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CURT® Lean Summit

*“Industrial Design Process &
Integrated Form of Agreement Perspectives”*

**CII Research: Case Study - Lean management principles & their
impact on successful project delivery**

Monday May 3rd, 2021

CII Research: Case Study - Lean management principles & their impact on successful project delivery



PTAG Bruce Burwell - Partner Capital Projects

Bruce is a Project and Construction Management professional with extensive experience in all industrial sectors. He has held numerous positions with Ontario Power Generation and its predecessor Ontario Hydro throughout a 34-year career before joining PTAG as Partner – Capital Projects leading PTAG’s Industrial Integrated Project Delivery practice (I2PD). He possesses an in-depth knowledge of I2PD projects and skillful understanding of project lifecycle and project development methodologies. He is focused on process improvement and project certainty.

He is proficient in contracting strategies including Alliancing, IPD and Collaborative Contracting projects and was the first to implement Industrial Integrated Project Delivery (I2PD) as a pilot project for Ontario Power Generation. He led the OPG I2PD team in the development of the Multi-Party agreement and the creation of the project processes and templates required for the planning and execution of the project.

He is Chair of the Construction Industry Institute (CII) University of Texas Integrated Project Delivery (I2PD) Research Team, Chair of the CII Power Utilities and Infrastructure Implementation Committee and has presented Collaborative Contracting as an alternative contracting model to organizations and executives all over North America.

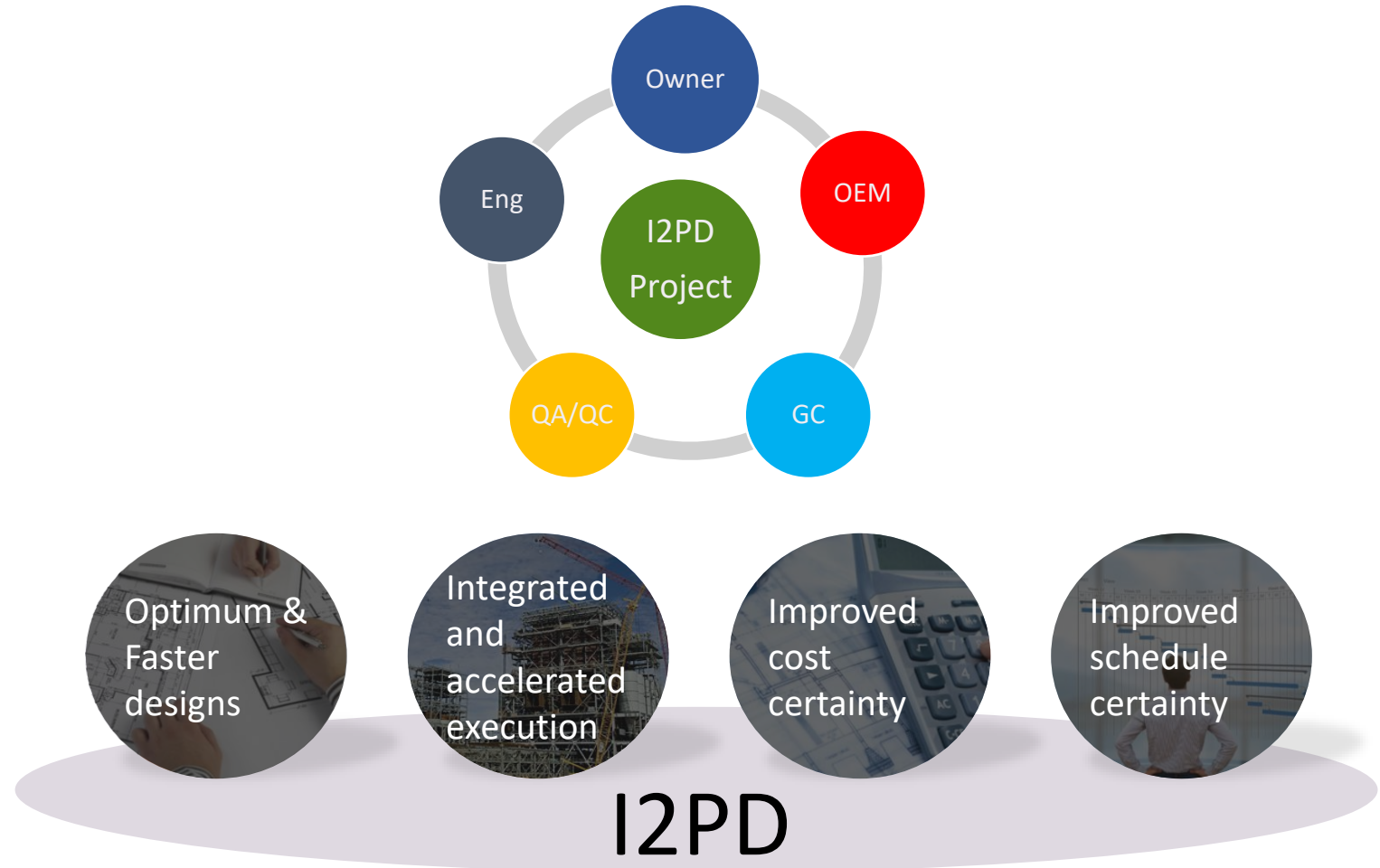
Professional Affiliations



Industrial Integrated Project Delivery – I2PD

Case Study

- Why I2PD
- CII I2PD Phase One Research
- Case Study
- Big Room
- Joint Risk Assessment & Pool
- I2PD Cost
- Tools & Templates
- I2PD Critical Success Factors
- I2PD Benefits
- CII I2PD Phase Two Research



Industrial Integrated Project Delivery – I2PD

Why I2PD

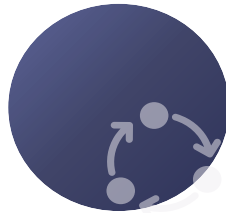
Commercial IPD has been proven to have a superior performance in metrics related to quality, communication, and change performance.

Projects see less change, faster processing times, and significantly faster delivery times (El-Asmar et al. 2013).

A major finding, on a study of construction projects utilizing Commercial IPD, showed a striking uniformity of success for all projects in the study, regardless of project type, scope, geographic location, or previous experience with IPD (Cheng et al. 2016).



Increased cost certainty



Assurance of costs being covered



Schedule acceleration



Supply chain certainty



Improved quality



Collaborative next gen environment



Facilitates knowledge transfer

I2PD is a great fit for the planning and execution for complex and large capital projects

Industrial Integrated Project Delivery – I2PD

Construction Industry Institute project survey results

DATA COLLECTED FROM 85 PROJECTS ACROSS ALL SECTORS



TARGET PARTICIPANT
SENIOR PROJECT MANAGERS

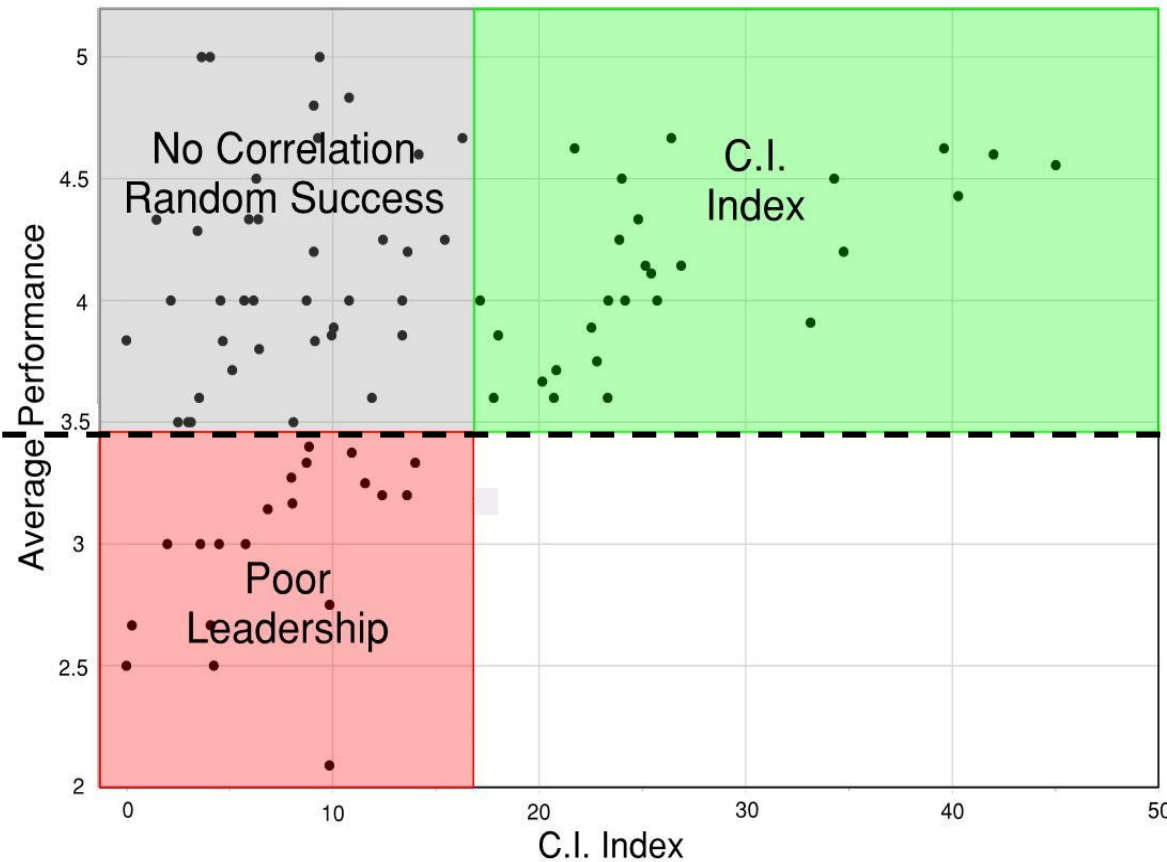
IDENTIFIED ONE CAREER PROJECT
AS HAVING HIGH AMOUNT OF
COLLABORATION & INTEGRATION

IDENTIFIED TOP PERFORMANCE METRICS USED TO DETERMINE PROJECT SUCCESS:
SAFETY • QUALITY • CLIENT SATISFACTION • COST & SCHEDULE CERTAINTY

(Source [CII RT 341 2018](#))

Industrial Integrated Project Delivery – I2PD

Construction Industry Institute project survey results



Research results:

a Minimum of 15 Principles and Methods provide Certainty of Project Success

(Source [CII RT 341 2018](#))

CASE STUDY

**Collaborative Contracting
Schedule, Cost and Scope Improvement
Using Industrial Integrated Project Delivery - I2PD**

Overview

Company

Major Power Generator

Industry

Hydro Electrical Generation

Category

Construction

Project Budget

\$115M

Goal

Provide Cost and Schedule certainty while maintaining quality and safety on a major 8 year, 8 generating unit hydro power station

Obstacles

Operating power plant with numerous other dam safety and powerhouse projects all vying for space in a live operation environment. Four key suppliers needed to act in tight highly orchestrated time frame to reduce outage time

Solution

Selected 4 suppliers using traditional contracting methods for competitive bidding. Winning suppliers entered into an 8 year Multi-Party agreement with owner to develop final eng, construction plans with integrated cost, schedule & risk plans

Results

7 month reduction in procurement time, 32% percent cost reduction, 36% execution schedule savings, integrated project management and trades teams, safety, quality and reporting. 100% profits at risk with shared savings

GOALS

To Reduce uncertainty in Cost and Schedule adherence on large multi-year refurbishment program

Successfully select and integrate 4 key vendors, Engineering, OEM, Constructor and Quality into an integrated team with the Owner to finalize scope development and Front-End Planning to produce an Integrated Schedule and Estimate of the program where all suppliers would be willing to put their profits at risk in return for participation in any savings.

Develop Detailed Engineering with Owner, OEM and Consulting Eng. in an integrated team with ongoing constructability reviews. In Parallel develop the detailed Construction, HSSE, Quality Plans, Project Controls, Commissioning and Return to Service Plans.

Reduce the outage window from 14 months. Reduce costs caused by site coordination complexity, increased regulatory and union labour (trades and professionals) requirements.

OBSTACLES

Management of Change to Achieve Compliance

Challenges in meeting the goals of the project:

- Large operating site, with multiple other facility work programs
- Limited laydown space and construction crew accommodation space
- Ideal Outage window 5 months shorter than historical windows
- Highly regulated Owner – Public company owned by Provincial Government creating perceived governance issues with collaborative contracts
- Support Organizations reluctant to take risks with new approaches to contracting
- Program needed long-term monitoring and reporting to ensure adherence

SOLUTION

PTAG Developed and Delivered in Partnership with the Client Project Management Team

PTAG Advised the owner on the selection and implementation of Collaborative Contracting as a method to improve performance and certainty of outcome on a province wide overhaul program to a portfolio of 66 Hydro Electric Generating Stations representing 7.5 Terawatts of electrical power.

The initial project is an 8 unit generating station. PTAG proposed and the client selected Industrial Integrated Project Delivery ("I2PD") as the Collaboration Contracting method as it combined principles and methods to improve both design considerations and reduce construction risk.

Provided Facilitation, Coaching and PMO services to all project phases from the initial competitive vendor selection phase through to execution.

Vendor Selection started with an EOI to 17 pre-selected suppliers who already had MSA agreements with the owner and had a history of good performance. Sixteen vendors were selected to proceed to the RFP stage - 4 vendors each representing Engineering, Equipment Supplier, Construction and Quality Management.

Validation Phase was performed by one vendor in each of the four categories and the owner to finalize the Scope, Integrated Estimate and Schedule, Integrated Risk Plan, Integrated Engineering Plan and preliminary Construction Plans. The Validation report had all parties agreed to Target Cost and Schedule, including putting all supplier's profits at risk for a substantial portion of the savings achieved during pre-construction and project execution.

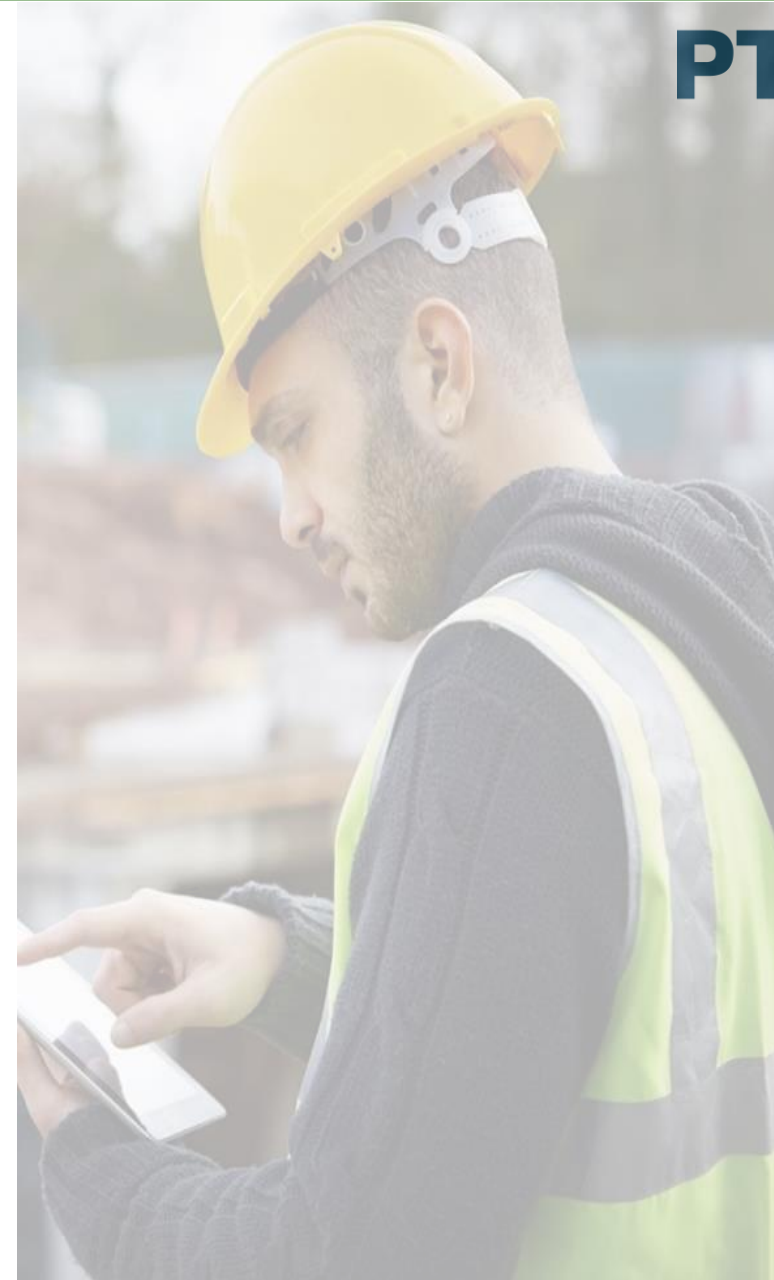
Pre-Construction phase produced detailed engineering and construction plans resulting in a further reduction of cost and schedule while at the same time including additional changes to take advantage of design opportunities that were recommended by the integrated project team to extend the time between the next major overhaul by up to 20%.

Execution Phase is based on an Integrated project team of the 5 Parties (Owner, Engineer, Constructor, OEM, QA) performing as a single team with one integrated set of processes for all disciplines including integrated multi-union trades, procurement, quality, inspection permits, construction, project controls, HSSE and field engineering. Schedule has been reduced to 9 months with further reductions expected as the team uses lessons learned from unit to unit. Cost has been reduced by over 1/3rd from the original estimates

PROCESS

Advised, Facilitated and Coached the development and execution

- 
- 1** Reviewed Project Requirements and Review Organizational Capabilities
 - 2** Competitively Selected Suppliers, initial focus on technical capability and senior management commitment to collaboration principle
 - 3** Facilitated Validation Phase delivering Target Project Schedule and Estimate
 - 4** Facilitated Multi-Party Agreement with Owner and 4 key suppliers
 - 5** Facilitated Pre-construction, Detailed Engineering, Procurement, Construction Plans, HSSE, Quality, further reducing Cost Schedule and improving Scope
 - 6** Facilitated Execution Startup with Ongoing Monitoring



Process

SMEs Delivered and Implemented the Program

Provided Facilitation, Coaching, Training and PMO. PMO services included integrated project controls plan, processes and systems, integrated document management and control plan processes and systems

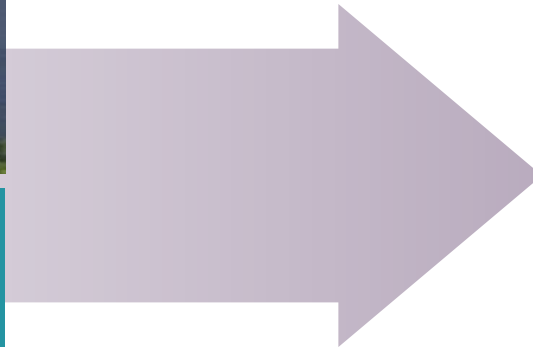


Big Room

Joint Risk Assessment

Shared Risk/Reward

Multi-Party Agreement



COST REDUCTION
32% from RFP

SCHEDULE IMPROVEMENT
36% from RFP

Four major vendors putting 100% of their profits at risk for equitable decision making and majority of execution savings

RESULTS

- Reduced procurement time by 7 months
- Achieved early certainty in cost and schedule at concept phase
- Collaborative design process using Value Engineering resulted in up to a five-year live extension between major overhauls
- 32% cost reduction from RFP prices going into execution, while adding additional scope
- 36% schedule reduction from RFP responses going into execution with further opportunities to improve schedule in execution

“Collaborative Contracting using I2PD has delivered on its promise to bring to reality - cost, schedule and scope improvements”

Big Room Activates

Validation Phase

- Kick off meeting, using a Big Room format with some pre-read materials and activities including I2PD TEAM maturity assessment to set phase activities and cadence
- Values setting, equitable decision-making process review
- Detailed Design Reviews, Enhancements and Agreement
- Detailed Schedule Reviews, Integration, Enhancements and Agreement
- Detailed Estimate Reviews, Integration, Enhancement and Agreement
- Detailed Risk Reviews, Integration, Enhancement and Agreement
- Detailed Contract Reviews, Enhancements and Agreement

Output - Validation Study with Agreed to Design, Schedule and Cost

Pre-Construction Phase

- Kick off meeting, using a Big Room format with some pre-read materials and activities to set phase agenda and cadence
- Design details, reviews and enhancements,
- Constructability Reviews (Value Stream Mapping, Clash Points etc.)
- Construction Work Planning (Pull Planning), Sequencing, Interference reduction, Permits, Safety/Environment Plans, Site Planning
- Project Management Planning (Reporting, Project systems Integration, documentation management)
- Schedule Enhancements
- Estimate Enhancements
- Procurement Plan

Output Project Execution Plan including Expected Maximum Price, Level 5 Schedule



Big Room Activities Cont'd

Construction Phase

- Kick off meeting, using a Big Room format with some pre-read materials and activities to set phase agenda and cadence
- Safety meetings
- Environmental review meetings
- Community and Stakeholder reviews (Traffic, noise, closures, encumbrances)
- Site logistics and scheduling
- Progress meetings, payment certificate reviews
- Change request reviews
- Quality and Inspection review meetings
- Construction Work Planning (Pull Planning), 1, 2 and 6 week look aheads
- Uncertainty Management - Opportunity and Threat reviews

Output - On budget, on schedule construction project

Close Out Phase

- Punch List reviews
- Submittal reviews
- Demobilization reviews
- Lessons Learned session
- Final Completion Certificate reviews
- Final Payment reviews
- LOC or Bond releases

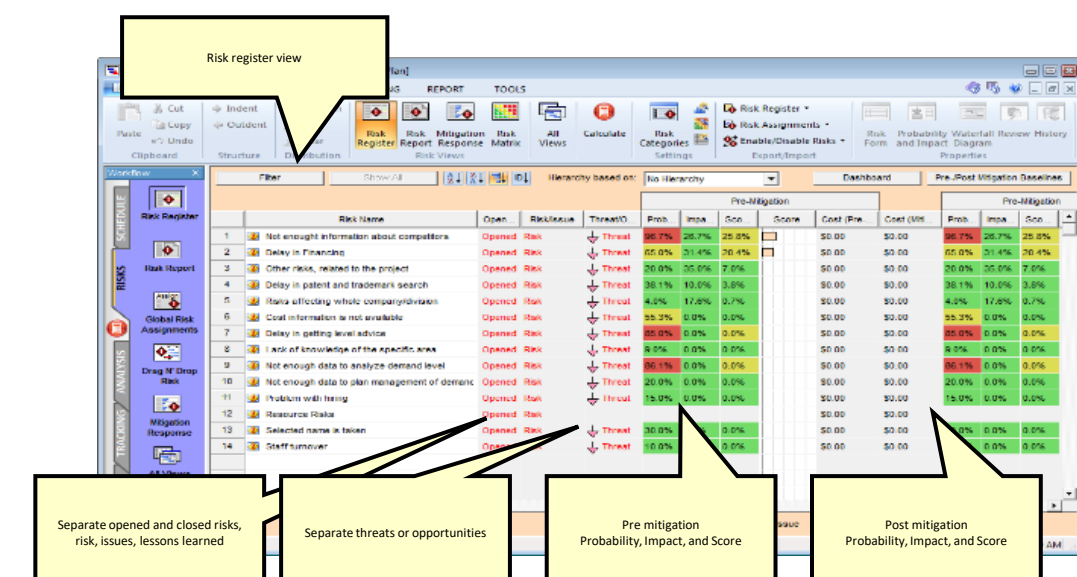
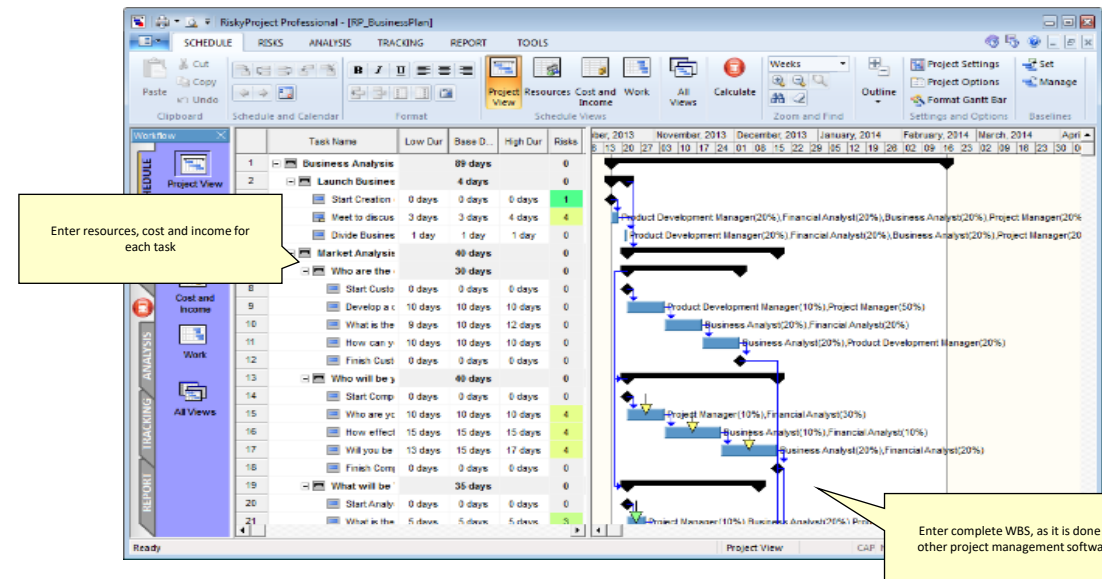
Output - All project close out documents complete as per the close out plan and schedule



Joint Risk Assessment Tool

Uncertainty Management

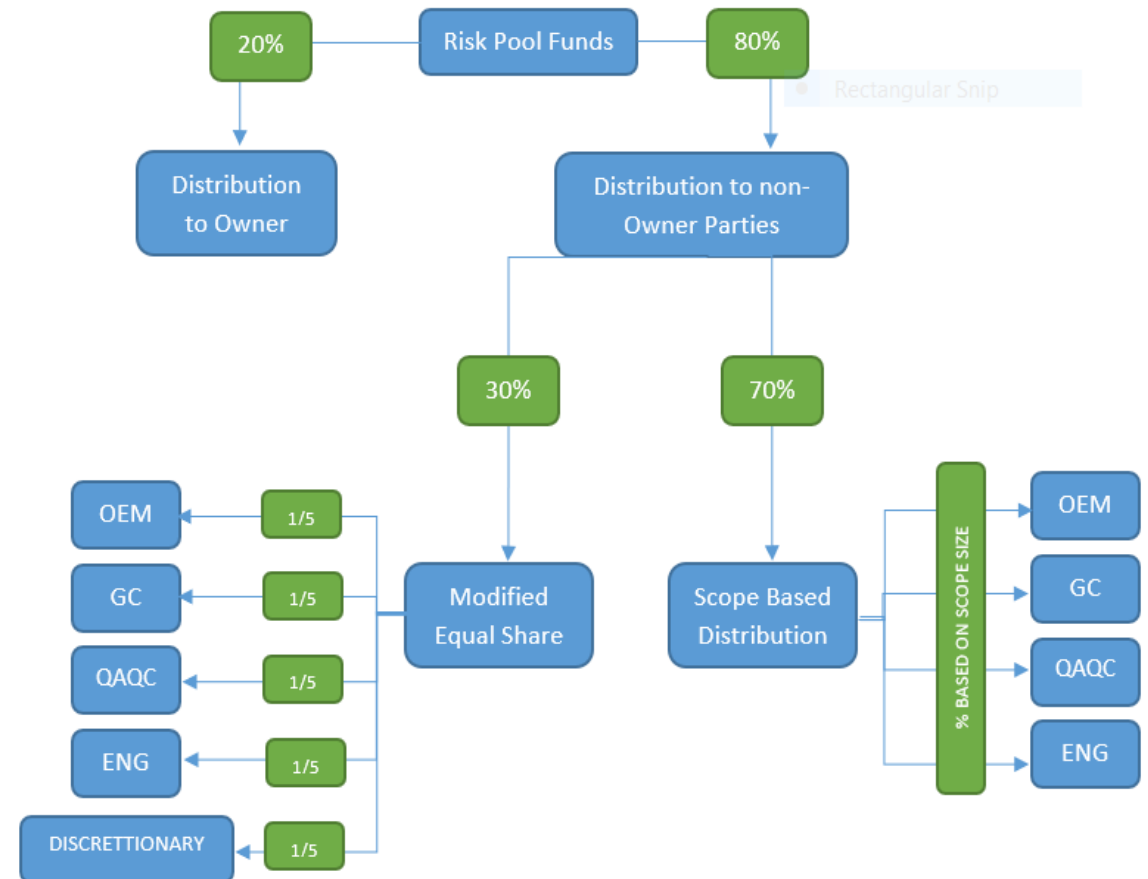
- I2PD Uncertainty Management Plan: follows CI's Best Practice in risk management
- The management of Uncertainty through the development of the Risk register (Opportunities and Threats) is a process that includes the owner, designer, contractor, consultants and sub trades
- Starts in the Validation Phase with the development of the Opportunity register and the Threat register, collectively the Risk Register. The Risk Register is managed through each project phase right through to Project Close out
- The inclusion of all parties allows the team to draw on diverse experience and expertise, resulting in innovative solutions to capture and realize savings in cost and schedule (opportunities) as well as identify and mitigate threats (delays, added costs)



Joint Risk Pool

Contingency Model

- The Risk Pool is calculated as a function of the expenditure or saving of the estimated Payable Costs, Contingencies, Allowances and Profit
- Each Risk Pool Member has a vested interest in the management of the project to reduce payable costs, preserve contingency and exploit opportunities



Industrial Integrated Project Delivery Costs

Profit

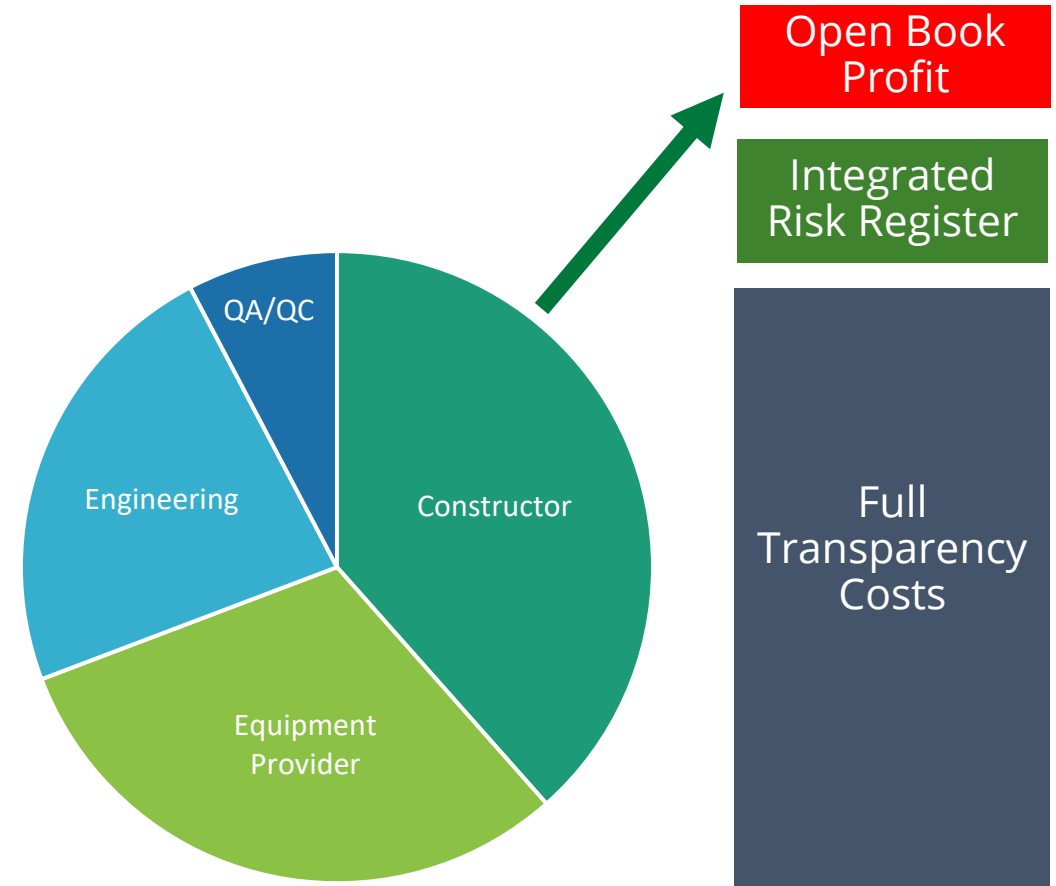
- Profit for all I2PD parties, as laid out in the final target cost

Risk Register

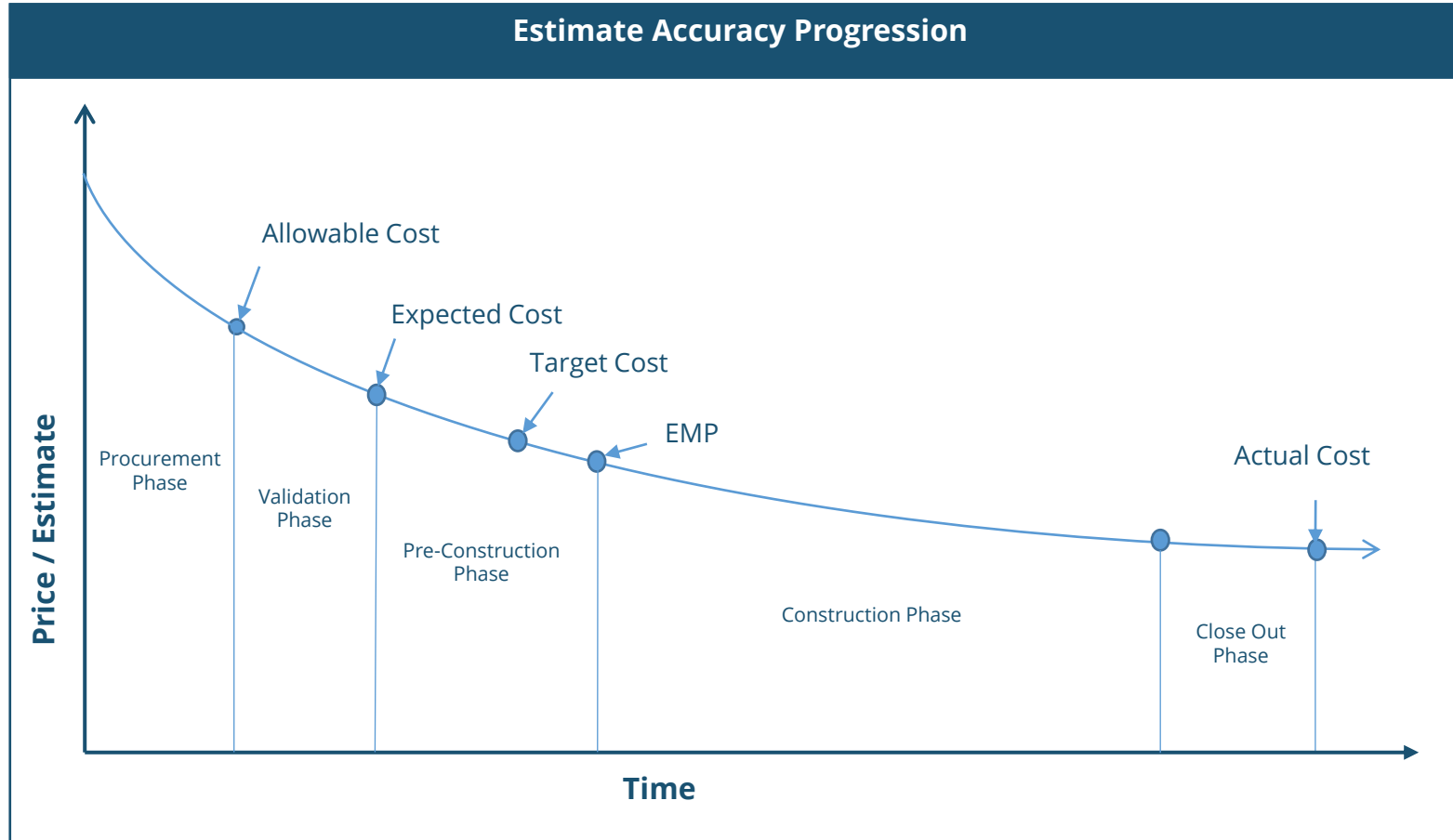
- Risk items
- Joint management of risk

Costs

- Chargeable/allowable costs
- Overhead



Progression of Costing



Multi-Party Agreement Background

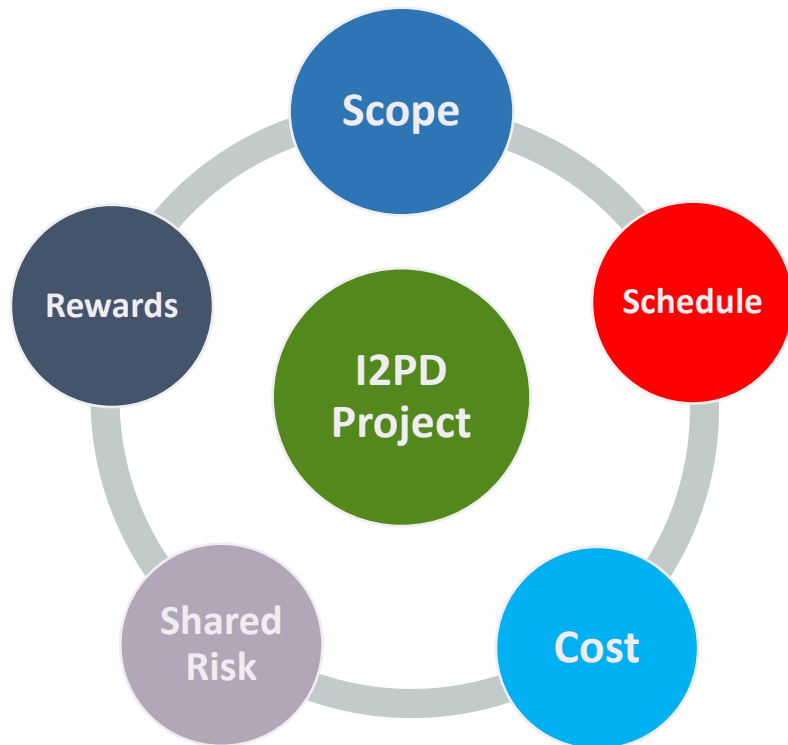
The Multi-Party Agreement was developed by a team of 24 senior project professionals and academics as part of CII's RT-341 research team in in 2018.

The Agreement Template was developed using input from the following templates:

1. EPC Agreement Template
2. Alliancing Agreement Template
3. Commercial IPD Template

The template was further improved by Ontario Power Generation where the template was used to execute a 5 party Multi-Party Agreement for an 8 year, 8 unit overhaul of a 243MW generation station.

I2PD Multi-Party Agreement



SECTION 1 – INTERPRETATION

1.1 Definitions

SECTION 2 – I2PD METHOD AND LEAN CONSTRUCTION PRINCIPLES.....

2.1 Industrial Integrated Project Delivery.....

2.2 I2PD Team.....

2.3 Relationship

2.4 Goal

2.5 Reliable Commitments.....

2.6 Pull Planning.....

2.7 Collaboration and Integration Methods.....

SECTION 3 – COLLABORATIVE PROJECT MANAGEMENT.....

3.1 Core Group

3.2 Selection and Replacement of Subcontractors and Consultants

3.3 Self-Performed Work

3.4 Participation in Collaboration

3.5 Management of the I2PD Team

3.6 Project Personnel

3.7 Supervision

3.8 Objection to Personnel

3.9 Decision-making

SECTION 4 – PROJECT OBJECTIVES AND PARTIES’ RESPONSIBILITIES

SECTION 5 – VALIDATION PHASE.....

SECTION 6 – PRECONSTRUCTION PHASE – TARGET VALUE DESIGN

SECTION 7 – RISK POOL

SECTION 8 – ESTIMATED MAXIMUM PRICE.....

SECTION 9 – BASIS OF COST BENCHMARKS.....

SECTION 10 – PAYABLE COSTS

SECTION 11 – RISK IDENTIFICATION AND ALLOCATION

SECTION 12 – CONSTRUCTION PHASE.....

12.1 Project Planning and Schedule

12.2 Project Organization.....

12.3 Subcontractors

12.4 Project Meetings

12.5 Requests for Information (RFIs).....

SECTION 13 – CONTRACT TIME

SECTION 14 – CHANGES IN WORK, GOODS OR PROJECT

SECTION 15 – CHANGES TO SCHEDULE

SECTION 16 – COMPENSATION - PAYMENT OF PAYABLE COSTS.....

SECTION 17 – SUBSTANTIAL AND FINAL COMPLETION

SECTION 18 – TERMINATION AND SUSPENSION.....

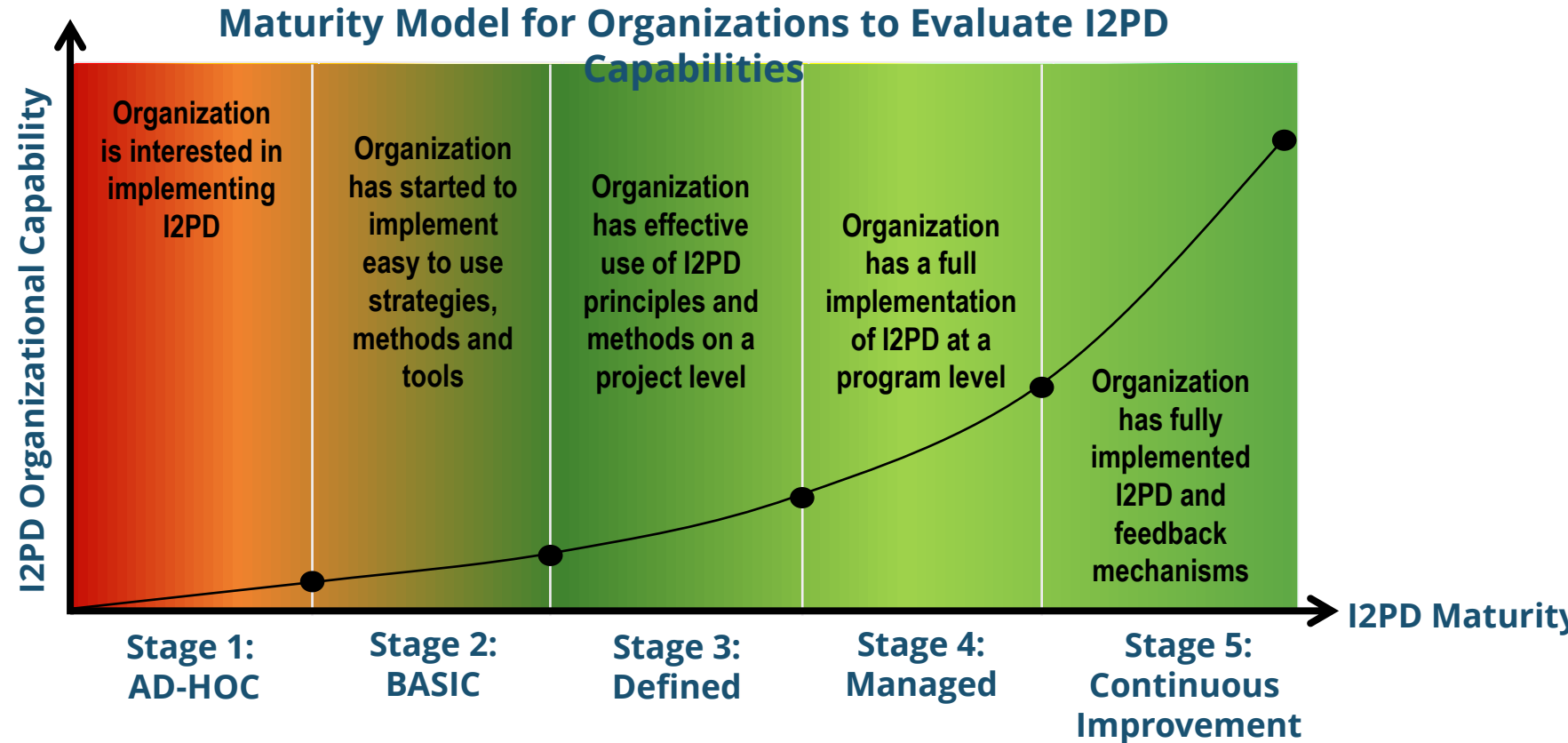
SECTION 19 – INTELLECTUAL PROPERTY AND CONFIDENTIAL INFORMATION ..

SECTION 20 – DISPUTE RESOLUTION.....

SECTION 21 – CONTRACT DOCUMENTS.....

SECTION 22 – GENERAL.....

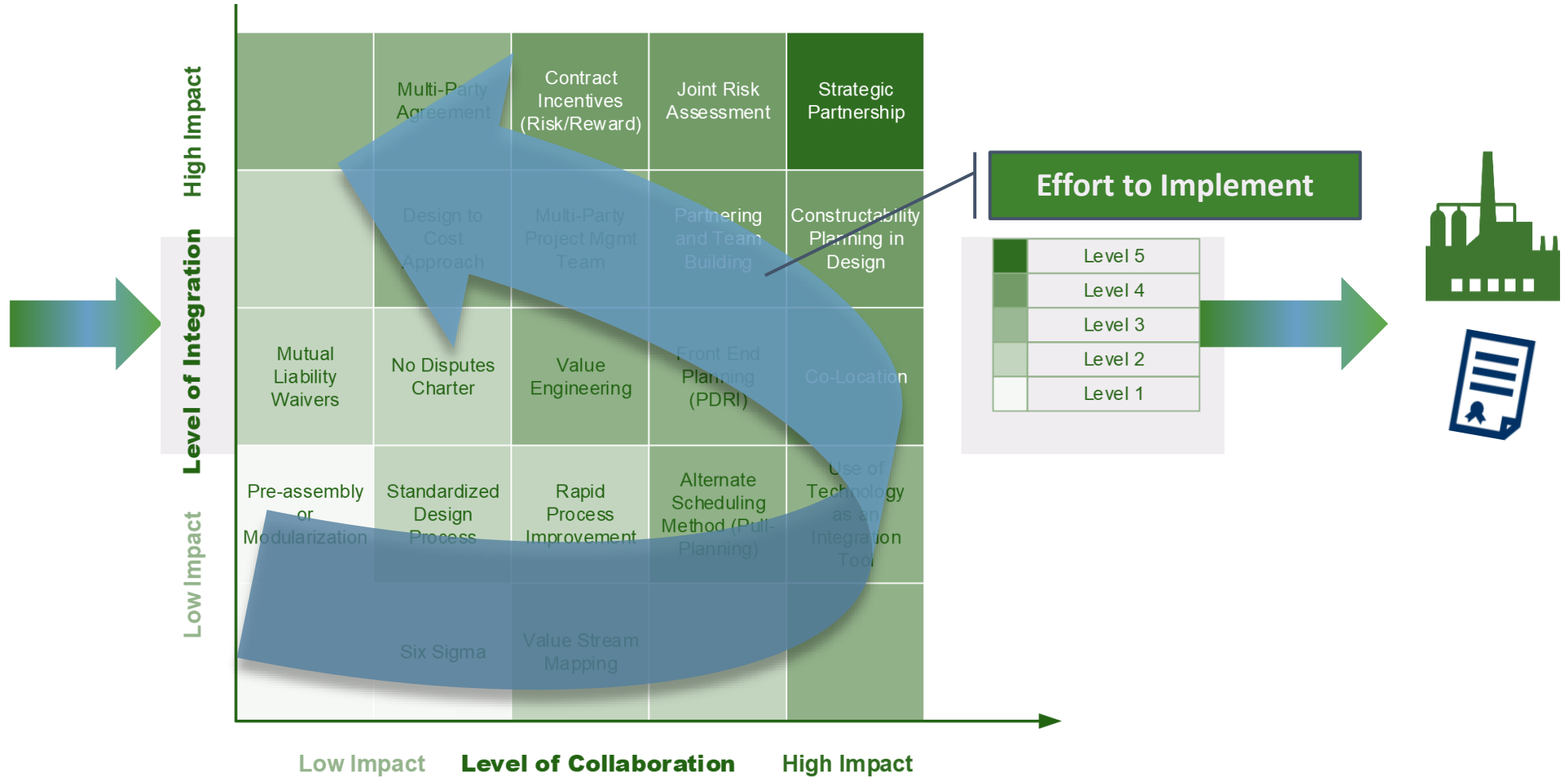
I2PD Implementation



(Source [CII RT 341 2018](#))

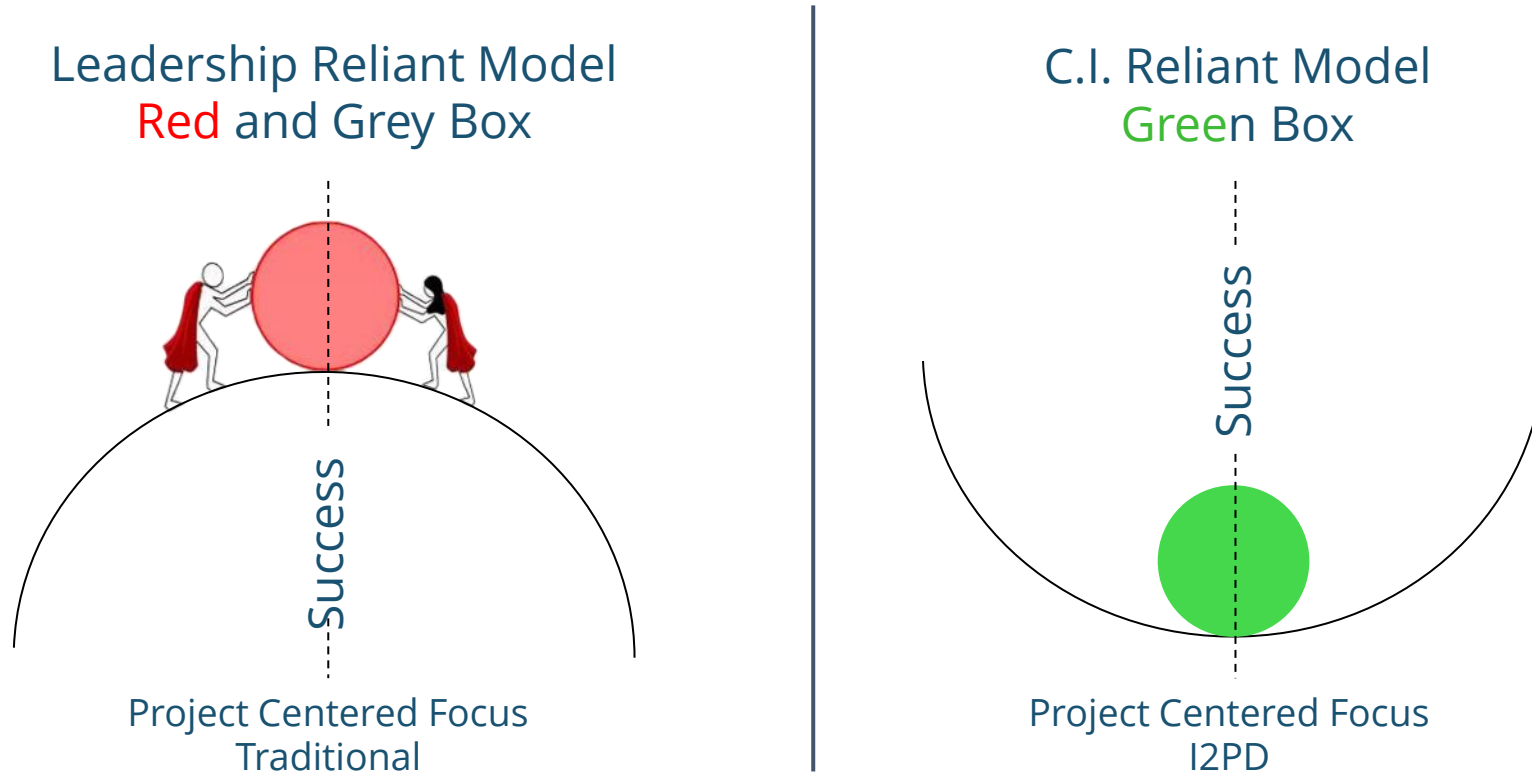
I2PD Implementation

Methods
(Best Practices)
to aid in
implementation
of I2PD



(Source [CII RT 341 2018](#))

Improving certainty through I2PD



(Adapted from sketch by Howard Ashcraft and Renee Cheng)

Industrial Integrated Project Delivery – I2PD

I2PD Critical success factors



A CAPITAL PROJECT
SERVICES PARTNER

Success Factor
Safety
Duration (Schedule)
Budget
Quality
Business Expectations
Future work
Profit / Return on Investment
Certainty

- I2PD Team **Values**: team commitment
- Cultivating an environment of “**Trust**”
- Collaborative Team: project team must have the **proper mindset** and values for this type of project delivery or contracting strategy looking to improve project performance
- Decision Makers: must have the **authority to make decisions** and be present at all milestones meetings (Big Room)
- Willingness to **Adapt** (nimbleness)
- Openness and Transparency, **open book**
- Willingness to **Share** Risk and Reward (sink or swim together)

Industrial Integrated Project Delivery – I2PD

I2PD Critical success factors



A CAPITAL PROJECT
SERVICES PARTNER

Success Factor
Safety
Duration (Schedule)
Budget
Quality
Business Expectations
Future work
Profit / Return on Investment
Certainty

- Corporate **Culture** aligned with Collaboration and Integration principles and methods
- Early and **Active participation** in design and construction planning
- Technology as an **Integration tool** for planning, control and reporting
- Seek Senior Executive **support** at the outset: provide regular milestone updates
- Utilize **lessons learned**: reach out to I2PD experienced companies
- Acquire the services of an **I2PD coach/facilitator**: one of the key lessons
- Involve internal **support groups** early: Supply Chain, Legal, Project and Construction
- Management and I2PD coach **working collaboratively** to draft the project and contract

Industrial Integrated Project Delivery – I2PD

Benefits of I2PD

The Benefits to the I2PD Team include:

- Early and increased certainty of project success and goal attainment particularly in the areas of:
 - Scope Definition
 - Schedule
 - Cost
- Alignment of business project goals with key suppliers
- Pooled profit
- Direct and indirect costs are reimbursed
- Risk managed collectively
- Culture factors into onboarding choices
- Waive claims against each other

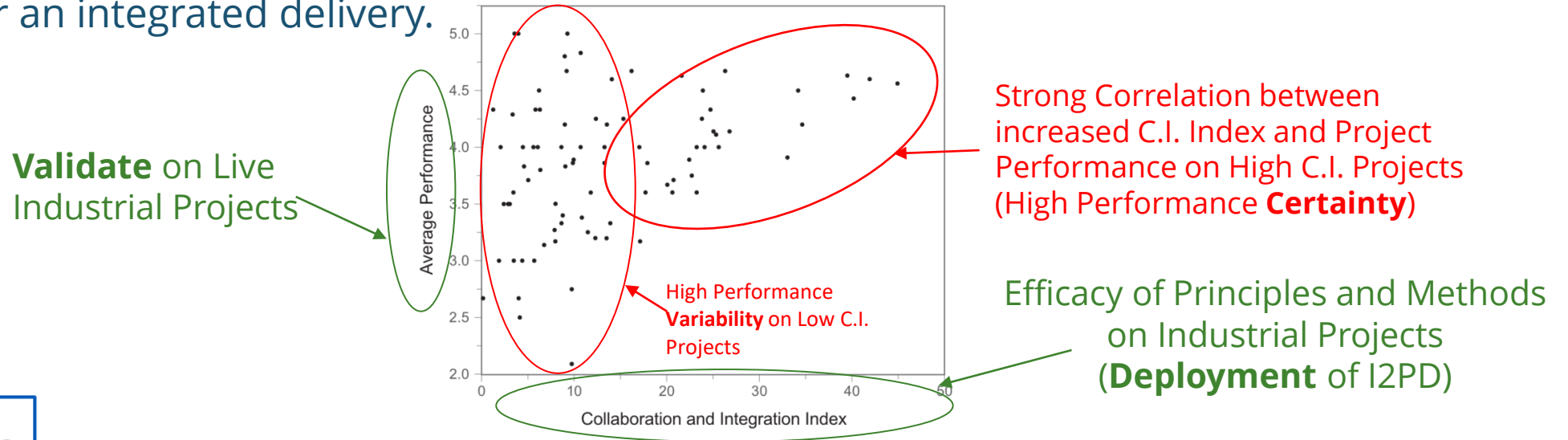
BENEFITS



“What’s best for project”

RT 383 I2PD PHASE II – Pilot Projects

The CII RT-341 findings provide evidence to suggest industrial project performance is improved by increased collaboration and integration, demonstrating that industrial projects are good candidates for an integrated delivery.



Therefore, the overarching essential question for Phase II is,
 “Is there an increase in **project success rates** using I2PD RT 341 Phase I data consistent with the results on **live projects** that apply some or all of the **principles and methods** of I2PD?”

RT 383 I2PD PHASE II – Two Step Approach

Connecting **Fundamental Research**  **Deployment**

Divide validation and deployment project into two steps:

Step 1 – Research Extension:

- 2-year study with a focused effort on specific research objectives to build from the findings of Phase I.

Step 2 – Deployment Connection – Externally Funded:

- Longitudinal quantitative study to validate the findings of Phase I on active projects.
- Deployment focus on providing updated implementation materials.

RT 383 I2PD PHASE II – Step 1 (First 2 Years)

Research Questions to be Included in 2-year Study:

1. Efficacy of Principles and Methods?
2. What is a good fit project for I2PD? (Component of **PDCS** Update)
3. Validation of the proposed I2PD framework? (Data to be aligned with and stored in the **CII Data Warehouse**)
4. I2PD as compared to IPD and alliancing?

2-Year Deliverables (Pilot Project & Case Studies):

- Guidance for the prioritization of the I2PD methods
- Initial performance assessment of I2PD on Case Study Projects
- The assessment/validation framework for integrated project delivery (I2PD) using ~ 30 Pilot Projects – **The ask**
- Interim report at the 2021 CII/CURT Annual Conference featuring preliminary findings from the 2-year study
- Final report and a presentation at the 2022 CII/CURT Annual Conference

RT 383 I2PD PHASE II – Step 2 (Years 3-8)

Longitudinal Quantitative Study

- Validate and demonstrate the benefits of the integrated delivery framework against traditional project delivery methods.

Deployment Activities and Deliverables (Report out every 2 years including the CII/CURT AC Presentation);

- I2PD Implementation Guide updates
- I2PD Process Workflow (Playbook) updates
- I2PD Training Package – updated educational resources
- Updated I2PD contract templates
- Risk Reward Models updates
- (Updated) Maturity Model and other preparatory tools
- Initial benchmarks and stats on the benefits of IPD/I2PD adoption

**Fundamental
Research**



Deployment

The Ask

The purpose of the RT 383 Industrial Integrated Project Delivery (I2PD) Phase II research is to validate the findings of the RT 341 Phase I research using live projects that are planned and executed with the I2PD principals and methods and a Collaboration and Integration (C.I.) level of greater than 15.

Phase II research will be conducted on thirty projects planned and executed using the principles and methods developed in RT 383 I2PD Phase I research. Thirty projects were selected to ensure statistical validity of the results. To be considered for the research a project must be willing to use a C.I. index of greater than 15 and have a control project using a traditional delivery method such as EPC, EPCM, DB, DBB, CMR.

For more information regarding our research and or your organization participating with an I2PD Pilot Project contact:



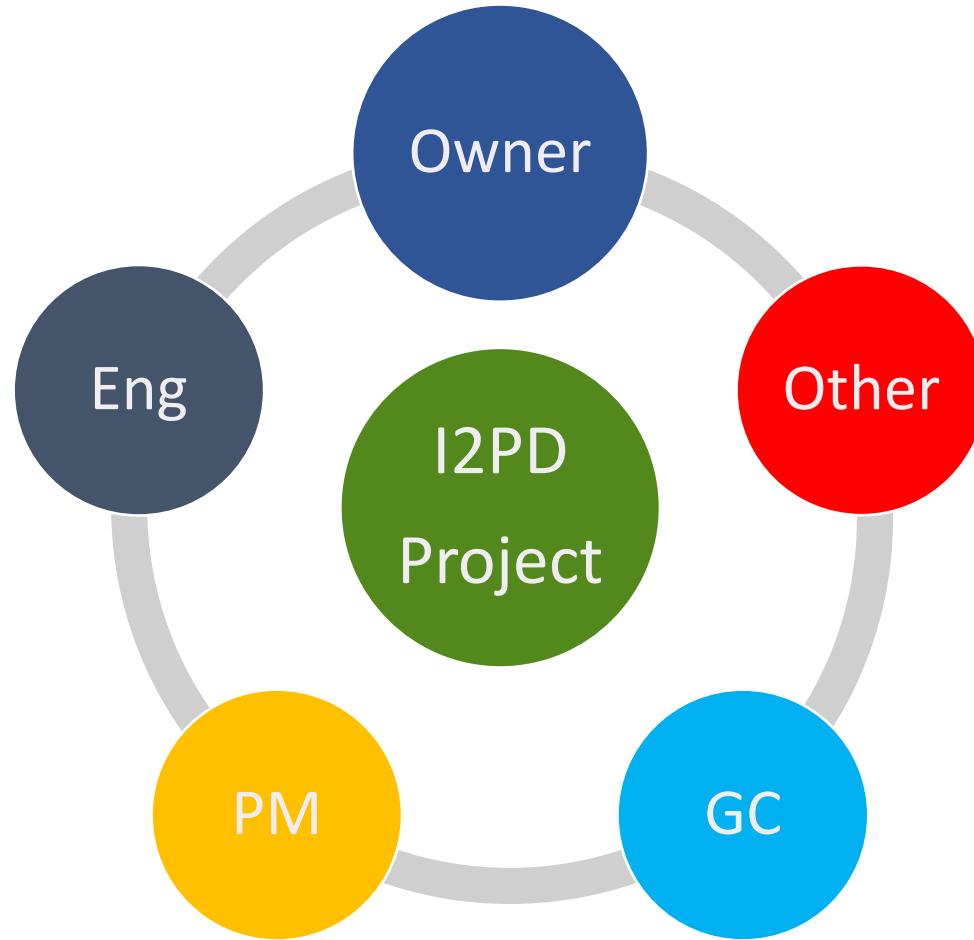
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*Delivering Safe Projects with Certainty,
Integration and World-Class Performance*



Toronto | Calgary | Houston | Southampton | Brisbane

Questions & Discussion



Collaboration
+
Integration
= Certainty