

ACAP
11/17/16
Agenda Item 4a

(Only required if the institution intends to request or receive appropriations from the state)

Name of Institution:
Clemson University

Name of Proposed Center/Institute:
Product Lifecycle Management Center

Proposed Date of Implementation:
17 August 2016—the Center was initiated following approval by the CU Board of Trustees and now seeks CHE approval

Sites:
Clemson University, main campus
CU ICAR (Greenville, SC) and CURI (N. Charleston, SC)

Program Contact Information (name, title, telephone number, and email address)

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Institutional Approvals and Dates of Approval

Board of Trustees Approval on 15 July 2016.

State the nature and purpose of the proposed center/institute and its centrality to institutional mission. (1500 characters)

A Product Lifecycle Management (PLM) Center at Clemson University has been proposed to champion the educational and research usage of PLM software donations. The Center, housed within the College of Engineering, Computing and Applied Sciences (CECAS), will be a resource for all faculty and students at Clemson interested in multidisciplinary applications of these computerized design, simulation, and analysis tools.

A dedicated laboratory space, located in the Fluor Daniel Engineering Innovation Building, will feature computer workstations with high speed graphic capabilities and large display monitors to host the PLM software tools. A PLM application engineer(s) will be recruited to assist faculty / students in the use of the PLM software packages as well as the development and delivery of education programs both on- and off-campus.

The Center will support education and research opportunities for students, faculty, and industries in the application and development of PLM software tools. Students on the Clemson University campus will have access to the software for use in courses and research. In addition, continuing education will be offered to regional companies for workforce development with a pathway leading to certificates. For research, the Center's consortium of companies will participate in the selection of PLM-based studies that will be conducted by Clemson faculty and graduate students with results shared with the assembled academic-industry PLM community. For those companies interested in proprietary research, individual sponsored projects can be established with faculty and graduate students (in conjunction with the Office of Industry Contracts) to directly conduct research on a specific topic.

List the objectives of the proposed center/institute. (1000 characters)

- Foster multiple learning environments throughout the state for PLM technology using a dedicated computer laboratory, remote training sites, workshops, seminars, and industrial outreach efforts for education, research, and product applications.
 - Train next generation of engineers, technologists, and manufacturing workforce with the skills necessary to function in a data-driven, systems-oriented PLM environment through educational programs at all levels.
 - Provide industry with training, consulting, and collaborative research to advance PLM technologies across industries and drive regional product innovation.
 - Facilitate mixed software module integration for seamless flow between systems.
 - Create a regional testbed to interface industrial manufacturing capabilities “digitally” at the Center along with supply chain capabilities and other location specific information to develop a realistic framework for research, product development, and workforce training.
- Champion the capabilities of PLM software for students, faculty, staff, researchers, and industry through research and education.
- Establish an Industrial Consortium for PLM software users within South Carolina that will participate in the Center through membership fees that offer continuing education and research opportunities as well as guidance of the planned research activities.
- Implement a PLM user's community within the State.

Assessment of Need

Provide an assessment of the need for the proposed center/institute for the state, the region, and beyond, if applicable. (1500 characters)

Clemson University proposes to create a Product Lifecycle Management (PLM) Center to address this emerging paradigm shift for many industries within the State of South Carolina. Advanced computer-aided design, modeling, and simulation tools are continuously developing but have often done so in isolation.

Today, data is being collected at nearly every step of the manufacturing process – so much data that it is unclear how to make best use of the data. Product Lifecycle Management provides the overarching platform where the disparate software tools, data management and analytics, and business processes all come together – integrating via a “digital thread”. This is a burgeoning area that is transforming the way that major industry sectors do business. Now, components and systems can be managed from idea inception all the way through end of life. Feedback from the field can be used to alter a design, and the impact of the design change can be immediately realized all the way through the supply chain, manufacturing process, and use. Changing the way companies function in this new paradigm not only requires advanced technical software tools and models, but also a cultural change within the industry.

Leading companies are clamoring for new hires that are at home with this new philosophy, plus educational opportunities for their incumbent workforce and their suppliers. Further, these leading companies need research to better integrate these tools and their processes into the PLM platform, and to create advanced modeling and visualization tools for the future. The PLM Center at Clemson University will play a critical role in this rapidly growing area, enabling Clemson students and faculty to be on the leading edge of this paradigm shift. It will support education and research endeavors on campus, provide outreach to industry through consortium activities, and advance economic development in the Southeast, especially South Carolina.

Will the proposed center/institute impact any existing programs and services at the institution?

Yes

No

If yes, explain. (1000 characters)

List of Similar Centers/Institutes in South Carolina

Name	Institution	Similarities	Differences
McNAIR Center	University of South Carolina	Teaches PLM with the use of CATIA, and provides a certificate on completion of courses. Also offers continuing education to industry professionals.	McNAIR Center focuses on aerospace education, research leadership, and industry advancement. Clemson University PLM Center will focus on PLM application from a multidisciplinary industrial lens with strong corporate guidance and participation.

Faculty

Provide a brief explanation of any changes in faculty and/or administrative assignment that may be required as a result of the proposed center/institute. (1000 characters)

The PLM Center at Clemson University will be primarily operated by faculty and administrative staff within the Department of Mechanical Engineering and College of Engineering, Computing and Applied Sciences (CECAS) who have other assigned duties within the University including current academic and research responsibilities.

- Director, Professor John Wagner, is a 25% appointment (1 academic course release) from the Department of Mechanical Engineering with continuing responsibility for teaching and research activities.
- Co-Director, Professor Randy Collins is a 10% appointment from the Department of Electrical & Computer Engineering with continuing responsibility for teaching and academic initiatives.
- Associate Director of Education & Training, Associate Professor Greg Mocko, is a 15% appointment from the Department of Mechanical Engineering with continuing responsibility for teaching and research activities.
- Associate Director of Industrial Relations, Elizabeth Colbert-Busch, is a 10% appointment from the SCE&G Energy Innovation Center and Duke Energy Electric Grid Research Innovation and Development Center with continuing responsibility for the Clemson University Restoration Institute business and economic development.
- Associate Director of Research position will be filled (15% appointment) with a CECAS faculty member.
- Administrative Assistant, Corbin Kolehmainen, is a 25% appointment from the Department of Mechanical Engineering with continuing responsibilities in the Department.
- Accountant, Rebecca Summey, is a 15% appointment from the Department of Mechanical Engineering with continuing responsibilities in the Department.
- PLM Application Engineer(s) FTEs and graduate students will be hired once the Center is operational.

Library and Learning Resources

Identify current library/learning collections, resources, and services necessary to support the proposed center/institute and any additional library resources needed. (500 characters)

The Clemson University Cooper Library will be utilized by faculty, staff, and students in the completion of PLM education and research endeavors. The engineering librarian, Jan Comfort, will be requested to help provide on-line journals, reference books, and trade magazines on PLM applications and research in support of the Center's three-fold mission (education, research, and outreach). In addition, the assistance with patent and other database searches, including training students and Center participants in the use of these tools, will be helpful in the completion of classroom and research projects.

Physical Resources

Identify any new equipment needed for the proposed center/institute. (500 characters)

The Center will primarily require computer workstations and furniture to host the PLM software packages for education and research activities. Specifically, the needed equipment includes high end computers, large display monitors, printers, desks & chairs, and big screen wall mounted monitors for projection, as well as video-conferencing capabilities to teach both remotely and on-line. In addition, the video-conferencing will be used to host technical interchanges with remote industry participants. A total of 30 workstations with accompanying furniture will be required with 18 workstations in Fluor Daniel building (Clemson, SC), 6 at CU ICAR (Greenville, SC), and 6 at CURI (N. Charleston, SC).

Will any extraordinary physical facilities be needed to support the proposed center/institute?

- Yes
 No

Identify the physical facilities needed to support the center/institute and the institution's plan for meeting the requirements, including new facilities or modifications to existing facilities. (1000 characters)

The PLM Center will be located in the Fluor Daniel Engineering Innovation Building (EIB) on the Clemson University main campus. This building hosts the Department of Mechanical Engineering and some faculty in the Department of Electrical & Computer Engineering which allows close proximity to active education and research programs. Offices will be available for faculty, staff, graduate students, and corporate visitors. A security card will accessed PLM Laboratory which will house computer workstations used for course work, research, and industrial outreach which will be monitored by closed circuit security cameras. The 30 workstations will feature appropriate RAM and advanced graphic cards to support the PLM software packages. Clemson University is sponsoring renovations of the suite to meet the needs of the Center. The Center will offer both credit and continuing education courses on the on the main campus and at remote sites in Greenville (CU-ICAR) and N. Charleston (CURI). University students and industry workers will have the opportunity to use similar workstations to maintain uniform configurations.

Financial Support– (checked by Amanda Long, CECAS)

Estimated New Costs by Year						
Category	1st	2nd	3rd	4th	5th	Total
Program Administration	\$31,500	\$40,500	\$49,875	\$56,689	\$57,009	\$235,573
Faculty and Staff Salaries	\$182,633	\$ 199,355	\$203,342	\$279,731	\$285,325	\$1,150,386,
Graduate Assistants	\$59,998	\$ 61,408	\$62,853	\$64,334	\$65,850	\$314,443
Equipment	\$75,000	\$17,389	\$17,389	\$17,389	\$17,389	\$144,556
Facilities	\$30,000	\$15,000	-	-	-	\$45,000
Supplies and Materials	\$2,500	\$5,000	\$5,150	\$2,732	\$2,814	\$18,196
Library Resources	-	-	-	-	-	-
Other*		-	-	-	-	-
Total	\$381,631	\$338,652	\$338,609	\$420,875	\$428,387	\$1,908,154
Sources of Financing						
Category	1st	2nd	3rd	4th	5th	Total
Tuition Funding	\$30,000	\$60,000	\$90,000	\$120,000	\$120,000	\$420,000
State Funding (i.e., Special State Appropriation) *	-	-	-	-	-	-
Reallocation of Existing Funds*	\$220,000	\$56,204	\$6,408	\$9,612	\$9,612	\$301,836
Federal Funding*	-	-	-	-	-	-
Other Funding*	\$150,000	\$235,000	\$320,000	\$405,000	\$405,000	\$1,515,000
Total	\$400,000	\$351,204	\$416,408	\$534,612	\$534,612	\$2,236,836
Net Total (i.e., Sources of Financing Minus Estimated New Costs)	\$18,369	\$12,552	\$77,799	\$113,737	\$106,225	\$328,682

*Provide an explanation for these costs and sources of financing in the budget justification.

Budget Justification

Provide a brief explanation for the other new costs and any special sources of financing (state funding, reallocation of existing funds, federal funding, or other funding) identified in the Financial Support table. (1000 characters)

Note: Only provide this budget justification if any other new costs, state funding, reallocation of existing funds, federal funding, or other funding are included in the Financial Support table.

A ten-year financial plan has been formulated that estimates a financially sustainable business venture with adequate sources (e.g., consortium membership, education program, projected F&A return, & Provost Seed funding.) and sensible expenditures (e.g., personnel, travel, materials/supplies, fringe, GAD). Over ten years, the center is expected to generate ~\$565K in cumulative net contributions. By leveraging or reallocating existing personnel resources, the incremental impact is more significant, with an estimated cumulative contribution of \$1.27M over 10 years. Net contributions will be reinvested in research efforts, supporting students and faculty performing the research in the center.

Revenue Highlights:

- The center will reach steady state in year five and generate on average, \$536K per year in revenues. Consortium membership is the main driver. Continuing education efforts will also be a component of revenue generation for the Center.

Expense Highlights:

- Incremental personnel costs are supplements for the Director & Co-Director, 2 FTEs for the PLM Application Engineer, and Grad Students. The second PLM Engineer will be hired once revenues reach steady state.
- Costs for space renovation/upfit are included in the business plan.
- Projected expenses for the 'Continuing Education Operating' is 30% university overhead and \$10k in general operating. The application engineers will help teach courses.
- An important consideration is the minimization of expenses associated with the PLM software, which are crucial for financial sustainability.
- Affiliated faculty members are not expensed against industry consortium revenue in the business plan; therefore, industrial consortium projects will need to be completed by the application engineers & graduate students. This may limit the scope of the initial activities. At this time, the center has five industry partners interested in joining the consortium (the companies need to remain confidential until such time as agreements are signed).

Evaluation and Assessment

Provide an outline of how the proposed center/institute will be evaluated. Identify assessment tools or software used in the evaluation. Explain how assessment data will be used. (1500 characters)

The PLM Center will report to the Associate Dean of Research (College of Engineering, Computing and Applied Science) and indirectly to the Chair of the Department of Mechanical Engineering. An Industrial Advisory Board will help guide the Center's research activities as it works with Consortium Members to select and oversee research efforts completed by faculty and students. An Executive Committee will provide membership oversight and policy guidance. The evaluation and assessment of the PLM Center will be focused on the education, research, and outreach activities completed by faculty, staff, students, industry members, and workforce development participants.

The education efforts will be assessed using the established instructor and curriculum survey tools deployed within the Clemson University classrooms. One of the items included in this category will be the number of students enrolled in courses at each level, as well as professional classes (including seminars, workshops) for workforce development participants. These results will be reported using the WEAVE (or similar) assessment management system. The research evaluations will focus on the research papers written, number of faculty / staff/ graduate students engaged in Center research, research expenditures, number of Center-based proposals submitted to federal agencies, and additional research funding awarded each year. The industrial consortium activities will be assessed by the number of industry partners engaged in Center activity, and number of research projects completed within the Center. Lastly, community outreach will be assessed in terms of the companies assisted with PLM efforts and the establishment of a PLM Users Community within the State of South Carolina. These research results will be published in an annual report to be shared with the Clemson University administration and faculty, and the Industrial Advisory Board regarding the Center's continuing education, research, and outreach endeavors as noted above.