and add value to business through highly responsive workforce development programs and (as appropriate) technology transfer services to help employers remain competitive. An ATC is not necessarily a physical facility, but is often thought of and referred to as a structure. An ATC is more an array of highly technological offerings than a physical facility. But, because the technologies for innovation typically require greater and more flexible space than exists on a typical college campus, draw additional student populations, operate on different time schedules, and require recurring collaborative investments to stay “advanced,” they typically require a separate customized and flexible facility.

Beyond bricks and mortar, an ATC operation is a conscious effort to bring together the resources of the college in business and industry outreach, and it can be an organizational model that encompasses many functions of the college. A successful AIMC serves as a locus of economic development with substantial and concerted business and industry outreach products and services.

NOTE: Expanded definition / terminology for ATCs can be found on page 46.
SPECIFIC OBSERVATION HIGHLIGHTS

1. **Manufacturing Sector Health** - The manufacturing base of Hampton Roads is quite large with some 275 companies and robust as many that we have seen elsewhere in the country. The sector includes 14 large Virginia Peninsula companies that employ 85% of the region’s 28,000 skilled workers. Some 250 smaller manufacturers in Hampton Roads that employ 25-50 individuals each. The Greater Hampton Roads Region contains a healthy and diversified range of domestic and foreign manufacturers in such sectors as defense, marine, aerospace, energy, turbines, medical, camera, digital equipment, fiberoptics, software, and food products. This strong manufacturing diversification has helped the region maintain its manufacturing strength during the economic downturn that affected most of the Commonwealth, the nation, and the world. Hampton Roads industries reported a net gain of 1,100 manufacturing jobs for the year ending December 2013, the large majority in North Hampton Roads/Peninsula region where the AIMC would be located.

2. **Career Opportunities** - The region will present excellent career opportunities for decades to come for individuals with the right combination of technical skills, employability “soft” skills and work ethic. The greying of the sizeable workforce with an average age over 55 will require additional skilled technicians. In addition, it is anticipated that the impact of sequestration on the defense industry may result in significant numbers of military and contractors needing to be trained in non-defense manufacturing jobs in the region. The college can have the greatest impact in developing career technical skills. But a challenge will also be in creating the facilities, curricula, and learning experiences to develop its students’ employability skills and work ethic to meet employer expectations.

3. **Community And Industry Commitment** - Thomas Nelson has enjoyed a history of partnership with industry and government to produce a skilled workforce of technicians that dates back to the college’s second year of operation, the longest sustained partnerships being with NASA, the Cities of Hampton and Newport News, and the Shipyard. A strong foundation already exists at the college with dedicated and skilled instructors knowledgeable about the demands of the modern manufacturing related workplace and committed administrators who understand how to connect the institution with employers. There seems to be a strong commitment across the majority of the college and in the community to continue to invest further in developing a world-class manufacturing workforce.

4. **Technical Training** - Thomas Nelson offers a wide array of technical training and education including a variety of programs under the umbrella of Information Technology and Engineering Technology. Many certificates, like CCNA, A+, are offered in both credit and noncredit formats to meet the needs of different populations.
NOTE: We did not investigate enrollment or rates of completion, placement or continuation into higher credentials for these programs. However, most classes seemed to be running at full capacity.

Of particular note is Thomas Nelson’s history of partnership with major manufacturers in the region to provide customized degrees, certificates, and industry credentials. During the Executive Leadership Think Tank Session, these companies referred to four in particular as models for the AIM Center:

The Design Coop Program – Thomas Nelson worked with Newport News Shipbuilding to develop and deliver a customized Associate in Applied Science Program in Computer Automated Design that included a paid internships – a cooperative education work experience for six credits at Newport News Shipbuilding, which the employer paid students in the Thomas Nelson program $2,000 per month to work on the job during semester breaks. Over 400 students graduated the program over ten years, including from other Hampton Roads Colleges, Tidewater and Rappahannock, with the vast majority from Thomas Nelson. With successful GPA, their tuition paid by the manufacturer, and were employed as mid-level designers on graduation at salaries beginning at over $30,000 with full benefits. This customized Associates degree was mentioned as a model for internships for the AIM Center.

The Aerospace Technician Program – Thomas Nelson has had a 45-year history of partnership with NASA Langley, including several cooperative education programs graduating over 800 associate degree technicians. The most recent was an aerospace technician program where students completed coursework at Thomas Nelson and rotational internships at NASA or a NASA contractor. On completion of their associate’s degree, students took the national aerospace exam. Thomas Nelson students maintained a 100% pass rate on the national exam. Upon hire, the Thomas Nelson graduates were given credit for three years in NASA’s five year apprenticeship program. This was also mentioned as a model for rotational internships for the AIM Center.

The Canon Connect Pipeline – Thomas Nelson was recruited to partner with Canon Virginia and the City of Newport News and the Virginia Economic Development Partnership in an expansion proposal to Canon headquartered in Japan. Thomas Nelson proposed to form and lead recruitment, screening and training partnership for Canon with other colleges and agencies that would deliver over 500 skilled technicians. The proposal was a key to landing the expansion in Virginia. Thomas Nelson accessed federal, state, local and private funds and led a Collaborative of Virginia Community Colleges, the Employment department, and the region’s One Stop Centers that has recruited over 10,000 to the employment department, provided orientations at the one stops, and offered pre-hire training at the college, and customized credit and noncredit post-hire training on-site at the Canon Workforce facility.
Thus far, over 550 skilled technicians have been hired and skilled through the collaborative efforts of partners. This was mentioned as a model for pre-employment pipelines for AIM Center, working in partnership with the Workforce Board and Economic Development. This program is an example of an integrated credit and non-credit credential.

The Marine Skilled Trades Training Program – A two year partnership of five regional community colleges serving ship manufacturing in Hampton Roads, led by Thomas Nelson, included industry, the Virginia Community College System, Tidewater, Paul D. Camp, Rappahannock and Eastern Shore Community Colleges and the NSF SMART Center. The program leveraged public and private funds to replicate industry training in college classroom and mobile labs to produce a pipeline of highly skilled, employment-ready marine electricians, surface painter, outside machinists, and welders. Graduates are hired by industry at $32,000 with full benefits after 80-120 hours of intense, hands-on college instruction in mock ups replicating the ship unit. The program has prepared over 250 manufacturing technicians with a 98% graduation rate, a 92% placement rate, and over a 95% job retention rate. This was mentioned as a model for accelerated short-term technician training for the AIM Center.

5. **Equipment** - The College has made a quite good investment in equipment over the years and has a good inventory to support information technology, construction trades, machining, auto repair, and other industrial technology programs. The access to this equipment varies from the current technologies offerings to other campuses and some facilities are better than others at providing a good learning environment. And, the IT and Construction areas seem to offer good hands on equipment labs for solid experiential learning.

6. **Facilities** - While the current *applied technologies center* PWDC campus is generally adequate, much of its structure does not reflect the modern industrial workplace, as a progressive 21st century educational facility should. Several rooms are smaller and a bit cramped, cinderblock walls lend the feel of an older vocational school, and the building in general does not create a completely exciting environment that respects both students and faculty due to its 20th century cement block walls and lack of modern, transparent labs in the majority of the space. In addition, the PWDC was created for just-in-time noncredit offerings. Substantial space is unavailable on campus in present buildings to expand an array of manufacturing offerings in the credit arena, including transfer and applied degrees and certificates. This has led the College to lease an additional 4,500 ft\(^2\) building off-campus to facilitate the expansion of trades’ skills training.
7. **The Vision** - the College’s “AIMC Vision” plan is farsighted and exciting. It is clearly a rallying point for the college and for the community. It will continue to create rising expectations, as the plan becomes reality over the coming years. As with any grand plan there will be some significant challenges down the road so it is important that the college leadership continue its successful effort to build strong partnerships within the institution and with the community. The open and transparent approach to creating and eventually implementing the “AIMC Vision” will ensure its success.

8. **Engaging Youth and Young Adults** - Numerous business, industry and community participants in the two and one-half day fact-finding trip expressed concern about the rapidly declining work ethic among the younger crowd. This appears to indicate a fundamental culture change that has had impact nationally may be even more acute in Virginia. It will not be enough to have world-class training programs oriented to well-paying jobs to ensure a globally competitive workforce. Initiatives designed to restore a solid commitment to the value of work may need to be incorporated into the design and operation of the AIMCs to ensure their success in helping to spur economic development for the 21st century. Many are looking for “Rural / Farm Kids with IT or Manufacturing Passion”.

9. **Increasing Access** - The population of 500,000 on the Virginia Peninsula travels extensively up and down the region boarded on three sides by water. All are within 30 miles of a facility located in the central area of the Peninsula from the Hampton Campus area to Mid-Newport News/Yorktown. The widely dispersed population of more than 1.7 million in Hampton Roads creates significant challenges for access to advance training. Participants were in general consensus that people will not travel far (30-40 miles) for training and education yet it is unrealistic to expect to put world-class training within easy commute of everyone. It is easy to fall back on models of distance education over the Internet and possibly even television, but the reality is these models alone have limited effectiveness in delivering the kind of skills and knowledge the ATCs are designed to deliver. The instructors and administrators at the AIMC will have to be very creative in the design and delivery of instruction in order to serve the substantial numbers of students more than a short commute from the AIMC.

   **NOTE**: Recent developments from “DigitalVille” and “Apple’s iPad/iBooks Textbooks” initiative could make a very big, positive impact in these needs and should be followed closely for potential integration – as appropriate.

10. **Sustainability** - It is our experience that a successful major Advanced Technology Center requires sustainable funding that is a strategic and long-term investment with a long-term payoff. No effort succeeds as a one-time investment. Sustained innovation requires collaborative funding at multiple federal, state, local, private, and community college levels.
Sustainability of the AIMCs is of some concern for many participants. Facilities of this kind require ongoing capital support from the public and industry to keep training technologies up-to-date for rapidly changing industrial and technological needs. They also require ongoing, predictable operational funding in order to be able to hold prices low enough to provide access to the people who most need the AIMCs’ services.

**NOTE:** There was insufficient time to learn about the entire regional initiatives and apologies are given for observational inaccuracies that may result from such a short visit. It is our opinion that this review validates the plans of Thomas Nelson and it encourages the leadership to continue its outstanding work.
GENERAL RECOMMENDATIONS

Based on these observations and additional details gleaned from our visit along with experience from other AIMCs, we offer the following recommendations:

1. Proceed as Rapidly and Practically as Possible to Create an Actual “Advanced Integrated Manufacturing Center (AIMC)” as envisioned. Without the AIMC, an inadequate workforce will restrict the long-term strength of the region’s manufacturing based economy. The necessary skills cannot be imported; they must be created locally and regionally. The community clearly supports the initiative and recognizes it needs the AIMC to fulfill the economic potential in the VA Peninsula region. The timing may never be better given the availability of resources, the commitment of people inside and outside the college, and the strong economic growth – especially in advance manufacturing industries. (*This is not withstanding the economic and political uncertainty facing the nation as we write this report.*)

   **NOTE:** Thomas Nelson should continue to enhance, grow, and promote all of the programs, education, and training that will eventually be housed in the AIMC building as a *virtual AIMC presence* in the VA Peninsula, going forward.

2. Continue to Build Emphasis Across all Units of the College to Focus on the Needs of Business and Industry. Thomas Nelson should continue to enhance, grow, and promote all of the programs, education, and training that will eventually be housed in the AIMC building as a *virtual AIMC presence* in the VA Peninsula, going forward. It should be noted that there is confusion from the many similar names and abbreviations, and consideration should be given in merging divisional silos for greater efficiencies and effectiveness. A unified “brand recognition” to industry is very important. Something emphasizing *Workforce Development Solutions, and Advanced Integrated Manufacturing Center* is a good place to start. Marketing a simple message with an easy to remember name-emphasizing preparing a highly skilled workforce for the region will be valuable to all constituents.

3. Review, Revise, and Integrate Current Programs into the AIMC. Thomas Nelson appears to offer a lot of programs that provide logical, ready for stackable credentials. All similar programs / courses should be reviewed system-wide and consolidated / AIMC to industry and academic needs with core curriculum being standardized and concentrations (specializations) being taught at specific campuses where they are best equipped.

4. Create a College-wide, Unified Strategic Plan for Advanced Manufacturing. Thomas Nelson needs a unified, strategic plan for all of its technology-related locations to emphasize 21st century industry-driven, equipment and facilities that ensure safe, attractive, and effective learning environments. The creation of a state-of-the-art AIMC should also be an opportunity to reassess and improve all technical training and education at
the college. This is important for many reasons not the least of which are the potential morale problems among students and staff located outside the AIMC itself and who do not feel part of the overall improvement process.

5. **Develop and Awareness Plan** - We recommend that there should be as much energy and professional talent directed toward creating awareness among students, parents, high school teachers, guidance counselors and the general public about careers in information technology, construction trades, manufacturing, and advance technologies as there is directed to designing and building the expanded and/or new AIMC. Industrial Maintenance / Mechatronics programs will be in demand by employers for decades and it is very likely that even with full enrollment, jobs may outnumber graduates for years to come. The challenge, however, is getting full enrollment. It is surprisingly difficult to attract capable young people into these programs despite the solid career opportunities that are available. This is the challenge facing most industrial training and education programs. Addressing this challenge requires a community-wide effort to create a culture that respects manufacturing work and that has confidence in the future of this kind of work. We know that the “build it and they will come” mentality that drove the planning for many advanced technology centers in the past has not worked. The college can’t do it alone. Employers must play a key role in educating the community to the opportunities that exist in Manufacturing and related technician careers.

6. **Develop a Staffing Plan** - Review current and future personnel staffing competencies / needs and formulate a plan to adjust staffing levels and skills to improve responsiveness to business and industry training requirements. This may involve professional development initiatives like faculty externships, additional technical training and education, reassigning staff as appropriate, and hiring new Workforce Development staff.

7. **Develop Integrated, Modular Courses and Programs** - Develop additional modular credit and CEI-Credit courses for delivery to business and industry that address their current and future needs while being mindful of the cost-benefit issues. This action will help in offering small chunks of just-in-time training that they need. While credit based credentials are in high demand, some companies may be satisfied with CEU-Credit based courses. And, stackable certificates / credentials will continue to grow in demand and popularity.
8. Create a Regional Model for Articulation - The AIMCs will further strengthen the College’s influence in the region. Leverage the momentum for the expanded and/or new AIMC to create a regional model that fully articulates from K-12 to the Thomas Nelson AIMC to four-year institutions (2+2+2) and is responsive to the economic development stakeholders to ensure alignment of programs and services for seamlessness and to avoid needless duplication of effort. Even stronger partnerships with Hampton City Schools and surrounding counties (James City, York, etc.) are highly encouraged that best articulate into the TNCC AIMC model.

9. Develop Strong Relationships with Small Businesses - Continue to develop even stronger relationships with successful small business owners and new start-up companies to foster more entrepreneurship, creativity and innovation. Infuse curricula with concepts of entrepreneurship that focus on in-demand technology-oriented education. Consider adding space for the high school programs, staff, and students that meet the College’s AIMC model outcomes within the expanded and/or new AIMC. Many of the innovative ideas and practices shared by the VA Peninsula Public Schools, especially the Hampton City HS, were very progressive and could easily link to the Thomas Nelson AIMC mission.

10. Ensure Work Experience/Internships are Embedded in all Curricula - There is an absolute necessity for applied work experience in industry for students as a part in all AIMC programs in order to develop skilled postsecondary technicians and technologists with the experience to go from program into employment—through co-operative education, internships, and apprenticeships. The strongest programs ensure that students have real industrial experiences from the beginning of their time in the program. In addition current secondary programs in K-12 / vocational schools lack opportunities for students to be exposed to advanced technologies through summer camps at state of the art facilities, and especially for technical and advanced high school students to begin a college education and to gain advanced technical and the applied soft skill competencies sought by industry. Thomas Nelson can fill the gap for employers and provide students with both career and educational pathways, dual enrollment, and Early College at the AIM Center that meet both college credit and employer requirements. Even though the College has best practices in this area—many more formal Co-Ops, Internships, and Apprenticeships are highly recommended!
11. **Co-locate Workforce, Economic, and Business Services at AIMC** - While Thomas Nelson has had some formal discussions around economic and workforce development organizations being integrated within the AIMC – NCATC recommends highly that the potential of providing office space and/or co-locating the Chamber of Commerce, Workforce Investment Board, and the state/region’s Economic Development Authority in the new AIMC to establish it as the focal point for the economic energy of the community and provide a powerful symbol of the cohesiveness of the entire region's economic development efforts. Beyond symbolism, it could also improve the bi-directional communication between all key entities and ensure that the AIMC is always aware of and responsive to the region’s emerging workforce needs.

12. **Integrate the AIM Center into Thomas Nelson Workforce Development** to assure industry engagement. Workforce Development at Thomas Nelson since 2000 is a single operation that includes the divisions of multi-sector continuing education, business and industry training, and career services and is guided by a Corporate Advisory Board, we recommend that the AIM Center be an integral part of Workforce Development. We recommend that a ‘task force’ be appointed to develop recommendations on the AIM Center relationship to the organizational structure, the new roles, responsibilities, and reporting structure. Further we recommend that the AIMC Instructional and Program Team should be located in the advanced integrated manufacturing facility where it would have a significant role in developing and nurturing employer partnerships and in helping to bridge the gap between the college and employers. In fact, we suggest that the AIMC Team be the primary point of entry for all employers and community organizations interested in the AIMC. Its name and contact information should be on all marketing pieces and in all press releases or other communications to the employer community.

13. **Ensure Lean and Safety are Always to the Fore.** Conduct regular Lean 5S and OSHA Safety Audit Programs (e.g., hazardous materials, personal safety, equipment and process safety, etc.) for all hands-on labs/learning centers in the Thomas Nelson system - [http://www.osha.gov](http://www.osha.gov). Build on recent state recognition of Thomas Nelson Workforce Development for best practices in safety protocols.

14. **Nurture Employers Relationships at All Levels** - Employers must be key partners in the AIMCs. While the Chamber and other organizations are valuable, they cannot bring the unfiltered voice of the customer to the AIMC. We recommend that TNCC establish an Employers’ Forum or some other
entity to be housed at the AIMC whereby employers regularly gather to discuss their shared concerns about all issues – not only workforce. Employers should be invited to use the AIMC facilities for meetings and special events. Professional associations such as the local chapters of the SME, AIM Institute, and others should be invited to meet in the AIMC. If possible, drop-in office space to support these organizations should be considered. Ideally, local employers will feel some ownership of the facility and refer to “Our AIMC” and not simply “your AIMC.”

15. Develop a Unified Regional Vision for AIMC - There needs to be more of a unifying vision among all of the stakeholders for the AIMC planned for the Virginia Peninsula region. At times, local and regional economic development interests appear to be competing in the VA Peninsula area rather than sharing a regional perspective. The individual Thomas Nelson sites each have distinctive goals and missions that may not readily align with one another. This diversity of interests may pose a leadership challenge for the president, the VPs and, eventually, the AIMC leadership. The success of the AIMC will be at least partially determined by the commitment of all the various stakeholders to its mission so it is important to plan and operate the AIMC and any AIMC satellite facilities to the benefit of all of those who should have a stake in the economic prosperity of the region.

16. Ensure Systems are in Place for Flexible Design and Delivery - The expanded and/or new AIMC will require a great deal of flexibility in the design and delivery of services. It will need to be viewed as an “industry center” much more than as another academic institution. This means that the instructors and administrators of the AIMC will need to continue to operate outside some of the norms of the academic college. Traditional academic approaches to leadership will limit market-responsiveness, innovation, program development, instructional quality, and economic impact. The AIMC leadership will need a great deal of autonomy and the strong support of the College President to avoid what one industry participant referred to as the “academic black hole.”

And, the AIMC staffing plan may need to involve a fresh review of the College’s HR policies to allow for fluid hiring practices. If indeed “just –in-time” and “just-enough” responses are essential for business, then a pool of training professionals and adjuncts will be necessary.
17. **Create an AIMC Board of Advisors** - We recommend the creation of a ‘Board of Advisors’ for the AIMC comprising executive level representatives from the college, the board of trustees, City government, economic development entities, universities, public education, and labor. This ‘Board of Advisors’ should meet at least quarterly to review how well the AIMC is meeting the region’s needs and to advise the College president on ways to ensure the AIMC is successful. This group should also serve as strong advocates for the Center(s) in the state and nationally.

**NOTE:** While NCATC does not provide an in-depth study of programs’ strengths and weaknesses at this time, we recommend that the Thomas Nelson Administrator(s) in charge of quality control and program effectiveness engage with the AIMC Team to more frequently audit programs that link to industry needs in the region. These audits should involve, but not be limited to: enrollment trends, completion rates, employer satisfaction surveys, age and condition of equipment, and how up-to-date is the curriculum. The vitality of programs and courses in your AIMC will continue to be of high priority for all of its stakeholders.
VA PENNISULA EMPLOYMENT DEMAND

Advanced manufacturing in the U.S. is growing and verging on the next industrial revolution, according to an August 22, 2013, report in *the Wall Street Journal*. The greatest growth is expected in the 11 areas of emerging technologies, including sensing, digital, additive, nano and bio-manufacturing, and robotics.

The Hampton Roads region represents one of the largest concentrations of manufacturers in the Commonwealth, with 20 large firms and over 250 small and medium sized companies. (Hampton Roads Economic Development Alliance; September 2012). Advanced Manufacturing represents a workforce of over 30,000 on the Virginia Peninsula, with a turnover rate of only 3.5% (Virginia Employment Commission’s Quarterly Census of Employment and Wages, 2013).

The Virginia Peninsula advanced manufacturing sector is especially strong, housing multiple U.S. companies as well as German, Japanese, Dutch, United Kingdom, Chinese, French and Chinese advanced manufacturing operations. The Peninsula also hosts two international leaders in innovation in manufacturing-- NASA Langley and the Jefferson National Accelerator Facility.

These large manufacturers, and their small business suppliers, provide specialized products for international markets, are growing and getting stronger. In a 2012 Advanced Manufacturing employer survey conducted by the Peninsula Council for Workforce Development, 14 manufacturing companies, representing 89.5% of the private sector manufacturing workforce in the region, reported that 11,150 manufacturing jobs will open through 2016. More than half of the surveyed companies expect to increase business by 8% to 25%, while 43% expect to maintain business at the same level. Businesses report they are transitioning to new materials and new technologies.

While employers expected to increase business, 64% of those surveyed described the applicant pool as deficient in applied technical skills. In the industry Executive Leadership Think Tank held in September 2013, industry leaders re-confirmed this issue and stated that many of the middle skilled positions in their organizations, especially technicians and technologists, are going unfilled due to the lack of candidates with sufficient technical training. Companies reported that the need for skilled advanced manufacturing technicians will outpace engineers 8 to 1, and that the majority of these jobs require less than a bachelor’s degree.

This recent information mirrors studies at the national level. A 2011 study, *Reclaiming the American Dream*, by the American Association of Community...
Colleges, reports that community colleges produced 23,652 advanced manufacturing technicians in 2010, but the demand exceeded 47,925. According to a 2009 report by the National Skills Coalition, “Middle-Skill Jobs State by State,” about 47% of Virginia’s jobs are in middle-skill occupations, but only 39% of the state’s workers have the appropriate training in those jobs. This again was confirmed by industry leaders at the September 2013 think tank. This skill gap is also a concern for economic development recruitment and retention efforts.

With a qualified workforce, the advanced manufacturing sector shows great potential for growth. The Hampton Roads Economic Development Alliance reports that majority of companies announcing openings in the last year were in advanced manufacturing technologies. “An Advanced Integrated Manufacturing Center” on the Peninsula would be a valuable resource for both existing manufacturing companies looking to expand, but also new prospects who see a well trained workforce as key to their growth and success,” according to Steve Cook, Vice President with the Hampton Roads Economic Development Alliance.
PARTNERSHIPS

In addition to high quality, responsive programming, the success of an AIMC / AIMC is often dependent upon the strength of the partnerships that comprise the center. Thomas Nelson enjoys excellent relationships with a wide range of important community partners who should be considered for inclusion in the ATC / AIMC in one manner or another. Specifically:

Old Dominion University - is already located in the Peninsula Workforce Development Center (PWDC). It may make sense for ODU and other colleges/universities to be invited to hold Engineering, Computer Science, Design Technologies, and other relevant upper level advanced technology classes in the new ATC / AIMC.

Virginia Tech and University of Virginia - Consideration should be given to VT and UVA that have located a combined center Mid-Peninsula in Newport News, 10 miles from the Hampton Campus, to offer bachelors and masters degrees in and engineering and management. Also, linkages with other four-year institutions should be given attention, where and when it makes good sense for students’ educational pathways that lead to high skilled, high wage career pathways.

High Schools and Middle Schools - are key feeders to any post-secondary institution. There are many advantages to partnering with high schools to bring select, older students – primarily juniors and seniors - to the center. The College already has a strong partnership with the career themed high schools and New Horizons.

Chamber of Commerce, Economic Development agencies, and the Workforce Investment Board should be important partners. They may even be invited to collocate offices in the AIMC / AIMC which would provide a powerful symbol of the cohesiveness of the entire region’s economic development efforts. Beyond symbolism, it will also ensure that the AIMC / AIMC is always aware of and responsive to the region’s emerging workforce needs.

Professional associations such as SME should be key partners in the AIMC / AIMC. They will bring the unfiltered voice of the employers to the AIMC / AIMC. We recommend that should be invited to locate offices in the AIMC / AIMC facilities or at least use it for meetings and special events.
Labor may be an important partner in the ATC / AIMC although we did not investigate this sector. The critical need for experiential learning in the form of internships, co-ops, and apprenticeships often depends on the active support of current labor. The effective training and education of the future workforce needs to be supported by – and to the benefit of – the current workforce or it will be very difficult to implement successfully.

Military and Returning Veterans comprise a large segment of the workforce and create great opportunities for workforce development. The VA may be invited to place an office in the AIMC.

Following is a partial list of currently engaged and proposed future partners of the AIM Center:

- The Peninsula Council for Workforce Development
- The Hampton Roads Economic Development Alliance
- The Virginia Peninsula Chamber of Commerce
- The Virginia Peninsula Advanced Manufacturing Collaborative
- NASA Langley Research Center
- Jefferson National Accelerator Laboratory
- Canon Virginia
- Liebherr Mining
- Siemens
- Alcoa-Howmet
- Continental
- Newport News Shipbuilding
- Ferguson Enterprises
- Dominion Resources
- Commonwealth Center for Advanced Manufacturing
- Old Dominion University, Virginia Tech, and the University of Virginia
- NSF SMART Center at Tidewater Community College
- Governor’s Academy for Science and Technology, NHREC
- The Cities of Hampton, Newport News, Poquoson, Williamsburg
- The Counties of James City and York
- The Hampton, Newport News, Poquoson, York, and Williamsburg-James City County Public Schools
INDUSTRY FOCUS GROUPS INITIAL FOCUS

The following unified outcomes and priorities emerged from the collective Business and Industry focus groups (refer to agenda on pages 4-5 for details) September 04-06, 2013.

- Soft skills & screening for potential employees highly desired
- Good Communications, Teamwork, Leadership skills all in high demand
- Entrepreneurial skills & knowledge were highly sought after
- Computer skills – basic to advanced – were highly sought
- Safety, OSHA Certs, quality control, and lean basics important
- Apprenticeships, Internships, and Co-ops desired, but needed streamlined
- Multi-skilled industrial maintenance techs high needs
- IT Certifications: Server+, A+, HP, DELL, Cisco, Fiber Optics, Java, Cobol
- Electronics / Optics technicians with ANSI standards knowledge needed
- Welders, welding technicians, and welding engineers high needs
- Process Technicians are in demand in Washington County specifically
- Construction scheduling (BIM) and PLM skills needed
- CNC, manual machines, problem solvers all needed
- Geometric Dimensioning & Tolerancing (GD&T) and Blueprint reading
- Computer Aided Design (CAD) needed in technician/engineering roles
- Pro-E, MathCAD, Skills upgrades also needed
- Computer Assisted Manufacturing (CAM) needed in technicians roles
- GibbsCAM, MasterCAM, and EasyMill are all good starting points
- Rapid Prototyping/Additive Manufacturing knowledge was mentioned
- Design for Manufacturability (DFM) with Integration of COTS knowledge
- Form, Fit, and Functionality understanding important
- Project Management was mentioned as a critical skill for all employees
- HVAC opportunities are immense, but can the staff fulfill the needs?
- Integrated computer literacy, math, writing skills in applied, project based learning modules for ALL ATC courses / programs was requested
NOTE: We briefly reviewed the traits of the new “Gold Collar” Worker (computer literacy, teamwork, problem solving, mechanical ability, critical thinking, interpersonal skills, etc.) and all of the focus groups agreed those traits are what they are looking for as a base.
ADDITIONAL RECOMMENDATIONS

The following recommendations are offered based on our experience with other ATCs to increase the effectiveness of the Thomas Nelson Community College:

• Consider some tiered classrooms and at least 12,000-15,000 sf of two-story, open-bay style flexible space for modular applied technology trainers, Instrumentation, PLC, Engineering Technologies, and flexible space for customized, industry training and equipment needs.

• Keep all industrial/manufacturing/maintenance hands-on and classroom space – flexible, 5S Lean organized, OSHA safe, and together in the same location (e.g., all on the same floor – one).

• Combine all IT functions, programs, and office space for ease of administration, student way-finding, and common use.

• Consider elimination of many private offices for team-oriented workspace – especially where programs overlap.

• Initiate national programs such as FIRST Robotics, VEX, Project Lead The Way, Bots IQ, Skills USA, and others that bridge the gap with K-12 and also offer excellent faculty development opportunities.

• Plan from the beginning to utilize distance/online/blended learning in nearly every course. Widely used patterns currently are: hybrids in which students meet face-to-face for scheduled orientation classes, some lectures, ‘flipped classrooms’, and scheduled labs with most lectures presented on-line; or completely distance with all lecture on line and students having access to open labs for individual hands-on experience.

• All instructors, faculty, and program administrators need to re-establish more formal “externships” to continuously be current and aware of the necessary skills, knowledge, and outcomes of students in their courses/classes. These externships should be a minimum of two periods a year and be documented for desired results.

• Keep current with trends and opportunities through active participation with workforce development focused associations and organizations like: NCATC, the National Council on Workforce Education (NCWE), the National Council for Continuing Education and Training (NCCET),
AACC/Workforce Development Institute (WDI), and others that meet the needs of relevant, cutting edge applications, techniques, and funding opportunities.

- The National Science Foundation (NSF), Departments of Labor (DOL), Transportation, Commerce, Energy, and Defense all are very good sources of national funding for advanced technology related workforce development programs at ATCs, as well.

**Best Practice ATC’s in the NCATC Network**

The following is a partial list (8) of equivalent and/or future ATC’s and Strategic Partners that Thomas Nelson should consider benchmarking for many of the needs in your service area:

- Gateway Technical College, Racine, WI
- Cuyahoga Community College, Cleveland, OH
- Florence-Darlington / SiMT, Florence, SC
- Edmonds Community College, Lynnwood, WA
- Lorain County Community College, Lorain, OH
- Ogden-Weber Applied Technology College, Ogden, UT
- Calhoun Community College, Huntsville, AL
- SpaceTEC, Cape Canaveral, FL
PROGRAMATIC PRIMARY AIMC INITIAL FOCUS

From the interaction with small, medium, and large manufacturing businesses coupled with interviews with Thomas Nelson administration and community economic development organizations, we determined that the top four programs that should be considered for the first phase or ‘initial focus’ of the ATC / AIMC would be:

**Applied Integrated Systems Technologies - Mechatronics** – Industrial Maintenance is a critical program for this region with its huge manufacturing base. Just from our conversations we heard about several hundred current job openings in the area. Mechatronics programs will also serve automated physical distribution and storage facilities, process technologies and other advanced technology-based industries. The installation, maintenance and repair of modern technology require people with a wide variety of very technical skills. Modern Industrial Maintenance workers require knowledge in nearly all technical areas including electrical, mechanical, fabrication, hydraulic/pneumatic, and other process skills along with critical thinking, troubleshooting and complex problem solving. Modern technology is almost always computer controlled and understanding how to work with and troubleshoot programmable logic controls and other control technologies is essential. Manufacturing and construction companies present like – Alcoa-Howmet, Liebherr, Ferguson, and Canon were very vocal on their continued needs for “multi-skilled maintenance workers” – now and in the future.

**EST. COST RANGE**: Throughput: 100-150 students, $1.5-$2.2m; 200-250 student, $2.5-$3.5m in hands on equipment costs for integrated training labs.

**Composites / Rapid Technologies / Additive Manufacturing** -Rapid manufacturing -rapid technologies-rapid prototyping are general terms describing a variety of methods used to directly construct three-dimensional models and end-use products from electronic data. Composites is a key compnent for advancing additive manufacturing. The systems use CAD data to build fabrications layer by layer in very thin cross-sections. Additive Manufacturing is the process of making a product by adding layers in a relatively efficient way, such that there is little waste or reduction of materials. Partnering with the Society of Manufacturing Engineers (SME), NASA-Langley, and the NSF/ATE National Center – RapidTech (CA) would be two very positive steps toward the development of RT/AM programs, courses, and certifications at the AIMC.
EST. COST RANGE: Throughput: 100-150 students, $1.2-$1.5m; 200-250 student, $1.8-$2.2m in hands on equipment costs for integrated training labs.

Integrated Advanced Manufacturing / Computerized Machining (CNC) – is another essential program for the region based on feedback from the manufacturing sector. The College’s Workforce Development campus is doing a good job in providing the training needs in this area and the College should consider expanding that operation. The new and/or expanded AIMC should also include these programs. Given the noise, heat, exhaust, and other “heavy industry” like characteristics associated with these programs, it is important to design the facility such that they won’t interfere with activities in the rest of the facility.

Thomas Nelson needs even more dedicated space for CNC and Intelligent Controls Machining and are an official HAAS Technical Education Center (HTEC) – An HTEC is an educational partnership between a local community and technical college, and HAAS Automation, Inc., a world leader in the design and production of CNC machine tools. The partnership agreement facilitates the placement of entrusted, state-of-the-art Computer Numeric Control (CNC) machine tools at the HTEC site, increasing the training resources of the local institution. While gaining knowledge and experience in the Machine Tool Technology program, learners will be afforded the opportunity to gain experience and develop skills on the latest CNC machines and technologies. While many AIMCs’ use smaller limits for hands-on labs of 8-12 per section for maximum effectiveness with good quality and safety. Several employers commented on the need for employees to be trained on the basics as well as on the advanced machining and fabrication technology. They want employees who can not only operate and troubleshoot modern machinery but who can also sharpen a bit, splice a cord and use a torque wrench.

EST. COST RANGE: Throughput: 100-150 students, $1.8-$2.5m; 200-250 student, $2.7-$3.8m in hands on equipment costs for integrated training labs.

Integrated Personal Fabrication - Advanced manufacturing technology is not just for Engineers and corporations. Technology today is producing rapid advancement in personal fabrication. Personal fabrication is a newly emerging manufacturing technology that puts advanced fabrication in the hands of regular, nontechnical people. It is a powerful force for creativity and innovation in a community and is an invaluable asset for budding entrepreneurs. We recommend that the College allocate high visibility space in the AIMC to establish a Fab Lab. With equipment such as 3D printers, desktop-milling machines, laser
cutters/etchers, vinyl cutters, industrial sewing machines and other computer controlled machines, a Fab Lab can become a place where anyone with an idea can create a physical product. A Fab Lab at the AIMC / AIMC will serve students, engineers, artists, entrepreneurs, and others – even children. It will connect the most important concepts behind creation of the AIMC / AIMC with everyday people and produce an endless stream of amazing stories of creativity and accomplishment. Combined with the design technology mentioned above, a Fab-Lab at the ATC / AIMC will serve students, children, engineers, artists, entrepreneurs, and others.

A Fab Lab (fabrication laboratory) is a small-scale workshop with an array of computer-controlled tools that cover several different length scales and various materials, with the aim to make "almost anything". This includes technology-enabled products generally perceived as limited to mass production. While Fab Labs have yet to compete with mass production and its associated economies of scale in fabricating widely distributed products, they have already shown the potential to empower individuals to create smart devices for themselves. These devices can be tailored to local or personal needs in ways that are not practical or economical using mass production. Examples of flexible manufacturing equipment within a fab lab:

- Laser cutter, plasma cutter and water jet cutter - sheet material cutting
- CNC machines - computer controlled mills, lathes, etc.
- Rapid prototyper - essentially 3D printing with plastic
- Printed circuit board milling

We believe that a well-designed Fab Lab in the AIMC /AIMC will soon become the most recognized and publicized aspect of the center. It will connect people to the technology in emotional ways that will resonate across the public.

**NOTE:** For a full understanding of this technology, read Neil Gershenfeld’s book, FAB: The coming revolution on your desktop – from personal computing to personal fabrication.

**EST. COST RANGE:** Throughput: 100-150 students, $500K-$1.2m; 200-250 student, $1.5-$2.0m in hands on equipment costs for integrated training labs.
AIMC SUSTAINABILITY

In our experience, no ATC can succeed without significant public funding to support direct revenue from students and keep tuition low.

- **Earned Income** - tuition and fees from students and contracted training for employers
- **State Support** - reliable capital and operating funds
- **Local Support** - capital funds (ideally some operating funds would be expected)
- We suggest a *shared operating budget* below with two-thirds of the total operating budget underwritten by state and local government with some support from grants and philanthropy.

**NOTE**: We include a simple “Pro-Forma Budget” Excel worksheet for planning the basic AIMC costs:

<table>
<thead>
<tr>
<th>Pro Forma Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FACILITIES COSTS</strong></td>
</tr>
<tr>
<td>Size in Sq. Ft.</td>
</tr>
<tr>
<td>65,000</td>
</tr>
<tr>
<td>Furniture / Equipment</td>
</tr>
<tr>
<td>65,000</td>
</tr>
<tr>
<td><strong>TOTAL AIMC COSTS</strong></td>
</tr>
</tbody>
</table>

**NOTE**: Facility size, construction psf, and furniture/equipment cost psf are all variable.

<table>
<thead>
<tr>
<th>OPERATING COSTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Throughput (FTEs)</td>
</tr>
<tr>
<td>1,000</td>
</tr>
<tr>
<td>Revenue Sources</td>
</tr>
<tr>
<td>- Customer Fees</td>
</tr>
<tr>
<td>- State</td>
</tr>
<tr>
<td>- Local</td>
</tr>
<tr>
<td>- Other</td>
</tr>
<tr>
<td><strong>TOTAL OPERATING</strong></td>
</tr>
</tbody>
</table>
**NOTE:** In addition, direct public support for contracted services to business and industry should require some level of matching funds from employers. This will ensure that the AIMC designs and delivers services that employers want while at the same time ensuring employers will be able to afford them.

**DISCLAIMER:** All costs and budgets figures are rough estimates using current AIMC models across the nation as benchmarks, only. No quotes or other detailed information has been acquired in the TNCC service region to further refine these figures and NCATC offers them as only a planning tool.

**DONATIONS:** Though donations of equipment, consumable products, scholarships, etc. are always sought and welcomed – they cannot be considered a stable source of sustainability for the AIMC.
CONCLUSION STATEMENT

NCATC believes that the time is now to begin expanding and/or building the first “state-of-the-industry” Advanced Integrated Manufacturing Center (AIMC) to be located on the Thomas Nelson Campus. During the building process, a full audit of ALL advanced technology and manufacturing programs and courses should be reviewed, paired to the vital few that meet the 21st century industry needs, and marketed to the regions’ industry in tandem with the ATC construction. The physical ATC/AIMC should be the “crown-jewel” of the region and become the place to be for all things in advanced technology training in the region.

We would like to thank President Dr. John Dever, Dr. Deborah Wright, John Calver, and the entire administration, faculty, and staff of Thomas Nelson Community College along with community business and industry participants for their openness, attentiveness and willingness to share information – bi-directionally with the NCATC MAP Team. The college and its campuses show that they value their personnel and their work displays great dedication to the college and its mission to serve the community. The College’s staff members are encouraged to make contact with Paul, Diane, or Craig throughout next steps of building and refining both of your Advanced Integrated Manufacturing Center building for advice and assistance as you prepare for current facilities updates and new facilities for advanced technical training and business & industry.
APPENDIX A: THE FACILITY

The AIMC Building Location – Based on all of the input we received, our collective expertise, and reviews of top sites considered - we believe that the best location the new ATC / AIMC should include the following criteria, at a minimum:

- Located close to the majority of students and/or co-located in a Technology Park or very close to well established business & industry
- A ‘PRIME’ landmark type (‘Crown-Jewel’) location/building.
- Easy to find, drive to, and see.
- Enough land and space for 50,000 to 125,000 sq. ft. building
- Plenty of free, secure parking (150-450 spaces)
- Easy access loading dock for large equipment in/out.
- Direct access to interstate via 4-lane road.
- Close proximity (15-30 minutes) to regional airport.
- A good selection of good restaurants and shopping within 1-3 miles
- Close as possible to “Jefferson Labs hub” location.
- All 21st century ‘community’ infrastructure needs available to ATC /AIMC.

The AIMC Program/Space Basic Requirements - after the Thomas Nelson site visits, including benchmarking additional ATC’s in the country – the following requirements are being offered as suggested starting points for the new Thomas Nelson ATC / AIMC program/space priorities.

Disclaimer – these are just simple reference points for consideration and DO NOT include many unknowns.

<table>
<thead>
<tr>
<th>Business &amp; Industry/CPE Space Required</th>
<th>QTY #</th>
<th>Square Footage</th>
<th>Capacity (ea.)</th>
<th>Total Sq. Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reception Area (Security, Registration, SBDC, and Recognition Area)</td>
<td>1</td>
<td>3,000</td>
<td>300</td>
<td>3,000</td>
</tr>
<tr>
<td>Restrooms (2 sets per floor)</td>
<td>8</td>
<td>TBD</td>
<td></td>
<td>TBD</td>
</tr>
<tr>
<td>Storage Rooms (Electrical, HVAC, Closets, etc.)</td>
<td></td>
<td>4,000</td>
<td>6-10</td>
<td>4,000</td>
</tr>
<tr>
<td>Assessment/Testing Center (NDT, Security, ASE, Skills Gap, etc.)</td>
<td>1</td>
<td>700</td>
<td></td>
<td>700</td>
</tr>
<tr>
<td></td>
<td>Room Description</td>
<td>No.</td>
<td>Area (sq ft)</td>
<td>Capacity (Max)</td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------------------------------------------------------</td>
<td>-----</td>
<td>-------------</td>
<td>--------------</td>
</tr>
<tr>
<td>5</td>
<td>Business Center (across from “Great Hall”)</td>
<td>1</td>
<td>300</td>
<td>2-4</td>
</tr>
<tr>
<td>6</td>
<td>Catering Kitchen</td>
<td>1</td>
<td>1,200</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Adjunct Instructor Space</td>
<td>1</td>
<td>1,800</td>
<td>15-24</td>
</tr>
<tr>
<td>8</td>
<td>Employee Break room/Lunch Area</td>
<td>1</td>
<td>800</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Great Hall</td>
<td>1</td>
<td>3,000</td>
<td>250</td>
</tr>
<tr>
<td>10</td>
<td>Multi-Purpose Health Room</td>
<td>1</td>
<td>1,000</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Authorized Computer Training Ctr</td>
<td>4</td>
<td>650</td>
<td>32-48</td>
</tr>
<tr>
<td>12</td>
<td>Lecture Halls / Theater-Style Rooms (1-50 seats, 1-90 seats – ITV, Flat screens, etc.)</td>
<td>4</td>
<td></td>
<td>140</td>
</tr>
<tr>
<td>13</td>
<td>Executive Conference/Board Room (refreshment area, sales presentations, etc.)</td>
<td>1</td>
<td>1,500</td>
<td>18-24</td>
</tr>
<tr>
<td>14</td>
<td>Offices</td>
<td>11</td>
<td>150</td>
<td>12-18</td>
</tr>
<tr>
<td></td>
<td>1 – Event/Facility Manager</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 – Sales &amp; Marketing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 – IT/Network Technician</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 – Program Offices (Tech, Bus, etc.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 – Conference/Work Room</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Large Training w/dining capability</td>
<td>1</td>
<td>2,200</td>
<td>120</td>
</tr>
<tr>
<td>16</td>
<td>Medium Training Rooms (Leadership training, etc.)</td>
<td>2</td>
<td>1,250</td>
<td>68</td>
</tr>
<tr>
<td>17</td>
<td>Smaller Training Rooms</td>
<td>4</td>
<td>650</td>
<td>10-12</td>
</tr>
<tr>
<td>18</td>
<td>Chambers / Workforce / ED Office Space</td>
<td>1</td>
<td>100</td>
<td>10</td>
</tr>
<tr>
<td>19</td>
<td>Small Business / Incubator Space</td>
<td>1</td>
<td>2,500</td>
<td>10-12</td>
</tr>
<tr>
<td>20</td>
<td>Digital Media Center</td>
<td>1</td>
<td>1,000</td>
<td>20-30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Qty</td>
<td>Building Size</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>--------------------------</td>
<td>-----</td>
<td>---------------</td>
<td>---</td>
</tr>
<tr>
<td>21</td>
<td>Teaching Learning Center</td>
<td>1</td>
<td>1,250</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Advanced Technology Center - <strong>flex</strong> <em>(includes receiving/training dock)</em></td>
<td>1</td>
<td>15,000</td>
<td></td>
</tr>
<tr>
<td><strong>T</strong></td>
<td><strong>Grand Total</strong></td>
<td></td>
<td></td>
<td><strong>50,000 - 65,000</strong></td>
</tr>
</tbody>
</table>

**NOTE:** Restrooms, Stairwells, etc. are not included in the square foot totals – at this time.
APPENDIX B: THE FOLLOW UP INQUIRY

Follow-Up Questions and Areas of Inquiry
The following questions were devised to give guidance to the follow-up consulting work from NCATC and the College team. Not all questions need to be asked as dialogue with the various stakeholders generally provided the information being sought. Other questions could be asked as the interviews progress. Similar or mirror questions can be asked of different groups as a method to check for consistency and observational differences.

Administrative Staff, Workforce Services Staff, Faculty
1. What does business and industry need in the service area of the college?
2. How do you find out what they need?
3. Who can engage business and industry?
4. What is the process for engaging business and industry?
5. How is information shared and communicated?
6. How does the rest of the college view your operation?
7. How/What is your involvement with the business community?
8. Who is your competition?
9. What budget expectations are there for the Advanced Technology Center (ATC)?
10. Is cost recovery an expectation?
11. How does Continuing Education and/or an ATC work across college locations?

Business & Industry Leaders and Economic Development Representatives
1. What is happening with business and industry in the Thomas Nelson region?
2. How is the College seen by business and industry?
3. What format is used by the college to listen to you?
4. What is your involvement with Thomas Nelson?
5. What programs and services of Thomas Nelson have you used?
6. Is Thomas Nelson considered part of your success strategy?
7. Are there any labor shortages; what are your labor needs?
8. If dollars were not an issue, what would you like to have from Thomas Nelson?
9. What was your involvement with the design, development, and program decisions of the new ATC?

Political Leaders
1. What are the next steps or plans for statewide economic development?
2. What are the long-range plans for community college involvement with statewide economic development?
3. How can Thomas Nelson position itself to take best advantage of state programs in regard to labor issues, labor needs, and support to industry, etc.?
APPENDIX C: SOURCE DOCUMENTS

Booklets/Brochures
• Thomas Nelson Online Course Catalog – 2013/14

Catalogs
• N/A

Charts
• Thomas Nelson - Organizational Chart (n/a)

Flyers
• Information Technology – Tri-Fold
• Electronics Technology – Tri-Fold

Newsletters
• None Available

Reports
• Thomas Nelson Campus Sites Map

Other Documents
• The Skills to Succeed Inventory
• The 21st Century Report – Reclaiming the American Dream
• Pathways to Prosperity
• Blueprint Virginia: A Business Plan for the Commonwealth, 2013

Organizations
• The National Coalition of Advanced Technology Centers (NCATC)

OSHA – Virginia

Virginia - Occupational Safety and Health Program
Regional Office
Federal Office Building, Room 614
200 Granby Street
Norfolk, Virginia 23510-1811
(757) 441-3820
(757) 441-3594 FAX
APPENDIX D: THE NATIONAL COALITION OF ADVANCED TECHNOLOGY CENTERS

A determination to place the community and technical college or university into the forefront of economic and workforce development leads to making a statement of commitment to the community. The statement often manifests itself in the design and operation of an Advanced Technology Center (ATC).

Mission Statement
The National Coalition of Advanced Technology Centers is a network of higher education resources that advocates and promotes the use of technology applications that enhance economic and workforce development programs and services. Community college leaders formed the National Coalition of Advanced Technology Centers (NCATC) in 1988. Its purpose is to provide a forum for the support of new and existing advanced technology center (ATCs) operations at community and technical colleges and universities. In the past 20 years, NCATC has assisted in the design and delivery of ATC programs and services through topical conferences and various forms of membership support.

Advanced Technology Centers - Description
Community colleges have added Advanced Technology Centers (ATCs) to their community outreach tools in concerted efforts to address the needs of business and industry. There is no definitive model of an ATC; rather they have been developed to meet the unique requirements of a particular district or region. The most common elements of ATCs across the country are an entrepreneurial spirit and a business approach to education and training.

An ATC is a commitment of persons and resources in the effort to reach, enhance, and add value to business. An ATC is not necessarily a physical facility, but is often thought of and referred to as a structure. Beyond bricks and mortar, an ATC operation is a conscious effort to bring together the resources of the college in business and industry outreach, and it can be an organizational model that encompasses many functions of the college. While there is no single definition, an ATC can be defined as a locus of economic development with substantial and concerted business and industry outreach products and services.

Since the major ATC movement began in mid-1980, many colleges have added an ATC operation to their campuses, usually centering them on new and remodeled buildings. Among the common features of these facilities are specialized training laboratories for information technology, manufacturing, and biomedical technologies, open and reconfigurable training space, demonstration
areas, technology theaters, meeting and function rooms, seminars rooms and classrooms, and administrative offices. Less common features include business incubator space and shared college and industry equipment prototyping laboratories. Those ATCs housed in new or remodeled buildings have found that it is often an asset to be able to bring prospective clients to a technology center and demonstrate the ATC capabilities.

Organizationally, many ATCs have evolved from more traditional continuing education departments, and many continue to reside within them. What often distinguishes the ATC operation from the continuing education programs is a more finely tuned and more deliberate attempt to meet the specific needs of industry for, and beyond, workforce development. ATC operations have proven to be valuable assets to communities involved in business attraction and retention strategies as the ATC provides leadership in business and industry problem solving, productivity and competitiveness enhancement, and the transition of workplace technologies.

ATCs have been key strategic elements of School-to-Work initiatives, One-Stop Career Centers, Job Training Partnership Act projects, Welfare-to-Work models, Tech Prep support structures, Displaced Worker centers, Carl D. Perkins grant projects, NSF ATE Centers, Small Business Assistance centers, and a whole range of grants, partnerships, and regional business and industry support structures. They have provided income, equipment, donations, and a point for entrepreneurial ventures for their parent colleges. They are a phenomenon of the community and technical college movement, and interest in their development continues to grow among the leadership of those institutions.

Typical among the products and services of an ATC are:

- Regular credit courses and programs
- Noncredit courses
- Short-term training
- Customized training
- Seminars
- Laboratory and facility rentals
- Shared facilities with industrial partners
- Technology transfer activities
- Small business development centers
- Contract procurement assistance centers
- World trade assistance centers
- Facilities for economic development, trade, and industry groups
- Testing and high-stakes testing facilities
- Grant-funded programs and grant management
- Partnerships with local and national vendors for laboratories and programs.
APPENDIX E: NCATC MAP TEAM BIO BRIEFS

J. Craig McAtee - is the Executive Director for the National Coalition of Advanced Technology Centers (NCATC), Principal of McAteeVentures, LLC, and Director of Additive Manufacturing for Tri-C. Before starting his own consulting company in 2007, McAtee served as Executive Director of the Workforce and Economic Development Division of Cuyahoga Community College (Tri-C) in Cleveland, Ohio for seven years. And, before that - he spent over twenty-five years in engineering and senior leadership positions for Swagelok Company, an international manufacturing organization, based in Solon, Ohio.

As a member of the Tri-C’s Executive Team, he was responsible for all of the advanced and applied technologies related programs including Manufacturing, Apprenticeships, CAD/CAM, CNC, Integrated Maintenance, Industrial Distribution, Construction, and the Lean Six Sigma Institute. Mr. McAtee also served as one of the College's primary liaisons with business, industry, community, and government agencies throughout Northeast Ohio and the US. He has also served on the Board of Directors of Educational Foundations for Precision Metalformers (PMA) and Power Transmission Distributors (PTDA) Associations, as well as the Manufacturing Awareness & Growth Network (MAGNET) and the Cleveland Engineering Society (CES).

While at Tri-C, he provided Dean level management of all new and existing applied technologies related credit and non-credit curriculum development, articulation, and deployment with over $3.8 million dollar annual budgets. McAtee also provided leadership for special projects directed by the College President and Executive Vice Presidents, as needed.

Back at Tri-C as a part-time consultant from NCATC in 2013/14 – McAtee is serving as the Director of a DOL TAACCCT Grant for Additive Manufacturing and Engineering Innovation.

McAtee received an Associate of Arts degree from Cuyahoga Community College, an Industrial Engineering degree from Kent State University, a Bachelor’s degree in International Management from Malone College, and an Executive MBA from Cleveland State University. He is actively involved with the AMTEC National Center as its NVC Chair, the American Production Control and Inventory Society (APICS), the Cleveland Engineering Society (CES), the Society of Manufacturing Engineers (SME), and FIRST Robotics. McAtee is also an adjunct professor at Cleveland State University, as time permits.
Diane Dostie

Diane Dostie serves as Dean of Corporate & Community Services at Central Maine Community College, prior to this position she served as Tech Prep Director at the college.

She has twenty years experience developing partnerships and implementing professional development and training programs. She was instrumental in obtaining two National Science Foundation grants for the college and serves as Principal Investigator.

Ms. Dostie has served as president of the National Coalition of Advanced Technology Centers (NCATC) and the Maine Vocational Association (MVA). She currently serves on boards for several local and state economic and workforce development organizations.

In 1999, she received the Business-Education Partnership Award from the Androscoggin County Chamber and in 2008 she received the Education Excellence Award from the Manufacturers Association of Maine.

Ms. Dostie earned B.S. degree in Industrial Arts Education and a M.S. Ed in Educational Leadership from the University of Southern Maine.
Paul E. Pierpoint, Vice President of Community Education and Dean of the Southside Center, Northampton Community College

Paul is the Vice President of Community Education and Dean of the Southside Center for Northampton Community College. In this role he is responsible for NCC’s wide array of non-credit programming comprising fifteen different business units which serve over 20,000 people annually. The division includes the Center for Business and Industry (CBI), the largest provider of Workforce Development and Corporate services in the region; the Emerging Technologies Application Center which helps manufacturers and others reduce pollution and conserve energy; Adult Literacy helping thousands of people develop English language skills, earn their GED, or enhance employability skills; and very popular Adult and Youth programs for families throughout the region among other departments and programs.

As Dean of the Fowler Family Southside Center, Paul has been instrumental in the conception and growth of this important community asset. Since it began offering classes in the old Bethlehem Steel plant office building in the summer of 2005, more than 21,000 people have taken classes there. In addition more than 100 different community groups and organizations have used the facility for meetings, forums and performances making the facility a center of community activity for the last six years. The center includes the Cops ‘n’ Kids Reading Room, the Fab Lab, several dance and Art studios, a demonstration teaching kitchen, and class rooms and labs supporting a wide variety of credit and noncredit programs.

Paul has an EdD in Higher Education Administration from West Virginia University, an MBA from the University of Pittsburgh, and a BA in Journalism from Penn State. He taught at West Virginia State College near Charleston, WV, for twelve years and also served two years as the Director of that college’s Community College Component.

Paul is married with two a son at the University of Wisconsin and a daughter at Pitt. He is active on many local and state committees, boards and volunteer organizations. He is a Leadership Lehigh Valley Alumnus class of 1995.

Paul served as treasurer of the NCATC Board of Directors from 2004-2008 and continues to work with the Coalition providing expertise in Advanced Technology Center and Workforce Development improvements and benchmarking across the nation. He most recently worked on the consulting project for West Virginia Community & Technical College System in programmatic design, industry validation, and refinement of plans for their two (2) new Advanced Technology Centers, currently being built in Charleston and near Morgantown, WV.
Advanced Integrated Manufacturing Center

Thomas Nelson Community College

Attachment B: Site Visit Summary Reports
SITE VISIT BEST PRACTICES – VISITING TEAMS DEBRIEFING

October 8, 2013

THOMAS NELSON COMMUNITY COLLEGE
Advanced Integrated Manufacturing Center

Attendees:

TNCC
Dr. Deborah Wright
Dr. Lonnie Schaffer
Dr. Michael Reynolds
John Calver (via phone)

Business Partners
Stu Harris, NASA – Ret.
Shawn Avery, PCFWD
Jesse White, HCS (via phone)
Ann Ifekwunigwe, NNPS
Dave Creamer, NHREC
Barry Fallon, HII-NNS
Dave Tilman, HII-NNS
Bob Poirier, Liebherr

Notes from Session:

GATEWAY, CUYAHOGA, LORAIN/GREEN TRIP
Team: Dr. Deborah Wright, Dr. Lonnie Schaffer, Shawn Avery, John Calver, Jessie White, Stu Harris, Dave Tilman

Gateway
- Branding –
- Program – Scattered centers around specific technologies. Did not appear to have integration.
  Non-credit: FAB LAB – Innovative process overview; MFS – Integration Bay; Boot Camps
- Partners – SC Johnson; IMET; Snap-On site; K-12
- Champion – President
  Fundraiser, Community engagement and many small companies, corporate head quarters
- Boot Camps – Re-employed rapidly, on a career path in industry, SC Johnson sponsor, but not a beneficiary
- Fund Development – very traditional manufacturing
- Development/Branding/Marketing – The Gateway Experience
- Leadership w/President
- Facility – visibility, clean industry, clean job. (K-12 allow different ages in FAB LAB
- Economic Development – co located
- Space for camps and fairs on main floor

Cuyahoga
- Branding/Naming – “Partners for Success” Wall, Fortune 500
- Welding Lab –
- Cuyahoga K-12
- Traditional Manufacturing – Different Pipeline: Immediate Employment; Coursework Pipeline current employees
Cuyahoga (continued)
- Brand new additive manufacturing
- CNC Machining
- Conventional Machining and CNC Advanced
- Funding - $3.2M in 3 years. Corporate support. Ohio can have own levy – 40% revenue
- Advisory Board – good corporate participation
- Marketing - $500K spent on newspaper alone
- Strong community commitment: Anyone can come in and use the internet; the former President is now head of Fundraising-Education Fund
- Madeleine Albright Leadership Dinner $5K/plate. A lot of ownership by community
- Programs – have trouble getting competency awarded credits; had some credit options
- K-12 – Clear walls that take the mystery out. Students walk in and look down on clean manufacturing environment. High bay walls making open and available
- Make sure space is utilized. Windows in classrooms on floor

Lorain
- FAB LAB stocked and open to the community. Sim Lab: Business and entrepreneurs pay fee; 2 labs for credit
- Used FAB LAB to teach applied math
- Converyer, robots, sim bay, auto welder
- Economic Development Center: Smart commerce for sensors; new center as a business enterprise; clean rooms; incubator
- Leverage was a huge incentive
- Corporate and Foundation support
- DO NOTHING THAT IS NOT DRIVEN BY INDUSTRY
- Manufacturing-some
- FAB LAB had integrated prototype to manufacturing to assembly and maintenance
- Integration of machine and IT
- High school on site: employ Principal; 3 years of Bachelor’s at community college and 4th at a university
- Leading edge technology in package – ID where can compete
- Going after big ticket and sensors small business
- Budget gamut from small business to leading edge
- Innovation Fund $25K - $100K
- Huge strategic plan – community engaged
- IT technical stackable career studies and credit certifications

FLORENCE-DARLINGTON/BLUE TRIP
Team: Dr. Deborah Wright, John Calver, Sandy Hespe, Stu Harris, Barry Fallon
- $186K - ATC and Conference Center, Ballroom, Theater
- Economic Development Offices on site
- State and local policies funded
- Bond - $25M: $3M; $5M
- Lobby area flexible and shows off center
- Used training systems rather than industrial systems
- Not big on credit. Credit people not cutting edge
- CAD – not a best practice (used drawing tables to teach CAD)
- Mod & Sim – Incubator fee. Students had no access
EDMONDS, OGDEN-WEBER/ORANGE TRIP

Team: Dr. Deborah Wright, Dr. Michael Reynolds, Shawn Avery, John Calver, Dave Creamer, Bob Poirier

Edmonds

- FAB LAB not glitzy – did not realize they had a Fab Lab
- Workforce Center in lab
- Advanced and traditional etching machine
- Primarily funded through grants: NSF, DOL and State
- Contracts with Boeing
- Students using FAB LAB in unassigned timeslots and had regular lab times. Learned Six Sigma
- Mel Cosset BIG leader making it happen
- Their focus on material science partnership with Rapid Tech
- Niche market
- Integration – in a way show a model of how to integrate pieces
- Competencies registered through ASTM
- Articulation (dual enrollment to Edmonds only)
- Water Center funded through Boeing
- Workforce Connect
- Mechanic
- Skill center certification
- Integrated basic skills
- IBEST – applied math co-teaching model
- Tech Advisory Group for college
- Entrepreneur program
- Economic Development –
- Veteran’s supports
- Train Boeing employees at Water Center

Ogden-Weber

- New Horizons and TNCC PWDC could transfer into 30 credit hours
- Advising on location
- Wall of fame
- Composites
- Occupational training – Health Care, Manufacturing (different building), Robotic Welders
- Walls white
- State funded on par w/four year
- Open entry – own pace
- Begin every Monday – work 1.5#hours
- HS with adults – free to HS indirect
- 1/5 is secondary, 5K/1000 is secondary
- Tooling U – always facilitator
- Schools provide transportation
- 900 hours transfer to 30 credits at Weber State
- COMPETENCY BASED
- CNC – flexible, accelerated
- Stud. Dem. Competence
- Based on industry
Ogden-Weber (continued)

- WELDING: 26 Advisory Groups — curriculum development by that advisory group; great model of what could look like and materials supplies by industry;
- New model – integrated, student led learning environment
- Milling around looking for what we have to do
- 220 brought together at the same time
- ROI Score Card – spreadsheet
- No pay scale for independent contractors
- Students on work floor doing their projects not separated in study
- 1% of all funding had to do art

CALHOUN, ROBOTICS TRAINING PARK/PURPLE TRIP
Team: Dr. Deborah Wright, Shawn Avery, John Calver, Mike Yaskowsky, Stu Harris, Mike Lindsey, Ann Ifekwunigwe
Big crane lots of space
Robotics – amazing center, no students across from camps
NAMING IN EACH ROOM
Businesses showcase equipment on consignment
Robotic welding – 10 of them
A Governor’s Project to fund an advanced robotics center: $1M each 4 localities
Governor $10M
Strong need for welders (6K)
Very focused on welding, automation w/robotics
600 students in advanced manufacturing
Building a building in a building
Funded by contract credit w/ 2-3 seats per class
Coops – how do students support selves while in accelerated credit

GULF STATE/GOLD TRIP
Team: Dr. Deborah Wright, John Calver, and from NCATC (Craig McAtee, Paul Pierpoint)
Attending Annual Conference of the National Coalition of Advanced Technology Centers and Grand Opening of the newest ATC
PROGRAMS & TECHNOLOGY

Advanced Manufacturing Programs and Equipment (level 1-trainers, level 2-production)
- CAD and AutoCAD--Solid Works,
- Mechatronics and Industrial Engineering-Amatrol, Festo, Lab Volt
- Precision Machining- HAAS, Okuma, Mazak (multi axis mill, lathes)
- Precision Welding/Advanced Joining—Lincoln, VRTEX, LE Robotic welder, Lincoln simulators
- Robotics—Siemens, Rockwell, Metatoya
- Composites/ Additive Manufacturing-UPrint SE Plus, iPro SLA, Fortus, Invespon, Connex

Methodologies
- Industry advisory board develops competencies, outcomes, evaluation; DACUMs, WorkKeys
- All curriculum is competency based, provides for easier articulation
- Include (1) cognitive/theory, (2) application on technology, (3) work experience/apprenticing
- Degrees, certificates, credit and noncredit options available on site, on same equipment
- Modules of instruction, stacked credentials to certificates, add gen eds to degrees
- Open-entry, open-exit; flexible scheduling; half day and full day programs
- Replicate work environment, 40-hours wk, culture, roll-on/roll-off manufacturing
- Team environment using cohorts, team teaching guide on the side
- Offer technical programs with on site applied math, writing, communication
- Wrap around the general education and elective courses off site or flipped classroom
- Flipped technical courses, video lectures replace classroom, Tooling U, Mooc-Youtube; live labs
- Accelerated certificates and degrees imbedding paid work experience, apprenticeship
- Boot Camps- Accelerated Short Term programs (Fast tracking 3 weeks to 5 weeks to a job)
- IBEST-imbed GED/Basic ed/applied math, in a technical program and ramp to credit

Industry Credentials
- Strong partnership with standards setting organizations, NIMS, PMA, MSSC
- CRC, AWS, National Aerospace Standards, ASNT, NIMS, ISO 9001/13485/16949, Six Sigma, Lean
- MSSC, APICS, ABET, SpaceTEc, CertTec, ASTM, NIST, MTAC

Work Experience
- Industry sponsored cooperative education, internships, apprenticeship, union registered
- On the Job training partnerships with One Stop

Scheduling
- 40-hour work week for accelerated programs, 5 to 8 week
- Half day at college, half day at worksite; full day two shifts a day (third shift maintenance);

High School/University Partnerships
- Dual enrollment on site as Early College, integrated with other students
- Transmit via video conferencing engineering technology lectures
- Camps, partnership with competitions, robotics club on site,
- University programs on site, weekend college, evenings
- Co-enroll or articulate apprenticeships to fulfill three years of bachelors
FUNDING

Engage corporate partners at the beginning of planning and throughout Curriculum, programs, sponsorship, investment, paid coops and faculty externships

Facility funding is partnership of public and private Public funding from state legislature, local bond or levy for facility & technology Regional industry support for equipment Locality contributions for infrastructure

Technology
Original technology funded with building from state or local bond Significant donations of equipment, tools, materials from partners New technology funded from major federal or foundation grants Equipment manufacturers are partners, naming and signage Visible facility provides market for equipment manufacturers, discounts

Faculty and staffing
New faculty provided through legislative allocation or federal grant College relocates workforce leadership, engineering faculty

Fundraising
Center is magnet to increased giving Can be used to launch new campaign for college, new image Center used to host College Foundation events Naming rights with long term strategic partner investments Sponsorship wall of donors

Student Funding
Pell and Perkins Industry donations to Foundation WIA, TAA, VA Industry sponsored Coops, Internships, Apprenticeships

Entrepreneurship
State Foundation for small business Fee based for use of equipment in FabLab

Materials and Maintenance
Technology fees, include maintenance replacement costs in fees Membership fee for maker space Customized corporate training self-support fees Corporate partner donations of equipment, tool kits, and consumables
# Gateway Technical College ATC Model Site Visit Summary Report

**College**: Gateway Technical College, Racine, Wisconsin  
**Center Name**: SC Johnson Integrated Manufacturing and Engineering Technology Center  
**Location**: Sturtevant, Wisconsin  
**Date of Visit**: September 23, 2013  
**Lead Contact**: Debbie Davidson, VP Workforce and Economic Development  
**Visiting Team**: Deborah Wright, Lonnie Schaffer, John Calver, Stu Harris (ret NASA), Shawn Avery (PCFWD), Jesse White (HCPS), Dave Tilman (NNS)  
**Facility Cost**: $10m 2003, +$2.5m 2013  
**Facility Funding**: Special leg appro $2.5m, leveraged $1.5m private support, $350k grants  
**Technology Funding**: $1m Spec Leg App; $400k A&E, Snap-On, Miller, AMTEC donations  
**Staffing Funding**: General Fund (FTE for credit and noncredit) ($1.8m SC Johnson-scholarships)  
**Features**: Quality Measurement Lab, Flexible Mfg Lab, Fab Lab, Auditorium  
**Staffing**: 9 full time including 4 full time faculty employed by WD in Center  

## Programs (Workforce) – Technology

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<tr>
<th>Program/Technology</th>
<th>Space</th>
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<tr>
<td>Computer Numer Control</td>
<td>Multi axis mach, Rockwell Auto ControllLogix, AMTEC</td>
</tr>
<tr>
<td>Industrial Maintenance</td>
<td>AMTEC, A&amp;E Tools, Proclaim Hydraulics</td>
</tr>
<tr>
<td>Welding &amp; Fabrication</td>
<td>Miller</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Mills: HaasVMC, Bridgeport2216, Fanuc 21i-M; ViperVT20lathe</td>
</tr>
<tr>
<td>Robotics</td>
<td>ABB, Fanuc</td>
</tr>
<tr>
<td>Quality</td>
<td>XTN306, Brown&amp;Sharp CMM, Dorsey Optical Comparator</td>
</tr>
<tr>
<td>Industrial Design/FabLab</td>
<td>Solidworks, Roland 3D modeling &amp; GX-24 vin cutter, MDX40-A milling, Epilog-Helix laser/ engraver</td>
</tr>
</tbody>
</table>

## Resource Persons Meta

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Email</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Bryan Albrecht</td>
<td>President</td>
<td><a href="mailto:albrechtb@gtc.edu">albrechtb@gtc.edu</a></td>
<td>262-564-3610</td>
</tr>
<tr>
<td>Debbie Davidson</td>
<td>VP W&amp;ED</td>
<td><a href="mailto:davidsond@gtc.edu">davidsond@gtc.edu</a></td>
<td>262-564-3422</td>
</tr>
<tr>
<td>Stephanie Skiba</td>
<td>VP Learning Innov&amp;Gvt Rel</td>
<td><a href="mailto:sklabas@gtc.edu">sklabas@gtc.edu</a></td>
<td>262-564-2662</td>
</tr>
<tr>
<td>Cabinet</td>
<td></td>
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</tbody>
</table>

## Best Practices:

President is the leading champion for the Center and its role in regional economic development. Designers modeled ATC best practices: big windows, high ceilings, light, show "new" work environment. College built a new image around the ATC, launched a branding campaign “The Gateway Experience” “New facility and the brand is bringing in the donors to Center and to College, expanded Foundation” Phase I building – State appro & Economic Development Grant, to incubate small businesses. Phase II addition – state & paid by donors-Mr & Mrs Tarnowski, SC Johnson $1m; flexible manufacturing construction. Trades Apprenticeship (Construction Electrical, HVAC, Plumbing, Sheet Metal)  
Industrial Trades Apprenticeship (CNC, Elec, Mfg Tech, Maint Mech, Millwright, Weld/Fabric, Repair)  
College’s Engineering Tech Faculty and programs on site, dedicated labs, Civil, Mech, Elec  
Center focus is largely on Boot Camps for manufacturing, large enrollment, community economic needs  
Boot Camps 15-20 wks FT 40 hrs NC&C: CNC, Industrial Machine Repair, and Welding/Fabrication  
Boot camps provide 14-27 credits over 5 mos, WIA & Foundation, credit faculty assigned to Center  
Classroom/lab replicates the work culture, students must apply, test in, mandatory attendance, on-time imbed technical, cognitive, interpersonal skills for job, immediate employment, 94% job placement rate  
On-site case management in partnership w/ 3 WIB Boards, co-fund staff, mandatory tutoring/coaching  
Courses offered for high-school dual enrollment; video conference engineering lectures, lab on site
GATEWAY TECHNICAL COLLEGE ATC MODEL SITE VISIT SUMMARY REPORT

Innovation Center Fab Lab is open-source design/prototype/build space - noncredit fee - $25 materials
Offers flipped classroom; video lecture imported from around world and EIGER Lab;
Combines interest of engineering and art to draw students to “open” Fab Lab, possible use as credit lab
Now a part of the US Fab Lab Network with MIT, “How to Build Almost Anything” Lab, Purdue
Engineering Faculty on Site, offices, dedicated SMART classrooms

TAKEAWAYS:
Local economic development office, seven regional economic development offices collaborate
WIB out-stationed at center, job sharing for staffer
Partner with MIT as Fab Lab, Dr. Gershenfeld said CAD-CAM+Additive Mfg = invention
New building is deliberate part/focus of college outreach efforts,
Look down on large hall used for career fairs
Fab Lab is a magnet to high school students, GCC outreach effort, camp, kids invent, parents pay
Students of sister institutions, including Rock Valley College, can access the Fab Lab
Considering model that if businesses pay full cost for the service, they can keep the patent
Considering charging community lab memberships, may not be allowable under grant funding
Cannot drug test for program entry, program entry via cognitive test, would like to drug test
Use video conferencing for dual enrollment to avoid busing
Individuals and businesses naming rights; Businesses donate tools and boxes for Boot Camps

LESSONS LEARNED:
Region sought Center to incubate business, low usage, decision made to focus on manufacturing
Large, beautiful, but located in rural area industrial park, light population of students
Boot camp array of credit classes, subset of credit, but ramp, not a part of credit “programs”
Boot camp students receive a noncredit certificate of completion, lacks value of credit certificate
Attempt being made after the fact to align NC and C deliverables, to be competency based
Students seeking the college to articulate Boot Camp for credit so students can go on to degree PT
Boot camp programs do not qualify for financial aid, students funded by WIA and scholarships
Credit is reviewing array of courses and other experience to align/match with credit certificate
Technology and fab lab not used for college credit programs except as offsite work space
Built noncredit first, now working to bring them together, aim to articulate Boot Camp for credit
Fab Lab appeals to engineering tech students, seeking faculty buy-in to build project based courses
Important to engage credit faculty in the design, development of building from the first concept
Fab Lab-fed grant bought equipment, discoveries req to be open source, try to charge membership
Fab Lab is show & tell space for rough prototypes, open source a catch 22 for intellectual property
Fab Lab requires large blocks of time; ties up space, single project scan takes 45 minutes
Fab Lab printers can print with metal, aluminum, plastic powders but are teaching quality
Fab Lab needs on-going sustainable ec dev funding, businesses need to be involved from start
Restrictions on use and charges come with many grant funds, my prevent sustainable funding by fee
Need to increase training contracts from business, seek to recruit/hire full time sales person
Tech colleges in region have full-time account managers to gain business training accounts
Sky is limit for industry changing needs but are limited by the size of the footprint, can’t expand
A lot of the training provided is grant funded, incumbent worker training funds going away
Businesses have not stepped up for the training, some can’t, others won’t, need sales force
Wisconsin moving to performance based funding, new concept for faculty, challenge to redesign curric

CERTIFICATIONS: ISO 9001/13485/16949, Six Sigma, Lean, MSSC, APICS
CUYAHOGA COMMUNITY COLLEGE ATC MODEL SITE VISIT SUMMARY REPORT

| COLLEGE: | Cuyahoga Community College, Cleveland |
| CENTER NAME: | Tri-C Advanced Technology Training Center (50,000 sq ft) for Energy & Emerging Technologies within the new Unified Technologies Center (113,000 sq ft) |
| LOCATION: | Cleveland, Ohio |
| ENROLLMENT: | 52,000 credit and noncredit (courses=1k-C, 6k-NC) |
| DATE OF VISIT: | September 24, 2013 |
| LEAD CONTACT: | Susan Muha, Exec VP Workforce & Ec Dev; Craig McAtee, , Interim ATC Lead; |
| VISITING TEAM: | Deborah Wright, Lonnie Schaffer, John Calver, Stu Harris (ret NASA), Shawn Avery (PCFWD), Jesse White (HCPS), Dave Tillman (NNS) |
| SIZE: | AdvTechTrain Ctr, 50k sqft, UTC- 113k sqft |
| FACILITY COST: | $5 m renov, $37 million UTC |
| FACILITY FUNDING: | $1.2 million state funding to renovate facility, college invested own funds $3 million in lights, floor etc to draw match from industry, also private-naming, |
| TECHNOLOGY FUNDING: | $1 million mechatronics, multiple USDOL $4 mill, $2 mill; $3.2 million from companies asked to have stake, naming rights; donated; |
| STAFFING&FUNDING: | $12 M GF, Pell ITAs, WIA 5%, Levy, DOL, NSF, TAA grants,+$9M self support |
| FEATURES: | Strong integration with industry; apprenticeships; accelerated programs 3 mos to job; community ownership & engagement in funding/internships; co-locat of C&NC, in ATC |
| STAFFING: | Full time faculty and full-time trainers; full-time support staff |

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<thead>
<tr>
<th>PROGRAMS</th>
<th>TECHNOLOGY</th>
<th>SPACE</th>
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<tbody>
<tr>
<td>Mechatronics/Industrial Maintenance</td>
<td>Amatrol, Festo, Lab Volt</td>
<td></td>
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<tr>
<td>Precision Machining Tech (tradit and CNC)</td>
<td>HAAS, simulators, Okuma, Mazak</td>
<td></td>
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<tr>
<td>Steelworker for the Future</td>
<td></td>
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<tr>
<td>Welding(MIG TIG StickFixCr) Advanced Metals Joining (robotic welding)</td>
<td>Lincoln, VRTEX, LE robotic welder, Lincoln welding simulator</td>
<td>1,790 sqft lab</td>
</tr>
<tr>
<td>Industrial Engineering</td>
<td>Amatrol, Festo, LabVolt</td>
<td></td>
</tr>
<tr>
<td>Robotics</td>
<td>Siemens, Rockwell</td>
<td>1,840 sqft lab</td>
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<tr>
<td>Composite Materials Technology</td>
<td></td>
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<tr>
<td>Construction Eng Tech</td>
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<td>2,170 sqft lab</td>
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<tr>
<td>Alternative Energy/Preconstruction</td>
<td></td>
<td>1,790 sqft lab</td>
</tr>
<tr>
<td>AutoCAD, CAD</td>
<td>Solid Works, no Inventor</td>
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<tr>
<td>Nondestructive Testing</td>
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<th>RESOURCE PERSONS MET</th>
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<th>EMAIL</th>
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</thead>
<tbody>
<tr>
<td>Dr. Jerry Sue Thornton</td>
<td>President</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Craig McAtee</td>
<td>Ex Dir, ATC</td>
<td><a href="mailto:Ncatc1@gmail.com">Ncatc1@gmail.com</a></td>
<td>708-326-2509</td>
</tr>
<tr>
<td>Susan Muha</td>
<td>EVP, W&amp;ED</td>
<td><a href="mailto:Susan.muha@tri-c.edu">Susan.muha@tri-c.edu</a></td>
<td>216-987-3110</td>
</tr>
<tr>
<td>Cabinet and staff</td>
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**BEST PRACTICES**
Federal Grant funding-Used initial grants of $75,000, leveraged to $10,000,000
Grants-faculty, programs, equip-NSF, KCTC, NASA, Goldman Sachs Found, DOE, DOL, Dominion Youth Tech Academy on site, IUTEST -STEM Academy for Youth on site, Robotics competitions Integrating IT Credit and Noncredit Programs, Cisco, Apple, tie to Manufacturing, close relationship Model energy LEED Gold facility and practices and offer green academic and workforce programs Programs--Alternative Energy/Sustainability, Power Distribution, Solar Photovoltaic, Thermal All programs developed with industry, industry funds apprenticeships and equipment Programs flipped classroom, knowledge online CBT or live cast, then onto trainers, then equipment Natural lighting, white walls/floors, energy efficiency; storm-water captured, envir. landscaping
### TAKEAWAYS:
Clean, open, well lit, attractive manufacturing floor; viewed glass from main ATC glass hall above Toyota City with manufacturing on floor, classrooms/labs surround and look out on floor Classrooms/labs attached to shop floor via glass wall, engages students in whole process Surrounding tech labs include Tooling U for credit and for noncredit CEU students open access, jump in and out, open entry exit, $4155, 80% paid by employers, p/f Apprentice students get 360 day Tooling U license $212 ($147@ sem), 32 units a semester Developing a one-year certificate “Breakaway Technician” in additive manufacturing Operate dual enrollment, hire 3-6 instructors, ADM, wheel in equipment Companies provided start up equipment and trained our instructors to certify for dual enroll Foundation funds dual enrollment Youth Tech Academy, 14-18, dual, 10th grade+, 2 12-hr courses semester, EET MET in IndE, CAD, Middle/High School robotics club on Saturdays, kids learn to program, build robots, compete Fab Lab maker space dedicated Maker Space for 2 college labs, schools--parents pay tuition Raspberry, students pay $120 make a computer they can keep and take home Broadcast classes to high schools, CAD machining, algebra,

### LESSONS LEARNED:
Exec VP Workforce & Economic Dev w/2 VPs: External Rel & Tech Progs, Directors CE, BDC, ATC “It’s in the blood of this community to give to their community college,” intentional campaigns Competed with 50 small NPOs, now CC Foundation lead fundraising for region Foundation Board is critical, members are 40 major corporations at CEO or EVP level, participate Engage corporations at the beginning; formal ask; then build apprenticeships on-top Formed ATC advisory board, with local companies, all asked to have a stake in the new facility All on advisory board provide interns, hiring preference Major gifts for facility from the corporate partners, very anxious to give No integration, stand-alone machinery, challenged to talk to each other, seek integrated floor Hourly training for non-apprentices run as open entry and exit Flex hours for industry: GM 8hrsx5wkdays=40 hrs, or 4 hr sx2days wk x 6 weeks=48 hours Imbed competencies in courses as outcomes, checklist articulate work exp, internships to credit ATC created first in IT; AT2, Adv. Tech training, but not integrated with machining Negotiate Tooling U rate at beginning with TU, offered annual or on semester basis to students Additive manufacturing-Scanner, Uprint SE Plus, Layering, combine design and production Imbed Creative Ideas modules, dev skill sets for what & how design & produce, w CNC Workforce and Economic Development Division includes Technology (Mfg&IT) and Health Care

### INDUSTRY CERTIFICATIONS— AWS, National Aerospace Standards, ASNT, NIMS mill and lathe Note: Offer many industry equipment specific customized programs; instructors cross-walked to curriculum to align, operators credentialed by companies;

3/18/13
**LORAIN COUNTY COMMUNITY COLLEGE**  
**MODEL SITE VISIT REPORT FORM**

**COLLEGE:** Lorain County Community College  
**CENTER NAME:** Nord Advanced Technology Center (also saw Desich Entrep Bldg, GLIDE Center)  
**LOCATION:** Elyria, OH  
**DATE OF VISIT:** Sept. 25, 2013  
**ENROLLMENT:** C/NC 17,000  
**LEAD CONTACT:** Terri Burgess Sandu, VP of Workforce Development  
**VISITING TEAM:** Deborah Wright, John Calver, Stu Harris (ret NASA), Shawn Avery (PCFWD), Jesse White (HCPS), Dave Tilman (NNS)  
**SIZE:** Ph II 32,000 sq ft  
**FACILITY COST:** Ph II $12m  
**FACILITY FUNDING:** Tax levy, legislative  
**TECHNOLOGY FUNDING:** Ph II $5 million state,  
**STAFFING & FUNDING:** Tax levy and legislative allocation; PhII $1 m operation fee based  
**FEATURES:** Powerful programs connected to community schools, universities  
**STAFFING:** Credit and noncredit instructors

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<thead>
<tr>
<th>PROGRAMS</th>
<th>TECHNOLOGY</th>
<th>SPACE</th>
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</thead>
<tbody>
<tr>
<td>Fab Lab</td>
<td>Vericut,</td>
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<tr>
<td>Mechatronics</td>
<td>ProEngineer, VanDorn Injection Molding, Vickers, Haas</td>
<td></td>
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<tr>
<td>Welding</td>
<td>Lincoln Elec, Miller</td>
<td></td>
</tr>
<tr>
<td>CNC/Robotics (C, NC)</td>
<td>Fanuc, Haas, SMTA, Emerson, Motoman</td>
<td></td>
</tr>
<tr>
<td>CAD-CAM, PLC</td>
<td>AutoCad, Allen Bradley, Banner, Haas, Gibbs</td>
<td></td>
</tr>
<tr>
<td>Maintenance Tech</td>
<td>Festo, Vicker</td>
<td></td>
</tr>
<tr>
<td>Alternative Energy Tech</td>
<td>PREMA trainers</td>
<td></td>
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</tbody>
</table>

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<tr>
<th>RESOURCE PERSONS</th>
<th>POSITION</th>
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</thead>
<tbody>
<tr>
<td>Terri Burgess Sandu</td>
<td>Exec Dir for WD</td>
<td><a href="mailto:tsandu@lorainccc.edu">tsandu@lorainccc.edu</a></td>
<td>440-366-4215</td>
</tr>
<tr>
<td>Kelly Zelesnik</td>
<td>Dean ATC&amp;Eng.</td>
<td><a href="mailto:kzelesnik@lorainccc.edu">kzelesnik@lorainccc.edu</a></td>
<td></td>
</tr>
<tr>
<td>Annette McIver</td>
<td>Dir Tal Dev Nwk</td>
<td><a href="mailto:amciver@lorainccc.edu">amciver@lorainccc.edu</a></td>
<td></td>
</tr>
<tr>
<td>Daniel Ereditario</td>
<td>Dir, SMART Cntr</td>
<td><a href="mailto:dereditario@lorainccc.edu">dereditario@lorainccc.edu</a></td>
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**BEST PRACTICES:**  
ATC: Delivers on college vision: Be region’s Innovative Leader in Education, Econ Com Cult Dev  
Whole college &ATC intentionally integrated w/the community: early college, return to college  
President leadership, 1500 stakeholders, “help LCCC succeed with support of entire county”  
Achieved special bond levy to support building the ATC  
Tie LCCC vision “Lead Innovation” tied to ATC programming (Exp: Digital Production Lab, Fab Lab)  
Fab Lab created in partnership with MIT, go from bytes to atoms in single environment  
LCCC Fab lab is integrated production envir, computers to printers to finishing/testing all in one  
Polycom connects inventors with other Fab Labs worldwide  
Fab Lab for students in 3D modeling, C and NC, 3 cred into Personal Fabric, MicroElecMechAAS  
Course lab time 1 hr, gain 5 hours of own time access, rotate thru 3 sections, 45 min,  
Students and Lab Aids make Fab Lab available to high school students  
Early College at ATC, OH-Lottery ATE $5700@, need 2.5 GPA, 1st gen+, home HS=clubs/sports  
Four years/HS=2 yrs HS teacher, 2 yrs CC faculty/dual enr, AS/AAS+HSD, 100 students per year  
4-5 dedicated Early College classrooms, lab schedule; employer engagement, mechatronics focus  
LCCC provides advisors, social supports 2 guidance counselors, tutoring, Grad rate is 70%  
U Center on site-3 years at Lorain plus 1 at U = Bachelors from U; legis. Funded, cc tuition 4 yrs  
Programs for U Center framed around articulation agreement and transfer; NASA partnerships
LORAIN COUNTY COMMUNITY COLLEGE
MODEL SITE VISIT REPORT FORM

Job Innov Accelerators- GLIDE Great Lakes Innov Dev Enterprise- exec coach high tech- DW eng.
LCCC Office of Community Tech Transfer–EdisonC, New product development, prototyping, SBDC
$7.09 million in LCC Innovation Fund; 2nd college foundation, Kaufman 3 more like LCC
$25,000 to start, $100k OH Third Frontier Funds, equity loan, LCC-IF hold equity, licenses
Listening and learning/networking sessions for Inventors; pre-prototyping,
Facility fee per hour access,
Manufacturing - Automation Lab- credit and noncredit and contract training in same space,
Short term training articulates to certificates stack to degrees, some AAS do transfer
16wk and 10 wk dynamic schedule, 40 hwr certif, 99% completion, employers reimburse
Developing an invention course for design certification, Blackstone Launchpad grows entrepreneurs
Project based learning is imbedded, marketed as “Manufacture A Career!” for ATC entrepreneurship
SMART Center, Accelerating Commercialization Systems for Microsystems, $5.5 m grant
Additional facility used by U grad students as accelerator, mfg grade equipment, automation
University Center on site “The University Partnership” –

TAKEAWAYS:
College positioned as a partner in the economic development process, more than just meetings
Partner with WIA NPO and ec dev partnership, for programs enrollment
Held focus groups throughout the community using instant voting/Turning Point Technologies
Vision group met 4x, dev ATC plan for 4 cornerstones: Education, Ec Devel, Com Dev, Cult Dev
ATC focused on STEAM – STEM with A for Arts; Creative students create synergy with techolgies
Fab lab = a way to advance culture, engage artist/designers, (now inventions like needle-holder)
Use Networks- NCATC (a founder), Manufacturing Institute M School, NSF Center for Weld Ed
ATC part of intentional rethinking of community college - Completion rate is 76%
Career programs lead to jobs- coops- employer named in program—if not on board, no program
Entrepreneurship Innovation Institute – recruit, train, talent plan, internships/coops
Traditional funding going away-less revenue in the future, three budget cuts in last three yrs
Tradit enrollmnt down, state fund down, rethink purpose— Continuing cred/NC WD, stack credent
Strategic partnerships with community, with employers is critical to future; build relevance
Community colleges can be job innovation accelerators—new view of transfer technology
Develop college processes/ systems for nimbleness to respond, 3 requests now we cannot meet
Build in stacked certificates from start for completion, learn and earn for adult career pathways
Place equipment, trainers on wheels, flexible manufacturing space and portability for outreach

LESSONS LEARNED:
Be intentional: mission of ATC is to deliver on college mission and vision-engages all community
Engaged community as partners in ATC -- EcDev Board, WIB, Chamber, Port Authority
Mission alignment & funding =separate issues; entrep/tech transfer aligns, but not funded
Manufacturing is 3rd largest producer of region’s wealth, but 13% of jobs instead of 28%
Needs grow-higher skills, cont. learning, mfr focus group 19/20 join LCC, 14 w/immediate needs
Hired OH retired atty general to develop documents for Foundation, Licensing, etc.
Plan 4 targets: immed. hires, pool of broad skill entry workers, up-skill current, supervisory.
Accelerator very successful but needs marketing and outreach
Fab Lab created by acquiring machinery open public access but no plan for academic integration
Need to plan Fab Lab for ability to expand

CERTIFICATIONS: NIMS, MSSC, AWS, NCRC, NAM-MSCS
**FLORENCE DARLINGTON TECHNICAL COLLEGE**  
**MODEL SITE VISIT SUMMARY REPORT**

<table>
<thead>
<tr>
<th>COLLEGE:</th>
<th>FLORENCE DARLINGTON TECHNICAL COLLEGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CENTER NAME:</td>
<td>Southeastern Inst. of Manufacturing and Tech (SiMT), Leatherman AMC</td>
</tr>
<tr>
<td>LOCATION:</td>
<td>Florence, SC</td>
</tr>
<tr>
<td>DATE OF VISIT:</td>
<td>Sept. 26, 2013</td>
</tr>
<tr>
<td>LEAD CONTACT:</td>
<td>Jack Roach</td>
</tr>
<tr>
<td>VISITING TEAM:</td>
<td>Deborah Wright, John Calver, Stu Harris (NASA ret), Barry Fallon (NNS), Sandy Hespe (York County Public Schools)</td>
</tr>
<tr>
<td>SIZE:</td>
<td>177,000 sq. ft (2007)</td>
</tr>
<tr>
<td>FACILITY FUNDING:</td>
<td>SC=$6m fac, $2m arch plan; EDAs=$2m sitewk, $3.5m GenFund, FDTC bond</td>
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<tr>
<td>TECHNOLOGY FUNDING:</td>
<td>SC- line item; donations; naming by major investors</td>
</tr>
<tr>
<td>STAFFING &amp; FUNDING:</td>
<td>SC and local levies; SC lottery scholarships; 20% grants; 80% credit Pell</td>
</tr>
<tr>
<td>FEATURES:</td>
<td>Moderns, space age, truly advanced technology manufacturing environment; Toyota City with Rapid Prototyping and Robotics labs off back, tradit and nontradit machining;</td>
</tr>
<tr>
<td>STAFFING:</td>
<td>5 FTE noncredit (Dir, Asst Dir, 2 sales, 1 technic), PT instructs; 6 FT faculty, dean</td>
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<thead>
<tr>
<th>PROGRAMS</th>
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<tbody>
<tr>
<td>Machine Tool Technology</td>
<td>Emco Concept</td>
<td>18,000 sq ft AMC</td>
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<td>Robotics Maintenance Technology</td>
<td>iPro SLA, Fortus, Invision, Connex</td>
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<tr>
<td>Rapid Prototyping</td>
<td>Sinterstation HiQ</td>
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<tr>
<td>Electrical Mechanical Machining</td>
<td>EMCO, HAAS</td>
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<td>Advanced Visualizat/Bus Incubator</td>
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<td>CAD, CAD for Entrepreneurs NC</td>
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<td>Industrial Maintenance Tech NC</td>
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<tr>
<td>Welding TIG ARC pipe NC</td>
<td>Lincoln, Weld booths, cutting facility</td>
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<tr>
<td>HVAC, CDL, HEO NC</td>
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<tr>
<td>Tool &amp; Dye, CNC (credit cert to AAS)</td>
<td>EMCO</td>
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<tbody>
<tr>
<td>Jack Roach</td>
<td>Dir of Mfg &amp; Tech Tng</td>
<td><a href="mailto:Jack.roach@simt.com">Jack.roach@simt.com</a></td>
<td>(843) 661-8121</td>
</tr>
<tr>
<td>Mike Mazen</td>
<td>Asst Dir.</td>
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**BEST PRACTICES:**
Vision: create economic epicenter for region, 8 building SE Inst. of Mfg Tech, ATC is crown jewel  
Trifold Focus of Education, Economic Development, Business Assistance  
Rapid Prototyping/Visualization--Creates tech face for college that attracts students, business  
ATC launched new college identity, tech college w/transfer options, doubled college enrollment  
Provides credit and noncredit credentials as well as business development/business incubation  
Naming rights for funding from Legislators and Big Donors  
Digital sign welcomes visitors, promotes special events  
Economic Dev (Florence and Darlington) have offices on site, businesses rent board room  
Breathtaking facility, steel and glass, windows, light; open staircases, view all activities clearly  
Ability to view manufacturing floor from large foyer designed for receptions  
All college engineering faculty located at ATC, all engineering tech programs on site  
Equipment manufacturers showcase technology; attracts STEM high school students
TAKEAWAYS:
Use of natural lighting, attractive, inviting; demonstrations of most advanced processes
Purpose is to grow small business, facilitate rapid design prototyping of products to market
Flexible spaces whether lab, production, class, lounge—furnishings and tech moveable
Provide multiple multi-flavor outlets in floor, walls for maximum flexibility
Replicates manufacturing floor and is a production floor
College purchased 146 acres of cotton field adjacent to campus in 2000, devel. Vision 2003
College teams visited six state-of-the-art facilities before planning their ATC
Facility is fourth dimension and sells students and public on future of clean manufacturing
Center foyer used for staging ec dev and Foundation fundraising activities
Focus: production quality machinery for industry entrepreneurs, not available to credit students
Provides internships and work experience, hire for 90 days, 2 days wk, $12 hr
Stack certificates to degrees, also have graduate certificate wrap around for AAS, BS,
Second facility of Institute under development, 32,000 sq ft business incubator
K-12 not included in facility, except providing tours for schools
WorkKeys pre-employment assessment and gap training
16 weeks include 8 basics and 8 applied
Permit to run as a for-profit, but unable to make profit
3D Virtual Reality Center—cutting edge, fee for service only to corporations able to pay
Interactive Digital Center is leading edge, limited access for students, mostly for corporate world

LESSONS LEARNED:
Built on a business model that did not materialize; vast spaces require fee for service
Planned as a self-supporting, self-sustaining Economic & Workforce Development Center
“The premiere technical service provider and training facility for industry in Southeast.”
“Provides engineering/CAD/CAM, rapid prototyping, and 3D/virtual reality services”
Provides leading edge manufacturing workforce development and business process training.”
Fee based financing =Field of Dreams—build it & they (businesses) come; they didn’t-2 FT sales
Lots of high tech but hard to sell, sales increasing but too far in front of revenue curve
Fee based business plan; operations $950k yr ($350k power, $500k personnel), $200k from GF
Unsustainable overhead on fee-based model, need federal/state/private investment
Unless engage faculty in original planning, are disconnected, separate, co-located
Credit operates in traditional model in stand alone labs, one to a program
Silo between credit and noncredit results in sense of separate, partitioned off spaces
Dedicated some spaces/class/labs to credit only; some to JIT noncredit only/incubator
Difficult to ratchet in integration of credit with scheduled planning after facility developed
Very diverse manufacturing base—difficult for agreement, pharmaceuticals, auto, steel, paper
State funding cuts last 2 years reduced FTE pool and dedicated funds
Power demands greater than planned, breakers for each section of building
Each Euro machine needs own transformer; power issues can bring down machines and center
Major sized conferencing facility available for rent, major banquet facility—difficult to maximize
Need a Champion, high visibility—Senator Leatherman was champion, took it to the Legislature
EDMONDS COMMUNITY COLLEGE ATC
MODEL SITE VISIT SUMMARY REPORT

| COLLEGE:  | Edmonds Community College |
| CENTER NAME: | Advanced Manufacturing Technology Center/Nat'l Resource Center for Materials Technologies and EDCC's WATR Washington Aerospace Training and Research Center at Paine Field |
| LOCATION: | Everett, WA |
| ENROLLMENT: | 11,000 credit and noncredit students, FTE based |
| DATE OF VISIT: | October 1, 2013 |
| LEAD CONTACT: | Mel Cossette, Principal Investigator for Proven Practices |
| VISITING TEAM: | Deborah Wright, John Calver, Michael Reynolds, Shawn Avery (PCFWD), Stu Harris (NASA ret), Dave Creamer (NHREC), Bob Poirier (Liebherr) |
| SIZE: | Planning 186,000 sq ft bldg. at Park |
| FACILITY COST: | NA |
| FACILITY FUNDING: | State funding/renovation & equip $3M, WATR = State, EDCC, Boeing, USDOL, AFA |
| TECHNOLOGY FUNDING: | NSF and USDOL grants, Foundation, corporations |
| STAFFING & FUNDING: | General Fund, State Funded Aerospace Scholarships/RISE, NSF, USDOL |
| FEATURES: | Learning College/Senge Systems, Aerospace, grants, Integrated Courses, Applied Math |
| STAFFING: | Credit and noncredit faculty, |
| PROGRAMS | TECHNOLOGY |
| Robotics ATA (MST+IT) | ACU, CustomBuild, Arburg, Pulse Echo NDT |
| Manufacturing Tech AAST | Instron, HotPress, Holden Oven, Filament winder, Envir. |
| Engineering Tech AAS-T | Chamber, Autoclave, Extruder, Inject Molder, SEM, CNC Mill |
| Composites/Material Sci | Hexagon Metrology, ZCorp, Metatoya |
| Fab Lab/Additive Mfg, NC | RapMan, Dimensions UPrint SE, ZCorp510, ExOneR1, Projet. Mojo, Next Engine Scanner, ProMetal |
| Manufacturing Assembly | Powerlab |
| Tooling Mechanic | Amatrol, Festo |
| Electrical Assembly | LabVolt, Amatrol |
| RESOURCE PERSONS | POSITION | EMAIL | PHONE |
| Dr. Jean Henandez | President | jean.hernandez@edcc.edu | |
| Mel Cossette | Pr. Invest Proven Practices | mcossette@edcc.edu | 425) 640-1376 |
| Gail Muilli | Exec VP Instruction | |
| Elliot Stern | Dean of Math and Science | |
| Joy Howland | Director Grants, Spec Proj. | |

BEST PRACTICES:
- Acquisition of Federal Grants for faculty and programs: $35 million
  - ID’d math as the major impediment to degree completion, now deliver applied as appropriate
  - Team teaching, project based, guide on the side, math level related to career (i.e.materials science)
  - Wrap around levels of math as increase program success
- Developed a applied module courses now also taught in the high schools
- Offer summer Math Bootcamps for HS, also ECC summer prof dev for HS and College math faculty
- Co-located and collaborative STEM credit and noncredit, programs in Monroe Hall
- Credit Science, Technolog, Engineering, Electronics and Math
- FabLab part of nat’l FabLab, run as noncredit, membership, equip. rental fees@machine, $400-4hrs
- MatEd NSF National Resource Center, fees for Metals and Composites Labs, use Polycom live VC
- EDCC runs offsite Center of Excellence for Aerospace & Advanced Materials Manuf. at Paine Field
- WATTr Pre-Apprent. -8 wks online + 4 wks WATTr lab, industry training avail. for 8-18 credit CSC
- Pace It program on line, meet with online mentor or in person tutor as needed,
2,000 students completed 12 week program, over; 1,500 hired at $18 and full benefits
EDCC WATr Center, EDCC Cntr for Aeros&Adv Materais Mfg, ECDC Adv Mfg Tng Cnt  TBA
Proactive coordination of internships and apprenticeships, partner with 161 aerospace firms
Active TACs “Technical Advisory Committees” for major program initiatives, 5-10 companies
Donations, curriculum advising, mock interviews, internships, faculty externships-Perkins fund
Prior Learning Assessment integrated in all pathways targeting Vets and Dislocated Workers
Internships: 1 week at company orientation, 2 weeks at college lab, pick internship location/focus

TAKEAWAYS:
IBest opens pathways for those with barriers, rigor and resilience in applied basic education
SME Chapter are mentors, sponsor Project Lead the Way, relationship, teams, high school to college
ECC is a learning college: Team Learning and Skills Mastery in the Senge Model
Strategic Plan for Grant Development (how $72,000 netted $10 million)
1. NSF Mat Ed Planning Grant $72,000
2. USDOL High Growth $1.5 M, Triad I- Industry-Ed-Government collaborative curric development
3. NSF Mat Ed $1.5 M full time faculty in materials science
4. Dept of Defense $1.99M for Fab Lab Equipment
5. NSF Proven Practices – STEM for Women, $.5 million for research and paper on recruiting
6. USDOL Triad II p $.5 M with Everett for training, scholarships, equip
7. USDOL Mat Ed II - $.11M for implem.(website, core competencies, content standards)
8. NSF Certif. in Adv. Manufacturing- $.8 M WATr Center, noncredit and cred certificates to job
9. NSF Technic Ed in Additive Mfg- $.9 M for core compet. ASTM standards for tech training
10. NSF National Educators Workshop - $.35 M

Grant Strategies
1. Package the passion
2. Create the vision
3. Communicate college commitment
4. Identify stakeholders
5. Ignite the interest
6. Identify the audience
7. Use breaking news
8. Deliver the elevator speech

LESSONS LEARNED:
Form network of advancing colleges to inform our planning, grants, strategies
Working with high schools to contextualize full curriculum
Anticipating growth in aerospace = 5-10% a year, plus 70% turnover in mature workforce
Stakeholders need to be a part of shared vision from start, shared vision and shared accountability
Determine how to support FAB Lab, fee based limits access, memberships dicey with WA-AG office
Use MOA with businesses using lab to pay rental/use fees on equipment, not a contract
Can contact with subject matter experts for fee, sign privacy agreements,
Remember to add replacement and maintenance costs to pricing model for fees
Prefer buy equipment and own it on average, but lease or consignment on production grade equip.
Serve as showcase for Metatoya equipment, weights and balances, metrology
Workforce has full time recruiter, follows up on those that show interest but do not register
Programs limited by campus space and planning for bldg. at aerospace park,

CERTIFICATIONS: SpaceT Ec, CertT ec, ASTM, NIST, MTAC, AWS,
OGDEN-WEBER APPLIED TECHNICAL COLLEGE
MODEL SITE VISIT SUMMARY REPORT

| COLLEGE: | Ogden Weber Applied Technical College |
| CENTER NAME: | Advanced Manufacturing Center |
| LOCATION: | Ogden, UT |
| ENROLLMENT: | 9,000+ |
| DATE OF VISIT: | October 1, 2013 |
| LEAD CONTACT: | Curtis Nielsen, Program Director for Manufacturing |
| VISITING TEAM: | Deborah Wright, Michael Reynolds, John Calver, Shawn Avery (PCFWD), David Creamer (NHREC), Bob Poirier (Liebherr) |
| SIZE: | 60,000 sq ft |
| FACILITY COST: | renovations |
| FACILITY FUNDING: | State, industry |
| TECHNOLOGY FUNDING: | State appropriation, $350 tool fee; equip donation, consignment |
| STAFFING & FUNDING: | State, fees, industry-apprenticeships sponsorship |
| FEATURES: | Industry driven, apprenticeship, postsecondary trade school model |
| STAFFING: | Credit and OJT NC trainers and staff, all transfers into credit as apprenticeship |

<table>
<thead>
<tr>
<th>PROGRAMS</th>
<th>TECHNOLOGY</th>
<th>SPACE</th>
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<tbody>
<tr>
<td>Composites Certif. and Non Destructive Testing</td>
<td>3D Parametric, Autoclave, CMM</td>
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<tr>
<td>Industrial Automation Maintenance Certif.</td>
<td>Tooling U, Fanuc, Motoman, Mazuc</td>
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<tr>
<td>Machinist Apprentice Certif. to AAS</td>
<td>Haas</td>
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<tr>
<td>Machinist Level I, II, III Certifs.</td>
<td>Hass</td>
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<tr>
<td>Metal Fabricator Certif.</td>
<td>Lincoln</td>
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<tr>
<td>Sheet Metal Worker Apprentice Certif.</td>
<td>Miller</td>
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<tr>
<td>Soldering Technician Certif.</td>
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<tr>
<td>Welder, Production and Advanced Certif.</td>
<td>Lincoln</td>
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<tr>
<td>Electronic Technology Certif.</td>
<td>LabVolt</td>
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<tr>
<td>CAD-CAM, CNC</td>
<td>ToolingU, AutoCAD, Fanuc, Mazuc</td>
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<tr>
<th>RESOURCE PERSONS</th>
<th>POSITION</th>
<th>EMAIL</th>
<th>PHONE</th>
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</thead>
<tbody>
<tr>
<td>Collette Mercier</td>
<td>President</td>
<td><a href="mailto:mercierc@owatc.edu">mercierc@owatc.edu</a></td>
<td>801-627-8302</td>
</tr>
<tr>
<td>Curtis Nielsen</td>
<td>Prog. Dir for Manufacturing</td>
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<td>801-627-8448</td>
</tr>
<tr>
<td>James Taggart</td>
<td>VP for Instructional Svs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monica Schwenk</td>
<td>Development Director</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kyle Jensen</td>
<td>Dir of IT</td>
<td><a href="mailto:jensenk@owatc.edu">jensenk@owatc.edu</a></td>
<td>801-627-8432</td>
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</table>

BEST PRACTICES:
All 54 programs competency based, 90% are Open-Entry Open-Exit, year round. Cohorts start Mondays.
Replicates true shop floor: production grade equipment, practices, culture, safety, layout, scheduling
All instruction follows the OJT individualized instruction model and is one-on-one, team based
As a technical college offers certificates that are stackable, offers no degrees but articulate to universities
Articulation is based on achieving same competencies but translated into credit hours
Universities provide wrap around gen eds at transfer level on admission (after success in tech courses)
All programs 900+hrs w GPA of C or better count for 30 credits in articulated agreement with university
All apprenticeship programs articulate for 40 hours of credit at the university
All programs have integrated work experience during or post program-internship, apprenticeship, OJT
Over 200 businesses actively provide internships for real work experience tied to certificates
Programs rely on two shifts, replicate the 40-hour workweek, project based knowledge with application
Quality control emphasis, Kaisen postings, individual Kaisen (efficiency, quality, lean mfg) reports
Programs have 70% placement in jobs, offer post-hire training for advancement, promo., high retention

TAKEAWAYS:
Leverage Governor's goal of 66% of population with postsecondary credential by 2020 (now is 43%)
Strong partnerships with the major trade unions as well as the employers of all sizes
Accredited postsec.trades school/skill center; 1 of 8 campuses of the Utah College of Applied Technology
Its programs count 30-40 credits in AAS at Weber State U as off campus technical skills site WSU,
Provides certificates of completion, Weber State provides wrap around Gen Eds, AAS in Apprenticeship
90% of courses are self-paced; M-W one shift, T-Th two shifts (eve class);
Instructors teach as guides on the side, as one-on-one, no group lectures
Have 1.5x hrs to complete course, maintain 67% progress; must enroll in 12 to 50 hours per week
Majority of flex staffing by wrap around faculty or adjuncts as technical assistants
Advisory teams composed of 10-12 companies, 24 advisory teams for the 53 programs
Advisory teams determine what to teach and value in average hours to achieve the competency
Scheduling non issue because students take all courses in the same environment / same classroom

LESSONS LEARNED:
Has its own governing board, 11 of 15 are from industry; assure mission fulfillment, and avoid drift
Unique competency based approach to apprenticeships, unions support, quality is there
Practical education is course requirement: 20% cognitive, 80% hands-on application w critical thinking
Time is variable but learning is constant, connect online, class/lab/work experience/job/empl. training
Best to have multiple models of apprenticeship depending on different company requirements, needs
Most students start on a Monday, set own pace, not seat time or semester driven;
Machining has value of 60 hours, if finish in 20 hours get the credit for the 60; but must complete in 90.
Employers needed take workers off line to inspect parts onsite, now bring them on campus;
Industrial quality testing equipment; CMM core measurement machine; on-destructive testing NDI
Accredited through Council on Occupational Education; requires outcome data on placement, retention
Requires that 60% complete and 70% are hired in related job or licensure, 42% must be hired in yr.
Faculty required to have at least six years experience in the trade
Reverse transfer with university, do theory then send to OWATC for the application, award credit
Students hired before they complete programs at OWATC
Students pay $350 each for consumables, covered by ARI and Federal Financial Aid
Dual enrollment, must be 16 and have completed sophomore year high school
IT challenges
- Required new software for new models of instruction, adapted Sequa Windows Based system
- Financial aid system, instruction, and curriculum development are integrated
- Machines had diff. languages, needed to talk to each other to create production environment
- Learning Management System developed to integrate with the technology
- Open entry and exit was SIS challenge, Northstar Software, developed application used by state
- CANVAS software=, online, multimedia, videos, podcasting, data mgt., industry certif. transcript
Offer Certificate of Apprentice Related Instruction but journeyman certificate from state office
Journeyman license counts for 40 college credits in AAS program at Weber State

CERTIFICATIONS: NIMS, NDI, AWS, FMA, SME, UCAT
# CALHOUN COMMUNITY COLLEGE
## ATC MODEL SITE VISIT SUMMARY REPORT

**COLLEGE:** Calhoun Community College  
**CENTER NAME:** Advanced Technology Research Center/AL Robotics Technology Center  
**LOCATION:** Decatur, AL  
**ENROLLMENT:** 12,000 credit students, 6,000 noncredit students  
**DATE OF VISIT:** October 3, 2013  
**LEAD CONTACT:** Bethany Clem Shockney, Dean, Workforce Devel, Technol, Bus, and CIS  
**VISITING TEAM:** Deborah Wright, John Calver, Stu Harris (NASA ret), Shawn Avery (PCFWD), Mike Lindsey (Continental), Anne Iffenegue (NNPS), Mike Yazkowsky (Hampton Ec. Dev.)  
**SIZE:** 3 buildings,  
**FACILITY COST:** $42 million (3 bldgs-$71m)  
**FACILITY FUNDING:** $42M; $1 M @ for localities, Ph 1-$17M, Ph 2 $10M, Ph 3 $3M  
**TECHNOLOGY FUNDING:** Consignment 9 equip manufact., USDOL, Foundation, State  
**STAFFING & FUNDING:** $3 M tuition/foundation, multiple USDOL grants, FTE=$2,600-$8,077*  
**FEATURES:** Robotics accelerator, 3 customers and 3 Fanuc employees are trainers  
**STAFFING:** VPWD, Dean Mfg, faculty and staff; co-located

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<tr>
<th>PROGRAMS</th>
<th>TECHNOLOGY</th>
<th>SPACE</th>
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<tr>
<td>Aerospace Technician/Aviation AAS</td>
<td>ABB, Fanuc, Kawasaki, Kuka, Mitsubishi, Motoman, OTC, Rockwell, Innovation</td>
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<tr>
<td>Robotics automation/technology</td>
<td>Lincoln, Miller, ABB, Cloos, Fanuc, Kawasaki, Kuka, OTC, Wolf, SKS Welding</td>
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<td>Welding/ Robotic welding</td>
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<td>Plastics</td>
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<tr>
<td>Additive mfg (AAS degree option)</td>
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<td>Industrial Maintenance</td>
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<tr>
<td>CAD/ Drafting/Design, 3DModeling AAS</td>
<td>Solid Works, 3D Rivit</td>
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<td>PLC/CNC Machining</td>
<td>Mazak, Haas</td>
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<td>CT- Quality/safetyOSHA</td>
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<tr>
<td>AAS spec Mech, Elec, HVAC, instrumentation</td>
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<td>AAS in Engineering Tech-EET MET</td>
<td>Lincoln, LabVolt</td>
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<td>Paint and Coatings (under dev)</td>
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<td>Nuclear tech (long range dev)</td>
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<td>Precision toolmaker-Machine Tool (Certif)</td>
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<td>Renewable Energy</td>
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**RESOURCE PERSONS**  
**POSITION**  
**EMAIL**  
**PHONE**  
Dr. Marilyn C. Beck  
President  
mcb@calhoun.edu  
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Dr. Alicia Taylor  
VP Instruction  
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256-306-2621  
Terry Bryson  
Dir Dev/Dean ResearchPk  
tbb@calhoun.edu  
256-890-4703  
Tad Montgomery  
Assist Dean Tech and WD  
tadm@calhoun.edu  
256-306-2539

**BEST PRACTICES:**  
President major proponent with State, Legislators and Local Govt, strong long-term partners  
Co-located ATC, AL Robotics Tech Park, Aerospace Center across Street from College Campus  
College programs utilize all facilities, both sides of street  
All classes at ATC and Robotics taught as 40 hour/wk classes; day and night classes  
Credit and noncredit programs co-reside;  
All trainers are mobile and can be rearranged on floor or transported to other sites
### CALHOUN COMMUNITY COLLEGE
### ATC MODEL SITE VISIT SUMMARY REPORT

**Project based learning**, students take in projects for business, run as enterprise learning
Incubator-Company pays for materials plus 20%; design&drafting, rapid prototyping
Piloting roll-on-roll off manufacturing
Integrated Robotics Production Lines on floor, multiple manufacturers
AAS degrees 68 cred, 21 gen eds, 16 level three tech courses
Show room for 9 companies; equipment on consignment, if sell then replace; tech transfer
Phase I request from Automotive Industry-ops and maint, Honda, Toyota, Kia, Mercedes, Nissan
Phase II, R&D for unmanned systems, focusing on aeronautics/airbus and biotech to diversify
Phase III, Production, robotics
AAS degrees and short term certificates of 24-27 credits

40-hour training structure -
Offer all community college students opportunity to come train, take 1 week off come to site;
Operate around the clock – 2 shifts, 3rd shift is maintenance
Students trained traditional welding, then automated welding
Pre and post hire training onsite from community organization
Bus in K-12 to visit, observe; dual enrolment on competitive basis to fill avail/open seats
Association with a Maritime Welding Center
OSHA Pay for Performance Training

### TAKEAWAYS:
One community college serves 500,000 with three campuses and ATCs
Colleges regional economic impact, credit and noncredit, calculated at $279,284,000
ROI for college including ATC investments is 12:1
Immediate need for 600 technicians, company surveys; demand for 400 process operators
Mobile unit with robotic welders goes to all high schools for camps; learn basics; career fairs
Hands-on skill validation for journeymen, NCCR certification
Offer vendor specific certifications with technology
Articulation agreements with UA Huntsville, Embry Riddle, UA Auburn, A&M; EET to MilSchEng
Include SAMSE WorkEthic test
Credit faculty able to do noncredit contract training
Robotics Tech Park PHI-Robotic Maintenance Training Center, PhII-Adv Tech Research&Dev
State Reimburses for High Tech Programs, $2,600 for regular, $8,077 for High Tech

### LESSONS LEARNED:
Production quality technology, avail to businesses for training, limited student access
Partners lined up at onset, invested: Robotics Automation, Robotic Weld, PLC, Standard
Adv robotics accelerator allows 2 capstone AAS students a semester to work on projects
Graduate and place 50 industrial tech a year, run 15-25 per course
NCCR takes to a certain level then need training on specific application
ABET accredited
Imbed CRC and WorkKeys; 11 grade is CT exam, 12th exit exam is CRC WorkKeys in AL
Work experience--Strong apprentice programs, cooperative education components
Transfer to specific university programs for most majors- U of AL Huntsville, Athens SU, U of AL
Fee based use of accelerator with experts on site

### INDUSTRY CERTIFICATIONS
SpaceTec, NIMS, AWS, CRAW, MSSC, OSHA, NCCER, ABB, Fanuc and other equip certifications
GULF COAST ATC
SITE VISIT SUMMARY REPORT

COLLEGE: Gulf Coast State College (formerly Gulf Coast Community College)
CENTER NAME: Gulf Coast Community College Advanced Technology Center
LOCATION: Panama City, Florida
DATE OF VISIT: October 11, 2012
LEAD CONTACT: Steve Dunnivant, Dean of Advanced Technology Center (WD, lead)
VISITING TEAM: Deborah Wright, John Calver; also Craig McAtee, Paul Plierpoint, Diane Dostie
SIZE: 96,000 sq ft
FACILITY COST: $35 million
FACILITY FUNDING: $30 m bond; $5m FL capital improvement for old tech bldg, paymts from O&M
TECHNOLOGY FUNDING: 1-K Panasonic, Siemens, Amatrol, Perkins, $3.5m/$5m 1/5yr MG cmp
STAFFING & FUNDING: 12 full time faculty and 8 staff and budgets moved over, Perkins
FEATURES: Green bldg, multipurpose, Business & Technology & Workforce, Teach & Learn Cntr
STAFFING: Workforce Dean, Division Dean, re-located staff

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<thead>
<tr>
<th>PROGRAMS</th>
<th>TECHNOLOGY</th>
<th>SPACE</th>
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<tbody>
<tr>
<td>Engineering</td>
<td>CNC, CAD/CAM, Rob, FAB</td>
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<td>Engineering Tech</td>
<td>Mach (all listed above)</td>
<td>All engineering tech fac</td>
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<tr>
<td>Industrial Maintenance/Mechatronics</td>
<td>(all listed above)</td>
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<td>Business</td>
<td>SMART lab, URLs, e-com</td>
<td>Half business fac</td>
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<td>Center for Entrepreneurship</td>
<td>e-learning</td>
<td>1st fl, staff, fac, SBDC</td>
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<td>Media Arts</td>
<td>Digital TV, Panasonic</td>
<td>Classroom and TV studio</td>
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<td>Culinary Arts</td>
<td>Fab Center</td>
<td>Kitchen, food service</td>
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<td>Corporate Training</td>
<td>Amatrol</td>
<td>5 flex labs</td>
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<tr>
<td>Center Teaching &amp; Learning</td>
<td>Panasonic</td>
<td>Two multi funct rooms</td>
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<th>EMAIL</th>
<th>PHONE</th>
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</thead>
<tbody>
<tr>
<td>James Kerley</td>
<td>President</td>
<td></td>
<td></td>
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<tr>
<td>Steve Dunnivant</td>
<td>Dean of ATC</td>
<td></td>
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<tr>
<td>Melody Boyd</td>
<td>Dean Bus &amp; Tech</td>
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BEST PRACTICES: CO-LOCATED WD&CREDS; LEARNING INNOVATION, INTERDISCPL TEACH
Community engagement- 1. Site visits, 2. Meet Leaders 3. NCATC-MAP meets, 4. Faculty retreat
Used the MAP study to engage the college and the community and the businesses, report out
"Not just a building but a philosophy of integration from very foundations" tech & teach & partners
College-wide "Center for Teaching and Learning Innovation" – two classrooms, fund innovation
Cross disciplinary teams teach in classrooms
Engaged Siemens in design to create a world model for green, 1 pt from Gold Level
Center for Entrepreneurship, SBDC, e-commerce support, licensing URLS, IT infrastructure support
"Wedding of Technology & Business together is the future, we've wedded them to the community
Locate a core high demand program for jobs, as we did with IT and Business, to attract manufact.
Walter Bumphus, president of AACC, key speaker at Opening “Product of the Vision of Your President”
GULF COAST ATC
SITE VISIT SUMMARY REPORT

TAKEAWAYS: x

Community is rural, only service sectors, some small and growing manufacturing and IT
Purpose of a tech future brought the community together—leaders, schools, university, businesses
President became the champion; created a powerful vision of where community could go
Entire community engaged at multiple levels, many open meetings, meeting throughout community
Faculty supported because they were engaged from start, planned something for all faculty in bldg.
From the beginning it was a shared space for the whole college, special use space avail to all faculty
Newness and availability of tech and labs has excited the community and the faculty
Center has attracted funding and scholarships for all college programs, our foundation is booming
Center has become a magnet for students-1,100 full time and 300 part time and 500 WD
Center is seen by Economic Development as a magnet to attract hi tech companies, already done so
Everybody on campus "OWNS" the center, out ATC
Design the entire space for flexibility—few stationary walls, movable furnishings and IT,
Used retirements and turnover to bring in new young faculty beginning three years before
Be creative, listen, and be willing to change based on what you hear throughout the community
Expose faculty to ideas and let them run with it

President Jim Kerley comments on opening:
"This is a great day for our community, our businesses, our board, and our students-We did it!"
"The whole community came together for a facility dedicated to Employment and Opportunity"
"I want to thank our faculty. The hard work of our faculty cannot be overstated. I commend the creativity of our architect and our community teams, and the dedication of our Board of Trustees."
"I want to recognize the contributions of our College Foundation, Florida State University, our elected officials and school boards."
"This facility should be a single point of access for our students not to the region but to the world."

LESSONS LEARNED: x

We wanted a building that inspires the imagination—light, airy, open shared learning spaces
We wanted a building that produces students with high advanced tech skills and generates new jobs
Fosters guide-on-the-side rather than sage-on-the-stage, students work in groups, move to spaces
Not just integrated technology, but integrated/applied teaching and learning-the dream from start
Develop it with all partners on board from Day 1 of planning, president meetings, faculty retreat
Be aware of changes affecting funding; take advantage of them; cement prices dropped, green tech
1D corporate partner non-WD need: Panasonic SMART tech, Amatrol trainers, Siemens green bldg.
Know that no community college funding model sustains the required hi-tech, need many partners
Resisted pressure by Economic Dev to make this a convention center-said no, not our business
Integrate the creative into all aspects, incorporate art, media arts on site, art and performances here
Fundraising dinners and events held here inside and on deck overlooking Gulf
Key Question: what how much do you produce for now and how much for where we need to go?
Technology/furnishings custom ordered not available from federal or state providers, visited Expos
Mixing/matching high tech and integrate-able furnishings is "wiggy" and IT/PLANT/WD together
Space laid out in programmatic lanes to be switched and moved by faculty and students