

**AC 2009-1704: OPERATING A CENTER FOR APPLIED RESEARCH AND TECHNOLOGY (CART)**

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# **Operating the Center for Applied Research & Technology (CART, Inc.)**

## **Abstract**

The paper describes the continuing development of the Center for Applied Research and Technology (CART, Inc.) at a small college as a vehicle for entrepreneurial success. It discusses our Unmanned Systems Laboratory (USL) to provide teams of engineering technology students for our School of Engineering Technology and Computer Science (SET) with in-house internship experience and the School with a source of increased funding through CART, the operation of our own Course Management System (CMS) as a fee-based self-sustaining business operation, our ongoing applied research projects for the mining industry and defense agencies, our partnerships with other colleges, universities, industry, and government, the creation of our ET AL fundraising unit, and the operation of the shop CART store.

The vision of CART is to become a highly respected resource for innovative engineering and emerging technologies in the discovery of advanced research and design of applications that drive our economic viability, solve industrial problems, and strengthen economic security and national defense.

Our specific mission is to produce outstanding financial returns by providing efficient and effective research contracting, program development, and revenue generation for our School of Engineering Technology and Computer Science. CART, Inc. focuses on innovation through applied research, transferring technologies to markets, continuing education, and raising funds that will enhance the overall competitiveness of our College.

CART was created to enhance the competitive position of our college for applied research opportunities in the current environment for research and development; promote the general economic development of the region; expedite and simplify the acquisition and utilization of research contracts; improve technology transfer; and link applied scientific research and technological advancements to economic development of our region.

CART fosters and supports applied research at our School for Engineering Technology & Computer Science and provides evaluation, development, patenting, management and marketing for the inventions and diverse service capabilities of its students, faculty, and staff. CART operations are subject to an independent audit.

## **Introduction**

CART, Inc. enjoys a unique small business relationship with the School of Engineering Technology and Computer Science (SET) at our college. SET prepares students for professions in which knowledge of mathematics and natural sciences gained in classrooms, online, and in laboratories, are applied primarily to the implementation and extension of existing technology for the benefit of industry. SET education focuses on applications of science and engineering aimed at preparing graduates for practice in applied research, technology development, product improvement, manufacturing, and engineering operational functions.

The School offers associate and baccalaureate degrees in Architectural (ARET), Civil (CIET), Electrical (ELET), and Mechanical Engineering Technology (MEET), and baccalaureate degrees in Computer Science (COSC) and Mining Engineering Technology (MIET). Graduates of the eight (8) accredited programs (Technology Accreditation Commission of the Accreditation Board for Engineering and Technology {TAC-ABET}) may participate in the examinations and complete the service requirements for registration as Professional Engineers in most states.

The School works with its own Center for Applied Research and Technology, Inc. (CART) that provides unique leadership in applied engineering research and technology development for the School. CART provides business management, contract development and administration as it conducts focused product and service development programs based in innovative research. It also provides technical assistance, continuing education, and economic development that enhance the college's competitive edge in technology development regionally and nationally.

CART was chartered in 2003 as a not-for-profit corporation and approved by the College's Board of Governors as a cooperative and affiliated organization. CART enhances the competitive position of the School for applied research opportunities in the current environment for research and development; helps promote the general economic development of the region; expedites and simplifies the acquisition and utilization of research contracts; improves technology transfer; and links applied scientific research and technological advancements to growth in the industries that employ graduates of the School.

### **Examples:**

SET and its Center enhance Institutional Outreach through ongoing efforts to connect its most creative ideas and share its best practices with the industries it serves, the professional societies it supports, the competitions it enters, and the region it respects in an engaging partnership for mutual improvement. There have been many examples of these activities in each program and among different combinations of programs over the years. A sampling of the various efforts of students and faculty participating in these programs over the recent years includes the following:

- CART and its industrial partners along with ARET and CIET students designed, and help build a new house for the local Habitat for Humanity in southern West Virginia, in 2003.
- CART works with local industry, agencies to support the School ELET program as it anchors our successful participation in Intelligent Ground Vehicle Competition, [www.igvc.org](http://www.igvc.org), which routinely involves ARET to make drawings, COSC in programming autonomous algorithms, CIET utilizing GPS to layout precise practice courses, MEET to develop vehicle platform designs. A CART-sponsored autonomous vehicle named "Vasilius" won Best Design at the 2003 international competition held annually in Rochester, Michigan. In 2008, our college won the competition outright with its Anassa III entry. Our teams have consistently placed among the top six since 2003, against universities considered best in the world in unmanned vehicle design.

- CART works with local industry, agencies to invest in ARET and CIET efforts to lead the college's American Society of Civil Engineers Student Chapter, [www.asce.org](http://www.asce.org) to conference victories related to lightweight concrete and steel bridge design. Winning and placing second in conference competitions qualified two of BSC teams to compete in national ASCE competitions in Denver, CO and San Diego, CA in recent years.

Competitions described above enhance the Institutional Mission by recognizing that the mission of the college is to provide students an affordable, geographically and electronically accessible opportunity for public higher education. The School demonstrates its commitment to this undergraduate education mission by providing an experienced, dedicated faculty and staff delivering quality Engineering Technology programs. The SET programs are designed and operated to promote BSC students' intellectual, personal, ethical, and cultural development.

The School and its Center primarily serves students from southeast West Virginia in Mercer, Greenbrier, Monroe, McDowell, Raleigh, Pocahontas and Summers Counties and Buchanan, Tazewell, and Giles Counties in southwestern Virginia. While there is abundant literature that suggests these geographic backgrounds can pose a difficult challenge for higher education in general, our college's specific experience has been different over the long run. The pride, diversity, resourcefulness, adaptability, persistence, resilience and good common sense approach of the School's students is an excellent foundation for building quality engineering technology programs and sound small business founded on applied research.

The School's students enjoy a spirit of competition, and this spirit carries through the classroom and laboratory experiences to extra-curricular activities. As mentioned earlier, they have won regional, national, and international competitions against major universities. They are prepared through real experiences that are provided in their academic assignments and their undergraduate research activities through CART. These experiences provide clear expectations that are designed to match the expectations of the industries that employ them. Employer and graduate surveys provide evidence of acceptance in industry and graduate programs and of continued growth after initial employment.

The School's faculty enjoys diverse backgrounds of education and industrial experience. They average ten (10) years of industrial experience and seventeen (17) years of teaching experience, and hold degrees of different levels at 28 different colleges and universities.

The faculty has received numerous awards while working with CART, in private industry and the college. Students recognize enthusiasm of these faculty members through industry-led applied research assignments and care for their professional development.

Responding to Industrial Advisory Committees, the School has determined that the represented businesses' and industries' missions have much in common with SET. They have identified common needs to respect and address safety, dependability, work ethic, teaming skills, communications and the use of the tools of the professions. CART, Inc. was founded on turning these principles into a self-sufficient business linked back to the School.

CART, Inc. enhances Service to the Community by investing its collective efforts in economic development activities. In the School's programs, industry participates, the programs are real, the expectations are clear, continuous quality improvement is alive; graduates, their employers, their families, and the communities are the beneficiaries. One recent example of the results of these activities is an international manufacturing leader setting-up shop in southwestern VA. Fenner-Dunlop Conveyor Belting, the world's largest manufacturer of conveyor belting for mining and industrial applications, will locate at the Tazewell County Business and Technology Center near Bluefield, VA., which is about a ten (10) minute drive from the campus.

"Obviously being in the conveyor belt business, one of our largest markets is coal mining," David Hurd, president of Fenner-Dunlop Americas, said. "So why not have something in the middle of the coal mine industry. To me, if you are going to do research on your product, why not do it in the heart of the industry."

The company has 13 manufacturing facilities on five continents. The company's conveyor belts are currently used in operation both underground and on the surface, handling materials in a variety of industries and countries.

Hurd said "The company will focus on research and development of conveyor belt monitoring systems at the Tazewell County operation. Portions of the company's research and development will involve collaboration with the Center for Applied Research and Technology (CART) at the college."

Bruce Mutter, vice president of CART operations at BSC, said that "The College is looking forward to collaborative efforts involving engineering students and faculty." "We must work more closely with industry," Mutter said. "We will have to solve problems that make an immediate impact on the economic engine."

Hurd said that "The Company will start out small with about three employees and between eight to 10 students assisting with cooperative research. The company hopes to expand to 10 to 20 employees in the near future."

### **Goals:**

Goals for strengthening the SET Programs of Distinction include: The CART vision for becoming a highly respected resource for innovative engineering and emerging technologies in the discovery of advanced research and design of applications that drive economic viability, solve industrial problems, and strengthen economic security and national defense.

The specific mission of SET with this endeavor is to produce outstanding financial returns by providing efficient and effective research contracting, program development, and revenue generation for the School of Engineering Technology and Computer Science. CART will focus on innovation through applied research, transferring technologies to markets, continuing education, and raising funds that will enhance the overall competitiveness of the College.

## **Strategies/Rationale:**

### **Strategies for attaining these goals include:**

- Fostering creative entrepreneurial activities within the School of Engineering Technology (and Computer Science) (SET)
- Generating research dollars for the College and its SET
- Leasing research equipment and facilities for use by SET through CART

CART will serve as patent agency for obtaining patents on SET faculty and student inventions and for licensing, developing and commercializing its products and services.

Continuing the development, support and marketing for the advanced vehicle robotics program.

Managing and marketing the CART-developed self-sufficient online course management system and deliver credit and non-credit professional development courses nationwide.

Ongoing review of these programs of distinction will primarily be based on the College's, and the School's, longstanding commitment to continual improvement of accreditation by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology.