CII Research Clearinghouse

Research ideas are always emerging across CII's standing committees, sector committees, and Communities for Business Advancement (CBAs). The list below is a compilation of these groups' top ideas. Some of these are just a one-sentence idea or research question while others are more detailed Research Topic Summaries (RTS), which is the way the Funded Studies Committee defines new research topics for funding. Ultimately, all ideas that are selected for funding should have a fully developed Research Topic Summary, which is used by CII in requests for proposals.

Committees and CBAs are encouraged to regularly revisit this page to:

- Provide any new ideas. If you would like to submit a research topic, please use the following link: Submit a Research Topic
- Review current ideas when prioritizing new ideas for funding.

The content of this page is organized in four sections:

If you are with a CII committee or CBA and need more information about topics, please contact Daniel Oliveira at daniel.oliveira@cii.utexas.edu

Research Programs

CII's overarching research is framed within research programs. Each research program drives a long-term goal that will improve CII members' businesses and bring innovation to the delivery of capital projects. Additional information regarding research programs can be found on CII's website.

Overarching programs were reviewed at CII's 2020 Innovation Workshop and the summary of these programs can be found here (click to view the presentation).

The current programs are described below.

Program	Future Topics/Ideas/Questions	Drivers / Challenges
AI Engine to Optimize Projects through AWP	**2019 Update** How can companies in the capital projects industry leverage AI to optimize AWP implementation and achieve better business and project outcomes? What AWP decisions or process steps can take advantage of AI? What strategies can companies adopt to incorporate AI in their AWP processes?	**2020 Update** Need to fully understand AI/ML capabilities Which specific AI tools apply to which data in AWP? Do we need time for industry to adopt and implement new supply chain and start-up /commissioning concepts before moving to the next steps? How can we standardize AWP processes to make improvements across the industry?
The Workforce of 2030	**2019 Update** The Impact of Automation on the Engineering Workforce New Approaches for Training, Assessing Performance, and Retention	**2020 Update** What technologies are needed to support work from home in project delivery? How will changes to current work practices due to COVID-19 impact the workforce of 2030? How do we anticipate the impact of future technologies on the future workforce? How do we improve information delivery to the project site and craft professionals?

Integrated and Collaborative Delivery for Better Business Results	**2019 Update** Quantitative Validation and Deployment of Industrial Integrated Project Delivery Improving Project Forecasts by Reducing Optimism Bias in Project Teams	**2020 Update** **Trust** Aligning incentives across organizations to encourage trust. **Contracts/Delivery and Legal** Buyout approaches focus on lowest cost instead of best value Is there an industry that works collaboratively that the capital projects industry can learn from? **Engineering/Concept** Linear development of solutions versus parametric Unwillingness to invest in bringing trades on early
Cultivating Change	**2019 Update** Cultivating Change: What structures, strategies, and processes will allow capital projects organizations to cultivate change by realistically and systematically identifying the need for change, plan and react to change? Breaking the “Cycle of One”: How can project organizations be structured so that knowledge is transferred from one project to other thus driving continuous change and improvement? How can organizations better perform knowledge transfer across projects?	**2020 Update** **Behavior** Mindset or culture does not necessarily encourage change Embracing change may not be typical behavior in project organizations. Project delivery typically works to minimize change. **Philosophy/Culture** Is culture portable? Can it be moved from project to project with different companies, players, people, facilities, and geographic locations? **COVID-19** What type of changes are we going to see or need as a result of COVID-19? COVID-19 has challenged organizations to rapidly change workflows, processes, and organization culture - how can this experience be leveraged into a culture of continuous change?
Circular Economy	**2020 Update** What professional capabilities are required to achieve circular economy for a project? Roadmap to a circular economy.	**2020 Update** Current financial models do not fit the needs of a circular economy. Decommissioning and end of project lifecycle offers a significant challenge to accomplish circular economy. Professionals need to be upskilled to work on this aspects of projects. The industry as a whole needs develop a better and more complete understanding of Circular Economy as it relates to capital projects.

Technology Committee

As of July 2020, the Technology Committee in considering the follow research ideas:

- P2020/1 Digital collection and reporting of Site Labor Hours (click to read the topic summary)
- P2020/2 Application Guide for Blockchain Technology within the Construction Industry
- P2018/1 Artificial Intelligence (AI) Driven, Data Cleansing & Migration Guide

You can find more information on the Technology Committee page and in the Technology Committee R&D Subcommittee page

If you want more information about the Technology topics above, please contact Bryan Kendig at BKendig@dow.com

Sector Committees

Sector initiatives were reviewed at CII's 2020 Innovation Workshop and the summary of these initiatives can be found here (click to view the presentation).

Downstream and Chemicals sector (DCC)	**Sector Objective** The DCC has defined the following objective: by 2024, our sector wants to improve capital efficiency by 50% through technological and contractual advances. To achieve this goal, the committee has developed the following ideas: • Define capital efficiency and establish a common metric - Capital Efficiency Scorecard • PDRI MATRS for small industrial projects • CII Best Practice selection tool • Project Benchmarking - by phase and discipline **2019 Update** **PDRI MATRS for Small Projects (Oct 2019)**: This project aims to update the existing PDRI for Small Industrial projects to include the PDRI MATRS framework. CII's recommendation is that several sectors could pull resources to fund a project to update several PDRI versions in parallel. This would create efficiencies in the delivery of the new PDRIS versions. These are several topics related to the "How to Double Productivity" project, which was sponsored by the DCC committee in 2017-18. These topics may also apply to other sectors and to overarching research. You can find a report with a detailed description of topics on the RT-DCC-01 Knowledge Base page. These are some of the topics included in the document: • Craft Competition (Full topic summary available - see link above) • Developing the Next Generation of Field Supervisors (Full topic summary available - see link above) • Productivity Cultures (Full topic summary available - see link above) • Provide Information at the Right Time and in the Right Format (Full topic summary available - see link above) Throughout 2019, the committee also explored a number of research ideas/questions, including: • An update for the CRA tool, which would add more clarity to the definitions of the different score levels of the tool. (CII recommendation: start collecting feedback from companies using the tools in order to better define the problem and launch a very short project. Alternatively, the DCC members could collect the definitions and work with the Deployment committee to implement changes to the tool). • Productivity related topic: the DCC sector decided to create a workgroup to create alignment on a standard definition of productivity before funding a new project. • What is the real impact of CII best practices? What brings the most value? (CII recommendation: DCC should review past work on the value of best practices available in the Knowledge Base. The new CII Data Warehouse project may also connect to this idea and the DCC could work with the deployment committee to create and track metrics related to the value of best practices. However, is this a DCC specific topic, or is it relevant to all CII members?) • Evaluation of global practices (CII recommendation: needs more definition).
Facilities and Healthcare sector (FHC)	**Sector Objective** The FHC has defined the following sector objective: By 2025, our sector wants to reduce costs by 5% per sq. foot in facilities constructed after 2005 and reduce operational costs of facilities constructed prior to 2005 by 25%. To achieve this objective, the FHC has developed the following research ideas: • Reduce facility operational costs by benchmarking data to determine targets for lifecycle performance • Develop a new tool to support operational cost improvement • Support implementation of CII tools and best practices to improve capital efficiency
Manufacturing and Life Sciences sector (MLS)	**Sector Objective** MLS has defined their objective as: Ensure capital project investment efficiency equal to or better than industry averages. And they have developed the following priorities: • Digitalization of construction process • Lead and IPD project delivery, education, and implementation • Benchmarking of project performance • Apply change management consistently across all projects

Power, Utilities, and Infrastructure sector (PUI)	**Sector Objective**
	
	PUI has defined their objective as understanding how PUI supply chain practices may be destroying delivered value to end users. They have developed the following questions to further this objective:
	
	• How can current supply chains be more sustainable, nimble, and cost effective while facing fast-changing project landscapes?
	• Can regulated companies adapt to more efficient procurement methods used by competitors in the private sector?
	• Who pays for supply chain entropy?
	
	2019 Update
	
	The Research Team RT-PUI-01 identified and evaluated the impact of regulations through the project life cycle. One product of this research project was a regulatory research roadmap (report available here - CII account required for download), which outlines the current state of knowledge and proposes a plan to develop research that will further explore underlying issues. The ultimate goal of the research roadmap is to develop knowledge and tools to help the industry more effectively address regulatory risks and opportunities. Some topics included in this document are:
	
	• Industry-level Strategies for Dealing with Regulatory Changes (Full topic summary available - see link above)
	• Regulatory Readiness Index (Full topic summary available - see link above)
	• A Cost-Benefit Analysis Methodology for the PUI-01 Future-Proofing Framework (Full topic summary available - see link above)
	• Regulatory Future-Proofing Maturity Model (Full topic summary available - see link above)
	
	The Committee also explored a number of options for future projects in fall 2019. The top ideas, along with possible links to existing programs, or Committees/CBAs:
	
	• What are the driving factors limiting construction productivity? What can improve it? (CII recommendation: connect to DCC and their interest in productivity)
	• Contract Types: is there a useful standard? LDs/Bonuses (CII recommendation: connect to upcoming DCC project PDCS Update)
	• Data: How to access and get in places that need it? Barriers and how to overcome culture? Security? Overloaded? correlation process? best uses for predicted analytics? (CII recommendation: connect to RT-372 Model-centric Delivery and to the CII Data Warehouse led by the Deployment Committee)
	• Psychology of decision making and risk assessment: What are we conservative? Can we enable transformation? Can we do a better job of learning from other industries? (CII recommendation: connect with the Cultivating Change program)
	• Business KPIs (leading and lagging): how do we bring approval authorities and project executives together when budgets don't align?
	• Prototype versus standard design - replicating design (CII recommendation: connect with Modularization CBA and to the standardization research team sponsored by Upstream and Mining sector committee)
	• Focus: day to day construction site - workers
	• Facilitate and create a framework for disruption (e.g. develop facilitators) (CII recommendation: connect with Cultivating Change program)
	• How can current supply chains be more sustainable, nimble, and cost effective while facing fast-changing project landscapes?
	• Can regulated companies adapt to more efficient procurement methods used by competitors in the private sector?
	
	Some other ideas proposed by the Committee are opportunities for collaboration with other Committees, such as Technology or Deployment.
	
	• Technology Committee
	  • Radical Changes in Construction Technology - Dramatic Cost Reduction
	  • Underground mapping/visualization technology (e.g. preventing utility strikes)
	• Deployment Committee
	  • How to get members to apply CII Best Practices in their company (Owner/Service provider/Contractor)? How long does it take to implement?

Upstream, Midstream and Mining sector (UMM)	**Sector Objective** The UMM Sector is committed to framing future project delivery, providing methods to address projects with the right size solutions, capable to drive capital effectiveness to prevent erosion of IRR* by achieving +/-5% project cost and schedule at project completion versus the forecast at Final Investment Decision (FID). UMM has developed the following topic ideas: • FEP and Feasibility - are they fully integrated? • Right sizing FEP and Stage Gate Approval Process for Enhanced Agility • Did you forget something? Are we capturing change in the right way? • PDRI for offshore projects (subsea, deepwater, top sides) -This project aims to update the existing PDRI resources to develop appropriate tools for the Upstream sector.

Common Threads in Research across Sectors

CII has identified opportunities for collaboration across sectors, CBAs, and standing committees. These opportunities are research topics that have been identified by multiple groups and their outcomes potential outcomes could provide value to these groups. The research topics identified include the following:

- Capital Efficiency
- PDRI
- Selection Tool or Playbook to aid member companies in identifying relevant CII resource(s)

Communities for Business Advancement

AWP CBA	**2020 Update** **Data**: Define data standards for common types of work packages that may be easily reusable across the industry **ROI/Benefits**: Develop quantitative AWP metrics to establish benchmarking **Engineering Deliverables**: Identify and develop best practices for engineering to incorporate AWP **Contracting**: Identify best practices regarding contracting guidelines to address AWP implementation across different stakeholders within the project organization
Information Management CBA	**2019 Update** How AI and machine learning can reduce IM and other construction costs, increase productivity?
Project Controls CBA	**2019 Update** PC Maturity Matrix; AI for project scheduling
Quality Management CBA	**2019 Update** Creating consistent reporting around rework; continued work on RT-313 + intersection between quality and safety
Risk Management CBA	**2019 Update** Development of a Risk Maturity Model
Safety CBA	**2019 Update** EHSS Training effectiveness EHSS in PDRI in site selection, community relations, air, water, and environmental permits, technology selection A “Living Library” to compile hazards in the field and develop an algorithm for data to identify potential events; increase EHSS training effectiveness & PDRI-EHSS steps; design in and out safety concerns New Technology opportunities for advancements in construction and safety
Supply Chain Management CBA	**2020 Update** A Transformative and Integrated Approach to Expediting Cash Flow Across the Construction Supply Chain (click to read the topic summary) Use AI to clean up connectivity throughout the materials supply chain (CII Recommendation: potential AI application for the AWP program) SCM Blockchain applications (CII recommendation: see OS2 research related to blockchain)