Summary

Clemson University requests approval to create a Center in Product Lifecycle Management to be implemented in August 2017. The following chart outlines the stages of approval for the proposal; the Advisory Committee on Academic Programs (ACAP) voted to recommend approval of the Center. The full center proposal is attached.

<table>
<thead>
<tr>
<th>Stages of Consideration</th>
<th>Date</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Proposal Received</td>
<td>10/3/16</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>ACAP Consideration</td>
<td>11/17/16</td>
<td>The Clemson representative discussed the nature of the proposed Center as a way to connect faculty at multiple locations and provide Product Lifecycle Management resources such as computers and software to allow faculty to collaborate and conduct research. The representative also stated the software will be taught in courses so students gain experience using it and thus enhance their employment prospects. The representative then informed ACAP members that Clemson was recently awarded a $357 Million software grant from Siemens for its Product Lifecycle Management platform to be used by the Center (see attached news article). In response to a question from Academic Affairs staff, the Clemson representative explained the facilities costs needed to renovate space to be used by the Center and the anticipated equipment upgrades required for using the software, both on-campus and remotely. The representative also explained the connections between the three sites. Upon remaining discussion, ACAP voted to approve the program proposal.</td>
</tr>
</tbody>
</table>
| Comments and suggestions from CHE staff sent to the institution | 12/6/16 | Staff requested the proposal be revised to:  
  - Describe the nature of the Center in the Background Information section, including the connection between and the need for the three sites and what the Center provides to the students and local community as described at ACAP;  
  - Identify the certificate programs students may pursue through the Center; |
### Stages of Consideration

<table>
<thead>
<tr>
<th>Date</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/12/2017</td>
<td></td>
</tr>
</tbody>
</table>

- Describe what is meant by “implement a PLM user community” and “facilitate mixed software module integration;”
- State clearly the relevant state workforce need (e.g., how many employees are needed and with what specific skills?);
- Include the information about the recent software grant awarded to Clemson mentioned at the ACAP meeting;
- State whether new library resources are needed, and if so, include a cost for these resources in the cost chart;
- Discuss the renovations needed for the Center in more detail, including their cost and then explain this cost in the Budget Justification;
- Specify how the Center will offer credit and continuing education courses (how many courses, how much credit, and which academic units will offer courses through the Center); and
- Explain the reallocation of existing funds and the other funding included in the cost chart in the Budget Justification, and provide the cost of the consortium membership and explain how membership works.

<table>
<thead>
<tr>
<th>Revised Program Proposal</th>
<th>Date</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Received</td>
<td>12/12/16</td>
<td>The revised proposal satisfactorily addressed the requested revisions.</td>
</tr>
</tbody>
</table>

### Recommendation

The staff recommends that the Committee on Academic Affairs and Licensing approve the Product Lifecycle Management Center to be implemented in August 2017.
(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)

John Wagner, PhD, PE
Professor of Mechanical Engineering
Clemson University College of Engineering, Computing and Applied Sciences
(864)656-7376, jwagner@clemson.edu

University Contact:
Debra B. Jackson, PhD
Special Assistant to the Provost
dbj@clemson.edu, 864-656-3194

**Institutional Approvals and Dates of Approval**

Board of Trustees Approval on 15 July 2016.

Document revised 12 December 2016.
Background Information

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.

The PLM Center will reside primarily on the Clemson University main campus (Clemson, SC) but will also have a presence on the CU-ICAR (Greenville, SC) and CURI (N. Charleston, SC) innovation campuses. As undergraduate and graduate students are at these locations, PLM resources (e.g., computers, software) will be made available to students and faculty for the completion of their departmental course work and also continuing education “certificates of attendance”. The PLM Center will be a multi-disciplinary endeavor with outreach across the university so an effort will be undertaken to have resources in the upstate and low country to fully leverage the PLM software. The Center will provide the university community with PLM education resources including software instruction, and outreach to regional business initially with continuing education training opportunities and progressing to research activities.

The PLM Center will champion the availability of continuing education “certificates of attendance” focused on product lifecycle management in terms of basic concepts and software tool suites. The Center will collaborate with university departments to facilitate software usage within existing or new credit courses. For instance, classes will cover model-based definitions, systems development, digital manufacturing, product data and configuration management, etc. in addition to applying common PLM software packages.
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.

Through discussions with regional companies that use PLM software tools in their engineering and manufacturing processes, it was suggested that a PLM User’s Community be created to enable practitioners (employees who work in the industries) to have a place (virtual and/or physical meetings) to share best practices, discuss programming challenges, interact with fellow PLM people, compare experiences with various software suites, etc.

For example, when companies use software packages from different vendors in their engineering, manufacturing, and/or business processes, the exported data from one computer program might not be readily imported into the next computer program without human intervention which lengthens the time required to complete the given task and raises the relative cost. By having a user’s community, people can talk about these products and exchange ideas related to implementation. Those interactions can help companies and university researchers focus on the seamless integration of select software utilities.

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.
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.

On 04 November 2016, Clemson University and Siemens announced an in-kind technology grant of PLM software to the College of Engineering, Computing and Applied Sciences for student coursework and academic projects (www.greenvilleonline.com/story/news/2016/11/04/clemson-gets-357m--kind-grant-train-engineers/93305014). (Appendix A)

Employers are seeking a workforce that is knowledgeable and fluent in PLM to affect the paradigm shift needed within their companies. PLM is integrated in a continuous thread from idea inception through end of life, and touches every aspect of industry such as those mentioned above. At a global level, the PLM market is estimated to rise from $40.3B to $75.9B between 2014 to 2022 (www.arenasolutions.com/blog/post/new-plm-market-reports-forecast-trends-2015-2022). Thus, beyond the immediate demand, the numbers of employees needed with PLM knowledge will grow over time as companies transition to becoming fully engaged in the PLM process. Within the State of South Carolina, specific estimates of employee numbers are not known at this time but major companies (e.g., BMW, Boeing, General Electric, Michelin, Siemens) utilize, or plan to use, these tools. Finally, the Tier 1 and Tier 2 suppliers to these companies will also require employees with PLM expertise since their components and products will need to be fully integrate into the PLM systems of the OEMs.

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

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Similarities</th>
<th>Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>McNair Center</td>
<td>University of South Carolina</td>
<td>Teaches PLM with the use of CATIA, and provides a certificate on completion of courses. Also offers continuing education to industry professionals.</td>
<td>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.</td>
</tr>
</tbody>
</table>
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. (Home Department – Mechanical Engineering).
- Co-Director, Professor Randy Collins is a 10% appointment from the Department of Electrical & Computer Engineering with continuing responsibility for teaching and academic initiatives. (Home Department - Electrical & Computer Engineering).
- 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. (Home Department – Mechanical Engineering).
- 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. (Home Organization – SCE&G Energy Innovation Center and Duke Energy Electric Grid Research Innovation and Development Center at CURI).
- 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. (Home Department – Mechanical Engineering).
- Accountant, Rebecca Summey, is a 15% appointment from the Department of Mechanical Engineering with continuing responsibilities in the Department. (Home Department – Mechanical Engineering).
- 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.
In conversations with the librarian, required resources by the Center would be gathered through Interlibrary Loan and PASCAL which are available to students and faculty without cost as they are covered by the R.M. Cooper Library existing budget. In addition, places to study and meet are available for student teams as needed in addition to technology items (e.g., photography, video, projectors, etc).

**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
- [x] 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.

At this time, the Center Director is working with the Facilities Project Manager (Brad Poore) in the College of Engineering, Computing and Applied Sciences to identify upgrades to the dedicated space on the main campus. A preliminary estimate has been requested for electrical & network wiring, wall removal, ceiling repair, floor cover, and paint. A second estimate will be obtained for the computer furniture (estimated $6,000-$12,000), large wall mounted computer monitor ($3,300), and several white boards ($450 each). The total budgeted funds will not be exceeded with the forthcoming uplift activities.
The Center anticipates that existing academic departments will be soon integrating PLM into their curricula, via lectures in existing courses and student projects. Courses on PLM and with PLM content and/or software will be supported by PLM Center. The Departments of Automotive Engineering, Civil Engineering, Electrical & Computer Engineering, Industrial Engineering, and Mechanical Engineering, as well as the School of Computing are expected to initially start integrating PLM into their coursework and curricula. The Center plans to facilitate the development of certificate programs in PLM, which could be at the undergraduate, post-baccalaureate, and/or graduate levels, depending upon demand. Such certificate programs would be modeled after existing certificate programs such as Clemson’s undergraduate certificate in Advanced Manufacturing. These certificates typically consist of 9 to 12 credit hours (3 to 4 courses) and complement the existing degree programs to add a dimension and credential above and beyond a student’s regular degree. Certificates would be developed and administered using the existing faculty governance and university administrative processes, and have an academic home consistent with policy. For example, an undergraduate PLM certificate might be offered via the Department of Mechanical Engineering, with support and faculty connected to the PLM Center. Certificates, developed and approved by the university, will be provided to CHE as outlined in the published SC CHE academic policy and procedures.
Financial Support

### Estimated New Costs by Year

<table>
<thead>
<tr>
<th>Category</th>
<th>1&lt;sup&gt;st&lt;/sup&gt;</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt;</th>
<th>3&lt;sup&gt;rd&lt;/sup&gt;</th>
<th>4&lt;sup&gt;th&lt;/sup&gt;</th>
<th>5&lt;sup&gt;th&lt;/sup&gt;</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Administration</td>
<td>$31,500</td>
<td>$40,500</td>
<td>$49,875</td>
<td>$56,689</td>
<td>$57,009</td>
<td>$235,573</td>
</tr>
<tr>
<td>Faculty and Staff</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salaries</td>
<td>$182,633</td>
<td>$199,355</td>
<td>$203,342</td>
<td>$279,731</td>
<td>$285,325</td>
<td>$1,150,386</td>
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<tr>
<td>Graduate Assistants</td>
<td>$59,998</td>
<td>$61,408</td>
<td>$62,853</td>
<td>$64,334</td>
<td>$65,850</td>
<td>$314,443</td>
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<tr>
<td>Equipment</td>
<td>$75,000</td>
<td>$17,389</td>
<td>$17,389</td>
<td>$17,389</td>
<td>$17,389</td>
<td>$144,556</td>
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<tr>
<td>Facilities</td>
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<td>$15,000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$45,000</td>
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<tr>
<td>Supplies and Materials</td>
<td>$2,500</td>
<td>$5,000</td>
<td>$5,150</td>
<td>$2,732</td>
<td>$2,814</td>
<td>$18,196</td>
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<tr>
<td>Library Resources</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Other*</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$381,631</strong></td>
<td><strong>$338,652</strong></td>
<td><strong>$338,609</strong></td>
<td><strong>$420,875</strong></td>
<td><strong>$428,387</strong></td>
<td><strong>$1,908,154</strong></td>
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</table>

### Sources of Financing

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<tr>
<th>Category</th>
<th>1&lt;sup&gt;st&lt;/sup&gt;</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt;</th>
<th>3&lt;sup&gt;rd&lt;/sup&gt;</th>
<th>4&lt;sup&gt;th&lt;/sup&gt;</th>
<th>5&lt;sup&gt;th&lt;/sup&gt;</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuition Funding</td>
<td>$30,000</td>
<td>$60,000</td>
<td>$90,000</td>
<td>$120,000</td>
<td>$120,000</td>
<td>$420,000</td>
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<tr>
<td>State Funding (i.e., Special State Appropriation)</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Reallocation of Existing Funds*</td>
<td>$220,000</td>
<td>$56,204</td>
<td>$6,408</td>
<td>$9,612</td>
<td>$9,612</td>
<td>$301,836</td>
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<tr>
<td>Federal Funding*</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Other Funding*</td>
<td>$150,000</td>
<td>$235,000</td>
<td>$320,000</td>
<td>$405,000</td>
<td>$405,000</td>
<td>$1,515,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$400,000</strong></td>
<td><strong>$351,204</strong></td>
<td><strong>$416,408</strong></td>
<td><strong>$534,612</strong></td>
<td><strong>$534,612</strong></td>
<td><strong>$2,236,836</strong></td>
</tr>
<tr>
<td><strong>Net Total (i.e., Sources of Financing Minus Estimated New Costs)</strong></td>
<td><strong>$18,369</strong></td>
<td><strong>$12,552</strong></td>
<td><strong>$77,799</strong></td>
<td><strong>$113,737</strong></td>
<td><strong>$106,225</strong></td>
<td><strong>$328,682</strong></td>
</tr>
</tbody>
</table>

*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 and 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 be remain confidential until such time as agreements are signed).

As mentioned in an earlier section, faculty and staff will have appointments in the PLM Center from various academic and other units on campus that range from 10% to 25%. A corresponding portion of their salaries will be funded by the Center to cover the administration, accountant, and guidance of this endeavor. The “Reallocation of Existing Funds” in years 1 and 2 reflect monies from the Clemson Provost’s Office to cover the space uplift and initial personnel cost while years 1 to 5 also reflect the return of indirect on research proposals as completed by the Center.
We are considering multiple-tier memberships with a cost between $10,000 to $50,000 per year dependent on the given class (e.g., Affiliate, Full II, Full I) which provides different levels of benefits. It is anticipated that larger companies will participate at the Full Member I while smaller ones will elect the Affiliate Member category. The distinguishing features and details of each membership classes will be addressed in conjunction with the university Legal office, university Vice President of Research, and Center Advisory Board.

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.

Appendix A

News Article on PLM Center Gift is provided as a separate pdf.
Clemson lands $357 million engineering grant

MIKE EADS
MIKE@INDEPENDENTMAIL.COM

Clemson University and Siemens USA officials will announce a $357 million software grant today for the school's engineering programs.

Siemens USA, a subsidiary of the German energy and manufacturing giant, is providing Clemson with its so-called Product Lifecycle Management platform, which is used by BMW, Boeing and more than 140,000 manufacturing customers worldwide to manage product development, inventory and other operations.

Both sides said the software, technical support, training and updates could drive the value of the gift higher over the next several years.

"Preparing students to be highly competitive in the 21st century global economy is a central part of Clemson's mission, and this new partnership with Siemens will provide our students with access to cutting-edge technical tools that will make them even more attractive to future employers — especially many of the world-class, advanced manufacturing companies operating in South Carolina," said Clemson President Jim Clements, who will be joined by Siemens USA officials and others for today's 11:30 a.m. announcement at the Watt Family Innovation Center.

It is the largest such donation in the university's history, and comes on the heels of the just-completed $1 billion Will to Lead fundraising campaign.

"We are honored to empower the next generation of digital talent at Clemson University through the largest in-kind grant in the university's history," said Siemens USA President and CEO Eric
Appendix A

Grant

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Spiegel in a statement provided Thursday.

"By giving students access to this software, we are preparing them for the fourth industrial revolution with invaluable real-world experience and equipping them with the skills needed to succeed in the software-driven advanced manufacturing industry."

The PLM platform is actually a large, adaptable suite of applications used by Siemens’ manufacturing customers to monitor every step of a product’s development and production, including:

- designing the manufacturing space in which the product is built;
- anticipating every lug nut, valve, motherboard, pipe and other part needed for the product;
- determining where and how parts are sourced;
- running 3-D simulations to generate likely performance data;
- costing out the labor; and
- managing each step of the process right through how best to recycle or repurpose the product after it has reached its useful life.

"It’s about failure-proofing devices," said Joerg Schulte, an executive at BMW in Greer and adjunct professor in Clemson’s ICAR automotive engineering program in Greenville. "It allows a big group of people to work together on one complex project. The simulation software allows you to monitor all of the pertinent elements: people, tools, parts, raw materials…” and predict potential defects, failure rates and other performance data.

Clemson’s engineering students will train on the platform they could encounter at their first manufacturing jobs and save employers the expense of months of PLM training. Some of them will even be able to simulate an auto plant and monitor all of its operations as it develops a vehicle.

"They can see the raw materials coming into one end of the plant, and the car coming out the other side," said Schulte.

"Boeing’s defense division uses this software, and automotive companies like BMW use this software," said Greg Mocko, associate professor of mechanical engineering at Clemson. "This provides a really great resource for students to gain experience, get training and market themselves to companies that are going to have an impact in South Carolina and the nation. They will most certainly hit the ground running."

That’s not just good for the students and employers, said Anand Gramopadhye, dean of Clemson’s College of Engineering, Computing and Applied Science.

"It creates a next generation ready for the workforce … they get trained on market-leading PLM software, which improves their marketability and our state gets more ready engineers."


"It creates a next generation ready for the workforce … they get trained on market-leading PLM software, which improves their marketability and our state gets more ready engineers,” Gramopadhye said. "It benefits our faculty, too … we can be the go-to organization in the advanced manufacturing sphere and have companies look to us to educate their employees.”

According to Clemson Provost Bob Jones, who oversaw the negotiations between the company and the university, this arrangement grew out of the relationship then-West Virginia University President Clements established with Spiegel several years ago.

The two sides first discussed a relationship between Clemson and Siemens over a year ago, and have spent much of the intervening period looking for a good fit.

Clemson alumnus Kevin Yates also worked with Jones and scores of others at Siemens and Clemson to make the gift happen. He graduated from Clemson in 1994 with an industrial engineering degree and now heads Siemens Energy Management Division.

“Having this PLM software would be a fantastic experience at Clemson,” said Yates, a 1989 graduate of Mauldin High School. “I used to work on a lot of projects with other industrial engineering students, and we had to manually share information because we didn’t have the connectivity we have today.”

Yates said PLM will allow the engineering students to draw on help from across the campus and world and better implement Clemson’s Creative Inquiry program — an initiative to overcome boundaries between different academic departments and draw more varied contributions to research projects. Clemson’s students and faculty could also help Siemens develop better products, too.

“I really believe this is the tip of the iceberg,” said Yates. “We’ll continue have discussions about the most effective ways to deploy PLM and take advantage of the opportunities from the software grant. We’re actively recruiting interns on campus now.”

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