



کنترل پروژه پیشرفته و ارزیابی عملکرد در پروژه‌های پیچیده (بر اساس اسناد CII)

معرفی دوره

ارائه دهنده:

سید محمدرضا علوی پور

(PhD, PMP, CMIT)

CMAA Authorized Trainer

دانشگاه Illinois Tech آمریکا



جدید

کنترل پروژه پیشرفته و ارزیابی عملکرد در پروژه‌های پیچیده (بر مبنای اسناد CII) (ویژه اعضای کانون)

«

چرا بسیاری از کارشناسان کنترل پروژه هرگز رشد نمی‌کنند؟



در پروژه‌های بزرگ، افراد زیادی با عنوان «کنترل پروژه» مشغول به کارند،

اما فقط تعداد محدودی از آن‌ها به نقش‌های اثرگذار مدیریتی و مشاوره‌ای دست پیدا می‌کنند.

دلیل این فاصله، کمبود تجربه یا تلاش نیست؛ بلکه بخش بزرگی از متخصصان این حوزه، کنترل پروژه را در حد انجام وظایف اجرایی یاد گرفته‌اند، نه به عنوان یک نقش تحلیلی و تصمیم‌ساز. بسیاری با وجود سال‌ها حضور در پروژه‌ها، هنوز دقیق نمی‌دانند مأموریت اصلی کنترل پروژه چیست، کجا باید وارد تحلیل شوند و چگونه باید خروجی قابل تصمیم ارائه کنند.

نتیجه این ابهام، درج‌ازدن طولانی‌مدت در جایگاه کارشناس و پیشرفت نکردن در این حرفه شغلی است.

DO 1

آیا واقعا سازمان‌ها مقصر نگاه فعلی به جایگاه کنترل پروژه هستند؟



در عمل، کنترل پروژه در بسیاری از سازمان‌ها به مجموعه‌ای از فعالیت‌های تکرارشونده تقلیل یافته است:
تهیه برنامه، به‌روزرسانی زمان‌بندی، جمع‌آوری هزینه‌ها و ارسال گزارش.

اما انجام این کارها به خودی خود به معنای کنترل پروژه نیست. زمانی که پروژه از مسیر خارج می‌شود، آنچه اهمیت دارد تحلیل، تفسیر و تبدیل داده‌ها به گزینه‌های تصمیم‌گیری است. همین جاست که تفاوت میان کسی که صرفاً گزارش تولید می‌کند و کسی که نقش مشاور پروژه را ایفا می‌کند، آشکار می‌شود. بسیاری از متخصصان سخت کار می‌کنند، اما چون خروجی‌شان به تصمیم منجر نمی‌شود، دیده نمی‌شوند و ارتقا پیدا نمی‌کنند و این اشتباه رخ می‌دهد که سازمان‌ها درک کافی از جایگاه این حرفه شغلی ندارند.

نتیجه این ابهام، درج‌زدن طولانی‌مدت در جایگاه کارشناس و پیشرفت نکردن در این حرفه شغلی است.



ریشه اصلی مشکل کجاست؟ چرا کنترل پروژه به گزارش‌سازی تقلیل یافته است؟

کنترل پروژه در بسیاری از سازمان‌ها صرفاً به واحدی برای ارائه گزارش‌ها تبدیل شده است.
اما مشکل اصلی فقط گذشته‌نگر بودن گزارش‌ها نیست.

**مسئله این است که در بسیاری از پروژه‌ها اساساً چیزی به نام «سیستم کنترل پروژه»
با تعریف روشن، معماری مشخص و استراتژی هدفمند وجود ندارد.**

آنچه اجرا می‌شود، ترکیبی از ابزارها، شاخص‌ها و رویه‌های پراکنده است که هرکدام جداگانه کار می‌کنند، اما به یک تصویر منسجم و تصمیم‌پذیر ختم نمی‌شوند. در چنین شرایطی، حتی دقیق‌ترین گزارش‌ها هم صرفاً داده تولید می‌کنند، نه بینش.

طبیعی است که چنین سیستمی نه به موفقیت سازمان کمک می‌کند
و نه امکان رشد حرفه‌ای برای متخصصانش ایجاد می‌نماید.

این چالش در پروژه‌های ایران چه پیامدی دارد؟



در فضای پروژه‌های ایران، پیچیدگی بالا، فشارزمان، محدودیت منابع، تغییرات مکرر و ساختارهای قراردادی غیراصولی، این ضعف ساختاری را تشدید کرده است.

بسیاری از تیم‌ها ابزار دارند، اما نمی‌دانند کدام داده واقعا حیاتی است، کدام شاخص قابل اتکاست و کدام تحلیل باید مبنای تصمیم مدیران قرار بگیرد.

نتیجه این می‌شود که انحراف‌ها دیر تشخیص داده می‌شوند و کنترل پروژه به جای پیش‌دستی، به دنبال اتفاقات حرکت می‌کند. در چنین فضایی، نقش کنترل پروژه ناخواسته به یک نقش واکنشی و کم‌اثر محدود می‌شود.



راه حل چیست؟



کنترل پروژه پیشرفته (Advanced Project Controls) یا همان APC

کنترل پروژه پیشرفته یا APC ارائه شده تا قبل از ابزار، یک استراتژی اصولی تعریف کند.

این رویکرد ابتدا مشخص می‌کند که «سیستم کنترل پروژه چیست»، چه اجزایی دارد، چگونه باید ارزیابی شود و چگونه می‌توان آن را به تدریج بالغ کرد. در APC، کنترل پروژه از یک واحد اجرایی گزارش‌ساز به یک سیستم تصمیم‌ساز تبدیل می‌شود؛ سیستمی که با تکیه بر داده‌های قابل اتکا، شاخص‌های استاندارد و معماری اطلاعات شفاف، امکان تشخیص الگوها و مداخله قبل از بحران را فراهم می‌کند. این همان نقطه‌ای است که کنترل پروژه وارد جایگاه مشاوره‌ای می‌شود.

چرا APC فقط یک رویکرد فنی نیست و مستقیماً به جایگاه حرفه‌ای شما مربوط است؟

ساختار APC حاصل تلاش بیش از **۳۵۰ متخصص حرفه‌ای** در طی چند سال است.

خبرگان باتجربه صنعت ساخت در قالب تحقیقات میدانی مؤسسه صنعت ساخت آمریکا (CII) دست به اقدامی بزرگ زده‌اند؛ تحقیقاتی که با مشارکت مستقیم شرکت‌های بزرگ پروژه‌محور جهانی انجام شده‌اند.

اهمیت APC صرفاً در ابزارها یا مدل‌هایش نیست؛ بلکه در این است که تعریف می‌کند کنترل پروژه چگونه می‌تواند در سطح مدیریت و تصمیم‌سازی معنا پیدا کند.

تسلط بر این مبانی، مرز بین «کارشناس کنترل پروژه» و «مشاور کنترل پروژه» را مشخص می‌کند و مسیر رشد حرفه‌ای را از اجرا به اثرگذاری واقعی تغییر می‌دهد.

چرا یادگیری APC در موسسه ACEMI نقطه عطف مسیر حرفه‌ای کنترل پروژه شما خواهد بود؟



این دوره برای یادگیری یک نرم‌افزار جدید یا تکرار مفاهیم آشنای کنترل پروژه طراحی نشده است.

اگر مسئله شما این است که چرا با وجود تجربه، تلاش و سال‌ها حضور در پروژه‌ها، هنوز در جایگاه اجرایی مانده‌اید و نقش‌تان در تصمیم‌سازی جدی گرفته نمی‌شود، APC دقیقاً به همین نقطه دست می‌گذارد.

سؤال اصلی اینجاست:

چه چیزی باعث می‌شود بعضی متخصصان کنترل پروژه وارد دایره تصمیم‌سازی شوند و بعضی دیگر، حتی با توان فنی بالا، همیشه در نقش کارشناس باقی بمانند؟

پاسخ APC روشن است: تفاوت در ابزار یا میزان کار نیست؛ تفاوت در نوع نگاه به کنترل پروژه است.

Dr

به بیان ساده‌تر:

APC به شما کمک می‌کند از نقش اجرایی عبور کنید و وارد جایگاهی شوید که نظر شما در تصمیم‌های پروژه وزن دارد؛ همان نقطه‌ای که مسیر رشد حرفه‌ای واقعی آغاز می‌شود.



در این دوره، علاوه بر مبانی فکری و سیستمی APC، به ابزارهای حرفه‌ای و کاملاً عملیاتی توسعه‌یافته توسط مؤسسه CII نیز دسترسی خواهید داشت؛ از جمله APC Tool (Project Controls Improvement)، ابزاری Excel-Based اما کاملاً مهندسی‌شده که برای ارزیابی عملکرد، شناسایی شکاف‌ها و بهبود سیستم‌های کنترل پروژه در پروژه‌های واقعی طراحی شده است، نه برای تزئین گزارش‌ها، بلکه برای تصمیم‌سازی!

اگر APC را یاد نگیرید، بیشترین هزینه را خود شما می‌پردازید!

اگر کنترل پروژه را صرفاً در چهارچوب اجرا و گزارش‌گیری یاد گرفته باشید، حتی با سابقه کاری بالا، در عمل با محدودیت‌هایی روبه‌رو می‌شوید که مستقیماً جایگاه حرفه‌ای و مسیر رشد شغلی شما را تحت تأثیر قرار می‌دهد. این محدودیت‌ها معمولاً در سه شکل خودش را نشان می‌دهد:

۱. حذف ناخواسته از فرایند تصمیم‌سازی

وقتی خروجی شما صرفاً گزارش‌های گذشته‌نگر باشد، در ذهن مدیران به عنوان «تأمین‌کننده اطلاعات» شناخته می‌شوید، نه تحلیل‌گر یا مشاور. در این شرایط، حتی اگر زحمت زیادی بکشید، در لحظه تصمیم‌گیری نقشی ندارید و مسیر پروژه بدون نظر شما تعیین می‌شود.

۲. ناتوانی در دفاع حرفه‌ای از تحلیل‌ها

بدون رویکرد APC، می‌توانید بگویید پروژه عقب افتاده یا هزینه‌ها افزایش یافته؛ اما نمی‌توانید با چهارچوبی

شفاف و قابل دفاع توضیح دهید چرا این اتفاق افتاده و چه گزینه‌هایی پیش‌روی مدیریت است. نتیجه، کاهش اعتماد حرفه‌ای، حتی با سال‌ها تجربه.

۳. رسیدن به سقف شغلی و فرسایش شغلی

وقتی کنترل پروژه به فعالیتی تکراری تبدیل شود، رشد شغلی هم متوقف می‌شود. پروژه‌ها عوض می‌شوند، اما نقش شما نه. این همان نقطه‌ای است که بسیاری از متخصصان دچار رکود، کاهش انگیزه و فرسایش شغلی می‌شوند.

کنترل پروژه پیشرفته دقیقاً برای شکستن این چرخه طراحی شده است. APC به شما کمک می‌کند نقش خود را از «گزارش‌دهنده» به «تحلیل‌گر و تصمیم‌یار پروژه» ارتقا دهید؛ کسی که الگوها را زودتر می‌بیند، قبل از بحران هشدار می‌دهد و در تعیین مسیر پروژه نقش دارد.

این همان مرزی است که جایگاه کارشناس را از مشاور پروژه جدا می‌کند.

دوره کنترل پروژه پیشرفته (APC) دقیقاً برای چه افرادی ارزشمند است؟



این دوره برای همه طراحی نشده است!

این دوره برای افرادی تدوین شده که در پروژه‌های واقعی، با تصمیم‌های پرریسک، پیامدهای مالی و مسئولیت‌های جدی سروکار دارند و می‌خواهند کنترل پروژه را از یک نقش اجرایی به یک نقش اثرگذار و تصمیم‌ساز ارتقا دهند.

• کارفرمایان و نمایندگان کارفرما

برای کسانی که باید تشخیص دهند کدام گزارش واقعا قابل اتکاست، کجا باید مداخله کرد و آیا سیستم کنترل پروژه تصویر درستی از وضعیت واقعی پروژه ارائه می‌دهد یا نه؛ نه اینکه صرفا حجم زیادی گزارش دریافت کنند.

• مدیران پروژه در پروژه‌های پیچیده

برای مدیرانی که نمی‌خواهند مدیریت پروژه‌شان واکنشی باشد و به دنبال سیستمی هستند که قبل از وقوع بحران، انحرافات را نشان دهد و گزینه‌های تصمیم‌گیری را شفاف کند.

• مدیران ساخت، مدیران طرح و مشاوران پروژه

برای افرادی که باید عملکرد سیستم کنترل پروژه را ارزیابی کنند، بلوغ آن را بسنجند و راهکارهای اصلاحی مستند و قابل دفاع به کارفرما ارائه دهند، نه توصیه‌های کلی و سلیقه‌ای.

• برنامه‌ریزان، مهندسان کنترل پروژه و مهندسان هزینه

برای متخصصانی که نمی‌خواهند نقش‌شان به تهیه برنامه و گزارش محدود بماند و به دنبال توانایی تحلیل شکاف‌ها، ارزیابی قابلیت اتکای داده‌ها و مشارکت واقعی در تصمیم‌سازی هستند.

• پیمانکاران و مدیران قرارداد

برای کسانی که نیاز دارند با اتکا به شاخص‌های معتبر و سیستم‌های قابل دفاع، از عملکرد خود در برابر کارفرما دفاع کنند و مدیریت تغییرات، ادعاها و ریسک‌ها را حرفه‌ای‌تر انجام دهند.

DO

• اعضای PMO و مدیران ارشد پروژه محور

برای افرادی که مسئول استانداردسازی، یکپارچه‌سازی و بلوغ سیستم‌های کنترل پروژه در سطح سازمان هستند و کیفیت تصمیم‌سازی مدیریتی برایشان اهمیت واقعی دارد.

• مشاوران مدیریت پروژه و کنترل پروژه

برای کسانی که می‌خواهند خدمات مشاوره‌ای خود را برپایه چهارچوب‌های به‌روز، مستند و هم‌سطح با اسناد رسمی CII ارائه دهند، نه صرفاً تجربه شخصی.

• متخصصان و دانشجویان تحصیلات تکمیلی مدیریت پروژه و ساخت

برای افرادی که قصد دارند از ابتدا با نگاه حرفه‌ای و پیشرفته وارد بازار شوند و مفاهیم کنترل پروژه را در سطحی فراتر از آموزش‌های رایج یاد بگیرند.

DO 1

**اگر هدف شما عبور از نقش اجرایی و رسیدن به جایگاه تحلیل‌گر و مشاور پروژه است،
APC دقیقاً برای همین مسیر طراحی شده است.**



چرا دوره کنترل پروژه پیشرفته (APC) طراحی شده در موسسه ACEMI یک دوره خاص است؟



اولین دوره تخصصی APC در ایران

این دوره نخستین برنامه آموزشی جامع و کاملاً کاربردی در ایران است که به صورت متمرکز بر رویکرد (APC) Advanced Project Controls طراحی شده است؛
رویکردی که در شرکت‌های پیشرو جهانی، مبنای تصمیم‌سازی پروژه‌های پیچیده است، نه صرفاً یک چهارچوب تئوریک.

ارزش واقعی این دوره چقدر است؟

هسته محتوای این دوره بر پایه چهار سند کلیدی و رسمی موسسه صنعت ساخت آمریکا (CII) طراحی شده است:

IR-244-2

IR-322-2

IR-402-2

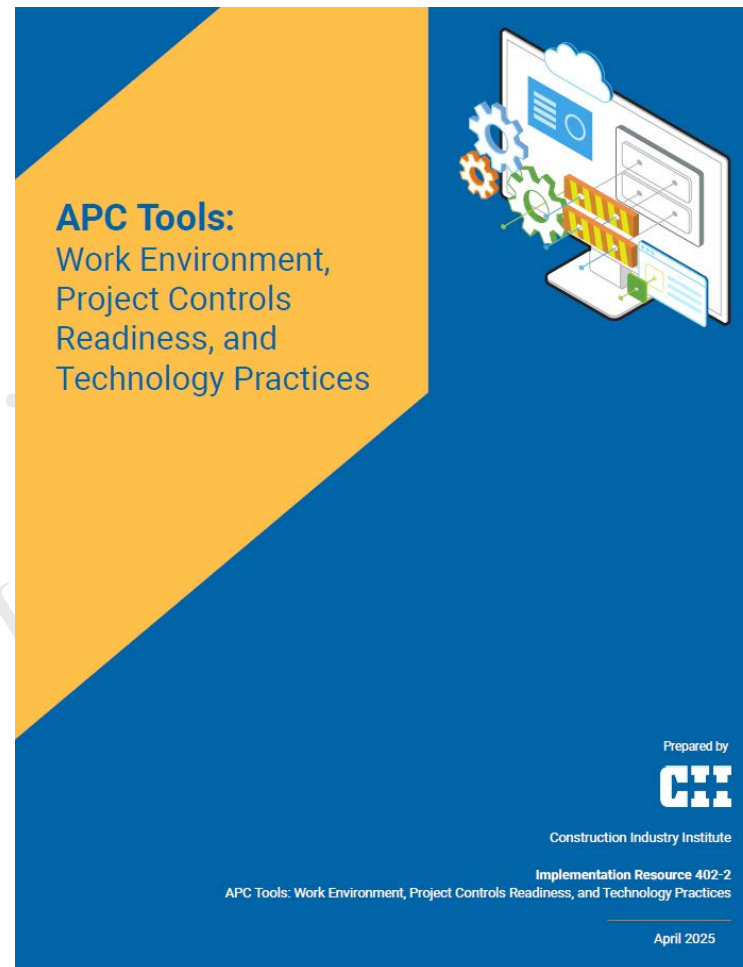
FR-402

ارزش ارزی تجمیعی این اسناد به‌تنهایی بیش از ۸۰۰ دلار است، یعنی چیزی بیش از ۱۱۰ میلیون تومان؛

اسنادی تخصصی، غیرعمومی و به شدت کمیاب که تهیه آن‌ها برای اکثر متخصصان داخل کشور عملاً ممکن نیست.



چهار سند کلیدی و رسمی موسسه صنعت ساخت آمریکا (CII) برای دوره کنترل پروژه پیشرفته (APC) موسسه ACEMI



Project Controls Improvement Tool User Guide



CII

Implementation Resource 322-2

Global Project Controls and Management Systems: Adapting Your PCMS Program for Success



CII Construction
Industry
Institute®

Implementation Resource 244-2

چهار سند کلیدی و رسمی موسسه صنعت ساخت آمریکا (CII) برای دوره کنترل پروژه پیشرفته (APC) موسسه ACEMI

دسترسی به منابعی که در ایران به راحتی در دسترس نیستند!

این دوره صرفاً «براساس این اسناد» طراحی نشده؛
بلکه خود اسناد، ابزارها و منطق تحلیلی آن‌ها مبنای آموزش قرار گرفته‌اند.

محتوایی که تاکنون به صورت ساختارمند و آموزشی در فضای حرفه‌ای ایران ارائه نشده و در بسیاری موارد، حتی نام آن‌ها برای فعالان حوزه کنترل پروژه ناآشناست.

چه ابزارها و منابعی در دوره APC در اختیار شما قرار خواهد گرفت؟



در این دوره، علاوه بر مفاهیم پیشرفته APC، به مجموعه ابزارهای عملیاتی دسترسی پیدا خواهید کرد که به شما امکان می‌دهند:

۳. فرایندهای بلوغ و ارزیابی سیستم:

برای بررسی حرفه‌ای کارایی سیستم کنترل پروژه و پیشنهاد اصلاحات مستند؛

۴. الگوها و گزارش‌های استاندارد جهانی CII:

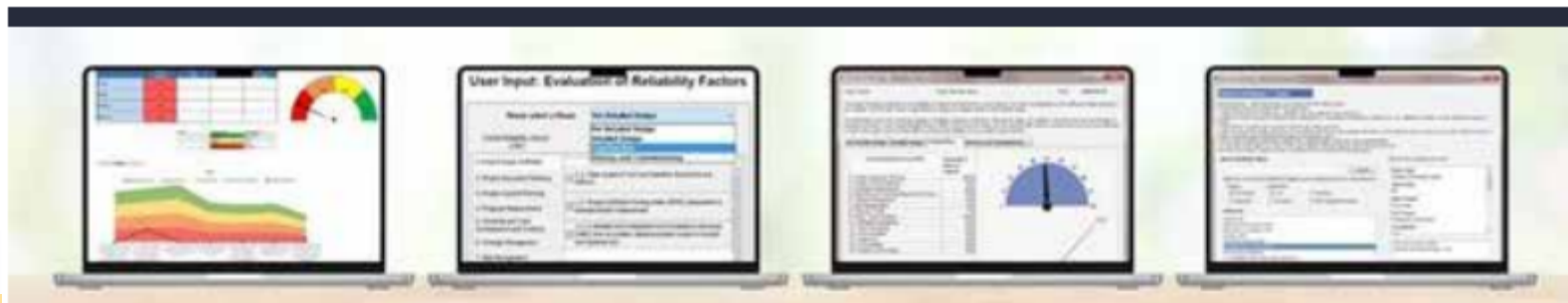
که شما را در سطح تحلیل پروژه‌های شرکت‌های تراز اول دنیا قرار می‌دهد.

۱. Project Controls Improvement (PCI) Tool:

ابزاری Excel-Based اما کاملاً مهندسی شده برای ارزیابی عملکرد پروژه و تشخیص زود هنگام شکاف‌ها؛

۲. ابزارهای تحلیل شاخص‌ها و قابلیت اتکا:

برای اطمینان از اینکه داده‌ها، معیارها و گزارش‌های شما قابل دفاع و تصمیم‌ساز هستند؛





گواهینامه مشاوره حرفه‌ای

نوع: مدیریت ساخت (CM)	
نوع دوره: مشاوران	دپارتمان: مشاوران
سطح تخصص: سطح ۲	سطح دوره: مشاوره
مدرس: دکتر سید محمدرضا علوی‌پور	
پیش‌نیاز: فرایند یکپارچه برنامه‌ریزی، زمان‌بندی، ارزیابی و کنترل پروژه مدیریت یکپارچه مالی، حسابداری و هزینه در پروژه و سازمان‌های پروژه‌محور استراتژی برنامه‌ریزی و کنترل پروژه در طول چرخه حیات پروژه فرایند جامع مدیریت ریسک در پروژه همراه با آموزش نرم‌افزار PertMaster	



۱. روش سریع و ساده برای تدوین لایحه تاخیرات

مقدمه و رویکرد کلان به کنترل پروژه پیشرفته

(Advanced Project Controls – APC)

- معرفی مفاهیم کلیدی APC و الزامات آن
- جایگاه APC در چرخه عمر پروژه و نقش آن در بهبود تصمیم‌سازی
- نقشه راه استقرار سیستم‌های پیشرفته کنترل پروژه

۲. آشنایی با ابزارهای کلیدی در استقرار APC

- معرفی سه ابزار پایه در اجرای APC
- ارائه ابزاری برای ارزیابی محیط کاری
(Work Environment Assessment Rating Tool)
- ارائه ابزار چک‌لیستی برای آماده‌سازی سیستم کنترل پروژه
(Project Controls Readiness Checklist Tool)
- ارائه ابزاری برای سنجش بلوغ فناوری‌های کنترلی
(Technology Practices Maturity Rating Tool)
- روش‌شناسی استفاده، نحوه امتیازدهی، و تحلیل خروجی این ابزارها
- بررسی فرم‌های نمونه و عملی

۳. معماری اطلاعات به صورت آنی در APC

- لایه‌های اطلاعاتی در APC و تفاوت آن با گزارش‌های گذشته نگر
- نحوه تولید، پردازش و تفسیر اطلاعات آنی
- اولویت‌بندی و استانداردسازی شاخص‌های آنی
- جریان‌سازی داده‌ها برای تحلیل‌های پیش‌بینی‌کننده (Predictive Controls)

۴. تحلیل عملکرد سیستم کنترل پروژه با ابزار خودارزیابی

(PCMS Self-Diagnostic)

- معرفی ابزار خودارزیابی
PCMS Self Diagnostic Assessment Tool
- ارزیابی عملکرد ۷ گانه سیستم کنترل پروژه: برآورد، برنامه‌ریزی، زمان‌بندی، کنترل هزینه، مدیریت تغییر، پیشرفت فیزیکی و پیش‌بینی دقیق
- تمرین تحلیل سیستم کنترل پروژه و استخراج نقاط ضعف
- معرفی پیشنهادهای اولویت‌بندی شده بهبود سیستم کنترل

۵. بررسی ۱۳ روند موثر بر عملکرد کنترل پروژه

• معرفی ابزار خودارزیابی

PCMS Self Diagnostic Assessment Tool

- تأثیر روندهای صنعتی و سازمانی بر عملکرد سیستم‌های کنترل: پیچیدگی پروژه‌ها، سرعت اجرا، جهانی‌سازی، مجازی‌سازی تیم‌ها، مقررات و...
- تحلیل تأثیر هر روند بر یکی از عملکردهای کلیدی سیستم کنترل
- تعیین اقدامات اصلاحی متناسب با هر روند

۶. ابزار PCI و بهبود ارزیابی عملکرد پروژه

- معرفی ابزار پیشرفته بهبود عملکرد کنترل پروژه
Project Controls Improvement (PCI) Tool و اهداف آن
- ساختار چهارگانه ابزار:
- تحلیل شکاف شاخص‌ها (Metrics Gap Analysis)
- تحلیل شکاف قابلیت اتکا به سیستم کنترل پروژه
(Reliability Gap Analysis)
- نقشه‌ها و واژه‌نامه شاخص‌ها (Metrics Dictionary & Maps)
- ابزارهای اصلی کنترل پروژه (Project Controls Utilities Module)
- تحلیل پروژه با نرم‌افزار اکسل PCI Tool
- نحوه استفاده از گزارش‌های خروجی برای اصلاح سیستم کنترل

۷. ارزیابی فناوری‌ها و استفاده از هوش مصنوعی (AI) در ۸. پیوست‌ها (قابل ارائه به شرکت‌کنندگان)

کنترل پروژه

- معرفی محدوده‌های فناوری در APC و ابزار ارزیابی آن‌ها
- تعیین سطح آمادگی فناوری (Technology Readiness) در پروژه‌ها
- آشنایی با کاربردهای کلیدی هوش مصنوعی در پیش‌بینی و تشخیص الگوی آینده پروژه
- معرفی نمونه‌های پیشرفته هوش مصنوعی با ارزش افزوده بالا
- تحلیل اثرات داده‌محور در تصمیم‌سازی پروژه‌ای
- فرم‌های بدون امتیاز
- واژه‌نامه شاخص‌ها و ساختار استاندارد گزارش‌دهی
- نقشه راه استقرار APC
- فایل ابزار PCI
- تحلیل شکاف‌های شاخص‌ها و قابلیت اطمینان
- فرم تشخیص عملکرد PCMS و توصیه‌های اصلاحی
- ...و

دانلود جزئیات این دوره



<https://dralavipour.com/general-course/advanced-project-control>

About Me

About me

- ❑ Founder and CEO of Alavipour Construction Engineering and Management Institute (**ACEMI**)
- ❑ Vice Chairman of the Board at **Ofoq Negar**
- ❑ Board Member at **Paran Beton**
- ❑ PhD in Construction Engineering and Management (**Illinois Tech**)
- ❑ **CMAA Authorized Trainer**
- ❑ Former Research Assistant (Professor **David Arditi**)
- ❑ Former Teaching Assistant (Professor **Raymond Lemming**)
- ❑ Former Research Associates of Construction Management Association of America (**CMAA**)
- ❑ Former Research Associates of Management Practices in Construction Industry (**MPIC**) of American Society of Civil Engineers (**ASCE**)
- ❑ Project Management Professional (**PMP**)
- ❑ Construction Manager in Training (**CMIT**)
- ❑ **Author** of 1st Construction Management Standard (Written in Farsi)
- ❑ **Translation** of 2nd **SCL Delay and Disruption Protocol** (Translated in Farsi)
- ❑ Researcher, Reviewer of international publications, Instructor and Consultant for more than 16 years
- ❑ **Outstanding Reviewers** selected by the editor of COENG (ASCE) Journal (2021)
- ❑ **Outstanding Reviewers** selected by the editor of Journal of Procurement for 2022 (ASCE) Journal (2021)
- ❑ The member of **International Construction Law Conference Committee** (2020 & 2022)
- ❑ The referee of **1st National Construction Law Competition** (2022)





About me

کنترل پروژه پیشرفته و ارزیابی عملکرد در پروژه‌های پیچیده (بر مبنای اسناد CII)
مقدمه: معرفی دوره

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[Education & Training](#) > [Courses & Training](#) > [Professional CM Course Licensing](#) > [CMAA Authorized Trainers](#)

CMAA Authorized Trainers

A CMAA Trainer has successfully completed the Train the Trainer course and is authorized to teach CMAA's Body of Knowledge, which focuses on the core competencies of construction management, for CMAA or a CMAA license agreement holder. CMAA Trainers are proficient in instructing all levels of learners, from those seeking basic and fundamental CM skills to experienced professionals. CMAA Trainers can also assist with effective preparation for the [Certified Construction Manager \(CCM\)](#) exam and the [Professional Construction Management \(PCM\)](#) Course.

Education & Training

[Courses & Training](#)[Live Webinars](#)[eLearning](#)[Calendar](#)[Emerging Leaders Program \(ELP\)](#)

Name	Organization	City	State
M. Hosney Abdelgelil	AECOM	Houston	TX
David Ahern, CCM	Orange County Public Works	Santa Ana	CA
Jumoke Akin-Taylor	San Francisco Department of Public Works	San Francisco	CA
S. M. Reza Alavipour, Ph.D., CMIT	Alavipour Construction Engineering and Management Institute (ACEMI)	Tehran	Iran
Mohammed Aljuboori, CCM	Hill International, Inc.	Haverhill	MA
Kimberly Armstrong	Naval Facilities Engineering Systems Command NAVFAC	Washington	DC
John Arrabito, PE, CCM	Port Authority of NY & NJ	Brooklyn	NY

About me





CMAA Trainer

Issued by [CMAA](#)

A CMAA Trainer has successfully completed the Train the Trainer course and is authorized to teach CMAA's Body of Knowledge, which focuses on the core competencies of construction management, for CMAA or a CMAA license agreement holder. CMAA Trainers are proficient in instructing all levels of learners, from those seeking basic and fundamental CM skills to experienced professionals. CMAA Trainers can also assist with effective preparation for the Certified Construction Manager (CCM) exam.

[Learn more](#)

Prep
DO NOT

Construction Industry Institute (CII)



CII History

- ❑ CII was established in **October 1983** with the purpose of improving the **competitive position of U.S. business** in the global market.
- ❑ Its **28 charter members** were responding to the recommendations from a study by The Business Roundtable entitled the **Construction Industry Cost Effectiveness (CICE) Project**.
- ❑ That **five-year study** of the industry and its problems specifically recommended that an **organization be created to take a leadership role in construction research**.



CII History

- ❑ The CICE participants – including **more than 250 industry** leaders, practitioners, and academicians – recognized this **particular recommendation** as an opportunity for companies and academia to work together for the improvement of the industry.



- ❑ Since its establishment at The **University of Texas at Austin** in 1983, CII has pursued a research agenda defined by its **Board of Advisors**, which is composed of one representative and an **alternate** from each member company.
- ❑ **Volunteers** from member companies are the **core of the effort** by CII in all of its activities.

CII History

- ❑ CII was conceived as a **three-way partnership** among **owners**, **contractors**, and **academia**.
- ❑ This partnership was based on the premise that **each party would contribute** from its experience and competence to the overall work of the Institute.
- ❑ The **academic community** could play a major role in CII by bringing its **knowledge** of the research process and by providing
 1. credible,
 2. neutral voicein the CII process.



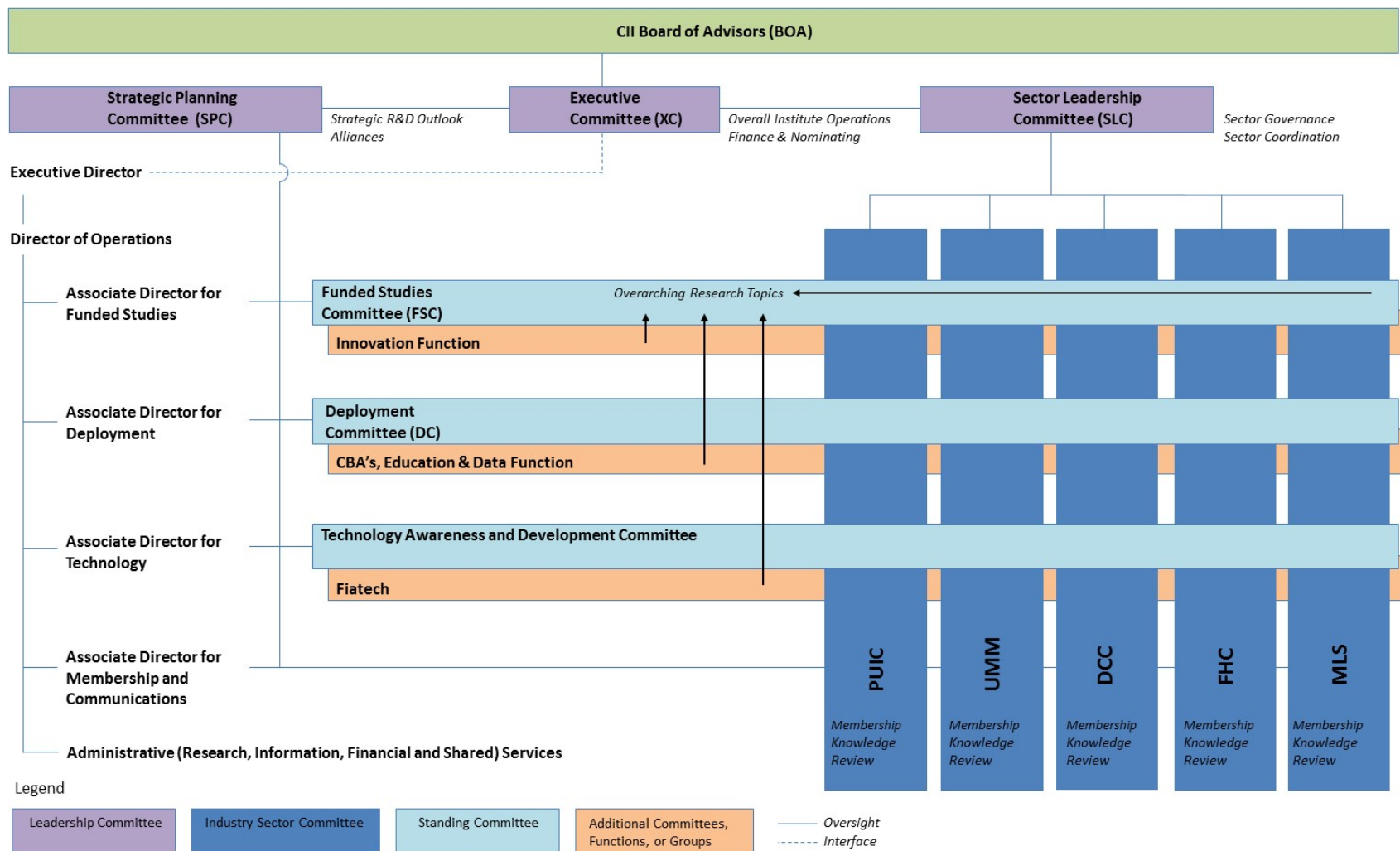
CII History

- ❑ For **practical experience**, owners and contractors would provide the knowledge that comes from first-hand and in-the-field experience.
- ❑ Together, the three would form an **owner-contractor-academia triad** that would lend itself to conducting **world-class research** whose findings could be **applied immediately**.



CII organization

CII ORGANIZATION



Some of CII members

Owners	Contractors	Service Providers
AdvanSix	AECOM	Accenture
Albemarle Corporation	Alfred Miller Contracting	Alvarez & Marsal
American Transmission Company LLC	APTIM	Atlas RFID Solutions
Anheuser-Busch InBev	Arcadis U.S., Inc	Autodesk, Inc.
Aramco Services Company	Baker Concrete Construction Inc.	AVEVA Solutions Ltd.
Architect of the Capitol	Barton Malow Company	Bentley Systems Inc.
Ascend Performance Materials	Bechtel Group, Inc.	Command Alkon Inc.
AstraZeneca	Black & Veatch	Construct-X, LLC
BHP Billiton	Brown & Root Industrial Services	Continuum Advisory Group
Cargill, Inc.	Burns & McDonnell	Dassault Systèmes SE
Chevron	Chiyoda Corporation	Deloitte
ConocoPhillips	Clough USA Inc.	Design + Construction Strategies
Consolidated Edison Company of New York	CRB	DyCat Solutions
Covestro LLC	Day & Zimmermann	ePM
DTE Energy	Digital Construction Works	Group ASI
Eastman Chemical Company	Emerson	Hexagon Process Power & Marine
Entergy Corporation	Fluor Corporation	Hilti Corporation
ExxonMobil Corporation	H+M Industrial EPC	I.M.P.A.C.T.

Some of CII members

Eastman Chemical Company	Hargrove Engineers + Constructors	O3 Solutions
ExxonMobil Corporation	Hatch	Oracle USA, Inc.
General Electric Company	JGC Corporation	Pathfinder, LLC
GlaxoSmithKline	KBR	PTAG, Inc.
Global Infrastructure Partners	Kiewit Corporation	SkyCam Aviation, Inc.
Honeywell International Inc.	Larsen & Toubro Limited	T. A. Cook Consultants Inc
INEOS Group Holdings S. A.	MasTec Power Corporation	Trillium Advisory Group Ltd
Johnson & Johnson	Matrix Service Company	Valency Inc.
Koch Industries, Inc.	McCarthy Building Companies, Inc.	Verum Partners
Los Alamos National Laboratory	McDermott International, Inc.	Zurich
LyondellBasell	PCL Constructors, Inc.	
National Aeronautics & Space Administration	PLH Group	
Naval Facilities Engineering Command	POWER Engineers, Inc.	
New York Power Authority	Richard Industrial Group	
NOVA Chemicals Corporation	Samsung C&T	
Nuclear Decommissioning Authority	Techint Engineering & Construction	
Nutrien	Technip Energies	

Some of CII members

Petronas Wanzek Construction, Inc.

Phillips 66 Wood

Public Service Electric & Gas Company Worley

Reliance Industries Limited (RIL) Zachry Group

SABIC - Saudi Basic Industries Corporation

Shell Global Solutions US Inc.

Smithsonian Institution

Southern Company

TC Energy

Tennessee Valley Authority

The Dow Chemical Company

The Procter & Gamble Company

The Williams Companies, Inc.

U.S. Army Corps of Engineers

U.S. Department of Commerce/NIST/EL

U.S. Department of Energy

U.S. Department of State

U.S. Department of Veterans Affairs

U.S. General Services Administration

Knowledge Base from CII

Portal
1

Knowledge Areas

Knowledge Areas Portal:

Portal
2

Project Phases

Portal
3

Project Functions or Roles

Portal
4

Best Practices

Portal
5

10-10 Metrics

Portal 1

Knowledge Areas

Knowledge Areas Portal:

"The CII Knowledge Base highlights the key findings and essential tools that drive project predictability and business value. Now, members and industry participants can go online and quickly discover project practices of highest priority to them without needing to read 300 page reports. Going forward, the Knowledge Base provides the foundation for CII to develop tools and resources for specific industries and project types."

– Dr. Stephen P. Mulva
Director CII

Knowledge Areas

The CII Knowledge Structure organizes the overall body of CII knowledge into common categories of research. It provides an easy mechanism for finding and using CII products.

[Home](#) > [Knowledge Areas](#)

Click or tap on a card below to explore a Knowledge Area.

Business and Project Processes

24 Research Team
Topic Summaries

Commissioning and Startup

3 Research Team
Topic Summaries

Construction Execution

13 Research Team
Topic Summaries

Construction Technology

13 Research Team
Topic Summaries

Design Planning & Optimization

13 Research Team
Topic Summaries

General CII Information

4 Research Team
Topic Summaries

Human Resource Management

12 Research Team
Topic Summaries

Information Management Technology

12 Research Team
Topic Summaries

Materials Management

2 Research Team
Topic Summaries

Modularization

5 Research Team
Topic Summaries

Performance Assessment

8 Research Team
Topic Summaries

Procurement & Contracts

9 Research Team
Topic Summaries

Portals

[Knowledge Areas](#)

[Project Phases](#)

[Project Functions or Roles](#)

[10-10 Metrics](#)

[Best Practices](#)

[Home](#)

[More filter options](#)

Knowledge Areas

[About the Knowledge Base](#)

[Topic Summary](#)

[Walkthrough Video](#)

[Knowledge Area](#)

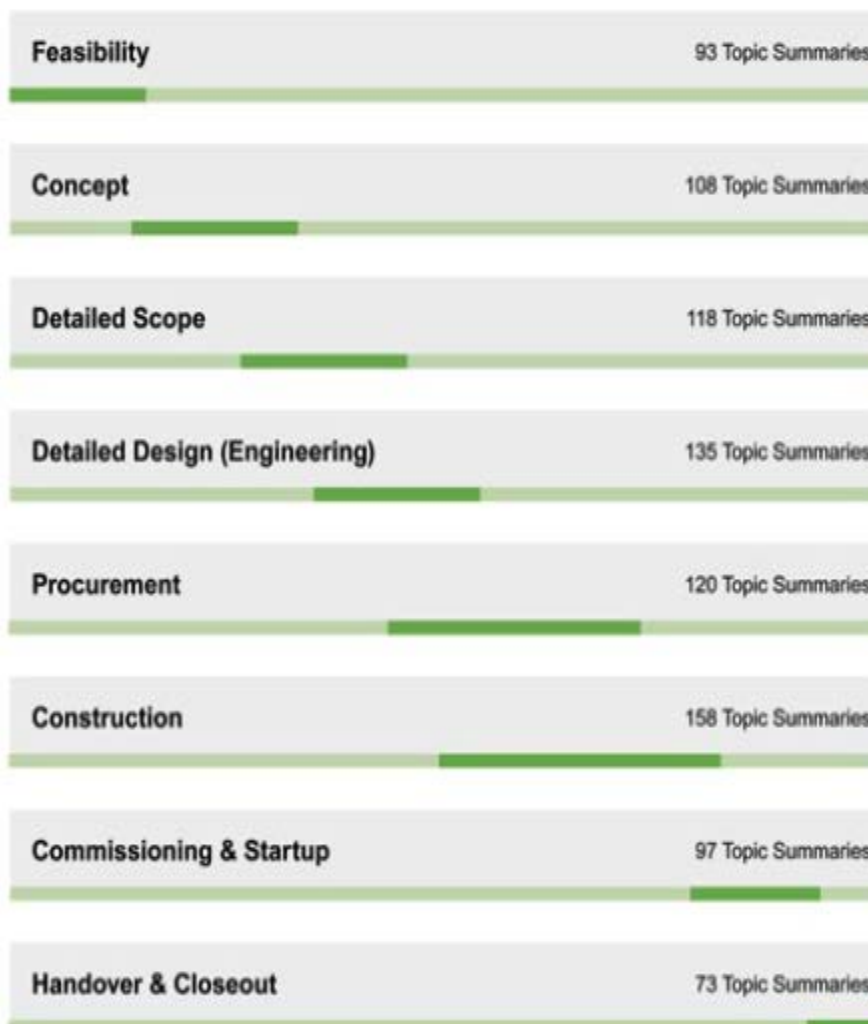
[Definitions](#)

[Glossary](#)

Project Phases

Projects are divided into phases to provide better management control. Phases have defined beginning and end points and are characterized by typical participants and activities.

[Home](#) > [Project Phases](#)



Portals

[Knowledge Areas](#)
[Project Phases](#)
[Project Functions or Roles](#)
[10-10 Metrics](#)
[Best Practices](#)
[Home](#)

[More filter options](#)

Project Phases

[CII Professional Development](#)
[CII Clinics](#)
[About the Project Phase Portal](#)
[Project Phase Definitions](#)
[Glossary](#)

Project Functions or Roles

Project Functions or Roles

A project requires the contribution of many different participants to be successful. The Project Functions or Roles portal provides a window into CII research that has never been available before.

Click or tap on a card below to explore CII's research related to particular functions and roles.

Architects & Engineering

156 Research Team
Topic Summaries

Business Development & Proposals

43 Research Team
Topic Summaries

Commissioning & Startup

84 Research Team
Topic Summaries

Construction

195 Research Team
Topic Summaries

External Stakeholders

80 Research Team
Topic Summaries

Health, Safety & Environmental

98 Research Team
Topic Summaries

Operations & Maintenance

80 Research Team
Topic Summaries

Procurement & Contracts

138 Research Team
Topic Summaries

Project Business Sponsor

94 Research Team
Topic Summaries

Project Controls

112 Research Team
Topic Summaries

Project Management

219 Research Team
Topic Summaries

Quality Management

101 Research Team
Topic Summaries

Risk Management

111 Research Team
Topic Summaries

SBU/Corp Functions

38 Research Team
Topic Summaries

Portals

10-10 Metrics
Best Practices
Knowledge Areas
Project Functions or Roles
Project Phases
Ordering
AWP Overview
AWP Virtual Summit
PDRI Overview

▼ More filter options

Project Functions or Roles

[CII Education](#)

[About the Project Functions or Roles Portal](#)

[Project Functions and Roles Definitions](#)

[Glossary](#)

Best Practices

A CII Best Practice is a process or method that, when executed effectively, leads to enhanced project performance. CII Best Practices have been proven through extensive industry use and/or validation.

[Home](#) > [Best Practices](#)

Click or tap on a Best Practice below to begin. Each Best Practice listing provides a secondary filter to narrow down results by project phase.

Advanced Work Packaging

Alignment

The condition where appropriate project participants are working within acceptable tolerances to develop and meet a uniformly defined and understood set of project objectives.

All Alignment Topic Summaries (3)

- Feasibility (2)
- Concept (3)
- Detailed Scope (3)
- Detailed Design (Engineering) (2)
- Procurement (2)
- Construction (2)
- Commission & Startup (2)
- Handover & Close-out (2)

Benchmarking & Metrics

Change Management

Constructability

Disputes Prevention & Resolution

Portals

[Knowledge Areas](#)
[Project Phases](#)
[Project Functions or Roles](#)
[10-10 Metrics](#)
[Best Practices](#)
[Home](#)

[More filter options](#)

Best Practices

[Best Practices Program](#)
[CII Best Practices Guide:](#)
[Improving Project](#)
[Performance, Version 4.0](#)
[CII Clinics](#)
[RT-166 Barriers to](#)
[Implementation](#)
[About the Best Practices](#)
[Portal](#)
[Best Practices Definitions](#)
[Glossary](#)

Portal

4

Best Practices

❑ A **best practice** is a **process or method** that, when executed effectively, leads to enhanced project performance.

❑ CII Best Practices have been proven through extensive industry use and/or validation.

❑ CII Best Practices include the 17 topics

- Advanced Work Packaging
- Alignment
- Benchmarking & Metrics
- Change Management
- Constructability
- Disputes Prevention & Resolution
- Front End Planning
- Implementation of CII Research
- Lessons Learned
- Materials Management
- Partnering
- Planning for Modularization
- Planning for Startup
- Project Risk Assessment
- Quality Management
- Team Building
- Zero Accidents Techniques

10-10 Metrics

The 10-10 metrics portal provides an important linkage with the CII Performance Assessment System. The purpose of the CII Performance Assessment System is to provide objective measurement of capital project execution. The 10-10 system can provide ongoing project diagnostic information so that practitioners can identify problems and take corrective action to improve ongoing projects.

Portal
5

10-10 Metrics

Select one of the 10 input measures to find topics related to your selection. Cross-filter by phase, if you'd like to drill down even further.

10-10 Input Measures

- ☐ Planning
- ☐ Organizing
- ☐ Leading
- ☐ Controlling
- ☐ Design Efficiency
- ☐ Human Resources
- ☐ Quality
- ☐ Sustainability
- ☐ Supply Chain
- ☐ Safety

Project Phases

- ☐ Front-End Planning
- ☐ Engineering & Design
- ☐ Procurement
- ☐ Construction
- ☐ Commissioning & Start-up

Your current
selections yield:

256
results

Clear Selections

Sort by: Date ▼

Portals

10-10 Metrics
Best Practices
Knowledge Areas
Project Functions or Roles
Project Phases
Ordering
AWP Overview
AWP Virtual Summit
PDRI Overview

▼ More filter options

More 10-10 Resources

[Learn About Performance Assessment](#)
[Take the 10-10 Diagnostic](#)
[About the 10-10 Portal](#)
[10-10 Metric Definitions](#)
[Glossary](#)

Updating Project Delivery and Contract Strategies

RT-DCC-06
2019 - 2021

- Publications: 1
- Presentations: 1
- Tools: 1

KA: Procurement & Contracts

Onsite versus Offsite Construction – The Impact of Offsite Construction on the

RT-371
2019 - 2021

- Publications: 1
- Presentations: 1
- Tools: 1

KA: Modularization

Capital Efficiency Scorecard for Downstream and Chemicals Projects

RT-DCC-07
2020 - 2021

- Publications: 0
- Presentations: 1
- Tools: 0

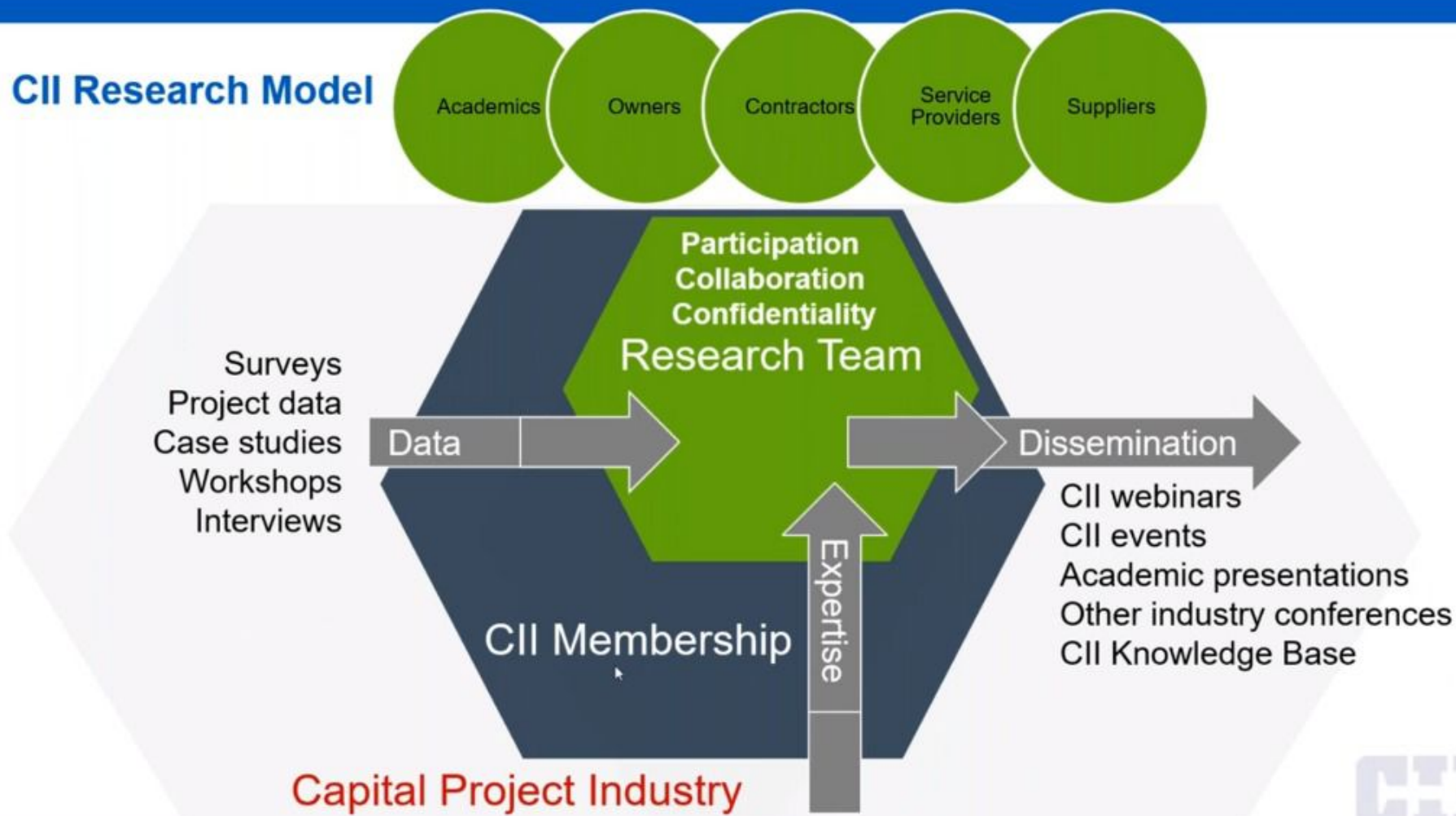
KA: Business and Project Processes

MCPI – The Business Case for Modular Chemical Process

Modeling the Composition of the 2030 Workforce

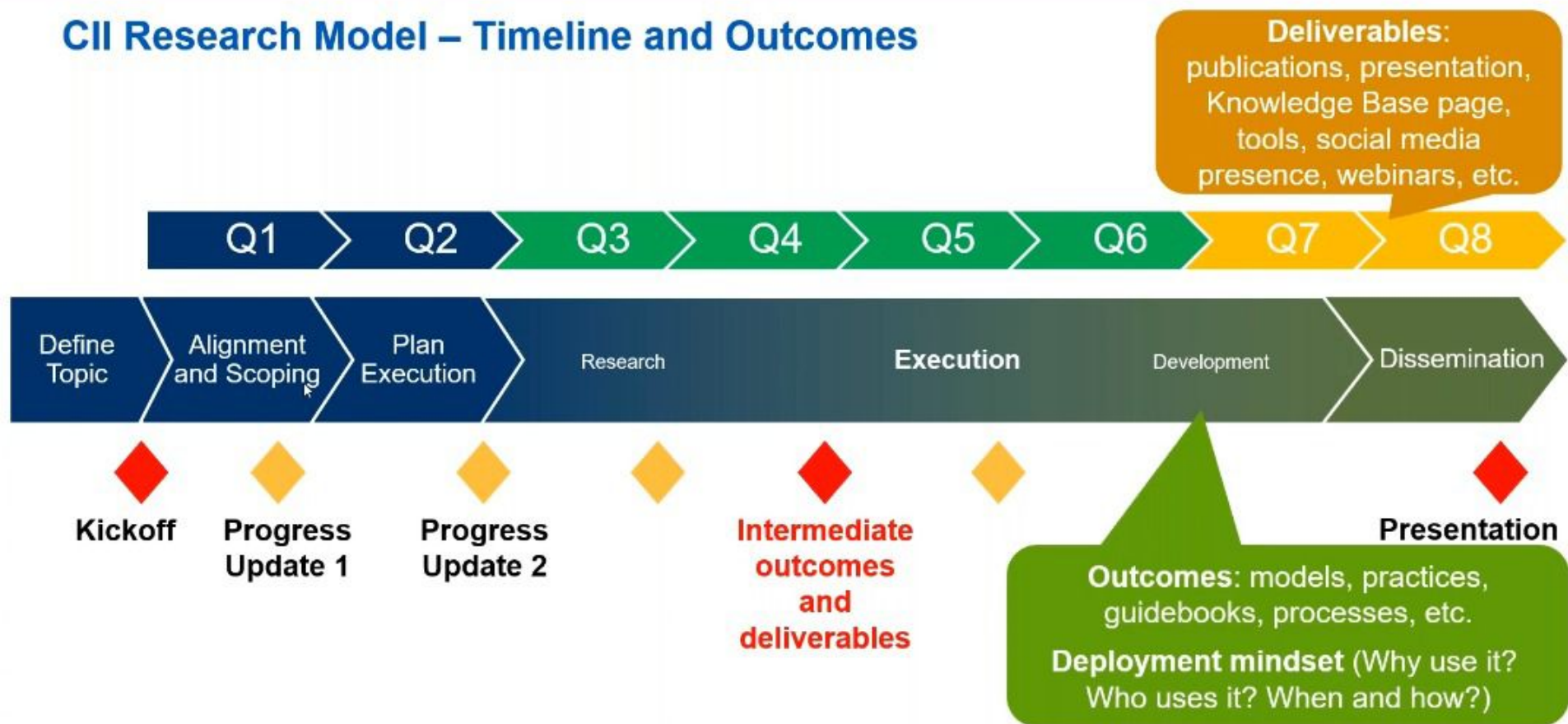
Advanced Work Packaging Digital Threads to Enable

CII Research Model



CII Research Model

CII Research Model – Timeline and Outcomes



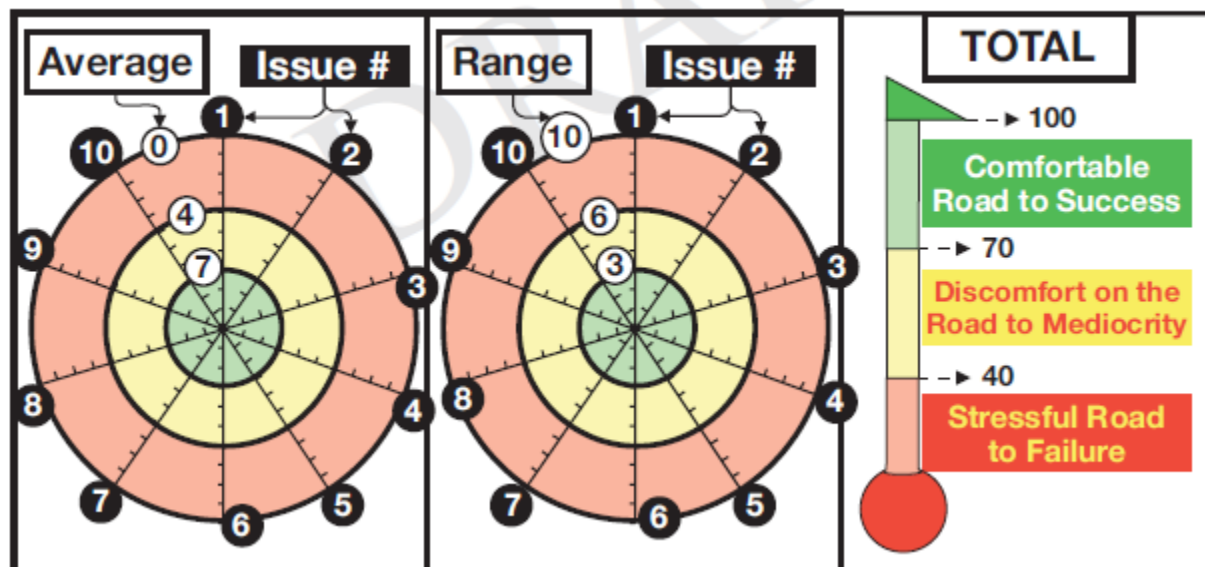


Validating CII Best Practices

Step 3. Plot your team's answers in the appropriate column and calculate the Average, Range (high score - low score) and $\text{Range} \div \text{Average}$.

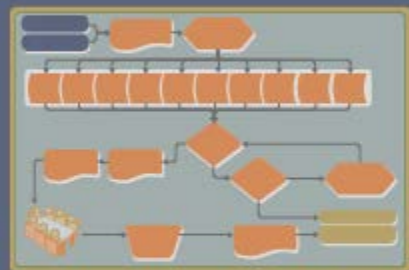
TEAM SCORE		Respondent							Calculated Average	Calculated Range	Range/Average
Issue		1	2	3	4	5	6	7			
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											

Step 4. Plot the Average and Range for each question and the Total on the Thermometer.



Validating Advanced Work Packaging as a Best Practice

A Game Changer





Validating CII Best Practices

A CII Best Practice is defined as: “process(es) or method(s) that, when executed effectively, lead to enhanced project performance.” To qualify as a CII Best Practice, a practice must be sufficiently proven through extensive industry use and/or validation.

The **2003 CII Value of Best Practices Report** presented a summary of the value of best practices based on data from the CII Benchmarking and Metrics (BM&M) database through the year 2002.

The **2010 CII Value of Best Practices Report** was designed to examine how well best practices have been used by the CII membership as a whole. Its aim was to provide quantitative analyses on the relationships between best practices and project performance.

Value of the CII Best Practices

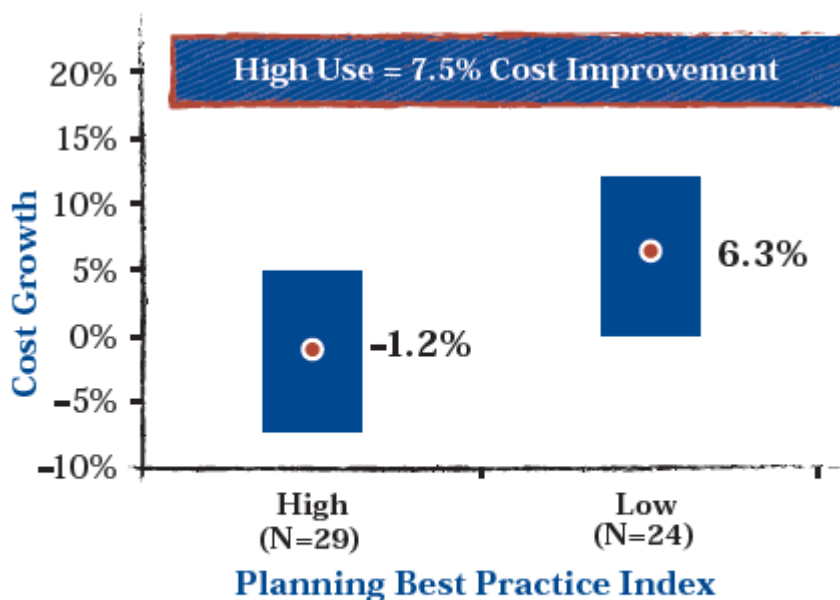


Figure 1. Comparison of CII Planning Best Practice Use on Cost Performance for Owners
(Ref: BMM2010-4, 2010 CII Value of Best Practices Report, p. 26)

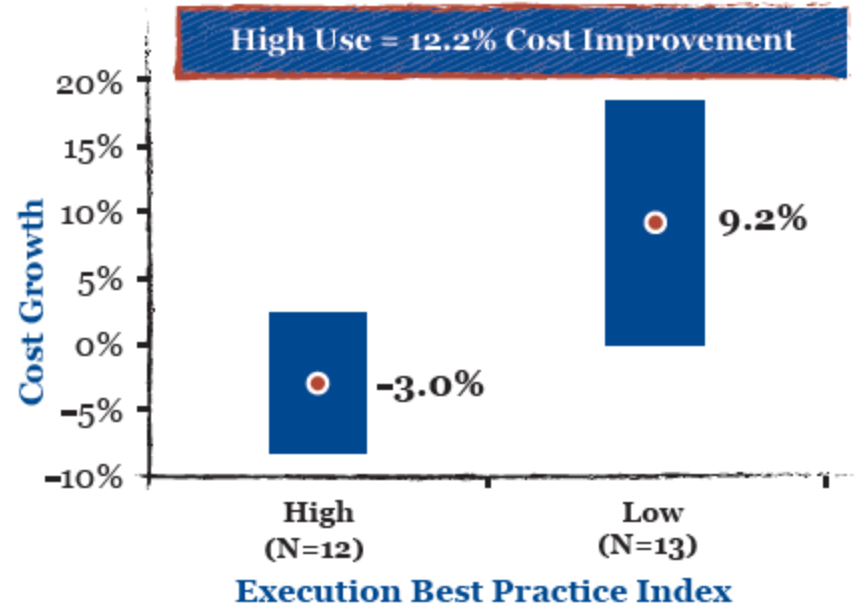


Figure 2. Comparison of CII Execution Best Practice Use on Cost Performance for Contractors
(Ref: BMM2010-4, 2010 CII Value of Best Practices Report, p. 26)



Value of the CII Best Practices

Since the 2010 report was published, CII launched the 10-10 Program, a Performance Assessment effort designed to assess, in each project phase, the organizational issues that affect project performance, as well as the outcomes of each project phase. The data from the 10-10 Program served as the basis for the **2016 CII Value of Best Practices Report**, which provided insights into which practices could provide more benefit if they were better implemented by CII members, and which practices already have high scores and are providing benefits in terms of project phase outcomes.

Prepared by
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Value of the CII Best Practices

MATERIALS MANAGEMENT

16%

The benefits of a materials management program results in 16% schedule improvement.

DESIGN PLANNING & OPTIMIZATION

6.1%

High use of constructability results in 6.1% cost improvement versus low usage and reduces project schedule by 7.5%.

PROJECT PLANNING

\$25

Each \$1 spent on the PDRI process can save \$25 in return.

FRONT END PLANNING

\$3-\$10
payback

Front End Planning has a \$3-\$10 payback on every dollar spent.

CONSTRUCTION TECHNOLOGY

30-45%

Adoption of proven technology can improve construction industry productivity by 30-45%, as well as improve material predictability and reliability.

CHANGE MANAGEMENT

11.4%

The CII Knowledge Base adds value to Change Management Practices through a 11.4% cost growth improvement.

Oracle and CII



Oracle Construction and Engineering Blog

Oracle Construction and Engineering Blog

Oracle Construction and Engineering Smart Construction Platform

While we often focus on project execution (“do the project right”), capital efficiency demands excellence in capital planning and allocation (“do the right projects”) at the portfolio level. Oracle Construction and Engineering’s Smart Construction Platform supports this full lifecycle model for capital efficiency.

Oracle Construction and Engineering has worked with leaders across industries to help them achieve capital efficiency, using CII best practices and Oracle’s suite of offerings—including portfolio management, planning and scheduling, capital program management, and payment solutions.



Oracle and CII



Oracle Construction and Engineering Blog

Oracle Construction and Engineering Blog

The Construction Industry Institute

In addition, Oracle now has an agreement with the [Construction Industry Institute \(CII\)](#). We're working to deliver CII best practices methodologies into configured packages.

Over time, we'll [provide capabilities that support all 17 best practices where appropriate](#), allowing organizations to enhance company-wide adoption of these best practices. [Packages to-date include project definition rating index \(PDRI\), project risk, and advanced work packaging \(AWP\) progress.](#)

Oracle and CII

How Oracle's Primavera Unifier Supports Best Practices

A Digital Data Thread





Small Infrastructure Projects

Project	Project Type (e.g., flair line replacement, packaging line, or oth
Owner/Client	Project Location
Project No.	Other Control No.

PDRI E(arly)

PDRI F(inal)

Select the PDRI assessment that best corresponds to the current status of your project

Feasibility

Concept

Detailed Scope

PDRI

Small Infrastructure

PDRI Cover Page

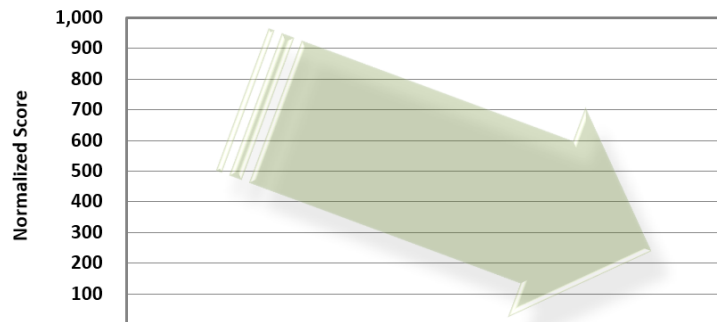
Print Chart

PDRI E

PDRI F

Small Infrastructure Projects

PDRI Score Chart Summary



PDRI E: Early Concept

PDRI F: Detailed Scope

Front End Planning References:

- IR 113-2, PDRI: Project Definition Rating Index – Industrial Projects, Version 4.1
- IR 113-3, Alignment During Pre-Project Planning: A Key to Project Success, Version 2.1
- IR 155-2, PDRI: Project Definition Rating Index – Building Projects, Version 4.0
- RS 181-1, Risk Assessment on International Projects: A Management Approach
- IR 181-2, Integrated Project Risk Assessment (IPRA), Version 2.0
- SP 181-3, Adding Value through a Practical and Proactive Project Risk Management Process
- RS 213-1, Front End Planning: Break the Rules, Pay the Price
- RS 241-1, Optimizing Construction Input in Front End Planning
- IR 241-2, Instructions for Using the Construction Input Assessment Tool, Version 4.0
- RS 242-1, Front End Planning for Renovation and Revamp Projects: An Overview
- IR 242-2, Front End Planning of Renovation and Revamp Projects, Version 1.1
- RS 268-1, Front End Planning Tool: PDRI for Infrastructure Projects
- RS 268-1a, Assessment of Effective Front End Planning Processes
- IR 268-2, PDRI: Project Definition Rating Index – Infrastructure Projects, Version 4.0
- SP 268-3, Adding Value through Front End Planning

Other References:

- IR 47-2, Tools for Enhancing the Piping Engineering Process
- IR 102-2, Partnering Toolkit
- IR 111-3, Core Competency Toolkit
- IR 121-2, Planning for Startup
- IR 134-2, Tools for Effective Project Team Leadership
- IR 142-2, Design for Maintainability Guidebook
- IR 161-2, Small Projects Toolkit
- IR 165-2, Owner's Tool for Project Delivery and Contract Strategy Selection User's Guide, Second Edition
- IR 166-3, CII Best Practices Guide: Improving Project Performance, Version 4.0
- IR 171-2, PPMOF: Decision Framework and Tool
- IR 184-2, Value Management Toolkit (only accessible to CII members)
- IR 220-2, Project Health Indicator
- IR 230-2, Implementation of Lessons Learned Systems
- IR 252-2b, A Guide to Construction Rework Reduction
- IR 257-2, Global Procurement & Materials Management: An eGuide to Effective Project Execution
- IR 257-3, Materials Management Planning Guide
- IR 258-2, Information Integration to Improve Capital Project Performance
- IR 260-2, CII Guide to Reimbursable Contracting
- IR 266-2, A User's Guide to the CII ValueShare Tool: Value Interest Identification Module and E&C Focus Points & Alignment Module
- IR 272-2, Enhanced Work Packaging: Design through Workforce Execution
- IR BMM-3, Implementing Project Security Practices
- RS 12-1, Project Objective Setting, Second Edition
- RS 32-1, Zero Injury Techniques
- RS 37-1, Team Building: Improving Project Performance
- RS 101-1, Design for Safety
- RS 171-1, PPMOF: A Framework for Decision-Making
- SP 34-1, Constructability Implementation Guide, Second Edition

FRONT END

PDRI Cover

CII

CII Tools – FEP and AWP

CII Advanced Work Packaging (AWP) Resources

#	Document Name	Publication Year	Document Number	Research Summary Link
1	Advanced Work Packaging: Design through Workface Execution	2013	IR272-2, Volume I	https://www.construction-institute.org/resources/knowledgebase/best-practices/advanced-work-packaging/topics/rt-272
2	Advanced Work Packaging: Implementation Guidance	2013	IR272-2, Volume II	https://www.construction-institute.org/resources/knowledgebase/best-practices/advanced-work-packaging/topics/rt-272
3	Advanced Work Packaging: Implementation Case Studies and Expert Interview	2013	IR272-2, Volume III	https://www.construction-institute.org/resources/knowledgebase/best-practices/advanced-work-packaging/topics/rt-272
4	Validating Advanced Work Packaging as a Best Practice: A Game Changer	2015	IR319-2	https://www.construction-institute.org/resources/knowledgebase/best-practices/advanced-work-packaging/topics/rt-319
5	Bridging the Gap between Design and Construction Models to Improve Advanced Work Packaging	2019	FR-TC-01	https://www.construction-institute.org/resources/knowledgebase/best-practices/advanced-work-packaging/topics/rt-319
6	Advanced Work Packaging Digital Threads to Enhance Visibility on Capital Projects			
7	AWP Data Requirements Implementation Guide			
8	Promoting the Use of Advanced Work Packaging			
9	Promoting the Use of Advanced Work Packaging			
10	AWP Concierge			
11	Modernizing the Supply Chain and Increasing Transparency			
12	Integrating Commissioning and Startup into the Project			
13	AWP Execution Planning Guide for Projects			

AWP Joint Working Group	
Phase I.	Data Requirements Definition Team (2nd Half of 2019):
- Tom Morris - ExxonMobil - Stephen Jones - Shell - Jacob Bubalo - Eastman - Manoj Dharwadkar - Dow - Tedd Weitzman - Construct-X - John Banda - Autodesk - Adam Messersmith - Kiewit - Srinivas Avantis - AVEVA - Colin McIntyre - Bechtel - Ted Blackmon - Construct-X - Eric Crivella - Digital Construction Works	
Phase II.	Publication Team (1st Half of 2020):
- Tom Morris - ExxonMobil - Stephen Jones - Shell - Jacob Bubalo - Eastman - Manoj Dharwadkar - Dow - Tedd Weitzman - Construct-X - John Banda - Autodesk - Adam Messersmith - Kiewit - Srinivas Avantis - AVEVA - Colin McIntyre - Bechtel - John Walker - Atlas RFID Solutions - Yong Cho - Georgia Institute of Technology - Eric Marks - Georgia Institute of Technology	

CII Tools – PM Assessment

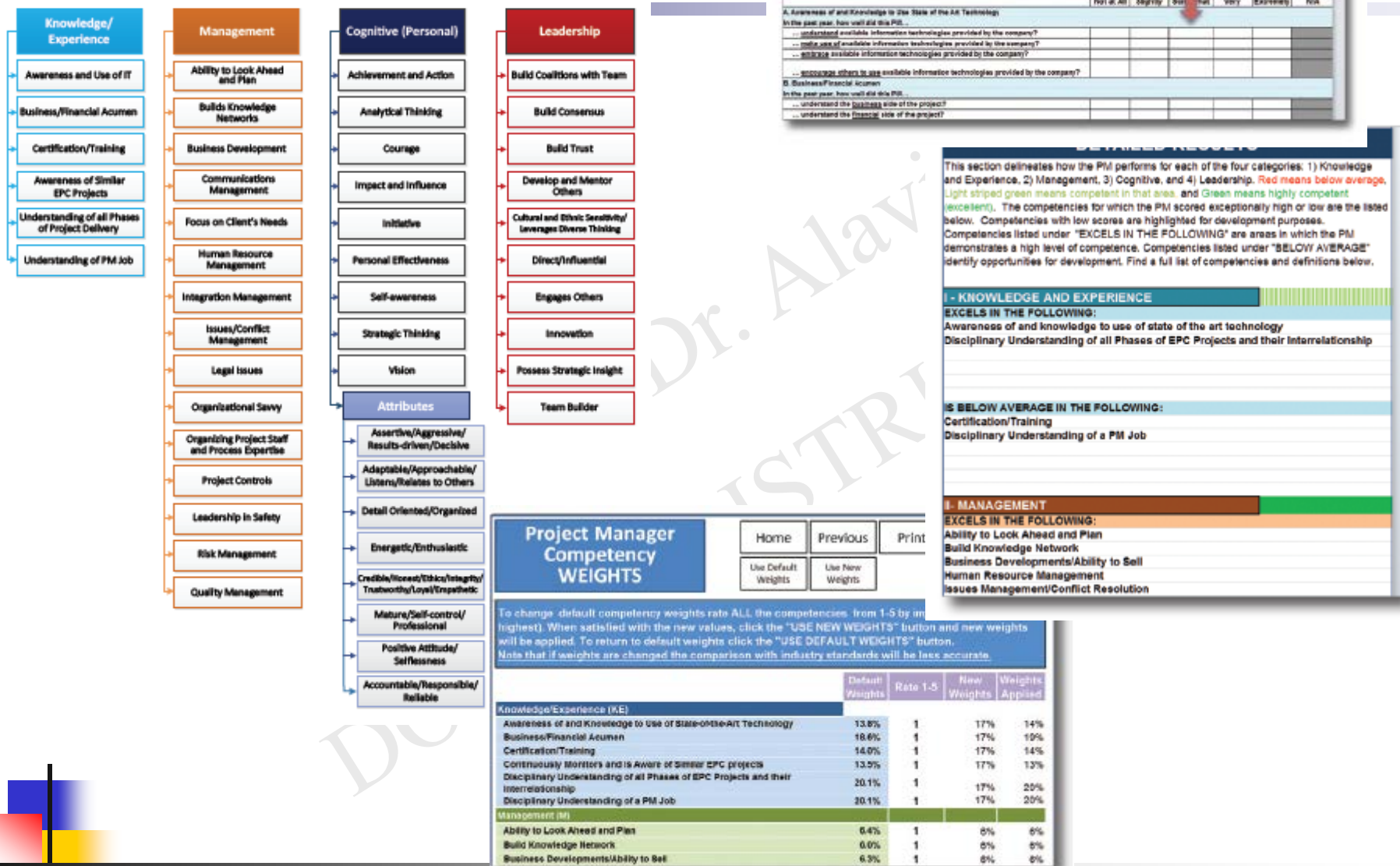


Figure 13. Image of Weights Tab

CII Tools – Dispute Assessment



Construction
Industry
Institute®



DPI - Disputes Potential Index

SP 23-3 version 2.0

Welcome to the second version of the Disputes Potential Index (DPI) tool. The first version was developed by the Construction Industry Institute (CII) Dispute Prevention and Resolution Research Team (RT 23) and was released in its original format in 1995. In 2016, CII updated and published the second version in Microsoft Excel 2010 format.

A substantial amount of research has investigated the causes of contract modifications and disputes. This research attempts to predict the "likely" dispute experience of a project based on its people, process, and project characteristics. A prediction tool can give the project team a measure of how the project is expected to perform. Since this information can be provided before construction begins, it gives the people involved and opportunity to make necessary changes in the project characteristics to improve the project's anticipated performance before construction begins.

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Please answer all questions before continuing on. Results will be displayed on the "Results" page, by hitting the "Calculate" button at the bottom of this page.

Owners Management and Organization

1. Were previous contractual parties satisfied with owner's upper management? ☐ 1-No ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6-Yes
2. Was the owner's responsibility structure effective? ☐ 1-No ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6-Yes
3. Would the owner's organization be considered successful based on past projects? ☐ 1-No ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6-Yes
4. How would you classify the owner's individual's interpersonal skills? ☐ 1-Low ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6-High

Contractor Management and Organization

5. Were previous contractual parties satisfied with contractor's upper management? ☐ 1-No ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6-Yes
6. Was the contractor's responsibility structure effective? ☐ 1-No ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6-Yes
7. Has the contractor's organization ever had the experience with this type of project? ☐ 1-None ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6-A lot
8. Would the Contractor's organization be considered successful based on past projects? ☐ 1-No ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6-Yes
9. What was the experience and competence level of the contractor's project individuals? ☐ 1-Low ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6-High
10. How would you classify the contractors individual's interpersonal skills? ☐ 1-Low ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6-High
11. How would the history of the owner and contractor together on previous projects rate? ☐ 1-Poor ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6-Good

Project Complexity

12. What was the likelihood of disputes?
13. What was the likelihood of disputes?

Project Size

14. Was the project size?

Financial Planning

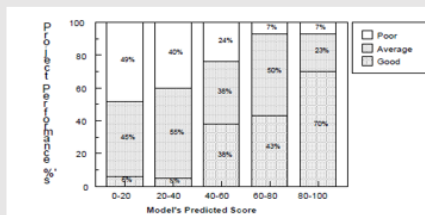
15. What was the likelihood of disputes?

Model's predicted score

Percent chance of:

Good dispute performance Average dispute performance Poor dispute performance

The experience on which the DPI is based shows that projects that receive scores between 40 - 60 have a 38% chance of a "good" project, a 38% chance of an "average" project, and a 24% chance of a "poor" project relative to the frequency and severity of contract disputes. Your overall score is based on individual scores for eight factors. These individual scores and scores from other projects with "good" experience relative to contract disputes are presented below:



Individual Evaluation factor	Your Project Score	Good Project Score
Owner management and organization		4.8
Contractor Management and Organization		5.0
Project Complexity		3.9
Project Size		4.4
Financial Planning		4.3
Project Scope Definition		5.0
Risk Allocation		4.6
Contract Obligations		5.0

Use the scores in this table to identify those factors that can be improved on your project, so that you can increase the likelihood of experiencing a low degree of contract disputes. If you can improve your project's score so that it falls in the range 60-80, the chances of a "poor" project decrease to 7%. Alternatively, if the situation deteriorates and your score falls to between 20-40, the likelihood of having a "poor" project increases to 40%.



CII Tools – Risk

RISK REGISTER INSTRUCTIONS
LEVEL 1 - IDENTIFICATION

Risk Register Tool Overview

This spreadsheet provides a template for a **Level 1, Risk Identification** risk register. Use this sheet if the highest desired management level on this project is risk identification. This file, which is divided into four separate sheets, will provide a core register, but it can be modified for user-added preferences or additional information. Please review the instructions on this sheet before proceeding to the subsequent sheets.

How to use the Risk Register Tool

The risk register tool consists of two individual input sheets: 1) Level 1 – Identification; and 2) Allocation & Risk Mitigation. To populate the risk register summary (Summary sheet), the user must complete, as fully as possible, the Level 1 and Allocation & Risk Mitigation sheets. When completing each sheet, enter data from left to right.

Data are entered in each cell in one of four ways: manually (users input information), using a drop-down list (users select from a populated list of choices), auto-population (users do not enter data in these cells; information is populated based on data entered previously), and auto-population with manual override (**data are auto-populated, but, users can override that in with their own values after unprotecting the sheet**). Columns are marked with the input method, and each cell also contains an input message, further explaining the specific information that should be entered.

Risk Register Sheet Overview

Below is a list of each sheet and the purpose it serves in creating the risk register.

Instructions

Provides necessary instructions and requires no input.

Level 1 - Identification

This is the first sheet to complete, including risk description, probability, and impact.

Allocation & Risk Mitigation

This is the next sheet to complete, monitoring the risks. The user can trigger events.

Summary

The final sheet of the Level 1 risk register, entered in the previous sheet.

Before completing the subsequent sheets, first complete this input sheet on the basis of the specific project being assessed. Instructions for each input section are located on the right side of this page.

Category of Impact				
Cost				
Description	Percent of Project Value	Mean Value		
	L	H	(Dollars)	
VL Insignificant Cost Increase	0%	0%	\$0	
L Minimal Cost Increase	0%	6%	\$300,000	
M Significant Cost Increase	6%	12%	\$900,000	
H Very Significant Cost Increase	12%	20%	\$1,600,000	
VH Critical Cost Increase	20%	40%	\$3,000,000	

Cost Instructions

For each description level, in the orange boxes, enter the high (H) percent of project value. Low percent values will automatically populate. Default percent values are provided.

Schedule				
Description	Value	Mean Value		
	L	H	(Days)	(Dollars)
VL Impact recoverable without affecting critical path	0%	1%	3.6	\$36,000
L Impact recoverable affecting critical path	1%	2%	10.8	\$108,000
M Critical path affected	2%	5%	25.2	\$252,000
H Restructuring of project required	5%	10%	54.0	\$540,000
VH Major restructuring of project required	10%	20%	108.0	\$1,080,000

Schedule Instructions

For each description level, in the orange boxes, enter the high (H) percent of project length. Low percent values will automatically populate. Default percent values are provided.

Risk Probability Ranking		
Description	Value	
	L	H
vl Very low likelihood of occurring	0%	10%
l Low likelihood of occurring	10%	30%
m Medium likelihood of occurring	30%	50%
h High likelihood of occurring	50%	70%
vh Very high likelihood of occurring	70%	100%

Probability Instructions

For each probability description level, in the orange boxes, enter the high (H) percentage value corresponding to that level. Low percent values will automatically populate. Default percent values are provided.

Deterministic Output Rankings										
Psi Heat Map					Ranking Definition					
Probability	vh								High	Unacceptable. Major impact on project goals. Different approach required.
	h								Med	Some impact on project goals. Different approach may be required.
	m									
	l							Low	Minimum impact. Minimum oversight needed to ensure risk remains low.	
	vl									
		VL	L	M	H	VH	Impact			

LEVEL 2 - DETERMINISTIC

Instructions	Provides necessary instructions and requires no input.	Item #	Brief Risk Description	Category of Impact	Pre-Mitigated Risk Ranking					
					Most Likely Impact		Most Likely Probability		Risk Mean Value (Dollars)	Overall Risk Ranking
					Qualitative Value	Quantitative Mean Value (Dollars or Days)	Qualitative Value	Quantitative Mean Value		
Level 1 - Identification	This is the first sheet to complete including risk description, probability, and impact.	Auto	Auto	Auto	Drop Down (Selection Required)	Auto (Manual Override)	Drop Down (Selection Required)	Auto (Manual Override)	Auto	Auto
Allocation & Risk Mitigation	This is the next sheet to complete monitoring the risks. The user triggers events.	1	Brief risk description text	Cost	Very High	\$3,000,000	Medium	40%	\$1,200,000	High
		2	Brief risk description text	Schedule	Medium	25	Medium	40%	\$100,800	Med
Summary	The final sheet of the Level 1 entered in the previous sheet.									

CII Phases (Referenced in Risk Identification Sheet)

Front End Planning	From definition of business need to authorization of total project budget
Detail Engineering	From design basis through release of all approved drawings and specifications for construction
Procurement	From the procurement plan for engineered equipment through the delivery of engineered equipment to the site



CII Tools – Communication



Section 2 - Project Information

Project Manager: Fill in the following descriptive information about your project.

P1. What is the name of this project?

P2. What type of facility is being constructed (e.g., process, power, civil, comm)?

P3. How would you primarily characterize this project?

☐ Grass roots ☐ Modernization ☐ A

P4. Is this a joint venture project?

☐ Yes ☐ No

P5. Are there multiple engineering execution locations for this project?

☐ Yes ☐ No

P6. Where is this project located (city, state, country)?

P7. What is the total installed cost of this project (in millions)?

In millions

P8. Under what type of contract is this project being executed (e.g., lump sum, cost reimbursable, cost plus fee)?

☐ Lump Sum ☐ Cost Reimbursable ☐ Cost plus Fee

P9. What services has your company contracted or been tasked to provide on this project?

P10. Does your company have previous experience with this client/owner?

☐ Yes ☐ No

P11. Do you personally have previous experience with this client/owner?

☐ Yes ☐ No

P12. What is the scheduled duration of this project in months?

months

P13. Are either partnering or alliances being used on this project?

☐ Yes ☐ No

P14. Is there or will there be formalized team building on this project?

☐ Yes ☐ No

P15. What communication approach is being used to execute this project?

☐ Introduction ☐ User's Guide ☐ Project

Section 3 - Engineering Questions

Your responses are important to the accurate assessment of the project, therefore please answer all questions possible. The questionnaire will be used to determine the project's communication effectiveness score and you MUST COMPLETE THE ENTIRE QUESTIONNAIRE PRIOR TO THE PROJECT'S COMPLETION.

Project Name:

What is your name?

1. How well do you understand what information your SUFFICIENTLY?

2. How well do you understand what information OTHER GROUPS have from you?

3. How often do you receive conflicting instructions from multiple sources?

4. How often does poor communication or lack of coordination occur?

5. Does the project have written procedures/practices for you to follow (e.g., Execution Plan or similar document)?

6. How effective are these procedures?

7. Is a Project Execution Plan (or similar document) being used?

8. How often are you kept current with DESIGN CHANGES?

9. How often are you kept current with SCHEDULE CHANGES?

10. Do you feel you have ADEQUATE ACCESS to the people you need to perform your job?

11. How often do you receive less information than you need to experience information underload?

12. Overall, how effective do you think communication is on this project?

13. In what phase is your project currently?

Communications Effectiveness Score

Overall **Not Enough Data**

By Stakeholder

	Project Management	Engineering	Construction
Overall	Not Enough Data	Not Enough Data	Not Enough Data

By Category

Accuracy	Not Enough Data
Timeliness	Not Enough Data
Completeness	Not Enough Data
Understanding	Not Enough Data
Barriers	Not Enough Data
Procedures	Not Enough Data

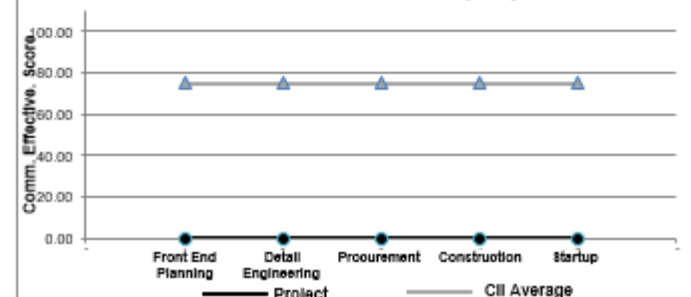
By Role

	Project Management	Engineering	Construction
Accuracy	Not Enough Data	Not Enough Data	Not Enough Data
Timeliness	Not Enough Data	Not Enough Data	Not Enough Data
Completeness	Not Enough Data	Not Enough Data	Not Enough Data
Understanding	Not Enough Data	Not Enough Data	Not Enough Data
Barriers	Not Enough Data	Not Enough Data	Not Enough Data
Procedures	Not Enough Data	Not Enough Data	Not Enough Data

By Project Phase

Front End Planning	Not Enough Data
Detail Engineering	Not Enough Data
Procurement	Not Enough Data
Construction	Not Enough Data
Startup	Not Enough Data

Communications Effectiveness Score by Project Phase





کنترل پروژه پیشرفته و ارزیابی عملکرد در پروژه‌های پیچیده (بر اساس اسناد CII)

فصل اول:

مقدمه و رویکرد کلان به کنترل پروژه پیشرفته (Advanced Project Controls – APC)

ارائه دهنده:

سید محمدرضا علوی پور

(PhD, PMP, CMIT)

CMAA Authorized Trainer

دانشگاه Illinois Tech آمریکا



What we will learn?

- ☐ Fundamentals and Rationale of Advanced Project Controls
- ☐ Role of APC in the Project Life Cycle and Decision-Making
- ☐ Conceptual Roadmap for Implementing Advanced Project Controls
- ☐ Research Methodology
- ☐ Reporting Frequencies

Prepared by Dr. Alavipour
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Fundamentals and Rationale of Advanced Project Controls

Summary of APC

- ❑ Project controls entails a **simple two-fold proposition**:
 1. Eliminate or proactively mitigate deviations and
 2. Accurately predict performance.

- ❑ Such a proposition can **only be attained** with careful and comprehensive project status updates that support **timely** and **informed decisions**.

Why data is very important here?

Summary of APC

❑ Generating project status information to

support decisions requires

1. on-demand,
2. continuous, and
3. timely collection

of data on project conditions.

What types of data do we need?

Summary of APC

❑ The data must be current and complete.

❖ The **large amounts of data** generated present a **wealth of information** for

intelligent reasoning mechanisms that can then

1. **spread** vast amounts of **records** across projects and

2. **identify trends** and **patterns**

that may otherwise **remain hidden** from the human
intellect.

How the APC helps?

Summary of APC

- ❑ **Advanced project controls (APC)**, the focus of the research by **CII RT-402**, offers the opportunity to
 1. **streamline** the execution of project control processes and
 2. do so in real-time.
- ❑ The team presents this **guide to APC** to help the industry improve in making **timely decisions** during **project execution**.

What is exactly APC?

Summary of APC

❑ RT-402 **defined** advanced project controls (APC) as:

a project controls function with

- 1. continuous and/or timely data collection,*
- 2. on-demand information analysis with expert and intelligent reasoning methods, and*
- 3. dynamic and on-demand reporting.*

What is one of the important goals of the team?

Summary of APC

- ❑ **One goal** of the team was to create or identify **resources** that can **enable timely decisions** so that **practitioners** can devote the vast **majority of their time** to analysis, with **less time spent** on data manipulation.

Why APC needed and what is the goal of that?

Summary of APC

- ❑ The team realized early on that an **instantaneous** project controls **competence** was not enough.
- ❑ With the help of **350 subject matter experts**, however, their study now outlines actionable steps to benefit the potential of APC.
 - ❖ This effort leverages best practices with a set of **three complementary tools** individually focused on the core aspects of APC:

What are they?

Summary of APC

❑ This effort leverages best practices with a set of **three complementary tools** individually focused on the core aspects of APC:

1. work environment,
2. project controls, and
3. technologies.

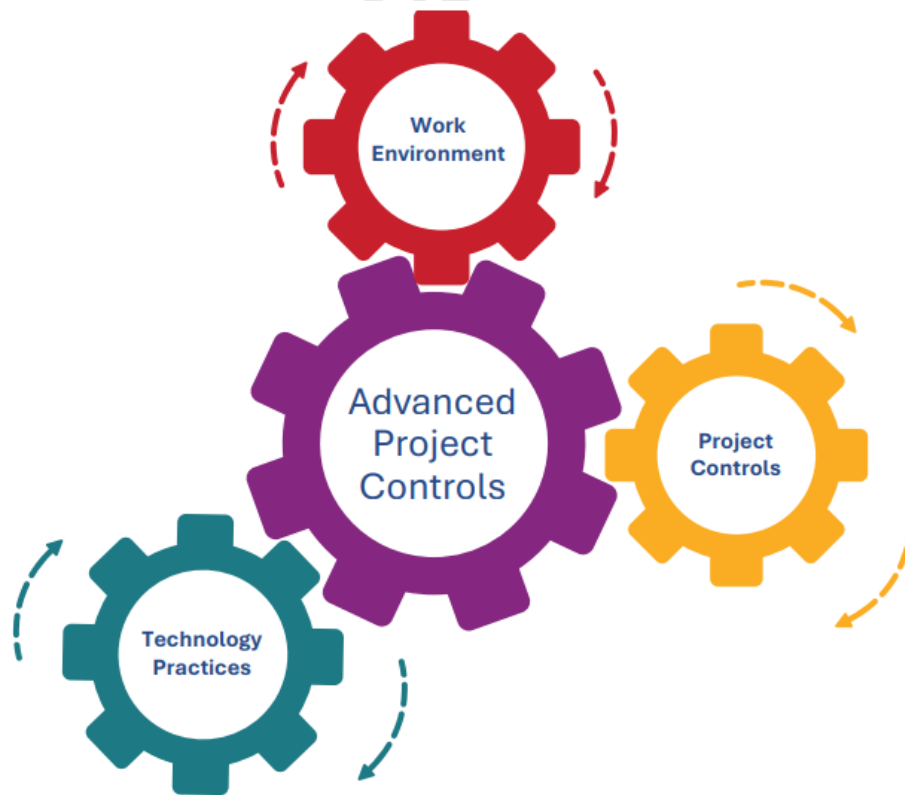
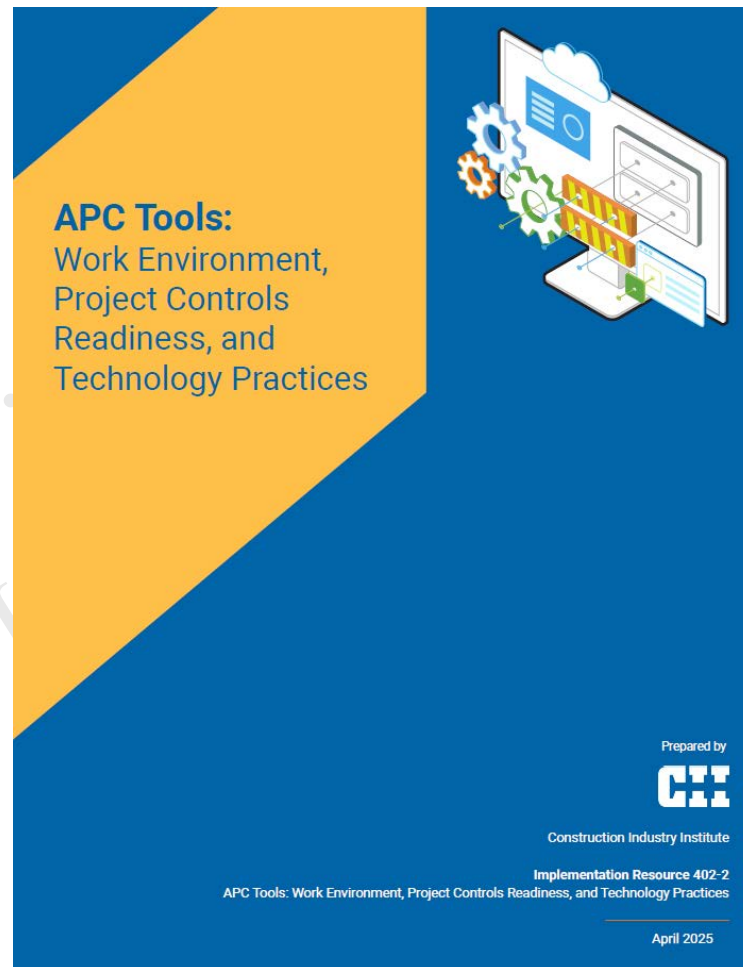


Figure 3. Advanced Project Controls

Summary of APC



Summary of APC

- This study also provides additional technology-centered guidance, including
1. **directions** on sensing and information technologies,
 2. **how to prioritize** real-time information that most improves project performance,
 3. **identification** of **controls processes** that significantly benefit from a real-time and automated execution, and
 4. **offering** potential **high-value applications** with artificial intelligence (AI).

*With **thoughtful investment**, industry organizations can benefit from using this **APC guide** to improve overall project performance.*

Summary of APC

❑ CII members have expressed that

1. the **current implementation** of earned value-based methods and
2. associated **key performance indicators (KPIs)**

cannot effectively control and **reliably** predict project performance.

Metrics and KPIs typically **lag** and
do **not offer** the opportunity to anticipate or proactively address problems.

What did they do?

Overview of Core APC Implementation Tools

❑ In response, CII chartered RT-402,

Advanced Project Controls, to

1. **investigate** this **important element** of project management and
2. **find ways** to streamline the execution of project control processes and
3. **do** so in real-time.

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Summary of APC

- ❑ **To holistically guide** CII member companies in their APC journey, RT-402 generated **additional resources**, such as the **prioritization** of
1. **real-time metrics** and **information** items or
 2. **high-value AI applications** in project controls.

These additional resources are included in the team's final report.

Is it enough?

Summary of APC

Global Project Controls and Management Systems:
Adapting Your PCMS Program for Success



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Implementation Resource 244-2



کنترل پروژه پیشرفته و ارزیابی عملکرد در پروژه‌های پیچیده (بر مبنای اسناد CII)
فصل چهارم: تحلیل عملکرد سیستم کنترل پروژه یا ابزار خودارزیابی (PCMS Self-Diagnostic)

PCMS self diagnostic assessment tool

- ❑ **RT 244** identified a range of practice in project controls and management systems implementation.
 - ❑ An **initial survey** of CII members revealed broad variance in self-reported performance along seven different PCMS functions
 1. estimating,
 2. planning,
 3. scheduling,
 4. change management,
 5. cost control,
 6. progressing, and
 7. forecasting in
- the dimensions of systems, tools, and training.

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Summary of APC

Global Project Controls and Management Systems:
Adapting Your PCMS Program for Success



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Assessment of the Seven Key PCMS Functions: Estimating, Planning, Scheduling, Cost Control, Change Management, Progressing, and Forecasting



Appendix A

☐ Checklist

کنترل پروژه پیشرفته و ارزیابی عملکرد در پروژه‌های پیچیده (بر مبنای اسناد CII)
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Summary of APC

Global Project Controls and Management Systems:
Adapting Your PCMS Program for Success



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Introduction

کنترل پروژه پیشرفته و ارزیابی عملکرد در پروژه‌های پیچیده (بر مبنای اسناد CII)
فصل پنجم: بررسی ۱۳ روند موثر بر عملکرد کنترل پروژه

□ These changes have been **distilled into 13 trends** with associated implications for PCMS. **These trends** are:

1. Sophistication of information technology
2. Project complexity
3. Speed of project execution
4. Recognition of changes
5. Changing owner-organization direct involvement
6. Globalization
7. Outsourcing
8. Graying of PCMS
9. Contractor specialization
10. Increase in regulatory oversight
11. Distribution of project risks among and within organizations
12. Virtual performers on project teams
13. Labor and materials availability and price elasticity

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Summary of APC

Global Project Controls and Management Systems:
Adapting Your PCMS Program for Success



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Appendix B

کنترل پروژه پیشرفته و ارزیابی عملکرد در پروژه‌های پیچیده (بر مبنای اسناد CII)
فصل پنجم: بررسی ۱۳ روند مؤثر بر عملکرد کنترل پروژه

- ❑ This **Appendix** details a **set of twenty-six recommendations** distilled from thirteen broad trends that **impact** the implementation of project controls and management systems.
- ❑ These **recommendations** are meant to broadly apply to PCMS and **should help teams make a thorough review** of their systems, particularly **when coupled** with the function self-diagnosis presented in **Appendix A** of this report.



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96

Summary of APC

Project Controls Improvement Tool User Guide



Project controls improvement (PCI) tool

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فصل ششم: ابزار PCI و بهبود ارزیابی عملکرد پروژه

❑ CII Research Team 322 (RT-322) developed the Project Controls Improvement (PCI) Tool to

1. **address** these industry-wide questions and
2. **identify** potential gaps in **current in-flight** project control practices.

❑ Based on surveys, case studies, and review by a panel of experts with more than **350 years of experience**, as owners and contractors,

RT-322 crafted a tool that contains valuable information on

1. Core metrics and
2. Critical Reliability Factors

to ensure robust project progress and performance assessment.

*This **software** is an **effective tool** to improve cost and schedule outcomes at both the project and organizational levels.*

Summary of APC

Project Controls Improvement Tool User Guide



The research approach is aligned with the objectives to deliver desired outcomes



Objective #1

Develop a systematic project controls framework

Metric Framework and Typology



Objective #2

Identify the core project control metrics

Metric Classification



Objective #3

Generate guidelines for improving the reliability

Reliability Improvement

Project Controls Improvement Tool

Summary of APC

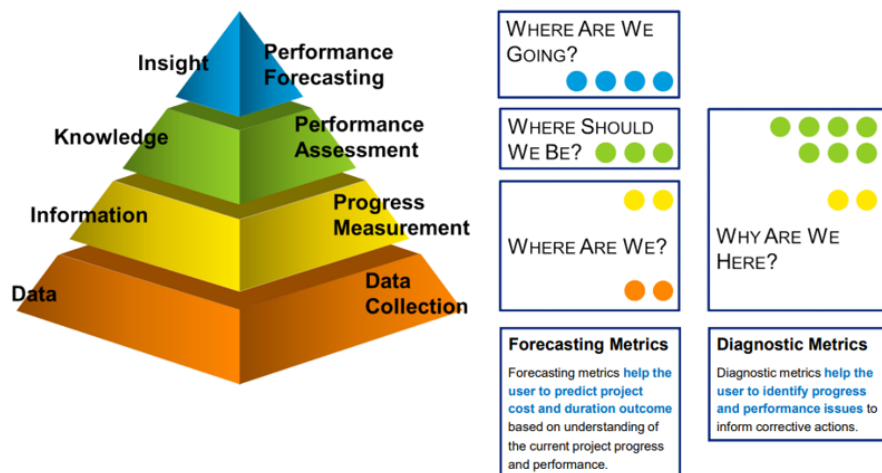
Project Controls Improvement Tool User Guide



Introduction

کنترل پروژه پیشرفته و ارزیابی عملکرد در پروژه‌های پیچیده (بر مبنای اسناد CII)
فصل ششم: ابزار PCI و بهبود ارزیابی عملکرد پروژه

Metric Pyramid – Distribution of Core Metrics



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47



Summary of APC

Do we need additional resources?

Additional resources



Figure 1. RT-402 Resources

Role of APC in the Project Life Cycle and Decision-Making

Objective and scope

- ❑ The **objectives** of RT-402 were to **explore** and **document** mechanisms capable of
- (1) **enabling** an instantaneous read of data and **feed** of information,
 - (2) **providing** comprehensive and accurate information on the **actual performance** of a project, and
 - (3) **forecasting** project completion outcomes **early** in project delivery.

Objective and scope

❑ The **goals** of the **research** included providing

1. tools,
2. recommendations, and
3. practices

that **enable** project **teams** and stakeholders to

make timely and informed **decisions**

with current, reliable **information**.

The scope of the research was limited to the phases of **engineering**,
procurement, and **construction (EPC)**.

Commissioning and **startup** were not included.

Let's look at project controls background

Objective and scope

- ❑ Some of the **fundamental questions** of the research were:
 - ❖ What are the **best practices** for proactive, efficient, and effective project controls?
 - ❖ What **project controls methods** and **key performance indicators** can overcome the current **limitations** of earned value management?
 - ❖ What is the **best method** to depict **project progress**?
 - ❖ Which **leading indicators** can provide a more **effective project controls process**?
 - ❖ How can **intelligent reasoning mechanisms** be leveraged to support and **streamline** project controls?

Project controls background

❑ Getting **timely access** to **actual** project status is a **long-sought industry milestone**.

❖ **Decision makers**, from supervisors to project and corporate managers, should **not have to wait** until the next week or reporting period or be **prevented** by systems limitations, technologies, or management practices.

Owner and contractor organizations both rely on **project control functions** to monitor work progress.

**Does every project need this system?
Even a well-planned project?**

Project controls background

- ❑ The reality is that **regardless** of how well-planned a project may be, **significant** events and factors, **both** internal and external, will **impact** a project's ultimate success **regarding** criteria such as cost and schedule.

Why cost and schedule?

Project controls background

- ❑ **Costs and schedule deviations** are a **direct consequence** of the inability to control projects,

a fact that has plagued the construction industry over the last century, if not further.

These deviations are even more pronounced in megaprojects.

- ❑ Since **megaprojects** represent the **backbone of the construction industry**, their **lack of performance** underscores the need for transformative approaches to project management and project controls.

Triad of tools

- ❑ To provide guidance and support implementation, RT-402 has generated **three complementary tools**.
- ❑ **Each tool** supports **one of the core facets** inherent to APC:
work environment, project controls, and advanced technologies.
- ❑ Research team members see the **production of the tools** as an opportunity to provide a **tangible impact** on how projects are delivered.
- ❑ The **ability to rapidly assess project maturity** promises a direct impact on project performance indicators.

The three tools are:



Triad of tools

□ The three tools are:

1. Work Environment Assessment Rating Tool,
2. Project Controls Readiness Checklist Tool, and
3. Technology Practices Maturity Rating Tool.

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Additional resources

- ❑ In addition to the tools, RT-402 generated **technology-centered** resources and guidance, such as
 1. directions on sensing and information technologies,
 2. identification of opportunities for on-demand information updates and process automation, and
 3. identification of potentially high-value AI applications.

See Figure 1.

- ❑ Such resources may be considered in **combination** with the tools for comprehensive guidance and implementation of APC.

Additional resources

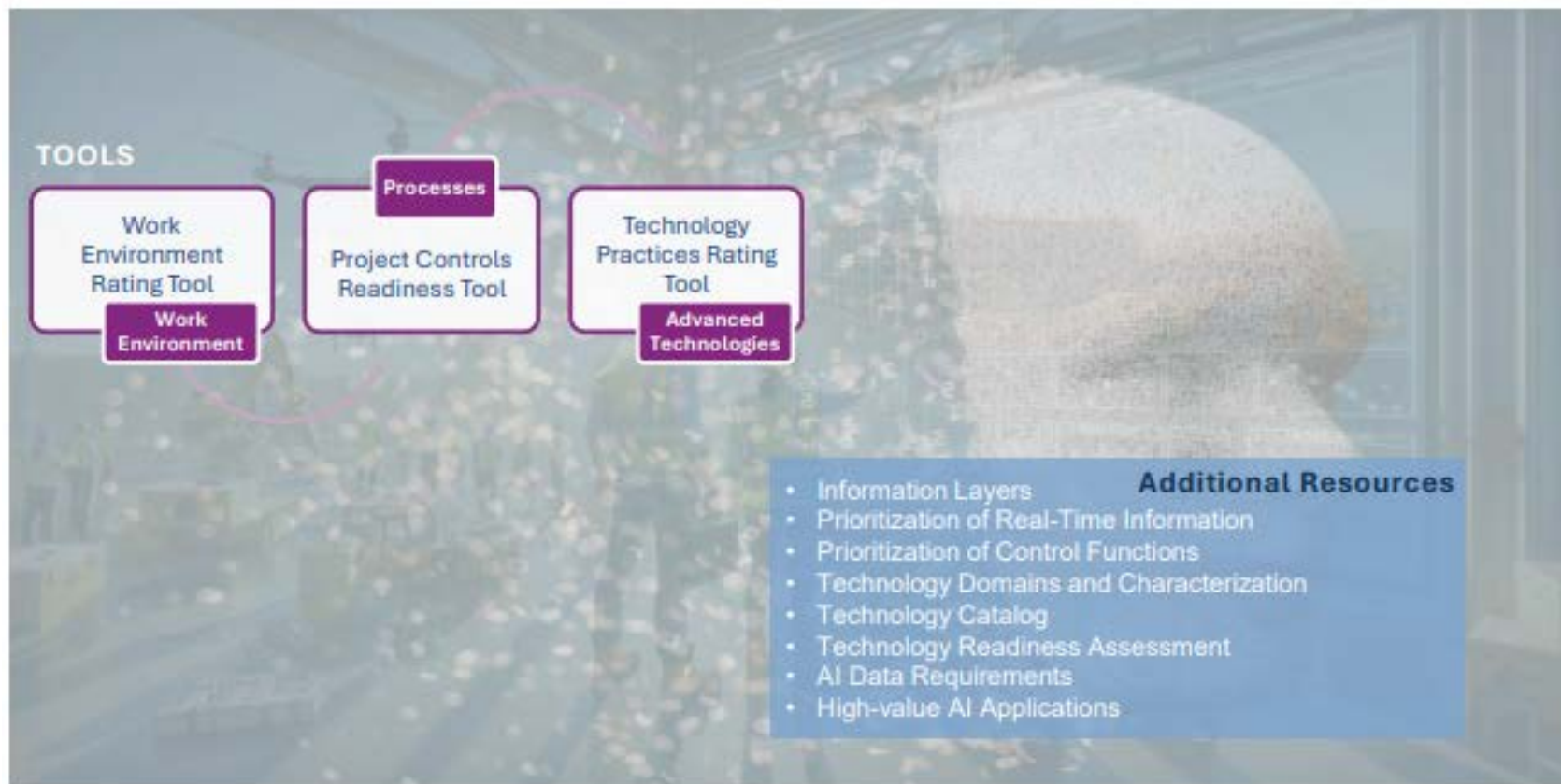


Figure 1. RT-402 Resources

Conceptual Roadmap for Implementing Advanced Project Controls

APC tools

- ❑ RT-402 offers a **triad of complementary** tools, **detailed** in the Implementation Resource, to **comprehensively guide** industry organizations in their APC journey.
- ❑ Such a comprehensive approach was **motivated** by the lack of resources and tools to support practitioners in **conducting a rapid assessment** of a project controls function, and the **compelling evidence** found by the research team that the **implementation of technology tools** alone is often not productive.

APC tools

- ❑ APC requires the implementation of **advanced technologies**.
- ❑ APC can **only** be achieved, however, with the proper job setting **coupled** with effective **project control processes and procedures**.
- ❑ This **fundamental coupling** can provide a solid foundation to enable the use of advanced technologies and the resulting benefits. See Figure 3.

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APC tools

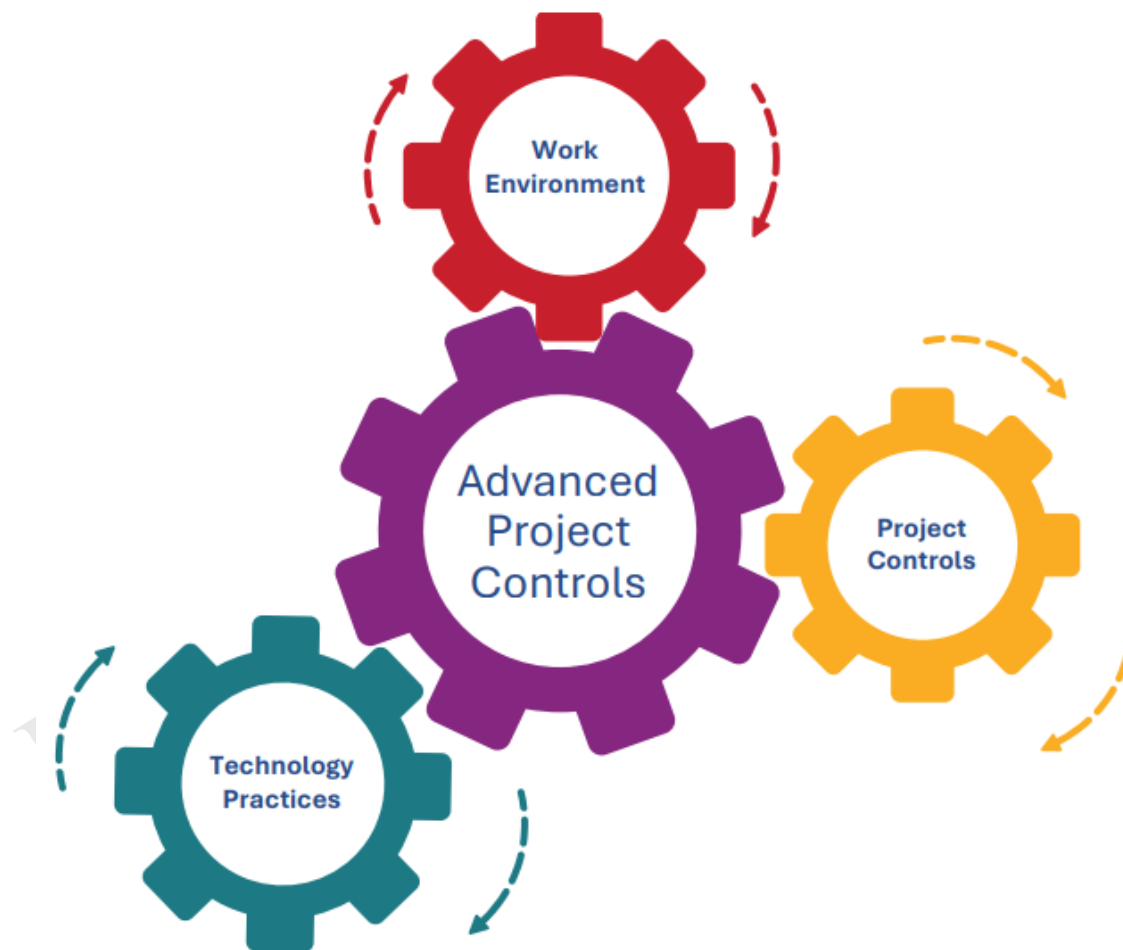


Figure 3. Advanced Project Controls

APC guidance tools

- Thus, in recognition of the three distinct facets inherent to APC—work environment, project controls, and technologies—**three tools were developed.**

See Figure 4.

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APC guidance tools

Work Environment Assessment Rating Tool

(Four categories & 27 factors)

- Culture
- People
- Processes
- Resources



Project Controls Readiness Checklist Tool

(Three sections & 55 elements)

- Basis of Decision
- Basis of Design
- Execution Approach



Technology Practices Maturity Rating Tool

(Five subprocesses & 21 practices)

- Technology Architecture
- Workflow
- Data Collection
- Monitoring & Intelligence
- Reporting



Figure 4. APC Guidance Tools

The work environment assessment rating tool

- ☐ It evaluates the level of **commitment** and **support** of stakeholder organizations toward **project controls** and its **advanced implementation**.
- ☐ Work environment factors are categorized into culture, people, processes, and resources.
- ☐ The tool is implemented in **spreadsheet format**.
Printable forms for a **manual assessment** are also provided.

The project controls readiness checklist tool



It

1. **Defines** the **fundamentals** for an effective controls function and
2. **Assesses** the function's principles, processes and procedures, and implementation.

☐ The **checklist tool** contains **40 elements grouped** in

1. Basis of decision,
2. Basis of design, and
3. Execution approach.

The technology practices maturity rating tool

- ☐ It captures the **advanced technology aspect** of APC.
- ☐ It defines 21 technology practices grouped into the five subprocesses:
 1. architecture,
 2. workflow,
 3. data collection,
 4. intelligence, and
 5. reporting.

The tool is implemented in spreadsheet format.

Printable forms for **manual assessments** are provided.

The technology practices maturity rating tool

- ❑ Importantly, the **maturity tool** allows adjusting the evaluation to the specific scope of the APC function,
 - whether the scope is
 - ✓ across project control functions or
 - ✓ limited to a single aspect, such as progress monitoring.

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Competency assessment example

- Figure 5 illustrates an **example of combined evaluation**, with the purple triangle exemplifying the competency assessment of an APC function.

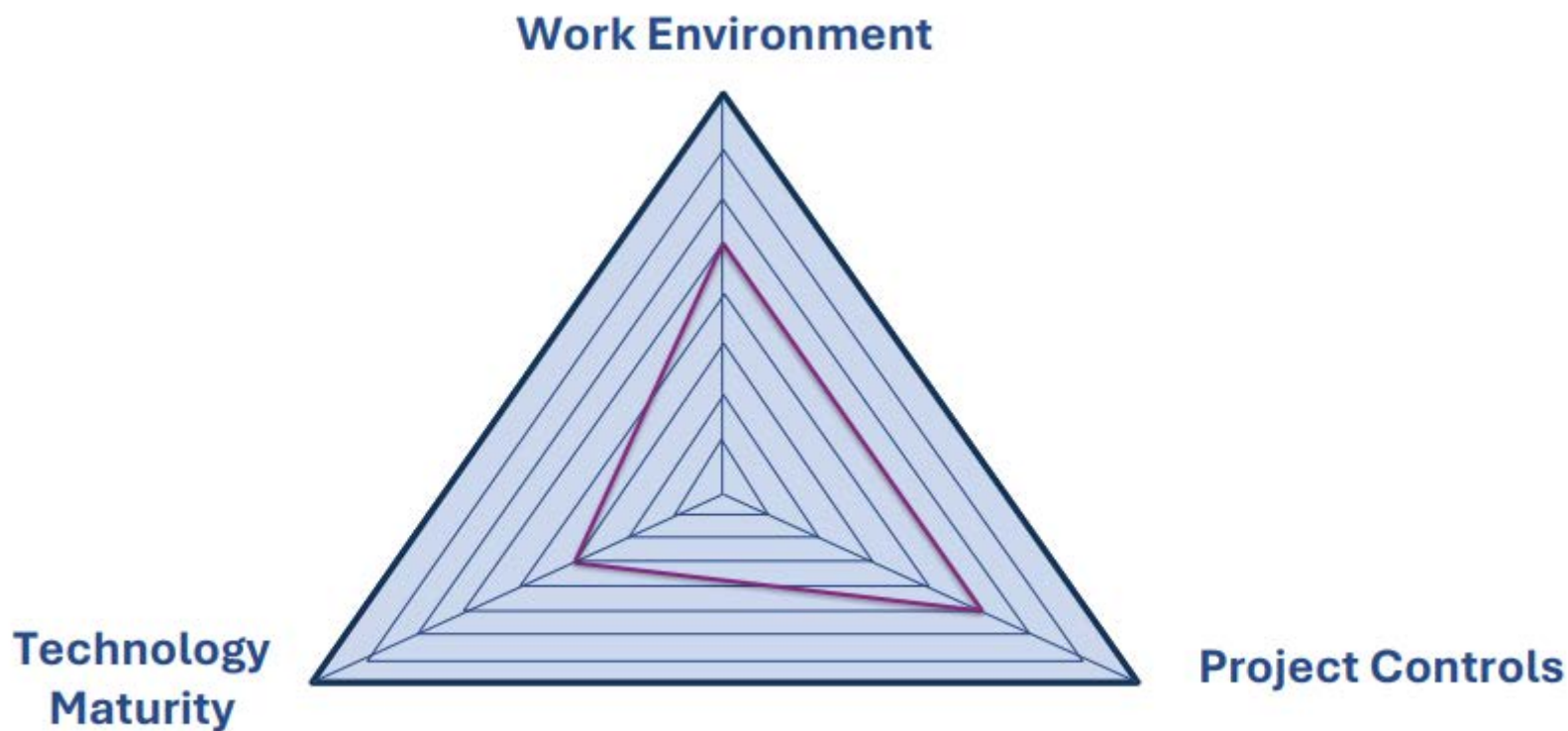


Figure 5. Competency Assessment Example

Information layers in APC

□ To

1. **optimize** APC and
2. **enable** data-driven functionality,
organizations need a clear understanding on
 1. how information is structured and
 2. how the elements involved relate to one another.

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Information layers in APC

- ❑ To **provide insights** into the conceptualization of information in an APC function, RT-402 expanded a **previous CII-developed information hierarchy**.

See Figure 6.

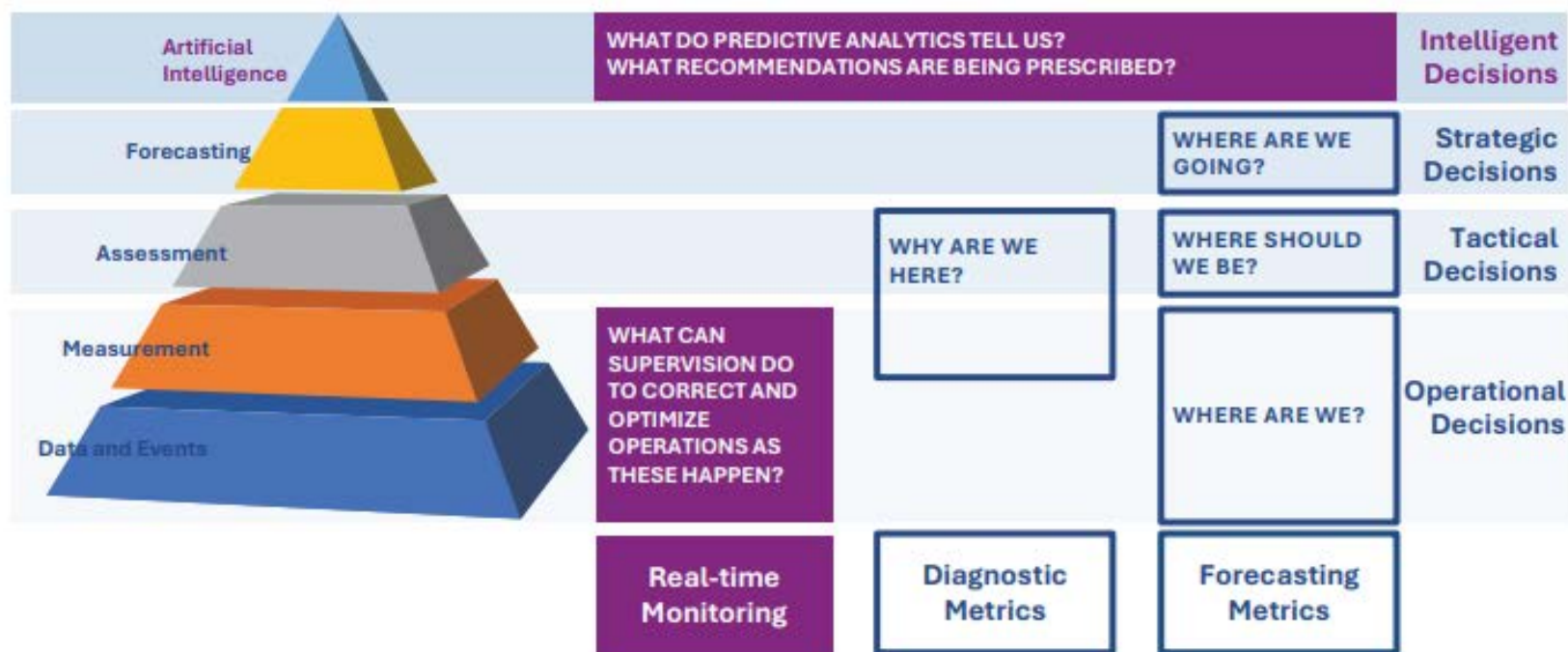


Figure 6. Information Layers

Information layers in APC

❑ In RT-402's **updated version** of the hierarchy, project controls information is grouped into **five information layers**, listed here from lowest to highest:

1. Data and Events,
2. Measurement,
3. Assessment,
4. Forecasting, and
5. Intelligence.

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Information layers in APC

❑ Information layers provide **insights** that trigger

1. operational,
2. tactical,
3. strategic, and
4. intelligent decisions.

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Information layers in APC

- ❑ Information is also **categorized** according to its controlling function:
 1. **real-time monitoring** to assess and correct **day-to-day issues**,
 2. **diagnostics** to measure and evaluate performance and identify causes, and
 3. **forecasting** to **predict** performance.

- ❑ The full course **detail**
each information layer and
its contribution to decision-making.

Layers and their contributions to decision making

❑ First, both

1. data and events and
2. measurement layers

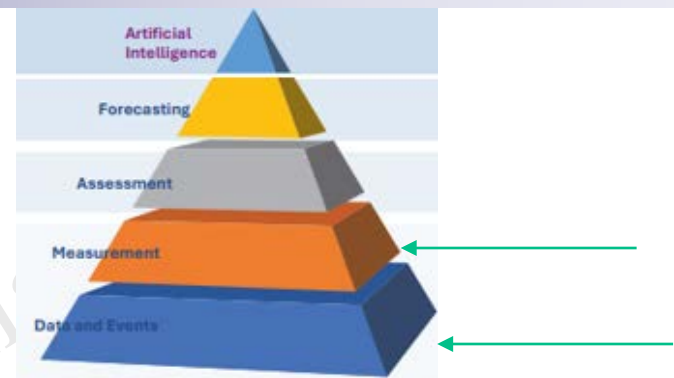
feed **operational decisions**.

❖ These types of decisions support

day-to-day management of tasks, issues, and corresponding resolutions.

*For example, the **notice of a delayed delivery** in the **look-ahead plan** from data and events would trigger **alternate ideas** on **installation plans**.*

***Low productivity ratios** by area, trade, or crew should **trigger additional inquiries** on their **root cause** and **lead to corrective actions**.*

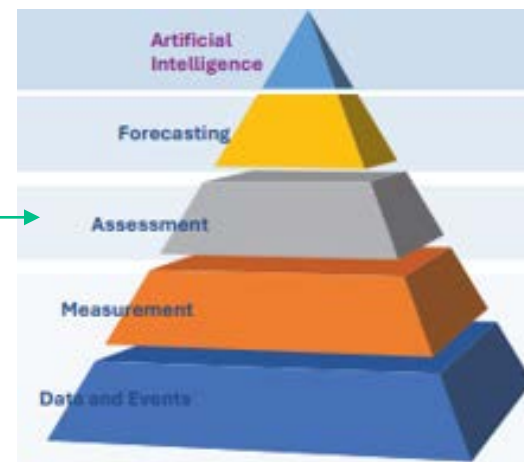


Layers and their contributions to decision making

❑ Second, tactical decisions

assess where the project should be by **comparing performance** against the baseline.

Metrics such as Cost Performance Index (CPI) or Schedule Performance Index (SPI) assess progress, raise concerns, and feed tactical decisions.

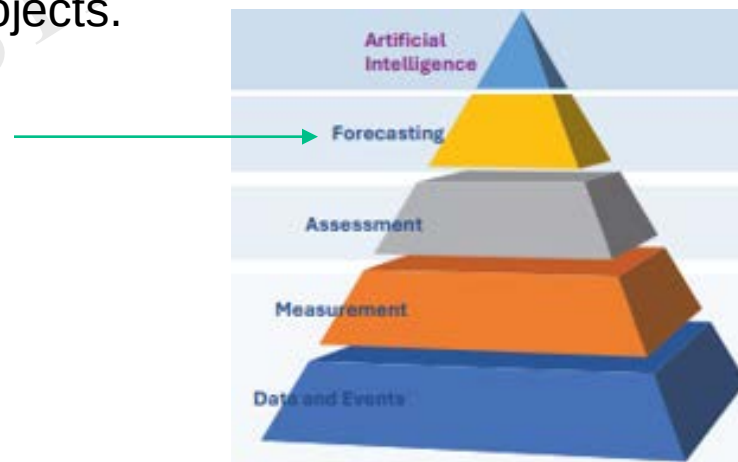


Layers and their contributions to decision making

❑ Third, strategic decisions

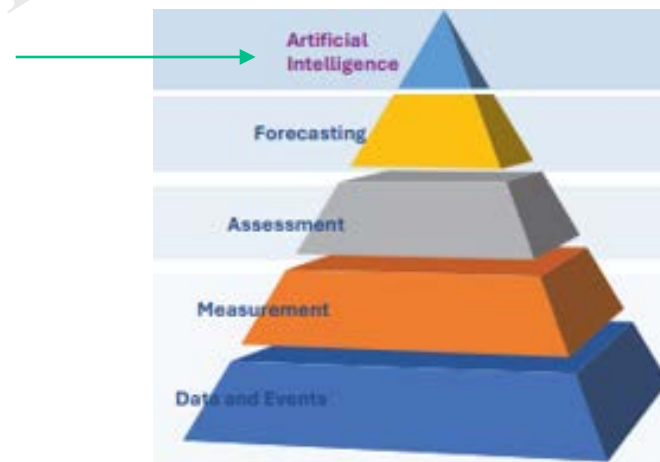
aim to

1. **predict** performance and
 2. **correctly steer** project performance and portfolio management.
- ❖ **Forecasting metrics** such as Variance at Completion (VAC) or Estimate at Completion (EAC) feed strategic decisions on behalf of the project or portfolio of projects.



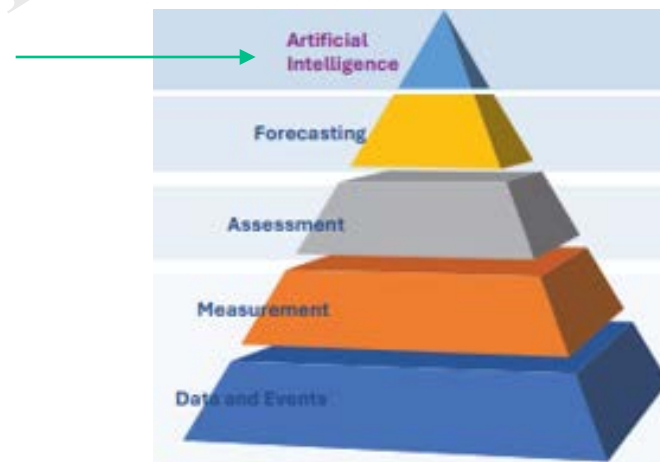
Layers and their contributions to decision making

- ❑ The **top** of the hierarchy, the **AI layer**, is useful if all other layers are engaged.
- ❖ The **AI layer** represents the possibility to **leverage advanced analytics** and **intelligent mechanisms** of reasoning and problem-solving.
 - ✓ *For instance, **scenario planning** and **resource optimization** through benchmarking, **what-if scenarios**, or **digital twins** are examples of reasoning and problem-solving applications.*



Layers and their contributions to decision making

- ❑ The **AI layer** also could **contribute** to streamlining virtually every project control task or process.
- ❖ *For example, it has the capability to **enrich data management with metadata extraction and knowledge representation**.*



Layers and their contributions to decision making

❑ **AI** also could build **semantic** search engines for

1. effective data querying,
2. leverage large language models for database interactions, or
3. automate data quality and validation.

*In another example, AI could perform **tedious tasks** such as cost and schedule **maintenance**.*

Potential high-value AI applications for project controls are discussed
in last section of this course.

**Definition of each information layers
will be provided in next sessions.**

Research Methodology

Introduction

- ❑ A review of the literature on project controls, human factors, and advanced technologies and commercial technology products provided the theoretical foundation for this study.
- ❑ RT-402 members also gained insights into state-of-the-art project controls by engaging with subject matters experts (SMEs) from various domains that informed the research process on construction technologies, information management, AI, business analytics, and advanced control functions at owner and contractor organizations.
- ❑ These experts provided firsthand knowledge and real-world examples.
- ❑ In addition, team members were exposed to real-time control experts from semiconductor manufacturing and software development.

Introduction

- Different data collection and analysis techniques were used to generate the information and resources in this project. Table 1 lists the methods and resources.

Table 1. Methods and Resources

Resource	Publication	Method
Prioritization of real-time information	Chapter 4 & Appendices I & II	Delphi Panel
Real-time automation of project controls processes	Chapter 5	Surveys and workshops
Technology domains, catalogue of technologies, and technology readiness assessment (*)	Chapters 6 to 8 & Appendix III	Literature review, state-of-the-art practices, surveys, and workshops
AI data requirements	Chapter 9	Literature review, and SMEs' input
High-value AI application	Chapter 9 & Appendix IV	Brainstorming techniques
Project Controls Readiness Checklist Tool	Implementation Resource	SMEs' input and workshops
Work Environment Assessment Rating Tool (**)	Implementation Resource	SMEs' input and workshops
Technology Practices Maturity Rating Tool	Implementation Resource	Case studies & workshops

(*) Technology readiness assessment was modified from the original definition by NASA and its adaptation by RT382

(**) Work environment factors were adopted from the Integrated Project/Program Management (IP2M) Maturity and Environment Total Risk Rating (METRR) study at Arizona State University

Research methods details

- ☐ The Implementation Resource contains the tools that are summarized later in this report.
- ☐ The following paragraphs describe the methods used to generate each tool.

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Research methods details

1. Work Environment Assessment Rating Tool.

The definitions of this tool's 27 work setting factors were adapted from the Integrated Project/Program Management Maturity and Environment Total Risk Rating (IP2M METRR) Tool, part of a research effort by Arizona State University and the Department of Energy.

RT-402's members decided to adapt its work environment aspect, which were developed with the insights and comments of nearly 450 SMEs in project management and controls.

RT-402 members revised and commented on the definition of each factor based on the information and findings generated through the study.

Research methods details

2. Project Controls Readiness Checklist Tool.

This tool resulted from RT-402's research based on its observation that neither CII's knowledge base nor its body of knowledge offers guidance on how to assess the maturity of a project controls function.

The checklist tool contains 40 elements grouped by basis of decision, basis of design, and execution approach.

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Research methods details

3. Technology Practices Maturity Rating Tool.

RT-402 members developed an interview protocol with 20 questions on advanced controls and key aspects such as data collection, technologies, automated analytics, key performance indicators (KPIs), reporting, and benefits and barriers.

The interview protocol was adapted for cases outside construction.

Since the interview protocol enabled the team to identify the coding of common traits and trends from multiple perspectives, it facilitated the validation of the strategies the team gleaned from the interview data.

Research methods details

- ☐ The **APC function** is expected to **substantially** evolve further in the coming years.
- ☐ Nonetheless, the **proposed set of practices** informs the foundational aspects required to realize technology-driven project controls.

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State of project controls practice: batch mode, delays, and fragmentation

- ❑ RT-402 **assessed** the current state of project controls through an online survey instrument.
- ❑ The survey **investigated** different project controls and technology aspects.
- ❑ Results indicate that the **industry is still** primarily reporting project controls information in “**batch mode**,”
where cost and schedule status are reported weekly, bi-weekly, or monthly.
- ❑ In such traditional project controls, SMEs expressed **spending 80 percent** of their time **manipulating data** instead of analyzing information.

State of project controls practice: batch mode, delays, and fragmentation

- ❑ Certain project delivery functions, particularly those with a high potential for project impact, are controlled at higher frequencies.
- ❑ For instance, quality inspection and test results are often reported within 24 hours, although their average reporting frequency is seven days.
- ❑ Experts emphasized that failing to promptly address a non-satisfactory inspection or test has a significant negative impact on craft labor productivity and worker morale, which are both associated with rework.
- ❑ The longer the delay in reporting failed inspections or test results, the greater the impact on the project.

State of project controls practice: batch mode, delays, and fragmentation

- ❑ **Appendix V** contains the **reporting frequencies** to the project manager and ultimate authority by control function and project phase.

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State of project controls practice: batch mode, delays, and fragmentation

- ❑ It should be noted that the **project controls reporting frequencies** obtained at the time of the RT-402 research are similar to those obtained 10 years earlier in earlier CII research.

See the comparison in Figure 2.

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State of project controls practice: batch mode, delays, and fragmentation



Figure 2. Comparison of median reporting frequencies

State of project controls practice: batch mode, delays, and fragmentation

- ❑ Such a lack of improvement over a decade highlights the **persistent reliance** on batch reporting **despite** significant advancements in information and sensing technologies.

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State of project controls practice: batch mode, delays, and fragmentation

- ❑ On average, the survey identified **four or more different reporting levels**.
- ❖ This **multi-stage reporting** process makes information outdated at each reporting cycle.
 - ✓ During the research, RT-402 members observed instances **where upper management decisions** were often based on information that was **90 days old**.

*Currently, Information is **not generated continuously** but is instead **sequentially***

*aggregated,
analyzed, and
reported*

in batches.

State of project controls practice: batch mode, delays, and fragmentation

- ❑ A **prevalent fragmentation** of technology use characterizes the construction industry, with many of the **reported software products** lacking the ability to interoperate with other products and tools.
- ❑ An **apparent absence** of **information integration** still **hampers** project controls efforts and the efficient and swift reporting of project status.
- ❑ Practitioners report **spending 80 percent** of their time gathering, aggregating, and comparing data.

State of project controls practice: batch mode, delays, and fragmentation

- ❑ **Spreadsheets** are still commonly used to facilitate communication, analysis, and information processing.
- ❑ **Existing interfaces** in commercial tools are **rare**, with most respondents reporting the **integration** of **only two functions**, typically cost and scheduling.
- ❑ Managing, storing, and analyzing information is characterized by using multiple, non-interoperable systems and tools.
- ❑ A **limited number** of vendors dominate the markets for **Building Information Modeling (BIM)** and scheduling, but **many software tools** are used for other functions (**see Table 2**).
- ❑ **While all** the projects surveyed by RT-402 **used BIM** for planning and visualization, **none leveraged BIM for project controls purposes**.

State of project controls practice: batch mode, delays, and fragmentation

Table 2. Number of Tools Used (n=23)

Building Information Modeling	3
Enterprise Resource Planning	6
Scheduling	2
Cost Estimating	8
Accounting	8
Change Management	8
Progress Tracking	10
Procurement	7

Instantaneous data and information

- ❑ While a real-time feed of data and reading of information has been long considered the practical underpinning for improved project performance, the **reality is that until recently this was not possible or, at least, sustainable.**

For example, shutdown and renovation projects have had to invest significant human resources to collect field data and generate hourly or daily schedule updates. Such an approach would become cost-prohibitive in mega projects that extend multiple years and generate large amounts of data from every project phase. The integration of project controls data alone, however, has been shown to improve field productivity by 45 percent and reduce costs by 21 percent.

Instantaneous data and information

- ❑ **Technological developments** not only open the opportunity for seamless integration and sharing of data and information but can enable the automation of processes.
- ❑ The **volume** of data generated on behalf of a specific project is larger than ever before.
- ❑ The ever-increasing wealth of project data opens the opportunity for **forwardlooking approaches** to controlling a project.
- ❑ **AI and machine learning algorithms** can parse vast datasets to find hidden trends or to generate recommendations for engineers, procurement experts, field supervisors, project managers, and corporate managers.

Case studies

- ❑ **Open-ended interviews** by RT-402 documented **14 case studies** with **technology-driven control functions**.
- ❑ **Table 3** provides the sector, role, and functions/frequencies involved in the diverse case studies.
- ❑ The **studies included construction projects** across multiple sectors, both from **CII member and non-CII member companies**, instances of real-time and advanced controls in other industries, and technology providers.

Case studies

Table 3. Case Studies

	Sector	Role	Functions & Frequencies
1	Power	Owner	Daily progress & actuals; weekly schedule & cost analyses
2	Infrastructure	Contractor	Daily progress & production; weekly schedule & cost analyses
3	Oil and gas	Owner	Real-time and daily field updates; weekly reporting across functions with daily analyses based on criticality
4	Oil and gas	Contractor	Daily production, resources, and productivity; weekly schedule & cost analyses
5	Infrastructure	Contractor	Daily production, resources, and productivity; weekly schedule & cost analyses
6	Infrastructure	Contractor	Daily procurement reporting with schedule updating; daily field production, resources, and productivity; weekly schedule & cost analyses
7	Oil and gas	Contractor	Daily upstream fabrication updates; hourly to daily field production and work hours; weekly schedule & cost analyses
8	Oil and gas	Service Provider	Automated collection of actuals/quantities (with reality capture); automated payments & blockchain records
9	Oil and gas	Contractor	Daily field reporting moving with instant monitoring of critical and near-critical paths and instant safety alerts; weekly reporting of engineering, procurement, and construction; prescriptive strategic recommendations with AI support, for example on new contractors or fabrication vendors and locations. Comprehensive digitization effort.
10	Software engineering	Information Systems within Owner Company	Daily software project updates
11	Oil and gas	Owner	Percent completed on field tasks hourly; daily cost, schedule, performance metrics, productivity, and indirect ratios
12	Infrastructure	Contractor	Real-time equipment monitoring with daily field progress
13	Oil and gas	Contractor	Daily fabrication updates; real-time field progress
14	Semiconductor	Consultant	Real-time monitoring of semiconductor production variance and corresponding controls

Reporting Frequencies



Reporting frequencies (2024)

□ Appendix V

Prepared by Dr. Alavipour
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Research team 402

Research Team 402

Samer Alsharif, DTE Energy
Nathan Buehler, Oracle USA, Inc.
Emanuelle Coelho, Alvarez & Marsal
Cindy Gonzales, AdvanSix
Rodolfo Gonzalez, Occidental Petroleum Corporation (Chair)
Daniel Goldsmith, U.S. Department of Energy
David Grau, Arizona State University (Principal Investigator)*
Alex Koeberlein, Southern Company
William (Bill) Knowles, New York Power Authority
Joshua Lavers, Black & Veatch
Francois Lombard, Technip Energies, Inc.
Jake Machnik, Matrix Service Company
Eric Matthews, U.S. Department of State
Neerav Mehta, Larsen & Toubro Limited
Daniel Mehrabi Moezabadi, Arizona State University (PhD Candidate)*
Brian Petty, Hargrove Engineers + Constructors (Co-Chair)
Norberto Pazos, Techint Engineering & Construction
Erik Teagarden, Fluor Corporation
Flobert Tiam, INEOS Olefins & Polymers USA
Glen Watson, ExxonMobil

Past Members

Rana Alkadi, Hargrove Engineers + Constructors
Bryan Benbow, ExxonMobil Corporation
Mark Christopher, Pathfinder, LLC
Michael Culotta, Fluor Corporation
Kira Darroch, Ontario Power Generation
Deidra Garrett, Southern Company
Jim Johnson, Entergy Corporation
Eric Vyskocil, Ontario Power Generation
Kurt Winkel, Marathon Petroleum Corporation

* Principal authors

Editor: Thomas R. Haggard

موسسه مهندسی و مدیریت ساخت علوی پور (ACEMI)

دفتر آموزش



تهران، بلوار فردوس شرق، مجتمع آبگینه، طبقه سوم اداری، واحد C42



+۹۸ ۲۱ ۴۶ ۱۰۰ ۴۴۵



+۹۸ ۲۱ ۴۶ ۱۰۰ ۴۵۰



info@dralavipour.com



www.dralavipour.com



@alavipour_pm



@acemi_social



@alavipour_pm



@IRANACEMI

