

Wisconsin Automated Vehicle External (WAVE) Advisory Committee
Meeting Minutes
September 8, 2020 9:00am-12:30pm and September 9, 2020 9:00am-11:30am
- Meeting Held Via Video Teleconference -

WAVE Members Present: Eric Anderson, Steve Caya, State Representative Dave Considine, Jerry Deschane, Brian Doudna, Dan Fedderly, Rob Fischer, Cory Fish, Josh Fisher, Paul Fontecchio, Karen Gefvert, James Griesbach, Daniel Holt, Jessi Hopkins, Nathan Houdek, Debby Jackson, Luke Junk, Neal Kedzie, Jeff Lewandowski, Dr. Troy Liu, Ray Mandli, Dr. Henry Medeiros, Steven Michek, Kevin Muhs, Jennifer Neugart, Dr. David Noyce, Damon Payne, Alexander Pendleton, Matt Regnier, Brian Scharles, State Senator Jeff Smith, Stephanie Sward, Dr. Yang Tao, Tom Wagener, Tom Winker, Mary Wolf

WAVE-Member Organization Proxy Present: Andrea Bill

Guest: Sara Bennett, National Highway Traffic Safety Administration (NHTSA)

Wisconsin Department of Transportation (WisDOT) Staff Present: Brad Basten, Allison Blackwood, June Coleman, Tracy Drager, Don Gutkowski, Paul Hammer, Jackie Irving, David Karnes, Mike Kessenich, Mark Knickelbine, Alison Lebwohl, Andrew McFadden, Reed McGinn, Jennifer Murray, Joel Nilsestuen, Dave Pabst, Josh Reed, Anne Reshadi, Ethan Severson, Aileen Switzer, Craig Thompson, Matt Umhoefer, Kaleb Vander Wiele, Chuck Wade

September 8, 2020

- **Welcome and Opening Remarks**
 - Secretary Craig Thompson

Secretary Thompson welcomed attendees, thanking them for volunteering their time and expertise to support the WAVE. He reflected on the importance of the transportation system, how every aspect of people's lives is made easier and more enjoyable by a good transportation system, and that the potential impact of Connected and Automated Vehicle (CAV) technology may be as dramatic as the rise of digital technology. WisDOT wants to think ahead and prepare for the multitude of changes that may occur. He emphasized that CAVs could reduce the number of crashes, injuries, and deaths on the roads. He addressed the role of partnerships, regulations, and the need for maintenance and protection of new data. He expressed his appreciation for the diverse expert representation of the committee.

- **Overview of WAVE Advisory Committee**
 - Ms. Aileen Switzer, Division of Budget and Strategic Initiatives (DBSI) Administrator

Ms. Switzer welcomed the attendees, gave an overview of the meeting's agenda, and reviewed the materials WAVE members were sent in advance. Ms. Switzer proceeded to provide an overview of the WAVE, its origins, and its structure.

- **Member Introductions**

WAVE members introduced themselves, their organization, and thoughts on what they could offer the group.

- **Pre-Meeting Survey Results**

- Mr. Matt Umhoefer, DBSI

Mr. Umhoefer quickly reviewed the results of two questions that WAVE members were asked in advance of the meeting

First, what criteria are important for WisDOT to consider when ranking CAV-related priorities/activities?

Responses included:

1. Does that priority/activity increase safety?
2. Does it equitably expand mobility options?
3. Does it support economic development or competitiveness?
4. Is it practical, with realistic goals and definable metrics?
5. What is the effect on local governments and local transportation systems?
6. What is the effect on public education about CAVs?

Second, what should be the most important CAV-related priorities/activities for WisDOT and other state government agencies? The most-mentioned responses were:

1. the development of partnerships
2. the development of CAV-related policies
3. the development of an overall strategic plan for CAVs
4. integration of CAVs into WisDOT's multimodal plans and the finding of revenue to support CAV-related projects

- **Panel - Connected and Automated Vehicle (CAV) Research in Wisconsin's Universities**

- Facilitator: Ms. Jackie Irving, DBSI
- Panel Members:
 - Dr. David Noyce, UW-Madison
 - Dr. Troy Liu, UW-Milwaukee
 - Dr. Henry Medeiros, Marquette University

Ms. Irving introduced the panelists.

Dr. Noyce highlighted UW-Madison's efforts around four major themes: partnerships, research, education, and professional development. He discussed working with the City of Madison to develop a "connected corridor" on Park Street, where Dedicated Short-Range Communication-equipped vehicles can communicate with infrastructure. The project satisfied Wisconsin's goal for the National Operations Center of Excellence's SPaT (Signal Phasing and Timing) Challenge. He discussed message reliability in "connected environments", research on truck platooning, and how human factors are being studied in a full-scale driving simulator. He closed with comments about working with the City of Racine on a Level 4 automated shuttle deployment, and a joint research venture with Southeast University in China.

Dr. Liu noted that the UW-Milwaukee Institute for Physical Infrastructure and Transportation had received over \$5 million in research contracts the past five years. UW-Milwaukee's CAV-related research activities are centered on four areas: vehicle trajectory optimization and speed guidance, automated/assistive parking, transit priority, and CAVs for aging communities.

Dr. Medeiros's presentation focused on computer vision for autonomous robotic platforms and their use on automated vehicles. He provided a detailed look at how computer vision works and current use applications, including in airport security and agriculture. He discussed increases in computer processing power that has allowed for machine learning in ways previously unimagined. Dr. Medeiros cautioned that relatively small disturbances in what computer vision systems "see" can prompt incorrect predictions at a high confidence level, a situation unacceptable for automated vehicles. He closed by stating that substantial progress has been made towards developing computer vision algorithms that show nearly-human performance in several tasks.

- **Panel - Private Sector CAV Research, Development, and Testing**

- Facilitator: Ms. Anne Reshadi, Division of Transportation System Development (DTSD)
- Panel Members:
 - Mr. Josh Fisher, Alliance for Automotive Innovation
 - Mr. Rob Fischer, SAE International
 - Mr. Brian Scharles, TAPCO

Ms. Reshadi introduced the panelists, each of whom was asked to provide a distinct look at private sector CAV work.

Mr. Josh Fisher introduced his organization's vision for future mobility, the historical context of CAVs, a look at where the industry is now, and key steps necessary to bring CAV technology into widespread use. He addressed the impact of COVID-19 on the auto industry. He emphasized "an automotive transportation system that is safer, cleaner, and smarter for all road users", how electric vehicles (EV) will be more efficient than internal combustion vehicles, and that CAV and EV technologies will offer opportunity for increased economic productivity, access, and first/last-mile connectivity. He highlighted the distinctions in federal and state roles, and noted that a potential policy barrier in Wisconsin to widespread AV deployment is the assumption that every motor vehicle has a human driver. Mr. Fisher offered a series of considerations for WisDOT, both for infrastructure within the state and the harmonization of state laws and regulations with neighboring states.

Mr. Rob Fischer presented progress of AV developments around the world and that the U.S. is currently 4th in the world for AV preparedness, following closely behind the Netherlands, Singapore, and Norway. This is a result of numerous factors, including AV-specific regulations, the number of firms working in the AV space, the number of AV-related patents, the quality and extent of mobile internet coverage, the quality of roads, consumer opinion of AVs, and the percentage of the population living in AV test areas. He closed by saying that three areas - restructuring of existing agencies to support AVs, investment in infrastructure, and collaboration - were the keys to ensuring the U.S. was ready to take advantage of the benefits AVs will offer.

Mr. Scharles opened by noting the benefits of CVs, including improvements to highway safety, mobility, and the environment, displaying a list of nearly 30 specific applications CVs are anticipated to support. He presented a series of smart infrastructure pilots involving his company, including the City of Madison Park

Street “connected corridor”, Maine DOT CV Midblock Crosswalk, Florida DOT Wrong-Way Driver Warning Systems, and a wide-ranging effort with Central Texas Regional Mobility Authority.

- **Small Group Discussions - Universities, the Private Sector, and Opportunities and Implications for Wisconsin**

Attendees, along with WisDOT facilitators and notetakers, moved into small group breakout rooms. They were asked to discuss two questions (below). Themes from responses to question #1 included interest in universities researching how CAVs will affect urban vs rural environments, and concern that universities maintain strong relationships with each other, as well as the public and private sector, to ensure research is being conducted for a specific goal in as transparent a manner as possible. Themes from responses to question #2 included the idea that state governments can be a critical partner with the private sector, from drawing in partnerships, to developing a policy environment supportive of CAV technology, to playing a role in "democratizing" information. Government and government-associated organizations are seen as crucial partners for the private sector for messaging and outreach to the public. A complete list of responses to both questions can be found in Appendix A.

1. *Based on your organization’s perspective and what you heard from the panelists, what are the opportunities and implications of universities’ efforts for Wisconsin?*
2. *Based on your organization’s perspective and what you heard from the panelists, what are the opportunities and implications of private sector efforts for Wisconsin?*

- **Preview of Day 2 and Wrap-Up**

- Ms. Aileen Switzer, DBSI Administrator

Ms. Switzer thanked the university and private sector panelists for their role in helping to provide a common baseline of understanding for WAVE members and said day 2 of the meeting would focus on the federal and state government perspectives on CAVs.

September 9, 2020

- **Welcome and Review of Day 1**

- Assistant Deputy Secretary Joel Nilsestuen

Assistant Deputy Secretary Nilsestuen opened Day 2 by thanking attendees for their participation, highlighting his prime takeaway that the future is nearly here and it presents a high sense of urgency. An emphasis on safety and the need to gain public trust around CAV technology were underlying themes throughout the presentations.

- **CAVs - Federal Perspective**

- Ms. Sara Bennett, National Highway Traffic Safety Administration (NHTSA)

Ms. Bennett presented NHTSA’s mission and its role in ensuring vehicle safety. NHTSA’s authority comes via the Vehicle Safety Act, which specifies prohibitions on manufacturers selling vehicles that do not comply with the Federal Motor Vehicle Safety Standards, standards so rigorous that they are often used as benchmarks for vehicle sales in other countries. NHTSA’s six guiding principles for automated driving systems (ADS) are: prioritizing safety, remaining technology neutral, modernizing regulations,

encouraging regulatory consistency, facilitating the safe integration of AVs, and promoting choice in mobility. Ms. Bennett highlighted NHTSA's new "AV TEST Initiative", a voluntary, non-regulatory initiative between industry and federal, state, and local governments designed to provide on-road testing information nationwide.

- **CAVs in Wisconsin - State Government Perspective**

- Mr. Brad Basten, DBSI
- Mr. Don Gutkowski, DTSD

Mr. Basten provided an overview of WisDOT, structure, mission, vision, and values. He discussed a fall 2019 department reorganization to realign and reallocate resources to address critical priorities and emerging issues, such as CAVs. The effort includes re-engaging with stakeholder groups, other states, and at the national level to help inform the department's CAV-related decision making. He reviewed the findings of the department's previous AV Steering Committee and noted several efforts WisDOT had been involved with since that time. Mr. Basten also discussed WisDOT hosting the October 2019 Mid-American Association of State Transportation Officials (MAASTO) CAV Summit. He illustrated the coordination structure WisDOT has designed to inform the state's CAV strategy, with the WAVE serving as the primary external stakeholder forum.

Mr. Gutkowski presented technologies WisDOT currently utilizes, including Queue Warning Systems, Smart Arrow Boards, and Smart Sensors. He highlighted the Bureau of Traffic Operations' (BTO) lead role in WisDOT's Dedicated Short-Range Communication pilot. The pilot is designed to demonstrate hardware and software functionality in a laboratory setting within WisDOT's operational environment and to demonstrate hardware functionality and integration in a field setting.

- **Small Group Discussion - Government Presentations and WAVE's Focus**

Attendees, along with WisDOT facilitators and notetakers, moved into small group breakout rooms. They were asked to address three questions (below). Themes from responses to question #1 included positive impressions of how much effort WisDOT and the federal government have devoted to this issue, including the diversity of expertise recruited for the WAVE, and the need for flexibility in the regulatory framework. Themes from responses to question #2, specifically regarding state government's role in addressing issues most important for Wisconsin, included developing transportation system infrastructure and providing for statutory and policy clarity, including harmonization across state lines. Prominent responses to question #3 were highlighted in the "Focus for the Future" large group discussion. A complete list of responses to all questions can be found in Appendix B.

1. *What stood out from the federal and state government presentations today?*
2. *Based on everything you've heard so far, and your organization's perspective on CAV issues, what issues are most important to address first for Wisconsin? What role should government have in addressing these issues? What role should the private sector play in addressing these issues?*
3. *What "anchor topics" and exercises could the Committee focus on during future meetings? Are there any topics that should be the focus of a subcommittee?*

- **Large Group Discussion - Focus for the Future**

WAVE members offered their thoughts regarding topics the WAVE could address moving forward. These included: an examination of necessary legislative changes; public outreach efforts; infrastructure funding

and revenue models; coordination with local governments; impacts to key economic sectors; effects on transit and non-drivers; truck platooning; and workforce mobility.

- **Closing Remarks**

- Deputy Secretary Paul Hammer

Deputy Secretary Hammer closed the meeting by thanking attendees for a successful inaugural meeting. He noted WisDOT's reorganization and the creation of DBSI occurred, in part, due to an interest in dedicating staff resources to address the emergence of CAVs in Wisconsin. Deputy Secretary Hammer thanked the staff for putting together the meeting and said the next WAVE meeting was likely to occur in spring 2021.

Appendix A - Summary of Responses to Small Group Questions - September 8

Note: Responses are not listed in any particular order and may have been mentioned by multiple groups.

1. *Based on your organization's perspective and what you heard from the panelists, what are the opportunities and implications of universities' efforts for Wisconsin?*

- Research into how CAVs could affect Wisconsin's aging and disabled populations would be useful
- Research into the differences of how CAVs will operate, and what they will need to operate, in different environments - urban vs rural - would also be helpful
 - Will there be cost differences in installing infrastructure?
 - Will broadband internet access limitations be an issue?
- Research should be conducted for a specific end, not for its own sake
- Is there an opportunity for Wisconsin's universities to work together, perhaps in some sort of consortium, to make Wisconsin a more prominent location in the CAV "landscape"?
 - Could focus on areas Wisconsin is already well known for, such as CAVs effect on motorcycles
- Universities are unbiased, and therefore could play a key role in providing standardization for the state or in playing a "referee" role in planning for deployment of the technology
- More research should be conducted on human behaviors, vis-à-vis CAVs
- Universities can play a prominent role in promoting public acceptance
 - They should be involved in pilot demonstration projects
- Universities should be transparent to build and enhance credibility; some experts should be disconnected from commercial research and development
- Universities should be training the workforce necessary to make CAVs work, and then help those graduates get hired to work in Wisconsin
- Collaboration between public and private sectors and the universities needs to be maintained, including for funding purposes

2. *Based on your organization's perspective and what you heard from the panelists, what are the opportunities and implications of private sector efforts for Wisconsin?*

- The private sector must develop CAVs able to navigate Wisconsin's differing topography
- CAVs should be designed for accessibility from the start
 - Will they be able to accommodate wheelchairs?
 - Will they be available for everyone, regardless of their wealth?
- Wisconsin must be ready for the private sector to lead the process- they will determine how data is captured, the technologies that are developed, and drive public opinion of what is acceptable
- Wisconsin school bus and trucking companies could work with the private sector to experiment
- Can the private sector partner with government to invest in infrastructure to solve multiple needs?
- If Wisconsin shows it's serious about addressing CAV issues, it will draw in partnerships

- Organizations like the League of Wisconsin Municipalities and Wisconsin County Highway Association could work with the private sector on outreach
- The policy environment needs to be supportive of the technology
- WisDOT can play a role in facilitating private sector information sharing for testing and research
- CAV policies need to be considered from both the economic and recreational ends of the spectrum
- The private sector should organize itself to more effectively and efficiently interface with WisDOT, either in the form of an industry association or via some other method
- Wisconsin should focus on partnerships that offer funding opportunities
- When transportation planning is developed in support of large employment centers, CAV technology should be part of the commuter corridors to those areas
- CAV successes in Wisconsin should be publicized
- Can the government play a role in democratizing technical information?
- There needs to be a balance of between innovation and safety in the early stages of adoption
- Government should resolve uncertainty in regulations- issues like liability create hurdles for testing and development; statutory and regulatory language should be updated
- Can the private sector provide education opportunities to showcase the benefits and opportunities of CAVs for public works engineers?
- The private sector is critical in messaging about CAV technology to the public; values highlighted should be safety and mobility, and how CAVs will help the end user
 - Education/outreach efforts to the business community, especially in rural areas, will be important
- The insurance industry needs to be clear about how it will address CAV issues
 - If CAVs are seen as a bigger liability than the cost savings they provide, higher insurance premiums will be passed on to trucking companies who in turn will pass it on to their customers and, from there, to consumers
- Need to be aware there could be pushback from truck drivers who perceive CAVs as a threat to job security
- The safety aspect of CAVs is what will sell them, but there is a lot of fear- people relate potential difficulties with CAVs to the problems they have with other technology like cell phones
- If CAV technology becomes ubiquitous, people might want to turn off the technology
 - Will that be allowed?
 - Will insurance companies eventually require adoption and use of CAV technology?
- There needs to be clarity on how privacy and security concerns are handled
- Will investment costs be shared? If non-local funds are used on local transportation systems, will local governments still have control?

Appendix B - Summary of Responses to Small Group Questions - September 9

Note: Responses are not listed in any particular order and may have been mentioned by multiple groups.

1. *What stood out from the federal and state government presentations today?*

- It's incredible how comprehensive the task to maintain inclusivity on this topic is
- I'm impressed by how much work WisDOT has already done on the topic
 - There seems to be a strong group of individuals well-networked both within the state and nationally
- There was little to no focus on the local government aspects of CAVs
- We need to make sure federal legislation does not prevent new technology
- The regulatory framework seems ok for now, but statute changes will eventually need to happen at the state and federal level
- I'm impressed by NHTSA's preparedness
- Within Wisconsin, could any of the real-time changes related to weather events on state highways also be leveraged for tribal roadways?
- The idea of letting technology mature before regulations are set was interesting. The current environment, of anti-regulations, is a dangerous area to be in- not that it's necessarily wrong
- The difference between EU and U.S., where Europe doesn't move forward until they are regulated, was interesting. The EU has more stringent regulations on data- the U.S. situation could be challenging, with constituents asking, "Who has my data?"; at the federal level, we need to be able to answer that question.
- What stood out was how much work was already being done
- Knowing that WisDOT is doing what it can for quick fixes, in a quickly changing technological environment, is good. The federal government wants to help the states, and Wisconsin seems to be addressing the issue in the right way
- I was surprised that neither NHTSA or WisDOT addressed liability
- Federal rulemaking needs to distinguish between Level 1 and 2 automated vehicles and Levels 3-5
- WAVE committee is a big part of building trust- what other ways are there to build trust with general public?
- Federal plan seems to have flexibility
- It's great we were able to assemble a diverse group of experts for the WAVE
- The existing vehicle regulation framework needs to ensure new autos don't pose unreasonable risk; at the same time there's a benefit to not need to overregulate industry
- It's a credit to WisDOT that there's a clear strategy
- I'm impressed with WisDOT's exploration of technology
 - Would like to see more communication of these efforts to the public
- It's important to integrate efforts at state and local level- a statewide framework could be helpful
 - The work in Madison could be framed as a Wisconsin test-bed initiative
- We do not want Wisconsin to be an "island" (from a regulatory perspective)

2. *Based on everything you've heard so far, and your organization's perspective on CAV issues, what issues are most important to address first for Wisconsin? What role should government have in addressing these issues? What role should the private sector play in addressing these issues?*

- What Issues Are Most Important To Address First For Wisconsin?
 - Developing the technology
 - Safety and public acceptance
 - Clarity on emergency vehicle preemption
 - Legislation on data and connected technology
 - Freedom for experimentation
 - Determining how CAVs will react in urban, congested environments vs rural locations where there may be more wildlife than people
 - "Licensing" of CAVs
 - Developing an overall CAV strategy
 - Determining how funding is going to be altered from building roads to building the infrastructure that will help implement CAV
 - Determining how to build trusts from the citizenry
 - We need to have pilot projects (some currently happening) that can be tied to a strategic plan
 - Can we use interstate corridors for pilots?
 - Need for user-driver roadmap for priorities for CV applications unique to Wisconsin
 - Determining how CAVs will be integrated with newer mobility forms (multimodal, rideshare)
 - Data regulation
 - Communications, outreach, and action plan for public buy-in
 - Outreach to local government
 - Can use Metropolitan Planning Organizations as an outlet
 - Understanding tech issues and opportunities
 - Finding funding sources
 - Updating regulations
 - Supporting research and innovation
 - Determining what barriers exist in Wisconsin and then working to reduce them
 - Harmonization across states
 - Getting CAVs "on the road" to allow for/help with public acceptance
 - Providing clear info on what our state statutes, policies, and transportation code says about CAVs
 - Promoting public debate about specific safety regulation and ideas, i.e. can platooning vehicles be marked so people can see what/where they are?
 - Catastrophic scenarios, i.e. what if a truck realizes it will crash- will the public be able to review source code?
 - Public should know what is in the "electronic brain" to determine what it does or what mitigating action will occur when complete safety is not possible

- What Role Should Government Have in Addressing These Issues?
 - Infrastructure development
 - Determine how CV technology will be installed- via public or private sector?
 - Policies
 - Clarity on state regulations (statutes)
 - Build in budget for future tech, similar to aesthetics
 - Explore pilot opportunities
 - Improve visibility (signs/markings) that will benefit all levels of vehicle tech
 - Establish mechanism for funding/cost sharing
 - More communication and outreach- need to advertise what everyone is doing so the public knows it's happening; highlight successful projects
 - Combine FHWA and NHTSA funding possibilities (grants?) and have Wisconsin apply to get some of those funds
 - Future-proofing as much as possible
 - Synchronize efforts across state government
 - Act as the lead for a roadmap
 - Adapt quickly- don't preclude actions
 - Ensure data privacy and security
 - State and local governments need to work together
 - Focus on safety first, then congestion, emissions, etc... to "sell" CAVs
 - Need federal consistency and global consistency to limit barriers to OEMs' development
 - Could automated vehicles be placed in their own class, legally, so that we can have coherent legislation?
 - WisDOT should look at working with a broader base of users- freight rail operators, river freight operators, and the trucking industry
- What Role Should the Private Sector Play in Addressing These Issues?
 - Clarity on what can be produced now and in the near future
 - Research and development, testing, and implementation
 - Design of the vehicles, in particular to allow individuals with disabilities to have access
 - Establish pilot projects
 - Bring private sector stakeholders to bear on large projects- industries near the project may want to participate on data collection/sharing
 - Developing assisted transportation for people with disabilities
 - Private sector needs to organize into a formal organization which can communicate with WisDOT and the legislature effectively
 - Help identify research needs
 - How are jobs that are disrupted by CAVs replaced?
 - Determine where telecommunication companies come into play
 - Help state with roadmap
 - Be helpful in regulatory and data privacy/security efforts
 - Marketing/outreach
 - Work on collaborating across all levels of government, including local
 - Insurance industry needs to be further involved to reduce private sector's risk
 - Workforce development, particularly in cybersecurity expertise

3. *What "anchor topics" and exercises could the Committee focus on during future meetings? Are there any topics that should be the focus of a subcommittee?*

- Potential In-Meeting "Anchor Topics"
 - Costs associated with Vehicle-to-Infrastructure research and integration
 - How will it be implemented in rural areas?
 - How local governments are approached to ensure their perspectives are included
 - Needed statutory changes
 - How CAVs will affect multimodal movement - transit, shared mobility, bicyclists, pedestrians - and equitable access
 - Feasibility of connected corridors
 - Conducting outreach and education to build public acceptance
 - Areas where regulation is needed, and the consequent ability for regulatory agencies to do monitoring
 - Infrastructure assessment of current readiness for CAVs, e.g. signing and marking on rural highways
 - Truck platooning
 - Equity of mobility: how to democratize CAVs
 - How state government efforts are being synchronized
 - WisDOT's CAV Strategic Plan
 - New Revenue model: taking advantage of connected technology for user fees and accommodating the change to electric vehicles
 - Barriers for local governments (technical and regulatory)
 - How freight industries, like trucking, can take advantage of these technologies
 - CAVs impacts on non-drivers
 - Insurance implications of CAVs
 - Data privacy
- Potential Subcommittees
 - How CAVs will affect people with disabilities
 - How CAVs will affect multimodal movement - transit, shared mobility, bicyclists, pedestrians - and equitable access
 - Engineering design standards and guidelines for CAVs
 - How to weave first responders into the design process
 - Plan for rolling out CV technology in rural areas
 - Economic and workforce impacts of the technology
 - Developing a plan for communication and outreach to the public
 - Designing a revenue model
 - Opportunities for local government
 - Data (privacy and security)
 - Truck platooning
 - How to leverage existing Wisconsin university expertise to collaborate to create a premier CAV research center
 - Costs: how much, and who pays?