Georgia Tech, PTC & John Deere Conduct Experiment in Product Development

Multi-School Collaboration Project Prepares Students for Real-World Engineering

Georgia Institute of Technology, Atlanta, Georgia, USA

Founded 120 years ago, Georgia Institute of Technology is annually ranked among the world's leading engineering universities. The only technology university ranked among America's top ten public universities, Georgia Tech offers the No. 1 industrial engineering program as ranked by the U.S. News & World Report.

With more than 16,500 undergraduate and graduate students, Georgia Tech is an international leader in scientific and technological research, receiving more than $300 million in research awards in fiscal 2004.

Prepare Students for Complexities of Real-World Manufacturing

As global manufacturing becomes more complex and competitive, companies need engineering graduates to bring more than just basic design skills to the table. Today's fledgling engineers must be versatile in global collaboration and Product Lifecycle Management (PLM), in addition to advanced 3D CAD tools. To meet the challenge, universities and manufacturers are now seeking innovative ways to enhance engineering curricula, so students can make an immediate impact when entering the real world of manufacturing.

Collaboration Project with Georgia Tech, John Deere and PTC

In 2003, Georgia Tech–with co-sponsors PTC and John Deere Company-embarked on the Distributed Collaborative Product Development (DCPD) project, an ambitious and exciting product development project involving multiple universities, professors, and students, plus professional engineers from PTC and John Deere. The project calls for students at different universities to collaboratively design and build an amphibious utility vehicle based on John Deere's Gator. For the design, simulation, and development of the vehicle, the entire team would use Pro/ENGINEER Wildfire 3D CAD tools, provided by PTC through its popular University Plus program.

Students Prepared for Real World Manufacturing

With the DCPD project now clicking on all cylindars, professors, students and sponsors alike are seeing tremendous personal, professional and technological growth from all engineering participants. Not only are students widely applying the Pro/ENGINEER Wildfire tools they've learned from their courses, but they're also developing other skills prospective employers greatly value, such as Web-based collaboration, leadership, project management, and interpersonal communication. With the support of professors, John Deere engineers, PTC Education Program and PTC technical support, DCPD engineering students are developing invaluable skills that will pay immediate dividends–both for themselves and their employers—on their very first day on the job.

Amphibious Gator Utility Vehicle designed and rendered in Pro/ENGINEER by the student engineering teams.

Hitting the Ground Sprinting

With the amazing advancements in product development today–3D computer-aided design (CAD), global supply chain collaboration, real-time customer communication–professional engineers have all they can handle applying today's engineering tools. So imagine how newly hired engineers fresh out of college feel walking into this environment.

Today, thanks to the Distributed Collaborative Product Development Project developed by Georgia Tech and sponsored by PTC and John Deere, select groups of graduating engineers across the USA–from Georgia to Maryland to Illinois to Massachusetts–will soon arrive at the world's leading manufacturing firms with a much keener understanding of today's most advanced technology tools–and ready to hit the ground sprinting.

PLM: The Product–from Cradle to Grave

The DCPD project introduces engineering students to the many processes and practices of a new phenomenon in product development called Product Lifecycle Management. PLM is a marriage of all essential processes and technologies companies use to create any given product–from initial 3D design sketches, to prototyping, simulation, mold making, FEA–all the way to final product retirement.

Today, just four semesters into the DCPD project, the entire team–professors, sponsors and students–have discovered that the DCPD project is fostering much more than just technology skills. Students are also learning about leadership, problem solving, diplomacy, cost projection, project management, and a host of other talents. From all indications, this innovative program will serve as a model for other universities who want to enhance the quality of their engineering programs.

Reverse Engineering Project with Partner Universities

To introduce PLM into their engineering curricula, Georgia Tech first implemented the Distributed Collaborative Engineering Project with colleagues from the University of Maryland-College Park. Their first collaborative effort was to reverse engineer an existing product—a cordless screwdriver, where each university team would work on a different facet of the product, then combine efforts to deliver a new product.

The success of this pilot project inspired the team to join with sponsors PTC and John Deere to embark on a much larger project: the DCPD, whose goal was to collaboratively build an amphibious vehicle based on John Deere's successful Gator utility vehicle.

Building Real-World Product Development Teams

To launch the DCPD experiment, project managers at Georgia Tech and John Deere prepared a project plan to guide the entire team:

- At Georgia Tech, five engineering students were charged with analyzing the chassis of the vehicle and adapting it for amphibious function.
- At University of Illinois Urbana-Champaign, five freshmen were responsible for adapting the existing suspension and steering mechanisms, enabling the new vehicle to be controlled in water and on land.
- At the University of Maryland-College Park, a three-student team was responsible for researching, developing, and redesigning the engine, power train, fuel system and air systems of the Gator for the new mission.
- PTC, through its University Plus Program, provided students and professors with Pro/ENGINEER 3D product design software, plus training for instructors and students, along with technical support. PTC also donated its project management solution–Windchill ProjectLink–for managing schedules, data, and all critical deliverables.
- Co-sponsor John Deere provided professional guidance through its engineering personnel, plus a new Gator vehicle for students to study and redesign into an amphibious vehicle.

Putting Pro/ENGINEER Course Work to the Test

Unlike most college classes that have clearly defined coursework, the DCPD project encouraged students to throw away the syllabus, think outside the box, and be as innovative and creative as possible in applying their Pro/ENGINEER classroom training.

For Georgia Tech students, this meant using Pro/ENGINEER to develop multiple design alternatives, adding two additional axles to the existing Gator design. At U-Maryland, the design team used Pro/ENGINEER to develop alternative designs for sealing the engine and drive train compartment. At the University of Illinois-Urbana Champaign, Pro/ENGINEER simulation tools helped students discover that a rudder device would be needed for steering.

Using Pro/ENGINEER in a real-world project enabled students to take their skills to a much higher level than was possible in class. In fact, some students discovered new applications of the CAD tools, beyond their original specification. Tord Dennis, project director at Georgia Tech explains:

"Students found new ways of doing things. For example, in a previous semester, students figured out how to apply the sheet metal application in Pro/ENGINEER to build tires. It has a nice function for wrapping things. We could use this to wrap a shape and make a tire."

The Power of the Web

In addition to flexing their 3D design skills, students also learned to apply another essential tool in modern manufacturing: the World Wide Web.

Each week, team leaders from each of the schools met online to discuss major design issues and project deliverables. Then, as the project progressed, the entire team met online each week to discuss other project issues, such as using the Product Data Management (PDM) System, or how to apply specific tools in Pro/ENGINEER such as skeleton models.

Students also learned how to use the industry's most advanced project collaboration solution, PTC's Windchill Projectlink, the leading PLM tool for managing all digital project design iterations, backup documents, documentation, and schedules.

Communication, Collaboration–and Leadership

Thanks to the DCPD project, students are honing vital skills that take years to master in the real world, such as team collaboration, project leadership, resilience, patience, diplomacy, and the fine art of compromise. Better still, the project opened students minds to different ways of thinking.

"Everyone from Georgia Tech has taken the same courses from the same teachers and think in the same way. Working with students in a different place, who have different views on things, different ideas and experiences with different aspects that we don't have experience with–it sheds a new light on a design project," explains student Jacqueline Woo of Georgia Tech. "Working with other teams to work out problems is a real opportunity that students don't have before they get out there."

Win-Win for Students and Universities

While the DCPD project has been a tremendous benefit to participating students, it has also benefited participating universities by raising the quality of their engineering program.

"[The DCPD Project] has definitely enhanced the program at Georgia Tech and raised the bar for our engineering program as whole by A, getting more industry partners to get involved in projects, and B, doing more collaborative things with other universities," states Tord Dennis of Georgia Tech.

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