

# Clemson University International Center for Automotive Research

An exemplary automotive-sector  
public-private cooperation in  
research and education

A light gray world map is centered on the Atlantic Ocean. A blue dot is placed in the eastern United States. A blue rectangular box with white text is positioned below the dot.

Anderson, USA





# General Information

Title	CU ICAR (Clemson University International Center for Automotive Research)										
Pitch	An exemplary automotive-sector public-private cooperation in research and education										
Organisation	Clemson University										
Country	United States of America										
Authors	Arno Meerman & Hacer Tercanli (University Industry Innovation Network)										
Nature of interaction	<table><tr><td><input checked="" type="checkbox"/> Collaboration in R&amp;D</td><td><input checked="" type="checkbox"/> Lifelong learning</td></tr><tr><td><input type="checkbox"/> Commercialisation of R&amp;D results</td><td><input checked="" type="checkbox"/> Joint curriculum design and delivery</td></tr><tr><td><input type="checkbox"/> Mobility of staff</td><td><input type="checkbox"/> Mobility of students</td></tr><tr><td><input type="checkbox"/> Academic entrepreneurship</td><td><input type="checkbox"/> Student entrepreneurship</td></tr><tr><td><input type="checkbox"/> Governance</td><td><input checked="" type="checkbox"/> Shared resources</td></tr></table>	<input checked="" type="checkbox"/> Collaboration in R&D	<input checked="" type="checkbox"/> Lifelong learning	<input type="checkbox"/> Commercialisation of R&D results	<input checked="" type="checkbox"/> Joint curriculum design and delivery	<input type="checkbox"/> Mobility of staff	<input type="checkbox"/> Mobility of students	<input type="checkbox"/> Academic entrepreneurship	<input type="checkbox"/> Student entrepreneurship	<input type="checkbox"/> Governance	<input checked="" type="checkbox"/> Shared resources
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Summary	<p>In South Carolina's burgeoning regional reputation in the automotive sector, the Clemson University International Centre for Automotive Research (CU-ICAR) has assumed a leading role. Following the attraction of BMW to a region suffering from the loss of the textile industry, CU-ICAR has become a conduit for industry research and talent development in the sector, which has helped to attract both global players and local SMEs from the automotive sector.</p> <p>The university centre conducts extensive collaboration activities with industry including facility sharing, joint curriculum development of a specific purpose master's programme, joint research and development with businesses and commercialisation of R&amp;D in an exemplary public-private cooperation as well as community engagement to foster the next generation of automotive sector workers.</p>										



# Introduction & Overview

## 1. BACKGROUND

Clemson University International Center for Automotive Research (CU-ICAR), located about 45 miles from the main Clemson University campus in Anderson, South Carolina (United States), is a **one million m<sup>2</sup> advanced-technology research campus** focusing on the fields of automotive, motorsports, aerospace, and mobility. Also called *Millennium Campus*, the area is home to five technology centres, each of which facilitates an innovative, collaborative environment among the stakeholders in education, industry, and the state government of South Carolina. Links to industry are coordinated by the Partnership Office, that manages business development, real estate, and marketing within CU-ICAR and in the regional automotive cluster. The Department of Automotive Engineering located in CU-ICAR offers 200 master and PhD positions every year, the first graduate level programmes established in the US solely focused on automotive engineering.

The emergence of CU-ICAR as a prominent research-driven innovation centre has its traces in the economic reorientation in the region. After the **demise of the textile industry** in Greenville in the mid-20<sup>th</sup> century, the city's economy transformed due to the investment of diverse automotive industry establishments over the following decades. In 1992, the local and city governments of Greenville-Spartanburg successfully attracted **BMW to open its first manufacturing facility outside Germany**. A number of other advanced automotive industries started to locate in the region, gradually forming one of the largest automotive industrial hubs in the US.

Discussions between Clemson University and BMW regarding long-term cooperation in automotive research and development began in the early 2000s. This was initially motivated by BMW's need to train a skilled technical workforce, including engineers with advanced degrees, for its future operations and capacity building for the local suppliers<sup>1</sup>. CU-ICAR was devised in 2003, along with the establishment of its first lab BMW Information Technology Research Center. Opening for business in 2007, CU-ICAR today has **close partnerships with major corporate companies, such as BMW, Microsoft, IBM, Bosh, The Timken Company, and Michelin**. Since it was founded, CU-ICAR has been developed around three key pillars; **Education, Research and Economic Development**. All its activities are built around developing and integrating these pillars.

## 2. OBJECTIVES AND MOTIVATIONS

The objectives of CU-ICAR encapsulate the three building blocks the Centre's strategic focus; **research, education, and socio-economic development through industrial cooperation**. CU-ICAR identifies its vision to be the premier automotive and motorsports research, innovation and educational facility in the world. To achieve this vision, industry linkages with the campus are made available through **twelve different partnership models** – On-demand Testing, Development Partnership, Centre of Excellence, Graduate Course R&D, Graduate Student R&D, Project Green, Data Acquisition, Vertical Collaboration, Horizontal Collaboration, Faculty R&D, Government Supported R&D, and Deep Orange – that anchor automotive companies to Clemson students, the faculty, and the South Carolina region.



The four main missions of CU-ICAR, as presented by the Centre itself, are to be (1) a high seminary of learning in the field of automotive engineering, (2) leading transnational research, with emphasis on industry relevance, and support with excellence in basic research, (3) contributing to high value job creation in South Carolina, and (4) steering global thinking on the sustainable development of the automotive sector.

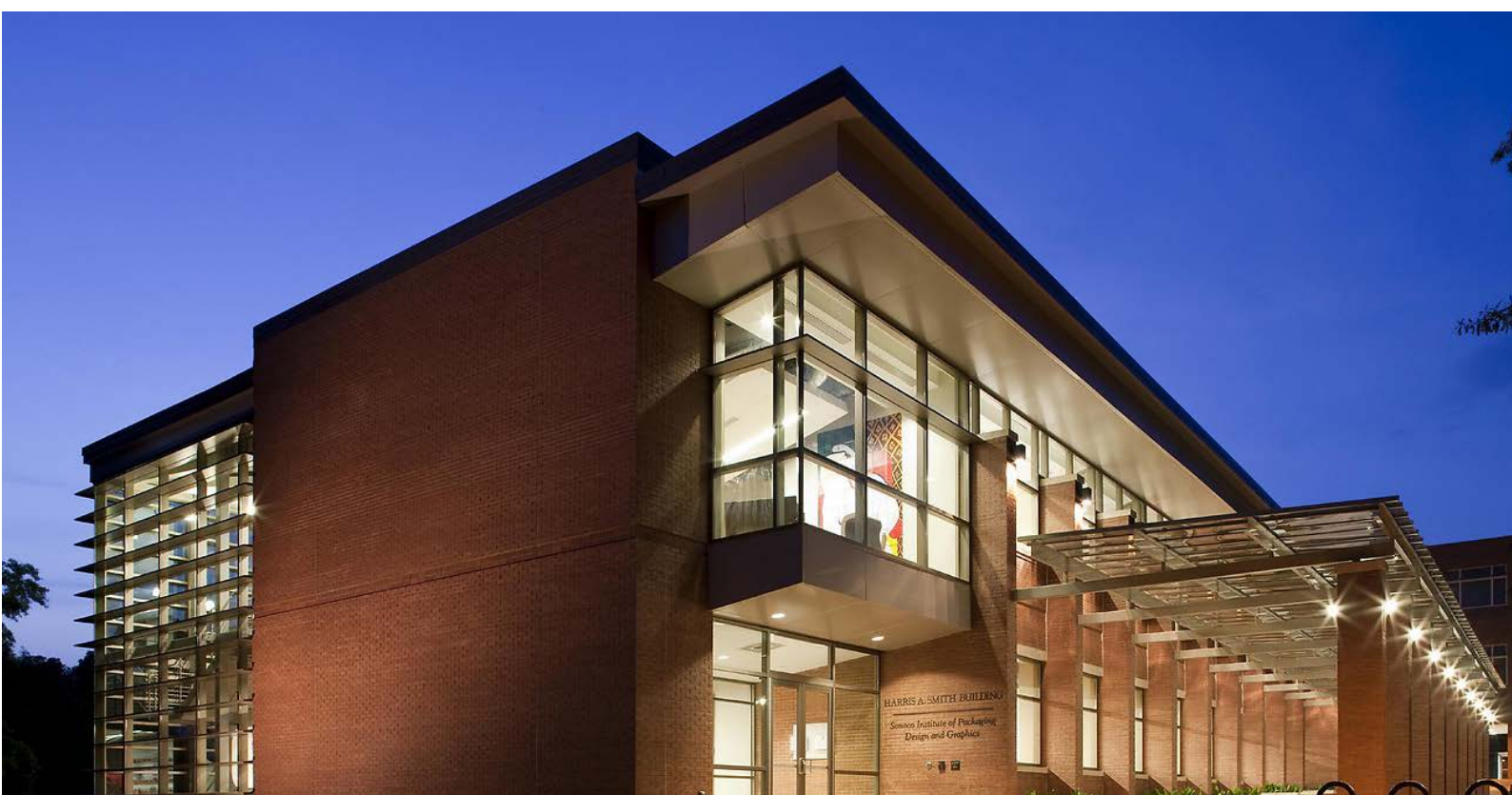
### 3. STAKEHOLDERS

CU-ICAR's primary stakeholder is the automotive industry, an industry that benefits from mutual research and development synergies with the CU-ICAR scientific community and joint development of curriculum. Industry members sponsor 80% of the applied research carried out in CU-ICAR, and hold memberships in the Clemson University board.

Secondary stakeholders are the local and state government agencies of South Carolina which bolster the developing campus ecosystem with financial incentives and initiatives. The broader stakeholder community includes the CU-ICAR Department of Automotive Engineering Faculty and its graduate students, and the society of the state of South Carolina.

CU-ICAR is involved in four types of interconnected partnerships with external stakeholders

- ▶ *Campus Partners* - are on-site industrial communities from across the world, including 20 major partner corporations such as BMW and Michelin, that work closely together with the Clemson University students and faculty;
- ▶ *Equipment Partners* - include Toyota, Ford, and Michelin providing labs, simulators, tools, and equipment needed for automotive research in strategic areas;
- ▶ *Fellowship Partners* - of automotive manufacturing companies, including BOSCH, Mazda, and Bridgestone, which offer scholarships and fellowships for CU-ICAR graduate students;
- ▶ *Founding Partners* - are public and private institutions who have made financial investments in CU-ICAR since its first stages of development.





# Implementation

## 4. INPUTS

Over the past decade, CU-ICAR facility has benefited from a total investment of \$250m (€235.7m) from the joint efforts of Clemson University, state government of South Carolina, and the automotive industry. These financial contributions were complemented by careful consideration of the architectural design and quality of the campus buildings, to encourage international attention and create opportunities for collaboration.

At its launch, CU-ICAR received \$40m (€37.7m) in funding from the South Carolina Department of Commerce through Clemson University, an amount collected from BMW tax credits for its job creation and capital investment. This followed a \$70m (€66m) grant by the South Carolina General Assembly for the establishment of research and facility infrastructure. Together with Clemson University, the charitable organisation Clemson University Real Estate Foundation (CUREF) granted \$26.4m (€24.9m) to the development of the CU-ICAR campus, 20% of which is actively being used today.

Initiated by the state of South Carolina, Research Centres of Economic Excellence Endowed Chairs Programme matched private funding to recruit highly qualified faculty to administer master's and doctoral studies in the Department of Automotive Engineering. The programme raised \$36m (€34m) from the state and private industry partnership, to launch endowed-chair positions<sup>2</sup>. Today CU-ICAR has four endowed-chair positions, each founded by Timkin, Michelin, and BMW, which has funded two of these positions. Equipment related industry endowments from 42 automotive companies amount to nearly \$20m (€18.9m), in addition to \$250,000 (€236,000) for fellowships and scholarships.

The design of the facilities of the CU-ICAR Millennium Campus is based on a 'Master Plan' drafted by Clemson University and CUREF that suggests five phases of campus development.

As of 2016, the first phase, *Neighbourhood 1*, is nearly complete with the new and the final addition of 'One Research Drive' that will serve as laboratory and classroom space for Clemson University. This section of the campus is currently composed of five buildings; BMW Information Technology Research Centre, Carroll A. Campbell Jr. Graduate Engineering Centre, CU-ICAR AutoPark & Innovation Place, Koyo/JTEKT (Collaboration Building 3), and Centre for Emerging Technologies (CET). A high degree of rigor is maintained in the architectural design, equipment, and restrictive code of the buildings to protect the investments of CU-ICAR partners, and offer them a quality research service using the most advanced automotive technology.

While there is great internal and external ambition to expand both the physical environment and the expertise pool of the researchers, CU-ICAR maintains focus on the prerequisite of having connections with and experience in industry when hiring faculty and campus staff. It is seen as vital for faculty to bring in industry contacts in order to keep up with the fast-evolving car industry. This is particularly valuable due to the rapid developments in computer and digital technology, the blurring lines between other industries, and emerging debates on the functions of the car as 'asset vs service' potentially affecting the business models of the car companies in the coming years.

The inclusion of new faculty in the team is dependent not only on their industry connections, but also with their internationally renowned expertise in the fields of Advanced Powertrains, Manufacturing and Materials, Vehicle-to-Vehicle and Vehicle-Infrastructure Integration, and the like.

## 5. ACTIVITIES

In alignment with their economic development mission, CU-ICAR provides a wide array of UBC activities, including **facility sharing, joint curriculum development, commercialisation of R&D, joint research with businesses, graduate level educational offerings** that exemplify a model for public-private cooperation, **testing services for industry**, and last but not the least, **community involvement**.

Graduate level degrees in Automotive Engineering have been offered by the Department of Automotive Engineering since 2007. They were originally started in response to industry needs, needs originally voiced by BMW Manufacturing upon their initial foundation in the Greenville area. Student numbers have stabilised at around 200-210 students per year, with 65 students registered in the PhD programme and 203 in the masters from 18 different countries as of 2015.

The **curriculum of the two-year master study was designed collaboratively with industry partners**, and further backed up with financial investments and commitment from Michelin, Timken, and investors in South Carolina, the programme integrates a hands-on learning experience through domestic and international industry internships. Students are trained to work in multi-disciplinary teams and develop a holistic understanding of vehicle manufacturing, as well as overcoming challenges that stem from complex social, political, and cultural influences surrounding product development.

Sponsored by major automotive industries of Toyota, Mazda, General Motors, and BMW, this initiative, labelled as 'Deep Orange', is aimed at addressing these training objectives and supporting the growth of the industrial cluster in the South Carolina region by linking local SMEs with multinational corporations. This accelerated concept development framework that guides students through the full-cycle of design, engineering, prototyping, and production until their graduation, enables a multi-disciplinary faculty and 20 industry partners to collaborate and produce a new vehicle; Deep Orange 8 is currently being engineered, every year. During the course of the project, the participants do not only gain valuable technical skills, but also develop soft skills, including collaboration, conflict resolution and creativity<sup>3</sup>. In addition, students develop valuable relationships with business which can lead to future employment.

**Facility sharing** between students and industry is another unique feature of the CU-ICAR Campus. The business partners benefit from the facilities equipped with some of the world's most advanced research and development technology, without any costs. This allows further collaboration among the stakeholders and harnesses an environment responsive to innovative ideas. Take for example, the BMW Information Technology Research Centre (ITRC), one of the CU-ICAR facilities, where joint pilot experiments are carried out on an open innovation platform with the participation of mechanical, electrical, computer engineers and students from BMW, the IT industry, and the Clemson University.

As facility provider, CU-ICAR also allows industry to access the Project Green and other **R&D testing rooms and equipment for commercial use**, to save them capital-intensive costs in their own amenities. The vehicle, component, and material testing facilities at the campus are worth approximately \$17m (€16m), most of which has been invested in by the leading industrial partners of CU-ICAR over the years.

CU-ICAR graduate students and faculty are regularly engaged **in joint research activities with industry partners**, through different business collaboration opportunities established by the Centre. Some current examples include Michelin and BMW jointly contracting Clemson for the development of a mobility technology that could benefit both companies in a *Vertical Collaboration* fashion, Timken working with group of researchers in the generation of an auto prototype instrument in *Faculty*

R&D model, *Government Supported R&D* project TWEEL by Michelin being subcontracted to Clemson, *Student R&D* projects under the supervision of a faculty member, and *Graduate Course R&D* capstone projects for teams of students towards solution of an industrial problem proposed by companies, such as Timken, FEV, and DiMora Motorcar<sup>4</sup>.

CU-ICAR leads a diverse range of off-campus public initiatives to expand its campus ecosystem. Managed by the Department of Automotive Engineering and CU-ICAR's Partnership Office, CU-ICAR is involved in **community engagement** activities that include a number of K-12 outreach programmes extending beyond Greenville into South Carolina, and across the south-eastern region of the United States. The initiatives are driven by the motivation to introduce school children to the STEM field, and providing those who are interested in engineering the academic support they need.

The programmes *Gateway to Technology CU-ICAR* and *CU-ICAR Engineering Encounter* aim to familiarise young students with the STEM field and world of engineering through school trips, projects competitions, and hands-on experiences in the CU-ICAR labs. Every year *A.J. Whittenberg Elementary School of Engineering* hosts CU-ICAR graduate students to present the elementary level students with the basics of control, turning radius and radio control using two radio-controlled cars.

Since 2014, Clemson University students, academics and staff are actively involved in the STEM field oriented *Fisher Middle School* as mentors, assisting students in their projects linked to their trans-disciplinary curriculum. A special emphasis is also given to encourage girls into the field through the programme *All Girls Auto Know*. The programme has been running for 5 years and is organised in cooperation with *Southern Automotive Women's Forum*. The programme's events bring together hundreds of young women from around Upstate South Carolina into the CU-ICAR campus for day-long events with the attendance of automotive companies including Michelin, BMW, Draexelmeier, SAGE, Clemson WISE, and Greenville Tech.

## 6. OUTPUTS

CU-ICAR UBC activities have created a magnet effect, attracting over 20 corporate and 30 research partners from across the CU-ICAR campus, as well as transforming CU-ICAR into an ideal site for national and international automotive conferences. Finally, the Centre has been granted over **\$130m (€122.6m) to date in research support** by corporate partners. During the 2015 fiscal year, a total of **26 research projects** were conducted, **22 of which were directed to industry**, while four were for non-profit government and educational institutions.

Since its foundation in 2007, the Automotive Engineering graduate degree programme has attracted considerable attention that resulting in a significant increase in the number of applications. The number of faculty has increased to 20, along with the student numbers having grown to 200 in 2016 compared to only eight students back in 2008. In the spring of 2015, 229 masters and 28 doctoral degrees were awarded to students, 95% whom were offered employment in the automotive industry<sup>5</sup>. Ford Motor Company, Fiat Chrysler, BMW, Cummings Inc. and Honda R&D America are named as the top five employers of the CU-ICAR Automotive Engineering graduates. To date, the programme has graduated close to 400 students, who are now nationally and internationally employed.

## 7. IMPACTS

Since its launch, CU-ICAR has had an immense impact on the regional community and further into the state of South Carolina, through the creation of jobs and attracting a large number of industries into the region. According to the South Carolina state records, **in 2012 unemployment rates**



**dropped to 9,4% from 10,5% in 2011**, in part explained by the growing concentration of the automotive industries.

The CU-ICAR has to date **created nearly 1,000 on-site jobs** and announced over 700 further jobs in the near future. Some of the recent surrounding projects attributed in part to CU-ICAR include:

- ▶ Verdae Development - a four million m<sup>2</sup> master planned urban community in Greenville with an expected population of 10,000;
- ▶ Hubbell Lighting Inc. - has made a \$36m (€34m) investment, along with the 350 new jobs it created in the region. The company selected the city of Greenville as the location of its business due to it being home to 40 of the Fortune 500 companies;
- ▶ St. Francis Health System - has built a 200,000m<sup>2</sup> medical building in Greenville, offering the community 500 new jobs.







# Support & Influencing factors

## 8. SUPPORTING MECHANISMS

CU-ICAR is the operationalisation of an important regional supporting environment for UBC. These activities are also supported on a senior university management level, with several leadership positions (i.e. the VP of Research and Economic Development and the VP of Advancement and University Foundation Leadership) also working in the Clemson University.

Through CU-ICAR, there is a large number of staff members; such as **communication and business development managers**; committed to reaching out to business and society. In addition, the **hiring policy of CU-ICAR** is focussed on hiring employees with a broad network and previous industry experience.

Besides written strategies, policies and dedicated staff, the University, region and businesses have dedicated **large financial investments to ensure and expand on the future existence** of CU-ICAR.

## 9. BARRIERS AND DRIVERS

There are several **drivers** that positively influence the UBC activities of CU-ICAR. First is the **commercial orientation of CU-ICAR and Clemson University and its alignment with industry**. Through this, strong public-private partnerships have been established that facilitate economic development in the region, with CU-ICAR in a central position providing human resources and work environment for car manufacturers. With over \$250m (€235.7m) of total joint investment so far, Clemson University, CU Foundation, the State of South Carolina, local and regional economic development partners, and companies with strategic interest in automotive research work closely to further expand the thriving automotive cluster.

Secondly, through the hiring policy of CU-ICAR their employees often have **prior relation to business partners**, and are able to bring in new partners to the region. There is already **mutual trust** present, and the current and future industry partners that are located in the region **share the same goals and are committed to the same cause**: Excellent research in the automotive industry and graduates educated to best fit industry needs.

Thirdly, through having **22 partners on-site** and **further businesses being located in the near vicinity**, and the **relatively small CU-ICAR organisation**, the centre is able to stay at the forefront of research and pivot itself and its research according to industry developments

The main **barrier** faced by CU-ICAR is its **narrow focus on the automotive industry**. Whilst this has been one of its major strengths and a leading reason for its success, this also puts greater pressure on the initiative as it requires the organisation to ensure they stay on top of recent development and maintain focus, as missing out would result in loss of business.

Due to the changes in automotive research, there is less funding available for the more classical engineering activities. Instead the **focus lies more on IT** which results in funding being allocated accordingly.

## 10. FUTURE CHALLENGES

CU-ICAR identified four main challenges it faces in their cooperation with industry and securing its future existence.

First, they are well aware of the **fierce competition among universities and research centres** in the country for the acquisition of collaborative industry projects, which compel the centre to differentiate itself from other similar institutions by its specialisation on certain subjects and distinct modes of cooperation. To this end, CU-ICAR has come far in securing deals with new industries owing to the rich human resources and physical facilities it has to offer.

The second challenge comes as the constant pressure on the academics to **keep pace with the speed of change in the automotive industry**. In the past few decades, this demand of a responsive academic environment has been coupled up with the need for a more diverse human talent in the fields of software engineering and cyber security, further challenging the institution to follow the latest trends in the IT and Computer Science, predict the market, and re-position itself.

The third challenge is to **maintain established partnerships** between the academics and the industry, nurturing the relationships, and ensuring mutual satisfaction among all parties. Given that CU-ICAR currently has 130 industry partners, of which 20 are on-site, the management of relationships requires a considerable amount of coaching and mentoring of the Clemson faculty and the participants from the industry, which is, in this case, a responsibility taken up by the partnership office of CU-ICAR.

The final challenge is the **rapid transformation of the car industry and their search for cost efficient plant locations** which poses a possible threat to the future operations of CU-ICAR. Increasingly more automotive businesses move their sites and make new investments elsewhere, including Mexico, due to the advantages of low labour costs and free trade agreements. On the other hand, while certain automotive industries are leaving the region new ones are launching their plants, including Volvo, and the existing industries, such as Daimler, GE, and Boeing continue to make large amount of investments in the region. CU-ICAR has the challenge set out for them to ensure the region stays attractive for business to locate to.

## 11. CONTEXT

CU-ICAR was founded to fill an economic vacuum in the region, addressing the high unemployment rate in the region and establishing the connections to the automotive industry that recently settled into the region. These economic circumstances were in favour of the development of the institute as a hotspot for automotive research and innovation.

Attracting academics with relevant experience, knowledge and connections in the automotive industry leads to establishing relationships with other businesses in the automotive industry. The local and regional support on a policy and economic level also contributes to the current and future success of CU-ICAR. After all, it was the regional government that convinced BMW to settle in Greenville in the first place.

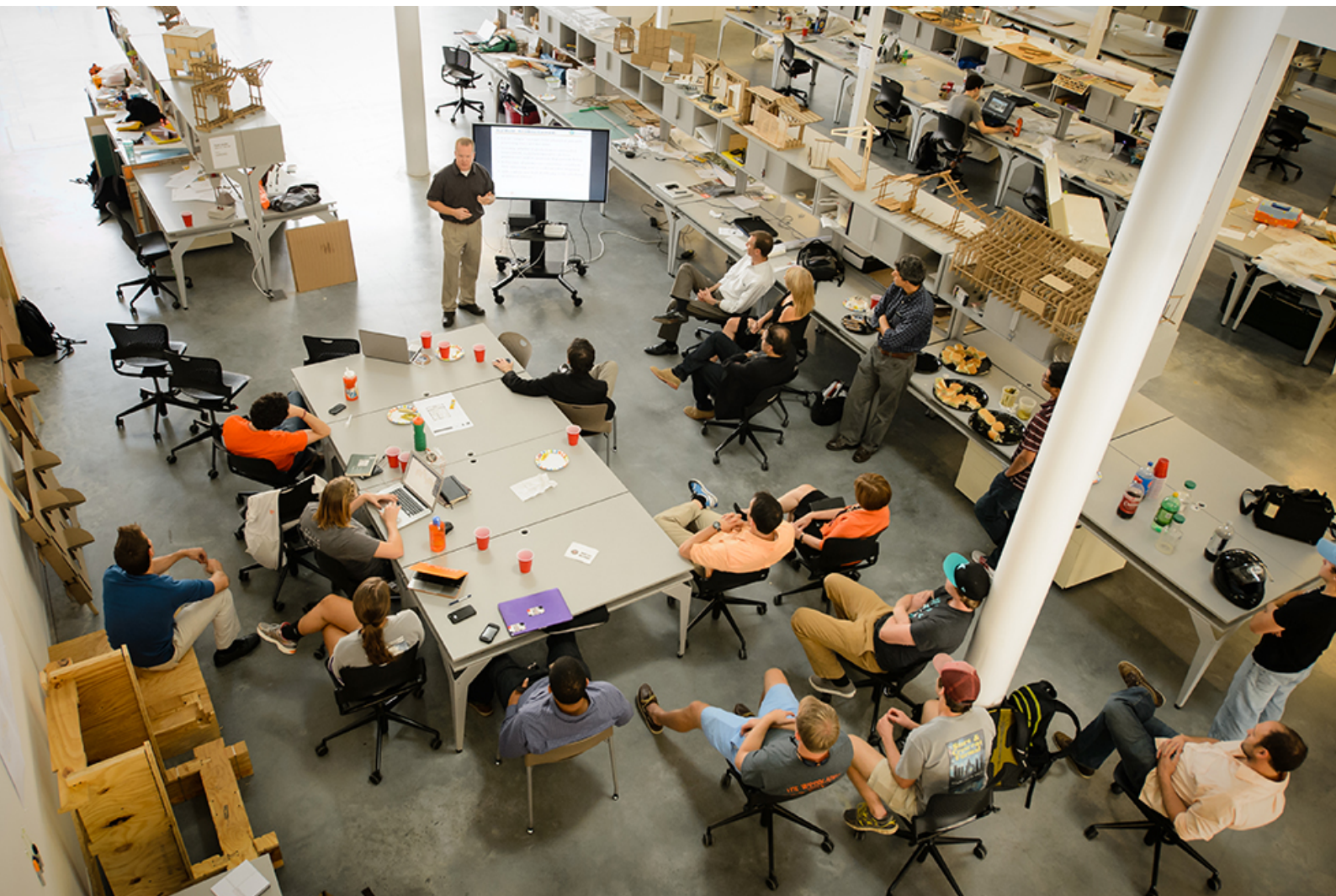
## 12. KEY SUCCESS FACTORS

There are a number of key ingredients that account for the regional and international recognition of CU-ICAR, and its success in the regional economic development.

Filling the void that the textile industry left behind, CU-ICAR was custom-built to align themselves with the automotive industry needs, which represents one of, if not the most important factors of its success: **the focus on one industry**. The focus on one industry has led to special attention given to **facility design** which again helped attract a greater number of automotive companies to work with CU-ICAR, offering numerous possibilities in facility share and product testing.

Being set up as an **autonomous organisation**, the centre was not hindered by the bureaucratic barriers of academia and was able to move freely. **Through the early buy-in that CU-ICAR got from the region**, that was also looking to fill the void of the textile industry, and the automotive industry from the start, the centre could rapidly scale their facilities and activities and thereby attract more companies to relocate to Greenville.

The strategic management of the organisation has also been crucial, with a large focus on **building a large network** in the industry. CU-ICAR organised and attended a wide variety of conferences, developed a large alumni network and most importantly focussed on hiring staff from the industry who bring in their knowledge and industry contacts.







# Further Information

## 13. SUSTAINABILITY MEASURES

CU-ICAR takes a range of measures to secure sustainability of the Centre's activities in the long run. One of the most prominent measures CU-ICAR takes pride in is the institution's **continuous alignment with the changing needs of industry**. To achieve this, researchers are involved in various activities with the automotive industry and through their interaction with industry, they are able to stay at the forefront of research in the automotive industry.

On the educational side, CU-ICAR continues to educate graduates with the skills and knowledge that industry needs. For example, the systems integration focused automotive engineering graduate degree programme has been established with the involvement of the industry stakeholders in curriculum development and training. As this leads to graduates being employed in automotive clusters in the region, it serves to feed back into the ecosystem and support the alumni network.

Support provided by the **partnership office** is another measure that plays an equally critical role in the sustainability of the CU-ICAR innovation ecosystem, acting as a bridge between academia and industry. Staffed with highly professional employees, the office promotes the organisation and its activities to ensure a continuous flow of information among the stakeholders. Building up the brand of CU-ICAR has been an important aspect of its current and future success. Through a wide variety of conferences, a strong alumni network and employing key people from industry, **CU-ICAR has a very strong network** and has embedded itself as an important knowledge facilitator in the automotive industry.

Finally, **the K-12 outreach programmes**, as part of CU-ICAR's community engagement activities aim to strengthen the future workforce pipeline by inspiring and educating young people in STEM fields.

## 14. TRANSFERABILITY

The CU-ICAR model of UBC is a model that can be replicated in any part of the world and shows similar characteristics to other regions that have experienced an industry decline that left a void in a region.

## 15. AWARDS AND RECOGNITION

CU-ICAR has received numerous awards for its achievements in regional economic development, sustainable campus, and graduate student success since its establishment.

Awarded very recently, in 2015, Clemson University was recognised as an 'Innovation and Economic Prosperity University' by the Association of Public and Land-Grant Universities (APLU) as a result of its commitment to leadership in innovation and regional economic development. CU-ICAR played a key role in the University being awarded this title for its industry oriented activities over the past decade.

Previously, in 2012, the Centre received another prestigious award for its role in the regional economic development. The State Science and Technology Institute (SSTI) recognised CU-ICAR with its 'Excellence in Tech-Based Economic Development' for improving the competitiveness of existing industries.

In 2009, CU-ICAR was recognised as an example of the five Global Best Practices by the National Academies of Sciences in the report 'Understanding Research, Science and Technology Parks.'

The same year, the Association of University Research Parks, an international organisation representing university-related research parks around the world, presented CU-ICAR with its 'Emerging Research/Science Park' award. CU-ICAR as a case study example was recognised in Battelle's 2008 report 'Trends in North American Research Parks: 21st Century Direction.'

Beyond the recognitions of its contribution to the economic development, CU-ICAR was also awarded by the US Green Building Council (USGBC) with LEED Gold and Silver certifications for its campus technology buildings. Automotive Engineering graduate students are granted scholarships by Speciality Equipment Market Association (SEMA) in multiple different categories every year. Finally, the graduate programme is nationally recognised to have graduated the first PhD students in the Automotive Engineering field.

## 16. LINKS

Clemson University Award Winner

[http://www.aplu.org/projects-and-initiatives/economic-development-and-community-engagement/innovation-and-economic-prosperity-universities-designation-and-awards-program/IEP\\_Library/clemson-university-cu-icar/file](http://www.aplu.org/projects-and-initiatives/economic-development-and-community-engagement/innovation-and-economic-prosperity-universities-designation-and-awards-program/IEP_Library/clemson-university-cu-icar/file)

Best practice Clemson University International Center for Automotive Research (CU-ICAR)

<http://fdibestpractice.org/pdf/CU-ICAR.pdf>

Characteristics and trends in North American Research Parks

[https://vtp.ostrava.cz/images/souviselici\\_projekty/FinalBattelle.pdf](https://vtp.ostrava.cz/images/souviselici_projekty/FinalBattelle.pdf)



## 17. CONTACT PERSON



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## 18. REFERENCES

- <sup>1</sup> Foreign Direct Investment - Clemson University Best Practice Study. URL: <http://fdibestpractice.org/pdf/CU-ICAR.pdf>
- <sup>2</sup> CU-ICAR information overview URL: <http://cuicar.com/about/quick-facts/>
- <sup>3</sup> CICEP Case Study (2015) URL: [http://www.aplu.org/projects-and-initiatives/economic-development-and-community-engagement/innovation-and-economic-prosperity-universities-designation-and-awards-program/IEP\\_Library/clemson-university-cu-icar/file](http://www.aplu.org/projects-and-initiatives/economic-development-and-community-engagement/innovation-and-economic-prosperity-universities-designation-and-awards-program/IEP_Library/clemson-university-cu-icar/file)
- <sup>4</sup> CU-ICAR business models (2012) URL: [http://cuicar.com/wp-content/uploads/2013/01/cuicar\\_business\\_models2012.pdf](http://cuicar.com/wp-content/uploads/2013/01/cuicar_business_models2012.pdf)
- <sup>5</sup> CICEP Case Study (2015) URL: [http://www.aplu.org/projects-and-initiatives/economic-development-and-community-engagement/innovation-and-economic-prosperity-universities-designation-and-awards-program/IEP\\_Library/clemson-university-cu-icar/file](http://www.aplu.org/projects-and-initiatives/economic-development-and-community-engagement/innovation-and-economic-prosperity-universities-designation-and-awards-program/IEP_Library/clemson-university-cu-icar/file)