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AN INFLEXIONPOINT GUIDE

Are You Flying Blind?

Navigating Complexity in Large-Scale Industrial Construction

A guide for general contractors managing complex OT & automation scope.

Guru Thakkar
Director of Engineering, InflexionPoint

DESIGN ▪ BUILD ▪ MANAGE

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FOREWORD

The Instrument Panel With Gaps

You run one of the tightest operations in construction. Civil, structural, mechanical, electrical — every trade answers to a schedule, a budget, and a safety standard you enforce daily. You know almost to the day when foundations will cure, when steel will top out, when the building will be weathertight.

Then there's the automation and controls scope — the PLCs, the SCADA systems, the building management platforms, the OT network that will run the facility you're building. It's usually the last major system commissioned, the hardest to inspect visually, and the one that is least visible to the construction team until startup and commissioning. It's also, increasingly, the scope most likely to blow up a schedule very late in the game.

That's not a knock on GCs. No one expects a general contractor to be a controls engineer. But on a growing share of projects — life sciences, water and wastewater, data centers, advanced manufacturing — you're flying part of the project on an instrument panel with real gaps in it.

This e-book is about those gaps: where they come from, why they're more common now, and what closing them looks like. We wrote it for GCs who are tired of being surprised by the automation subcontractor at week 42 of a 44-week schedule.

CHAPTER ONE

The Hidden Complexity in Modern Industrial Projects

Twenty years ago, controls scope on most industrial projects was contained. A single integrator wired up a handful of PLCs, commissioned a SCADA screen, and handed over a system that didn't talk to much else. It was a subcontractor line item, not a strategic risk. That world is gone. Three shifts have changed the risk profile of automation and OT scope on every large project you run.

1. Systems Don't Stand Alone Anymore

A modern facility's automation environment is a web of interdependent systems: process control (PLC/SCADA), building management (BMS/BAS), and IT/OT network infrastructure tying it together — often with cybersecurity and remote-access requirements layered on top. A change in one system now routinely affects two or three others. Coordination that used to happen inside one subcontractor's scope now spans several.

2. Regulated Industries Have Raised the Bar

If you're building for life sciences, water/wastewater, or another regulated end user, the automation scope isn't just functional — it's compliance-critical. Requirements like 21 CFR Part 11, GxP documentation standards, NPDES and Safe Drinking Water Act obligations, or IEC 62443 mean the controls subcontractor's paperwork is now part of your owner's regulatory submission. A gap that would've been a minor punch-list item a decade ago can now delay a facility's ability to legally operate.

3. More Vendors, More Interfaces, More Risk

Equipment OEMs, controls integrators, network and cybersecurity vendors, MES specialists — large projects routinely involve four to six specialty firms whose scopes overlap at the edges and whose success depends on each other's timelines. Nobody on that list is contractually responsible for making sure they all add up to a functioning facility. That responsibility, by default, lands on you.

The GC is accountable for a scope of work that no single subcontractor is actually responsible for delivering as a whole.

The result is a structural gap: real complexity, real interdependency, real compliance exposure — and no single accountable party coordinating it, other than the GC holding the overall schedule and budget. An experienced systems integrator can help keep the vendors aligned.

CHAPTER TWO

Five Ways GCs Get Blindsided

The automation and OT scope rarely fails all at once. It fails in small, recurring ways — the same five patterns, project after project. If you've run more than a handful of large industrial jobs, you've likely lived through at least three of these.

1. Schedule Risk From Uncoordinated Commissioning

Commissioning is where every trade's work gets proven out together — and where automation dependencies surface for the first time. Controls can't be fully commissioned until mechanical and electrical are substantially complete; network infrastructure can't be validated until IT and OT vendors agree on architecture; process validation can't start until controls sign off. Left unmanaged, commissioning becomes a scramble in the last few weeks — exactly when there's the least slack to absorb it.

2. Scope Gaps Between "Who Owns What"

Electrical installs the conduit. The controls integrator programs the PLC. The network vendor configures the switches. The BMS contractor handles building automation. Each firm has a clean scope on paper — and each boundary between them is a place something can fall through. Who owns the network cabinet the PLC lives in? Who's responsible when the BMS point list doesn't match what controls delivered? These are the actual content of most RFIs landing on a GC's desk in month nine.

3. RFI and Change-Order Churn

Automation documentation — point lists, I/O schedules, network diagrams, sequence-of-operations narratives — is dense, technical, and easy to get subtly out of sync across vendors. A revision the controls integrator makes but the BMS contractor doesn't reflect won't surface until someone tries to commission against it. By then, it's an RFI, and often a change order. Multiply that across a half-dozen vendors, and this becomes one of the most persistent, least visible sources of cost and schedule erosion on the job.

4. Commissioning Surprises Discovered Too Late to Fix Cheaply

The cost of a gap rises steeply the later it's found. A sequence-of-operations mismatch caught at design review costs a redline. Caught at commissioning, it costs rework and schedule float you don't have. Found after owner turnover, it costs a warranty callback and a damaged relationship. Automation systems are the hardest scope to visually inspect during construction — making them disproportionately likely to be the ones where the gap isn't found until it's expensive.

5. Owner Dissatisfaction at Turnover

This is the pattern that hurts most, because it happens after everything else went right. Every trade finished. Every inspection passed. The building is substantially complete — and the owner's operations team still can't run the facility the way they expected, because the systems meant to tie everything together were validated individually, not as one system. "Done" and "operational" turn out to be two different things, and the GC is standing in the room when the owner notices.

A FAMILIAR SEQUENCE

Week 30	Controls integrator requests network specs. The IT/OT vendor hasn't finalized them.
Week 36	A BMS point-list revision doesn't reach the controls team. Nobody catches it until commissioning.
Week 41	Commissioning reveals three systems weren't validated against each other. An RFI becomes a change order.
Week 44	Substantial completion. The owner's ops team finds the SCADA dashboard doesn't reflect the BMS as-built.

None of this happens because a subcontractor did bad work. It happens because no one owned the seams between good work.

CHAPTER THREE

Why This Isn't a "More Meetings" Problem

The instinctive response to Chapter Two's patterns is more oversight: another coordination meeting, another status report, another point person tasked with "keeping an eye on" the automation scope. It rarely works.

More meetings add visibility that a problem exists. They don't add the technical depth to catch it before it becomes one. A weekly call surfaces that the BMS point list and the controls point list don't match; it doesn't reconcile them. That takes someone who understands both systems well enough to do the work — not just report on its status.

The Real Issue: No Single Accountable Party for a Fully Integrated System

Every vendor on the automation scope owns their own deliverable. None owns the automation environment as a whole — the thing the owner actually has to operate on day one. That's not a communication gap. It's structural: the scope tying five vendors together doesn't belong to any of the five.

A GC's core discipline — project controls, schedule integration, single point of accountability — is exactly the right instinct. The problem is most GCs shouldn't need to build the deep OT expertise required to apply that discipline here. It takes someone who can read a sequence-of-operations narrative, understand a network architecture diagram, and know what "done" actually means for a validated, compliant OT environment.

What's missing isn't effort. It's a single partner who owns the automation scope as an outcome — not a deliverable.

That distinction — owning an outcome versus completing a deliverable — is the difference between a typical automation subcontractor and what we at InflexionPoint call an **Operating Partner**.

CHAPTER FOUR

The InflexionPoint Model: Design · Build · Manage

InflexionPoint works with general contractors and owners as an Operating Partner for OT and automation scope — not a subcontractor who exits at substantial completion, but a partner who takes lifecycle ownership from concept through years of operation. The model runs on three connected phases.

1 Design

IxP believes in getting the design right up front; the ripple effect of a seemingly trivial change later in the project can be far worse than it looks on the surface. Before a single conduit is run, IxP works through the automation basis of design and architecture end to end — process control, MES/MOM, BMS/BAS, and IT/OT network — as one coordinated system, not independent vendor scopes. Interfaces, cybersecurity architecture, and compliance requirements (IEC 62443, GxP, CSV, and similar) are addressed at the design table, where changes are cheap — not at commissioning, where they're expensive.

2 Build

During construction, IxP delivers and coordinates the automation and controls scope with the same project-discipline rigor a GC applies to every other trade — integrated into your master schedule, not running on a parallel timeline that surfaces conflicts only when it's too late to absorb them.

3 Manage

This phase changes the incentive structure entirely. IxP doesn't disappear at substantial completion. Post-go-live, IxP can provide remote monitoring, cybersecurity management, and continuous improvement of the systems it helped design and build. The same organization that commissions the system is accountable for how it performs afterward — so it has every incentive to get the handoff right, because it can't walk away from the consequences if it doesn't.

When the team that commissions your systems is also the team accountable for running them, "close enough" stops being good enough.

For a general contractor, this means one accountable point of contact for a scope that used to be split across four or five vendors, integrated into your existing project controls rather than running alongside them.

CHAPTER FIVE

The IxP Project Management Organization

The mechanism that makes Design · Build · Manage work in practice is IxP's Project Management Organization, or PMO — a dedicated coordination structure sitting over the entire automation and OT scope of a project.

What the PMO Actually Does

- Serves as a single point of contact across all automation-related vendors, so questions get one answer instead of four conflicting ones.
- Integrates automation milestones directly into the GC's master schedule, rather than reconciling conflicts after the fact.
- Proactively flags cross-vendor risks — a documentation mismatch, a slipping dependency — while there's still time and budget to fix them. Risks are managed, not just tracked.
- Owns commissioning coordination across systems, so validation happens against the facility as a whole — not one vendor's scope at a time.

How It Plugs Into Your Existing Process

The PMO is a translation layer, not a parallel process. It doesn't ask your project controls team to adopt a new system or attend new standalone meetings. It takes the technical detail of the automation scope and expresses it in the same schedule and reporting language your team already uses — so automation milestones show up on your master schedule the same way structural steel or MEP milestones do.

That's deliberate. A GC doesn't need another silo to manage. It needs the automation scope to stop being a black box and start behaving like every other trade: visible, scheduled, accountable.

CHAPTER SIX

What Clear, Consistent Communication Looks Like

"Better communication" is easy to promise and hard to define. Here's what it concretely looks like on an IxP-managed automation scope, compared to the default most GCs experience today.

A Familiar RFI Cycle, Without an Experienced Integrator Involved

A controls engineer notices the BMS point list doesn't match the network architecture diagram. No one owns reconciling the two, so it becomes an RFI addressed to the GC. The GC routes it to electrical, who routes it to the BMS vendor, who needs input from controls, who needs to check with the network vendor. Two weeks pass. The answer comes back as a change order, because work proceeded on an assumption that turned out wrong.

The Same Situation, With InflexionPoint

InflexionPoint maintains a coordinated set of design deliverables that serve as a single source of truth, so the mismatch is caught during a routine cross-check — before it ever becomes an RFI. When GC input is needed, it arrives as a single, resolved recommendation from one point of contact, with the cross-vendor coordination already done. The GC makes an informed decision instead of running a message relay.

A Standard, Predictable Reporting Cadence

GCs consistently tell us the hardest part of managing automation scope is not knowing what they don't know until it's a crisis. The PMO addresses this with a standing reporting rhythm: regular integrated status updates against the master schedule, clear escalation paths when a cross-vendor risk surfaces, and documentation that's audit-ready rather than assembled retroactively at turnover.

This cadence isn't about generating more paperwork. It's the opposite: fewer surprises, because risks that used to surface in week 41 are now visible in week 15 — while there's still time to act.

The measure of good communication isn't how many updates you receive. It's how few surprises you have left by substantial completion.

CHAPTER SEVEN

What This Means for Your Next Project

Self-Assessment: Is Your Automation Scope Flying Blind?

Ask these questions about your current or next large-scale project.

- [ ] Can you name, right now, the single person accountable for the automation scope working as one system — not just each vendor's deliverable?
- [ ] Are automation milestones integrated into your master schedule, or tracked separately by each vendor?
- [ ] If two automation vendors' documentation conflicted today, would you find out before commissioning — or during it?
- [ ] Does your compliance documentation (IEC 62443, GxP, CSV, NPDES, or similar) get assembled continuously, or reconstructed at the end?
- [ ] Has an owner ever told you a system was "done" but not truly operational at turnover?

If you answered "no," "separately," "during it," or "yes" to more than one, your automation scope is exposed the same ways described in Chapter Two.

Bring the Partner in Early

Timing is the single biggest factor in how much an Operating Partner can help. Brought in at design, IxP can shape the automation architecture, vendor scopes, and schedule integration before a dollar is committed to a design that will need reworking. Brought in during construction, IxP can still bring order to a fragmented vendor landscape and get ahead of commissioning risk. Brought in during a recovery situation — after a commissioning failure or schedule crisis — IxP can still help, but the options are narrower and the cost of gaps already found is already sunk.

The pattern holds across every project type: the earlier the automation scope is treated as one coordinated system with a single accountable owner, the less it costs to get right — and the fewer surprises land on your desk in the final ninety days.

CLOSING

Let's Look at Your Next Project Together

You don't need to solve the automation and OT scope on your own, and you shouldn't have to build deep controls and compliance expertise in-house to manage it well. That's the gap InflexionPoint exists to close — as a Design · Build · Manage Operating Partner who takes real accountability for the scope, backed by a Project Management Organization built to give general contractors the same visibility and discipline on automation that you already bring to every other trade on the job.

If you have a project in design, in the field, or heading toward commissioning, we'd welcome the chance to look at it with you — and show you specifically where the automation scope stands today, and where the gaps are likely to surface.

LET'S TALK ABOUT YOUR NEXT PROJECT

Turn your automation scope into your most predictable trade.

Reach out to start a conversation about your current or upcoming project.

InflexionPoint | Your Operating Partner | **Design · Build · Manage**

APPENDIX

Glossary of Terms

Automation and OT vendors will use a lot of shorthand on your project that isn't part of a general contractor's everyday vocabulary. This glossary isn't exhaustive — it's a quick reference for the terms most likely to show up in RFIs, submittals, and vendor documentation on a life sciences, water/wastewater, or data center project.

OT

Operational Technology — the hardware and software that directly monitors and controls physical equipment and processes (as distinct from IT, which manages business data and networks).

IT/OT

Shorthand for the intersection of information technology and operational technology networks — an increasingly critical, and increasingly regulated, integration point on modern projects.

PLC

Programmable Logic Controller — the industrial computer that directly controls equipment on the plant floor (motors, valves, pumps, sensors).

SCADA

Supervisory Control and Data Acquisition — the software layer that lets operators monitor and control PLCs and field equipment from a central screen or control room.

MES / MOM

Manufacturing Execution System / Manufacturing Operations Management — software that sits above SCADA, managing production scheduling, quality, and traceability on the plant floor.

BMS / BAS

Building Management System / Building Automation System — the platform controlling HVAC, lighting, and other building infrastructure (distinct from process control systems, though often required to interface with them).

Point List

The master document listing every input and output signal (sensors, switches, valves, alarms) in an automation system — the reference vendors use to confirm every device is wired, programmed, and accounted for.

Sequence of Operations (SOO)

The narrative document describing exactly how a system is supposed to behave — what triggers what, in what order, under what conditions. The basis against which controls programming is written and commissioning is tested.

Commissioning

The process of testing and verifying that installed systems perform as designed, individually and together, before being turned over to the owner for operation.

IEC 62443

The leading international standard for industrial automation and control systems (IACS) cybersecurity — increasingly referenced in OT network design and vendor contracts.

GxP

A general abbreviation for "Good ___ Practice" regulations (Good Manufacturing Practice, Good Laboratory Practice, and similar) that govern regulated industries such as pharmaceuticals and life sciences.

21 CFR Part 11

The FDA regulation governing electronic records and electronic signatures — directly relevant to how automation and data systems must be validated and documented on life sciences projects.

CSV

Computer System Validation — the documented process of proving that a computerized system (often a MES, SCADA, or data historian) consistently does what it's supposed to do, required in regulated life sciences environments.

IQ / OQ

Installation Qualification / Operational Qualification — the formal, documented steps in a validation process confirming a system is installed correctly (IQ) and operates correctly (OQ) before it's approved for use.

NPDES

National Pollutant Discharge Elimination System — the EPA permitting program governing wastewater discharge, frequently referenced in water/wastewater automation and reporting requirements.

RFI

Request for Information — in this context, most commonly triggered when documentation across automation vendors doesn't reconcile, or a scope boundary is unclear.

Operating Partner

InflexionPoint's term for a lifecycle-ownership relationship with a project's automation and OT systems — spanning Design, Build, and Manage phases — as distinct from a traditional subcontractor whose responsibility ends at substantial completion.

PMO (Project Management Organization)

InflexionPoint's dedicated coordination structure overseeing the full automation and OT scope of a project — serving as a single point of contact, maintaining a single source of truth across vendors, and integrating automation milestones into the GC's master schedule.