

Basics of Collaborative Construction & the Aligned Construction Enterprise (ACE) Handbook

Productivity Alberta's Guide to

What you need to know about the Future Model of Construction

BY ROBERT PORTER LYNCH,

ACKNOWLEDGEMENTS: George Jergeas, with Lori Schmidt, Allison Byrne, et al(PA please revise and update as needed)

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(Note to Productivity Alberta: please update and revise as needed.)

The Productivity Alberta Team

This book is a collective effort joining the wisdom of many into one short book.

The Alberta Team of contributors:

Robert Porter Lynch

George Jergeas

Lori Schmidt

Allison Byrne

Insert Names needed

Gary Loblick, Bob Overton

Association of Strategic Alliance Professionals, Etc.....

Thanks to the Australian Alliance Team

Richard Morwood.....

Deborah Scott

Ian Pitcher

To the Reader

This is Book One, the first in a series about Collaborative Construction. It is a “handbook” designed to provide you with the Basics for Collaborative Construction and introduction to the Aligned Construction Enterprise (ACE). We have provided a primer to introduce you to the underpinnings of the key frameworks, critical mindsets, and compelling rationale for creating a bold and more sustainable future for the construction industry. .

The first part of this book describes the power of Collaborative Construction as the best way to create productivity and competitive advantage in the future.

The second part of this book is written from the perspective of the team implementing large and Mega-projects. This section also aims to give ideas and inspiration to those owners contractors, architects, engineers, and supply chain managers working in small to medium sized projects, as many of the key principles of success are just as applicable when geared down to a smaller scale. Anyone seeking to implement collaborative methods and technologies such as Integrated Project Delivery (IPD), Lean Construction, and Building Image Modeling will find this section filled with ideas and advice that will make all forms of collaboration more effective.

We all believe the ideas you read in these pages will strike you as being good business and common sense.

If you have any comments, or want to join our team, or need our assistance, please contact us.

Sincerely, Lori Schmidt

PART ONE: COLLABORATIVE CONSTRUCTION – THE FUTURE OF THE INDUSTRY

If you speak to many seasoned veterans of the construction industry, they will say that, over the years, the industry has become less productive, less built on good personal relationships that enable good communications and problem solving, more transactional (in other words, don't pick up the phone, just send an email), contracts have double, tripled, and then quadrupled in size, and the experience is less enjoyable

Some shrug this off saying, after all, "It's dog-eat-dog world out there;" or this is just an example of a survival of the fittest – when the going gets tough, the tough get going." (after all isn't this what Darwin said?)

Many have asked, "Is there a better way?" The answer is yes, but it takes a shift in thinking and some new skills to make it work. The cooperative approach goes under a variety of names, such as *partnering*, *alliancing*, and *integrated project delivery*.

In this series of books, we have taken the best principles, best processes, and best practices from highly successful collaborative approaches toward construction, and unified them into a highly effective, systematic 'best of breed' methodology.

A. CONSTRUCTION AT THE CROSS ROADS

Construction has a major impact on the Albertan economy. Many leaders in the construction industry are facing the stressful situation where they cannot keep up with the demand, cannot find enough good employees as the older generation retires, and find the experience of bidding and building is becoming ever-more complex, conflictive, and legalistic. Simply put, the business is filled with more headaches and less productive effort.

Lack of Productivity Growth

In fact the statistics bear this out. In the last fifty years, according to analysts, productivity in the *construction industry declined* has actually declined (see Figure 1: Decline in Productivity By contrast, the productivity rate within *the manufacturing & industrial* market sectors has *more than doubled*).

This decline is despite all the improved equipment, tools, computers, and new technologies used in planning, design, and actual construction.

While it is easy to blame government for more rules and regulations, the realities are more subtle. Many attribute this decline to the introduction of layers of Non-Value Added (NVA) work from excessive accumulation of transactional and adversarial protection mechanisms over the years.

To use one example, think of the size and language of a legal contract forty years ago. Today to build the same structure will require a mountain of legal paperwork. And worse, the Draconian terms and conditions are onerous. All too often lowest price governs the buying decision,

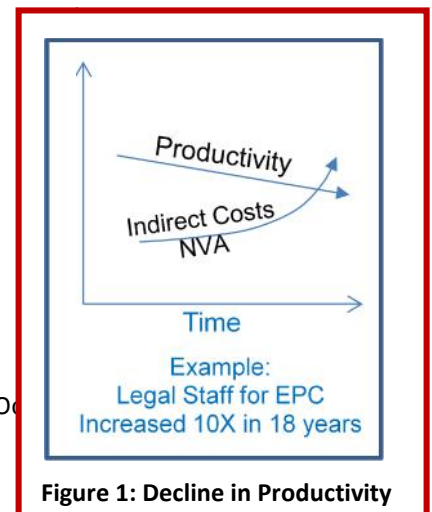


Figure 1: Decline in Productivity

completely overlooking factors such as reputation with government agencies, trustworthiness, reliability, teamwork, cooperative relations with subcontractors, or employee training.

Many contractors complain that the style of bargaining at the negotiations table before the issuance of a contract is designed to strip all profit from their effort. Being treated as a vendor, not a partner is demeaning as well. Many contractors know the only way to make money is to get even when a change order is issued.

Litigation, arbitration, and liquidated damages, once something hardly seen years ago is now the norm. One contractor of a medium sized commercial construction company allocates \$12 million a year just to their legal staff, and fully expects to engage in litigation at the end of most projects. Another Engineering, Procurement, and Construction (EPC) company complained their legal staff increased ten-fold in the last eighteen years to accomplish the same amount of work.

These and a multitude of other “frictional costs” act like sludge and grime in an engine, slowing everything down and creating lots of wear and tear on all the moving parts.

Add to this the fact that as projects get bigger, they become more complex and riskier. Managing a large-scale project, such as an oil sands development is a major challenge. Although success is the goal of all project stakeholders, it has been difficult to achieve; 50-100% overruns in budget and time are the norm. This is no small matter. On a major multi-billion dollar oil sands project, the all-in cost can run as high as \$10 to \$30 million per day (think \$1 million/hour).

Success/effectiveness in delivering capital projects and the extent of learning from experience are becoming a major challenge today. Literature is flowing with documents and papers about repeated global cost overruns and delay in the major project environment. The impact of consistently running over-time and over-budget means that investment dollars are already fleeing Alberta and seeking safer havens in other more efficient areas of the world.

The stark truth is: If we continue on this trajectory, the predicament will only get worse.

As a leader or manager in the industry, you are undoubtedly wondering, “Is there a way to fix this mess? Does anyone have a better way?”

We are happy to say, “Yes, there is a better way – a way that will create a strong competitive advantage for your company, while at the same time delivering a quality product that is either cost effective or on-time and on-budget.”

And better, by adopting these new approaches, Albertan construction companies can develop a competitive advantage that will not only sustain growth in the region, but can be exported to other areas of North America and the world.

But to understand the new approach, it’s worthwhile to step back and look at the big picture – the forces and dynamics that are operational in the industry.

Three Competing Options for Project Delivery

Over the years, new thinking has intervened to try to bring more value to shareholders and to avoid “leaving anything on the table” in negotiations. Legalistic thinking has been associated with avoiding liabilities and risk management has advocated more shedding of risk, holding contractors responsible for carrying higher risks, with fewer rewards as compensation.

Part One: Basics of Collaborative Construction

This has spawned three different belief systems and supporting methods that are causing fragmentation and misalignment of the construction industry. These three frameworks are actually driving competing project delivery models or systems, each quite different, each founded on different beliefs and philosophies (Table 1 following illustrates the three distinctly different models of project delivery and provides further details of its characteristics.):

Adversarial, Transactional, and Collaborative

Part One: Basics of Collaborative Construction

Table 1: Spectrum of Three Competing Models of Project Delivery & Their Characteristics

	Adversarial	Transactional	Collaborative
Key Beliefs	Business a "Psychological War Game;" Winning comes from Power	Trading, Bargaining, & Differential Views on Value Produces Economic Exchange	Extreme people work in teams to Push the Envelope on Performance
Behaviors	Argumentative, Money Rules, Use Age, Experience, Position or Budget to get your way, "dog eat dog"	Squeezing & Positioning enables you to get the best result in Negotiations, throw a bone to sweeten the deal.	Co-Creative, Teamwork, Trustworthiness, Highly Ethical & Honest; Maximize what's in the best interests of the whole
Rules of the Game	Pressure others; Winning is a result of Cunning & Craftiness; Hype your importance; Protect your backside; Don't Trust Others or you will get screwed; Everything is Win – Lose.	Take advantage of every opportunity, Exploit weaknesses; Timing is critical; Perception is everything; Trust but verify; Use lawyers to ensure protection; Everything is in the "deal;"	Create value & competitive advantage by using Teamwork (internally) & Alliances (externally). Close integration between operating units, suppliers & Close attention to customers/client; Strive for Win-Win.
View on Risk Management & Creating "Synergy"	Synergy is an impossible dream, (don't even think about it.). Manage Risk with tough contracts & tougher legal team empowered to litigate	Synergy is derived from High Efficiency and elimination of Non-Value Added Work. Risk Management, insurance, and shedding risk will limit losses.	Synergy is a result of high levels of trust, teamwork, and alignment of goals & values. Use high trust architecture to reduce risk. The biggest risk is failure to adapt & innovate.
Value Proposition	Minimum Required to Close a Sale; Squeeze vendors in supply chain	Competitive Price, Acceptable Quality; transact through supply chains	Performance Excellence thru Value-Networks, Good Price, Speed, Innovation, & more
Framework for Negotiations	Winning is essential for me; I get more if I push, squeeze, and threaten to ensure I leave nothing on the table. I'm stronger if you're weak.	What happens to you is your business. Long term relationships are only the product of me getting what I need/want. Switch suppliers to get best deal.	A Win/Win is essential to create productive long-term relationships to mutually thrive. Use our different needs & perspectives as the source of collaborative innovation.
Competitive Advantage	Gained from Size & Money	Gained from Information & Bargaining	Gained from Value Co-Creation
Information Sharing	Horde Information – It is Power	Contractor responsible for interpretation of information	Share Information to create more new ideas
Trust Level	Distrust, Deception, Aggression, & Manipulation Prevalent	Caveat Emptor (buyer beware) Trust is elusive and unsustainable	Trust is essential to generating a continuous stream of new value

Be sure to update

Part One: Basics of Collaborative Construction

Author's Note: In the Table above we have separated and distinguished the three key themes – adversarial, transactional, and collaborative – in order to provide a better understanding and diagnosis of their impact. In reality these three themes act as interwoven threads in the fabric of the construction industry. The result is often that a project, rather than running straight according to one of the competing themes, instead traps the participants in a cross-fire: the “muddle” of different philosophies, objectives, and ways of management. The end result is misalignment and fragmentation resulting in missed deadlines, budgets, and objectives.

Unfortunately these three are not differentiated in the minds of most business and project leaders in the construction industry.

Each model produces very different results. Each of the three models has a set of advantages and disadvantages, and a right time and place for using them. An adroit leader knows how to mix them together appropriately – but only if they are overt, appropriately positioned, and skillfully implemented.

For example, in dealing with highly unethical people, an *adversarial* approach may be appropriate. The *adversarial* model is positioning the firm to fight, apply win-lose gaming, and with protection and adversarial attitude. But dealing in a prolonged adversarial manner with a critical union or contractor relationship will ultimately end in a lose-lose for both parties; a *collaborative* engagement will ultimately turn far better results.

The *transactional* model is about bargaining, trading, and price-driven exchange. The buyer wants the lowest price possible, and the seller wants the highest price. A business model like eBay or Amazon benefits from an efficient *transactional* system. Issues like innovation are not inherently important in this model. Collaboration with other buyers and sellers is actually discouraged for fear of collusion.

In contradistinction, the *collaborative* model aims at working together, sharing ideas, sharing risk, developing fast innovation, adapting to change, and eliminating any wasted effort. It is best used in complex, long-term projects where the stakes are high and ambiguity or uncertainty is likely to arise during delivery. Teamwork across specialties and disciplines is essential to produce the highest value for the work effort. Trust is the core value that enables the teamwork to execute well and innovation to flow.

Each model has very different beliefs, underpinnings, motives, outcomes, and advocates.

But most importantly the central question is:

“Which of the three models creates the most sustainable competitive advantage to owners/clients as well as to contractors and their subs, measured by ‘On Time, On Budget, On Target’ delivery?”

Answering this question is the central theme of this handbook. Then there is a secondary question:

“Which of the three models is most likely to:

- be adaptable to changing competitive forces and project risks
- enable continuous improvement and innovation
- fully engage its key stakeholders such as contractors and their workforce
- be most productive and reduce non-value added work

- provide better employment security,
- be friendlier to the environment and the community in which it exists?”

The answers to these two questions are fundamental to determining the future pathway of construction, and especially important to Mega Project Delivery.

Let us discuss and assess the three models in more detail.

1. Transactional Project Delivery Model

“Transactional” model is based on an economic belief that everything is a “deal” and lowest price paid with highest return governs decision choices. Fundamentally, *transactional* thinking has a very narrow objective: increase shareholder value and increase profits. It treats those who deliver projects as “vendors.” “Vendoring” is a set of beliefs that drives decisions such as outsourcing to Asia, choosing to pay legal defense costs rather than making a compromise with a supplier, or choosing the lowest price even though a contractor may be deficient in quality, safety and productivity practices that result in cost overruns and project delays..

It’s not that something is “wrong” with this kind of thinking; it’s what’s missing from this thinking that is disturbing; there is:

- No regard for ensuring that the entire project delivery system is aligned in terms of goals, measures of success, integration between delivery specialties, or how rewards will be fairly allocated to ensure everyone is acting together.
- No method to ensure the contractors/employees/ supply chain of a project (who invest their time, commitment, and loyalty) are treated fairly or given any security (such as a favorable rating on the next project) in exchange for their full engagement and successful achievement.
- No support for building high levels of trust, teamwork, or innovation which create the competitive advantage that enables sustained project delivery success.

Because these safeguards are not built into transactional thinking, when difficulties and conflicting objectives arise, all-too-frequently the project begins to breakdown under stress, spinning out of control into an adversarial game that sets the participants against each other.

2. Adversarial Project Delivery Model

The adversarial model’s objective is winning at all costs. Based on self interest, strong-armed bargaining, and strong self-protection, it places barriers between each entity in the value chain. When placed under stress, the lack of trust typically fractures at the interface between organizations,, pitting one against the other, with the strong chance of degenerating into hard-nosed that leaves “bullying” as a last resort. This model, in the extreme, relies on win-lose bargaining and an army of lawyers to shift risks to contractors along with onerous contracts that assure the destruction of joint problem solving and trust-building at the outset.

Adversarial negotiations are typically driven by win-lose bargaining. While logical in theory, win-lose is irrational in the realities of real human interaction, driving those people on the losing end to get even, to form unions, to file grievances, withhold information, fail to cooperate, and hunker down in silos, all the while adding layers of non-value added work to the equation.

Adversarial relationships generate significant after-shocks which manifest as law suits, high employee turnover, customer churn, and projects that consistently run over-time and over-budget.

Productivity is severely jeopardized and innovation grinds to a halt in this model; high concern with self-protection results in defensive, not innovative behavior. When this approach was used in the automotive industry by the Big Three automakers in Detroit (Ford, GM, Chrysler) it literally destroyed the supply base. By 2007, 500 suppliers a year were driven out of business. In the next two years GM and Chrysler went bankrupt, followed by the City of Detroit. Ultimately this is a lose-lose strategy.

The consequence of increased proliferation of transactional and adversarial models in the construction industry is severe – over the last forty years, despite computers, better equipment, and improved materials, productivity has decreased (see **Error! Reference source not found.**)

3. Collaborative Project Delivery Model

The collaborative approach is designed to establish working relationships among the parties through a mutually-developed, formal strategy and operational alignment of conception, commitment, communication, and execution. It attempts to create an environment where trust, teamwork and innovation promote high productivity/efficiency, prevent disputes and conflict, foster a cooperative commitment to everyone's mutual profitability, and facilitate the successful, timely, and cost effective completion of projects. The model typically entails a considerable up-front investment in time and resources to forge a common team identity among participants from different organizations. It also involves the creation of mechanisms designed to sustain and expand collaboration over the course of the project.

Collaborative model sees that the purpose of a project is to deliver in a cost effective manner, on-time, on-budget, on-target competitively, safely, ethically, and sustainably at a fair profit for all.

Project stakeholders include clients, investors, engineering and construction contractors, subcontractors, employees, and suppliers, and larger community in which the project resides. It is the responsibility of management to balance and align these stakeholder interests to ensure that each receives a fair return. Companies that adhere to the Collaborative Construction model see that the foundation of a project is built on sound ethical principles, an adherence to trustworthy behavior, and a deep understanding of the needs and requirements of its stakeholders including contractors and suppliers.

A toxic Conversion -- Impact Adversarial and Transactional Models

When the *adversarial* and *transactional* modes of thinking described in Table 1 are brought to bear in a typical project, the mixture can be toxic as this example illustrates:

The Design-Bid-Build Low-Cost Struggle

Conventional thinking calls for a building project to start with the assumption that the best way to control costs is to engage in low-cost bidding. An Owner starts the Design-Bid-Build process by approaching an Architecture & Engineering firm (Designer) to draw up plans, then present a Request for Proposal (tender offer, etc.) to a series of three or more Contractors to see who comes in at the lowest price. The contract, after some rugged negotiations, is then awarded to the low price bidder, who, hopefully, will finish on time, and meet standards quality to pass codes.

Unfortunately, in the real world, seldom does this process produce its intended result according to plan. Too often 'Design-Bid-Build' turns sour and becomes 'Bid-Bully-Build-Breakdown-Blame.' What

was supposed to be the low cost approach cost more -- sometimes a lot more – and ends in a meltdown.

Here's what so often happens:

- Because price was the initial criteria for choosing the Contractor, and tough, hard-nosed bargaining was used from the outset, relationships start off on the wrong foot, plagued by distrust, poor communications and no teamwork between Owner, A&E, and Contractor.
- The strong-armed negotiations squeezed all the profit out of the project. In turn, to make any small margin on the project, in turn squeezes all the Subcontractors. But the Contractor and Subcontractors knows that poor communications will result in poor exchange of valuable insights between the A&E team and the Contractor/Subcontractors, which will result in a large number of change orders.
- Project managers, never versed in the delicacies of building trust, communications, joint problem solving, and teamwork, rule by the terms of the contract, not by common sense.
- Because control and trust has broken down, the parties hunker down, stop communicating across boundaries, seeking safety in their silos, and hurl accusations.
- o make any money, the contractor uses sub-standard materials wherever they can and hires the cheapest subcontractors.
- The poor communications, lack of coordination, and second-rate contractors cause the project to fall hopelessly behind schedule. Blaming is prevalent, which only gets worse.
- When the change orders are submitted, the Contractor and Subcontractors can now get even by charging an exorbitant fee for the change order. The budget begins to run over too.
- The Owner now feels manipulated, gets angry, screams at the construction crew, blames the Architects and Engineers for poor planning.
- As the project begins to wind down, the Owner is loaded with plenty of complaints, submitting an extensive punch-list of complaints along with harsh words. The Owner withholds final payments, the Subcontractors scream at the Contractor for final payment, forcing the Contractor to sue the Owner and Architect/Engineer, who, in turn counter-sue.
- In the end, the lawyers who drafted the onerous contract in the beginning, double dip by defending their clients in court.

Problems Magnified in Mega-projects

In larger Mega-projects these problems have monstrous impacts.

For example, an Oil Sands project running overtime can cost the Owner \$10-30 million per day in costs and lost production. It becomes worse as size and complexity increases.

The problem of over-runs in Mega-Projects are not limited to Alberta. Consulting firm Ernst & Young in a 2014 report evaluating performance of 365 oil and gas Mega-projects found:ⁱ

The majority of projects are facing delays and/or cost escalations and these overruns are prevalent in all of the segments and geographies:

- **64% of projects are facing cost overruns.**
- **73% of projects are reporting schedule delays.**

- **Completion costs are 59% higher** than initial cost estimates, on average, representing an incremental cost of US\$500 billion, [globally].

Comparing Transactional/Adversarial Approaches against the Collaborative Model

To see how the Transactional and Collaborative models work in real life, see Figure 2: Edmonton & Calgary Exchanges Compared.

The Tale of Two Interchanges

Edmonton's 23rd Avenue intersection with Route 2 on the south side of the city was a bottleneck. 100,000 cars per day tried to maneuver through. It also produced the most accidents in the city. In 2003 the city approved a \$75 million plan to reconstruct the highway. The whole affair was handled transactionally, seeking the lowest bidder once plans had been approved. Five years later, in 2008 the Edmonton Journal reported in a story entitled: **23rd Avenue Interchange 'a Horror Story:'**

City councilors reacted with breathless anger to the city auditor's scathing report on the ballooning cost of the 23rd Avenue interchange, which has tripled to \$231 million since it was approved five years ago.

Poor planning, late design changes and ineffective project management were big factors in driving the cost up. The interchange won't be finished until 2011, five years later than originally expected, partly because of extra time needed to deal with "significant deficiencies" in the concept plan. [The city auditor] reported "based on our review, the application of the concept planning process was not effective in delivering quality outcomes, resulting in rework, delays and higher costs."

The delays added \$86 million to the price tag of a project estimated to be worth \$75 million when councilors approved it in 2003. The other main reasons for the increase are that only two contractors in Alberta's busy construction industry bid on the job, which added \$55 million, and design changes and underestimates, which accounted for a further \$45 million. a junior employee, who was working on getting his professional engineering designation at the time, became project manager of concept planning in 2002 because of staff turnover.

Compare this to Calgary's 37th Street SW Interchange at the Glenmore Trail that used a Collaborative Construction partnering model. The behind the scenes story was told by Calvin McClary of ISL Engineering & Land Services and Andrew Boucher, of CH2M HILL, who collaborated on the development and design:

To address potential conflict with the Province's future Southwest Ring Road, the team responded with a unique design to build a temporary, low-cost interchange: Calgary's first interchange to be fully serviced by roundabouts. With the functional plan approved on April 1, 2010, the consulting and contracting team opted for an Integrated Project Delivery (IPD) model, which allowed for completion of design with constructor input, while early phases of construction proceeded. The project was completed in a record time of five months, with the interchange opening to traffic on September 11, 2010.

To achieve this tight timeline, the IPD model was used to leverage the team's contributions of knowledge and expertise early in the project, allowing all team members to realize their highest potential while expanding the value they provide throughout the project life cycle. Through IPD, owners, designers, and builders can move toward unified models and improved design, construction, and operations processes. Characteristics of IPD include the following: Early Involvement of Participants, Shared Risk and Reward, Multiparty Contract, Collaborative Decision Making, Liability Waivers, and Jointly Developed Goals. The Project had each of these to the extent possible within City procurement policy.

Professor Jergeas, who was consultant to the collaborative team, commented:

The goal was set to bring the interchange from concept to completion in five months, a record time for an interchange in The City of Calgary. The project wascompleted on budget and with excellent safety record.... From the outset, the Engineers had been preparing an Expression of Interest request for the purpose of pre-qualifying three contractors who would then submit unit-price proposals for construction [which] equally weighted price and the proponent's team and plan of execution.

PCL Construction Management, which won the contract, differentiated themselves by specifically addressing up front in detail how each major activity would be accomplished so that, as the design evolved, there was a sound basis for negotiating changes that could not be accommodated within the unit price schedule. It was noted during evaluations that PCL identified nine specific innovations they would bring to the project team for consideration.

Figure 2: Edmonton & Calgary Exchanges Compared

Magnitude and Causes of Over-runs

Our team reviewed numerous analyses done by consulting firms, university engineers, and industry experts to learn what was causing the overruns. We found numerous causes which are outlined in Appendix One, where we have summarized the numerous studies and their findings.

While some of the causes were considered “external” (such as markets in flux, oil prices, political pressures, regulatory challenges, poor infrastructure in the host country and civil/workforce disruptions) the most compelling issues are “internal.”

The problems that can be controlled typically start in the in the Project Development stage, primarily due to adversarial and transactional game plans, and then in turn these difficulties become the unstable foundation upon which the Project Delivery occur, at which point the clashes and collapses occur.

These problems are endemic in the construction industry, and both magnified and amplified in Mega-Projects.

Ironically, many of the root causes are the result of trying to utilize strategies and beliefs that may be effective in simple, small scale, short-term projects, but collapse under the weight of a complex, large scale, long-term interactions.

Ten Key Blockages

In the case of Mega-project planners are caught in a paradigm of thinking – the *transactional/adversarial* mindset that sees everything through the filter of Ten Key Blockages:

Root Cause Analysis of overruns in the oil and gas Mega-projects indicates only a collaborative interaction will give the participants a sporting chance of winning; adversarial and transactional interactions doom the project’s ability to address these ten root causes.

- 1) Compartmentalized planning done in isolation from those who will implement,
- 2) Defensive legalistic protective layers of contracting,
- 3) Price-driven decision-making where cost is the key metric that overrides value,
- 4) Pressure to maximize ROI for owner, while squeezing profit out of the provider chain,
- 5) Treating strategic contractors and suppliers as vendors or adversaries,
- 6) Failing to screen contractors based on collaborative qualities (trust, teamwork, etc.),
- 7) Fragmented/isolated specializations and responsibilities creating a “silo” effect ,
- 8) Risk adversity models that sheds risks to others while actually creating greater risks,
- 9) Blindness to degrading impact of transactional/adversarial behavior on managing complexity.
- 10) Failing to think about, believe in, and use collaborative methodologies with outsiders.

Despite numerous studies and reports, the overruns continue. You might be asking, “Why would intelligent people ‘keep doing the same thing over and over again, expecting a different result?’”

It’s because people have not recognized that escalating the scale, risk, and complexity requires a paradigm shift in delivery systems.

Impact of Scale, Risk and Complexity

The evidence from hundreds of successful complex projects around the world strongly supports the idea that the greater the entangled complexity, size, and risk involved, the more the project management needs to use the collaborative model. (see Figure 3)

Failure to understand how increased Scale, Risk and Complexity dictates a shift from adversarial and transactional thinking is holding back the entire construction industry, and, in particular, the high end industrial Mega-projects.

What works at small scale will not work at large scale. Here's an analogy to illustrate:

WWII produced the fastest, most sophisticated *propeller*-driven aircraft ever created.

But prop-driven planes were not capable of flying at super-sonic speeds; a new "systems design" was needed using *jet* propulsion.

Further, jets were not capable of flying outside the earth's atmosphere; a new "systems design" was needed using *rocket* propulsion.

Using a construction strategy that was designed for small scale, low-complexity projects in large scale, high complexity Mega-projects (see Figure 4) creates massive misalignments.

These misalignments then manifest as symptoms of having "broken parts."

But the solution is not about "fixing broken parts" just as getting an airplane to fly at supersonic speeds was not about designing more powerful piston engines driving bigger propellers with more blades.

Its starts with a shift in mindsets, which can first come from a better understanding of the

Collaborative Construction & Aligned Construction Enterprises

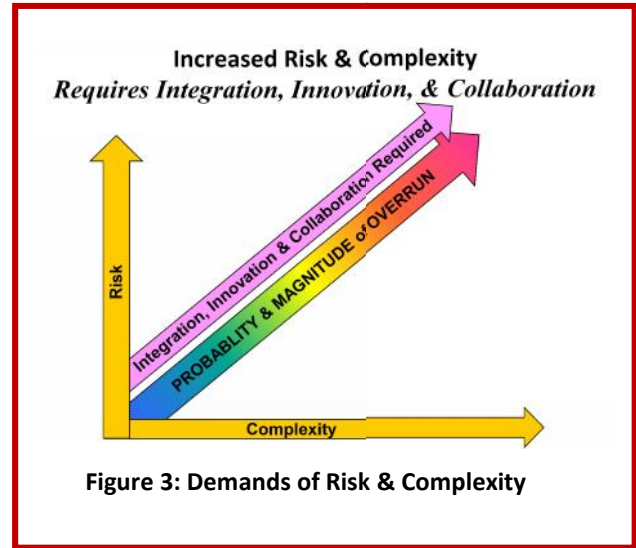


Figure 3: Demands of Risk & Complexity

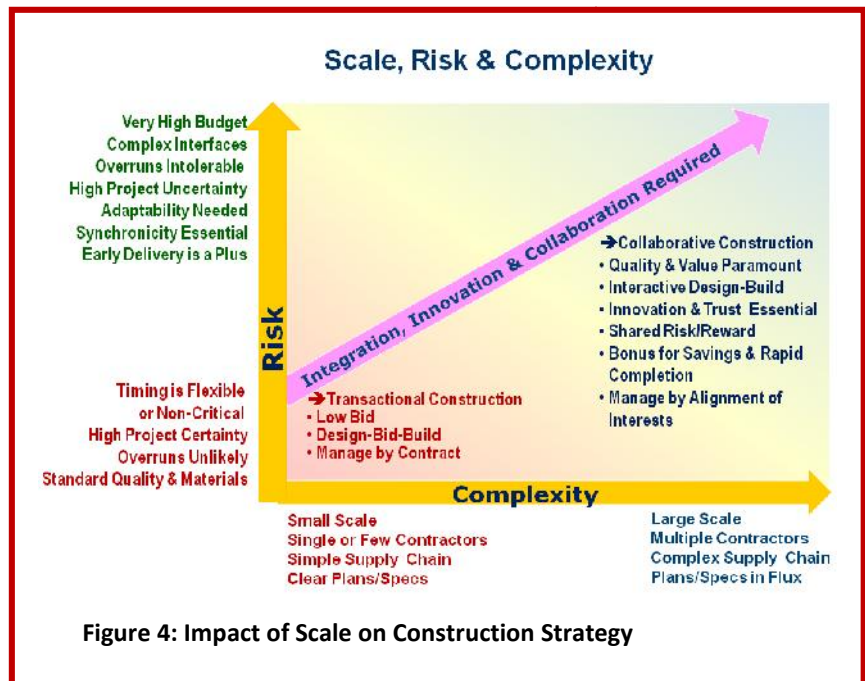


Figure 4: Impact of Scale on Construction Strategy

Nothing will change until Owners (Clients, Investors, and Operators), EPCs/Engineers, and Contractors join forces and embrace the Collaborative Construction Model.

effectiveness and dynamics of Collaborative Construction.

Collaborative Construction Produces Excellent Results

University of Calgary Senior Professor of Project Management, George Jergeas, has worked closely with major projects across Canada for years. He has closely studied, analyzed, and been a consultant to 90 Canadian projects, most of which were characterized by the predominance of the *adversarial* and *transactional* models. Most were in trouble, unable to produce the results they expected.

Based on his extensive analysis of the 90 Canadian projects, Professor Jergeas has assessed the success rates of each type

CONSEQUENCES OF ADVERSARIAL RELATIONSHIPS IN CONSTRUCTION

Time has not been kind to the construction industry. The trade has continued to be rated among the least attractive to graduating students. Job turnover is often extremely high, indicating low job satisfaction.

Project On-Time & On Budget Likelihood

Table 2: Typical Success Rates	ADVERSARIAL Construction	Transactional Construction	COLLABORATIVE Construction
% chance of being delivered On-Time, On-Budget, & On-Target	Under 10%	20-30%	80-100%

of construction model, represented in Table 2.

This collaborative framework was tested mainly on construction projects including Light Rail Train (LRT) systems, highway interchanges, airport construction, roads and bridges, high rise buildings, hospitals and mega oil and gas.

He managed to move them to a more *collaborative* mode, helping them get back on track, resulting in 90% success rate.

From this experience he developed the Canadian Collaborative “Partnering” model. Our team asked:

- What insights have been grasped by Professor Jergeas that produce these results?
- Can his results be replicated?
- Has anyone else found similar trends and strategies?
- What would enable Canadian businesses to use this approach to generate higher levels of productivity, profitability, and competitive advantage?

We have addressed these questions head-on, seeking methods and approaches around the world to determine if there is an “organization design architecture” that will continually produce superior performance. We have found a confluence of examples, studies, research, and best practices that all lead to a common conclusion – Collaborative Construction beats the competition.

Part One: Basics of Collaborative Construction

Business decision makers self change strategies, direction, methods, and beliefs because someone says it's good for them; they change if the new approach creates competitive advantage.

Every owner, investor, client, and construction executive wants to know:

“Is Collaborative Construction going to be competitive in the marketplace and profitable for our company?”

And the competitive advantage is substantial.

Best-In-Class Collaboration Results

Research by the Construction Industry Institute at the University of Texas at Austin found that companies that were truly committed to a “partnering” relationship in construction projects did extraordinarily well. These “best in class” companies had a profound competitive advantage. (see Table 3: Collaborative Construction – Best- In-Class Results)

Cost	
Area	Results
Total Project Cost (TPC)	10% reduction
Construction Administration	24% reduction
Marketing	50% reduction
Engineering	\$10/hr reduction
Value Engineering	337% increase
Claims (%TPC)	87% reduction
Profitability	25% increase

Table 3: Collaborative Construction – Best- In-Class Results

Simply put, adversarial approaches are more costly in two ways:

First, an adversarial process introduces high levels of non-value added work in the form of redundancies, fighting, protection, and useless energy trying to win in a win-lose game.

Second, adversarial strategies sap the human spirit, focusing energy away from teamwork, innovation, and problem solving, giving credence to blame, fault finding gossip, and defensiveness.

Not only does Collaborative Construction create cost savings advantages, but it also generates major advantages in employee engagement, claims reductions, fewer schedule changes, direct work rates, and safety. (for substantiation of additional impacts, see Table 7, page 72)

Bottom Line:

Cooperation beats combat in the long run. A cooperative approach is good for productivity, profitability, and labour well-being. Collaborative Construction is most effective means of producing better productivity, less strife, and attracting quality people to enter the profession.

Building the Empire State Building

The building of early skyscrapers was highly collaborative



Figure 5: Empire State Building 1931

In 1931 the Empire State Building was completed after only 14 months construction, including laying foundations. It happened during an era of steam shovels and hot rivets.

Innovations were needed because many of the construction techniques were not invented before the project started. It needed a railway to be built at the construction site to move materials quickly, new logistics to move bricks, and a new method of construction of elevator banks.

Working together the crews erected 14 ½ floors in just ten working days -- steel, concrete, stone and all.

In the end, the Empire State Building came in on time and under budget.

In 1945, a B-25 bomber crashed into the building on a foggy morning. The building survived, the fire was extinguished, and was fully operational shortly thereafter.

B. EVOLUTION OF COLLABORATIVE CONSTRUCTION

Here's the good news: Making the shift to a collaborative construction model has been tested and validated; plus there are excellent best practices from the field. We are not constrained by the sins of the past.

Based in the Roots of Canadian Heritage

Working in a cooperative arrangement is not a new phenomenon. A century ago, the construction industry was much more informal and community based. All across Canada early settlers would join together to help a new family with barn raisings. (see Figure 6)

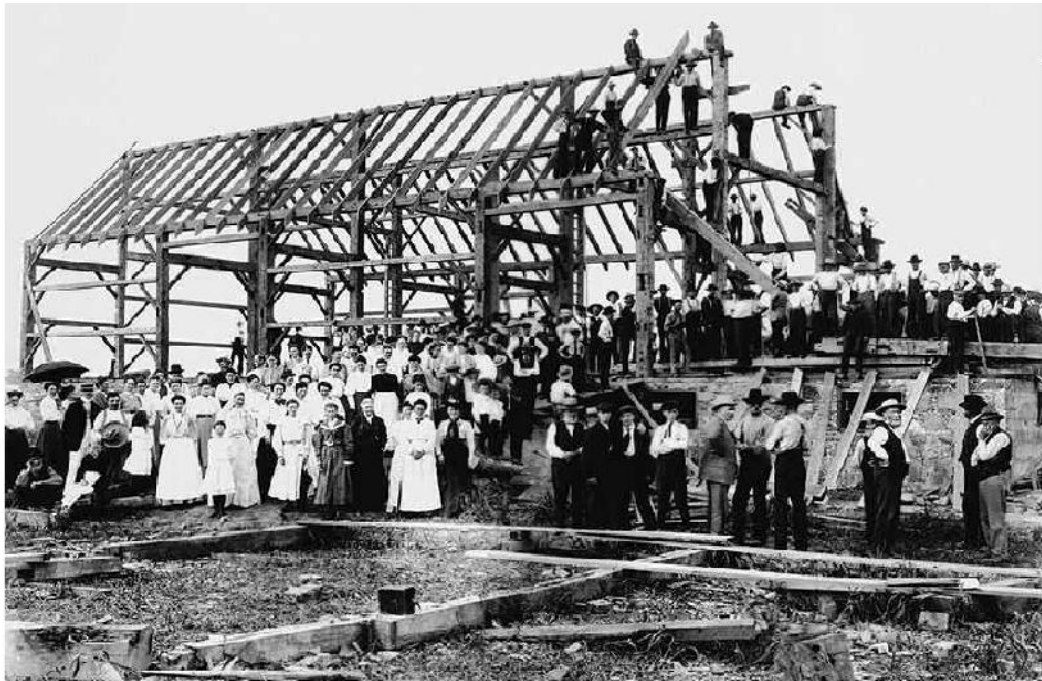


Figure 6: Barn Raising in Lansing, north of Toronto c: 1900.

The task, conducted mostly by volunteers, took between 1-2 days, depending on the size of the barn. Preparation, planning, and teamwork was essential to enable rapid accomplishment.

Everyone in this picture had a role in the Barn Raising, from supervision, setting the mortise and tenon joints, wielding tools, hauling lumber, and ensuring the construction team had food.

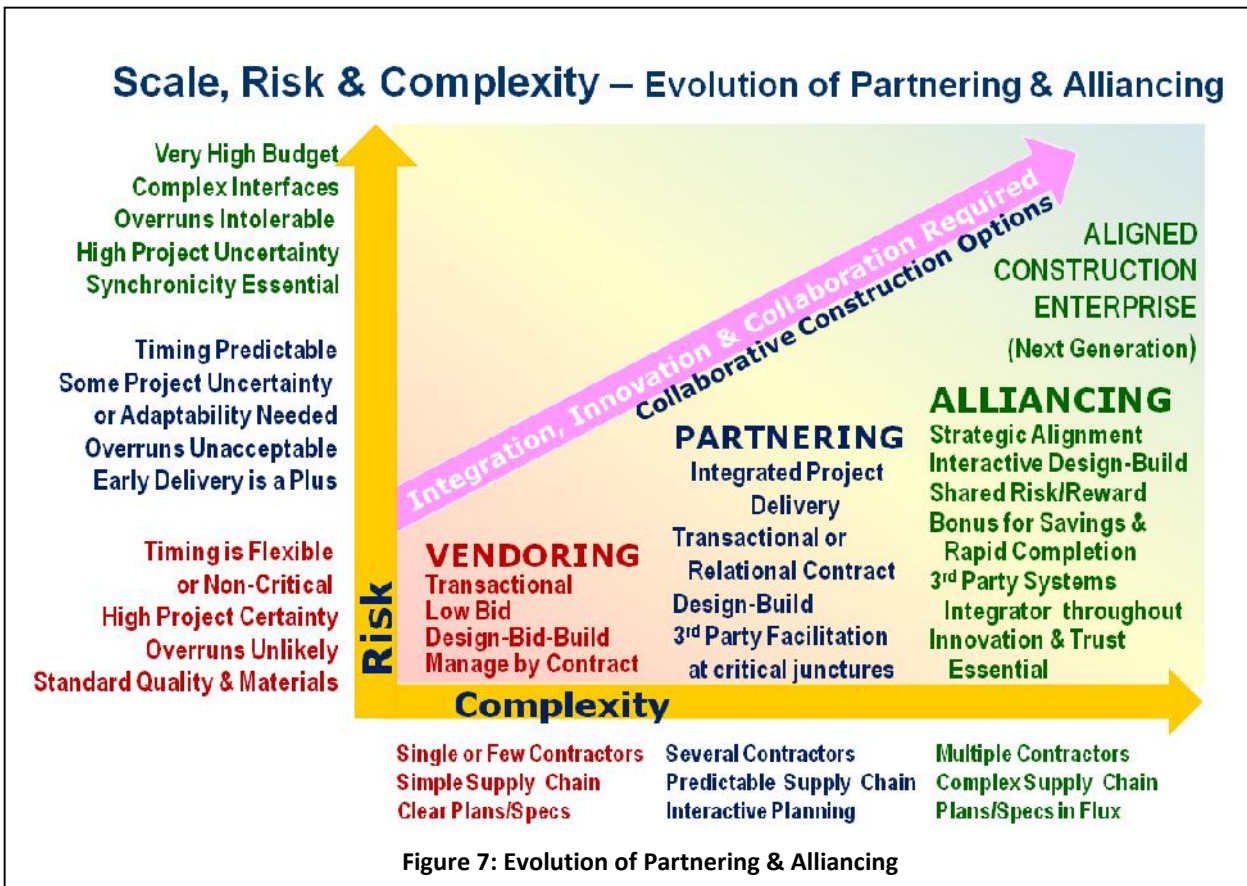
This tradition is still carried out today in rural areas and also in urban centers by organizations like Habitat for Humanity.

Today senior construction managers often speak, with some lament, of the days in the 1960s when construction started with a handshake, contracts were short and frequently signed well into the project cycle, and law suits were virtually unheard of. Canadians brought their reputation for trust and integrity to bear to ensure everyone got a fair shake.

This heritage is not dead yet.

Dual Pathways – Partnering & Alliancing

The evolution of Collaborative Construction has taken two parallel paths over the last two decades – “partnering” and “alliancing” – each path somewhat dependent upon the size, risk and complexity of the project or program. (Note: later, in **Error! Reference source not found.** see page 86), we clarify the differences between the methodologies in detail. In Figure 7: Evolution of Partnering & Alliancing, we show when each approach is most appropriate.



Partnering”

Across Canada many commercial and infrastructure projects do utilize “partnering” approaches, often based on Integrated Project Delivery (IPD) methodology. IPD embraces Lean Construction methods which aim to coordinate subcontractors and eliminate “non-value added” work, dead time, and inefficient workflows. For example, the Moose Jaw Hospital was built on schedule and 30% under budget using IPD. (see Figure 8)

Many of the City of Calgary LRT and Interchanges projects were delivered on time and on budget using a collaborative approach (see Figure 2), unlike many others that used adversarial contracting.

Small to medium sized construction projects in North America have used as cooperative approaches such as “partnering,” “integrated project delivery (IPD),” and “lean construction” with very high

Part One: Basics of Collaborative Construction

levels of success – but that success is highly dependent on a business environment that emphasizes high trust, high teamwork, collaborative innovation, and mutual win-win. (It must be emphasized that methodologies like IPD and Lean only work well in collaborative environments; they wither in transactional cultures and fail to take root at all in adversarial environments.)

LEADER-POST

New Moose Jaw Regional Hospital on schedule (and Under Budget)



By Pamela Cowan, The Leader-Post April 30, 2014

It's rare in construction projects, but Moose Jaw's new hospital is costing \$ 30 million less than originally forecast and is expected to open on time next summer.

- Consultant estimated the facility would cost \$ 130 million.

Collaborative Construction Moose Jaw Hospital

- Every two weeks, upwards of 30 personnel involved in the design and construction of a new regional hospital to serve the city of Moose Jaw, Sask. converge in an empty warehouse to flesh out the design of the facility.
- The so-called “big room” meetings, which typically span a period of three days, are an integral part of the project, which is being delivered using an innovative blend of Lean Construction and Integrated Project Delivery (IPD).



Figure 8: Moose Jaw Hospital 30% Under Budget

“Alliancing”

For large scale and Mega-projects, “alliancing” has been used in the U.S., Canada, Australia, and North Sea oil fields. Construction companies in the U.S. and Canada have joined forces in alliances to repair hotels in the wake of hurricanes in the Caribbean and to build massive sports stadiums costing over \$1 billion. North Sea oil drilling uses an alliance approach because it aligns the interests and fairly apportions rewards for the large number of companies that must coordinate their efforts in a complex project.

One of the most important and dramatic breakthroughs in the Collaborative Construction model has been achieved by our neighbors ‘down under.’ In Australia the construction industry was faced with horrible costs and labour pressures in a rapidly expanding economy in the early 1990s. Too much adversarial and transactional arm-wrestling was driving costs up, despite low-cost bidding. The culture was cut-throat. Contractors did not want to bid on projects or padded their estimates with large contingency costs, which drove prices higher.

Something had to give.

The Australian government and business jointed together to develop a better means of construction in infrastructure and industrial expansion. (see Figure 9)

Based on the collaborative model first tried on North Sea oil and gas projects in the early 1990s, the Australian alliance model has been used with enormous success, consistently bringing in hundreds of projects on time and on budget, and a substantial amount of learning has been made available from their wealth of experience.

They developed a collaborative construction model – called “alliancing.” It’s been tried and tested in over 400 large scale construction projects with nearly 100% success measured by “on time, on budget, or better.” It’s been used effectively for complex projects which require speed of delivery, cost certainty and may be changing in scope.

Alliancing in Australia

Australia’s recent period of sustained economic growth, its expanding urban populations and the strong focus on infrastructure development have all contributed to the rise in the number of alliances.

Providing infrastructure quickly, effectively managing costs and also delivering significant community, environmental and social legacies, have all become key drivers for owners. Alliancing provides a project delivery vehicle to do all that.

Another feature that owners sought through the alliance model was to provide a project delivery framework that continually pursued innovation and encouraged outstanding or game-breaking project outcomes in complex situations where a Business As Usual (BAU) outcome was considered just adequate. More traditional delivery methods can tend to constrain the pursuit of innovations to distinct phases, thus reducing the potential to achieve truly outstanding outcomes. This is particularly the case in traditional delivery methods where participants work separately (thus restricting integration and open communication) and when the risks are allocated rather than collectively assumed.

The cultural and behavioural principles that underpin the alliance model are being transferred back into the general engineering and construction industry as well as back into parent and owner organisations.

Many believe this to be a signpost to the future of our industry, and a welcome evolution away from the traditionally adversarial nature of the industry.

Figure 9: The Australian Experience

Part One: Basics of Collaborative Construction

Australian alliancing starts with an integrated development and construction team, characterised by aligned goals, mutual commercial drivers, and a commercial framework that fairly apportions both risks and rewards, to create a win-win outcome determined by collective performance.

The selection of the project delivery team is based primarily on quality, teamwork, and integrity; low price is considered to be a secondary to the achievement of high value.

The “alliancing” mindset calls for honorable behavior and innovative thinking. The governance structure of the alliance is through an integrated leadership team made up of the owner, the design team, and key delivery contractors. Decisions are made based on what is “best for the project;” not what is best for any participating contractor. The integrated governance team determines target costs and scope of work, aiming to beat the target cost with innovation, joint problem solving, and often “lean” principle. Contracts are based on a all direct costs paid, with indirect costs and profit at stake founded on a fair apportionment of shared risk, shared reward – a “painshare/gainshare” allocation.

Australian government agencies are authorized to use the alliancing approach when procuring major capital asset projects (with capital costs exceeding \$50 million), particularly complex, high-risk infrastructure projects (see Figure 10) such as difficult roads and bridges. Alliances are generally characterised by one or more of the following factors:ⁱⁱ

1. Project has risks that cannot be adequately defined or measured in the business case or prior to tendering.
2. Cost of transferring project risks to the contractor is prohibitive.
3. Project needs to start as early as possible before the risks can be fully identified and/or project scope can be finalised, and the project client (as well as the project investor) is prepared to take the commercial risk of a sub-optimal price outcome.
4. Client has superior knowledge, skills, preference and capacity to influence or participate in the development and delivery of the project, including for example, in the development of the design solution and construction method.
5. Where taking a collective approach to assessing and managing project risks will produce, in special and rare circumstances, a better outcome than contracted allocation risk.



Pacific Coast Highway in Australia. Replacement of one of the most dangerous sections. Existing highway had to remain functional while new highway was built.

Figure 10: Australian Highway built using Alliancing

Alliance Best Practice Assessment

The collection of alliance best practices has been conducted globally by the Association of Strategic Alliance Professionals (ASAP). These collaborative practices have resulted in the development of very successful models for alliances in many industries. Every year hundreds of alliance professionals convene from across the globe to share their collective wisdom and upgrade the best practices, migrating new ideas from one industry to another. The compendium of best practices (see Figure 11) is available to any professional interested in producing excellent result.

These best practices, when applied with reasonable discipline, produce 75-80% success rates in highly complex organizations. (Note: this author has been actively involved in this process for over 25 years.) The ASAP best practices have been integrated into the latest Collaborative Construction models.



Figure 11: Association of Strategic Alliance Professionals Best Practice Guide

Putting Theory into Practice in Australia

In the oil and gas industry, the primary driver of the early Australian alliance projects was to achieve a more equitable sharing of risk for complex and uncertain projects between the Owner and the Partners (Designer & Contractor). The alliance strategy also provided a welcome solutions-focused, relational-style project delivery alternative for an industry that had traditionally relied on more adversarial styles of project delivery, which had consistently plummeted over time, over budget, and into litigation.

The North Sea oil and gas industry first used what is now called alliancing in the 1990s to deliver major projects. Companies such as British Petroleum employed this form of contracting to move away from traditional master-servant relationships between owners and suppliers, to a more cooperative peer-based relationship characterised by mutual trust and respect.

Based on the UK experiences, Australia's first alliances were the Wandoo Oil Platform for Ampolex (Mobil), and East Spar Oil and Gas Project Alliance for Western Mining Corporation in 1994. These alliances were very successful and delivered outcomes that were highly valued by the owners.

The primary drivers of the early public infrastructure alliance projects were to introduce innovation and creativity to situations where there was no clear solution and to deliver outcomes in significantly constrained timeframes.

A catalyst milestone project in public infrastructure was the \$465 million Northside Storage Tunnel Alliance for Sydney Water Corporation from 1997 to 2001. The project needed to be finished before the 2000 Olympic Games in Sydney to minimise the risk of sewage overflows to the harbour.

It was a breakthrough because Sydney Water selected their alliance partners using a competitive interview-based selection process that focused on:

- competence, -capability, - experience,
- delivery approach, -the best people for the project
- commitment, and -alignment with Sydney Water's needs,

While the typical government bidding starts with the idea of accepting the low bid, in the alliance model the owner, design team, and the key contractors start with a "typical real cost" and then mutually engaging in a process of beating standard cost targets. Any cost advantages gained (the "rewards") are split among the owner, design/engineering team, and the key contractors.

Another important thing to note is that Australia, like Canada, is inherently a "high trust-low corruption" country (see www.Transparency.org). Collaboration is in the cultural make-up of both countries.

Distinguishing When Use the Different forms of Collaborative Construction

Knowing when to use “partnering” and when to use “alliancing” is important. While the philosophies and skill sets share a lot in common, the choice of which model to use is dependent greatly on scale, scope, complexity, and risk. (see Figure 7 page 25)

When to use “Partnering”

“Partnering” refers to companies working together as a team on a *project*. *High trust, joint problem solving, and close coordination* between owners, architects, and all subcontractors are the key attributes of partnering. One highly touted method for partnering is Integrated Project Delivery (IPD). Partnering sometimes uses a shared-risk/shared-reward model when appropriate and mutually agreed upon. Partnering is best used (see Figure 7 when:

- Design-Build (not Design-Bid-Build)
- Budget is \$10-100 Million
- Timing & Scheduling is Predictable
- Contingencies are manageable
- There is some Project Uncertainty, such as a Design-Build project
- Overruns are Unacceptable
- Owner and Architect/Engineer are committed and fully engaged

In a partnering arrangement, generally the contract is much more collaborative or “relational,” (see Figure 26 on page 65) designed to engender trust, coordination, and teamwork.

Partnering thrives on regular coordination and planning meetings. Typically contractors their subcontractors have early input into the design to suggest ways to lower costs, improve functionality, improve ease of construction, and lessen difficulties in coordination of the construction specialties. Third party facilitators are often used at critical junctures to assist in moving the project forward and preventing misalignment.

When to use “Alliancing”

“Alliancing” embraces all the aspects of partnering, but takes a more strategic and formally structured approach and is applied to very large, complex construction situations where budgets and risks are significantly higher. The strategic nature of alliancing means that often several of the members of the alliance intend on working together on additional projects in the future, taking their learnings forward to be even better at the next one. In this sense, alliancing is often not focused on just one project, but on a *program* of delivery of additional projects into the future. Alliancing is best used when:

- Very High Budget (typically over \$50 M)
- Complex Technologies and Multiple Organizational Interfaces (such as multiple contractors, complex supply chains, new technologies, difficult construction environments, etc.)
- Delays in completion have seriously detrimental financial or economic impact

- Overruns are extremely costly (thus Intolerable because of major adverse consequences), rapid cost escalation is a threat, and price certainty is important, thus innovation, speed and synchronicity is essential at all stages of construction.
- High Levels of Project Uncertainty or Plans & Specs are in Flux (such as unanticipated difficulties may arise that could not be assessed accurately until the project is underway) requires very close management by all members of the design and delivery teams.
- Value for money or long term operating costs are of greater importance than lowest bid price (which may not hold under real construction conditions).

Whereas “partnering” seeks to *maximize project efficiency*, “alliancing” is seen from both a *strategic systems* and *operational perspective*, recognizing that owners have a lot at stake in a highly competitive environment. Alliancing is most powerful in situations that require an interactive design-build alignment, high levels of coordination and alignment with all stakeholders, supply chain integration, and high levels of adaptability. Because of the presence of high risk, alliancing generally relies on a shared risk/shared reward incentive and often includes a bonus for savings and rapid completion.

Unlike partnering, where the interfaces between organizations are more informally managed, in alliancing, where the projects are larger and more complex, there is more formal cross-boundary management and continual realignment. Typically the alliance model calls for a dedicated alliance management team for managing interaction at interfaces, a third party systems integrator may be used throughout the construction cycle, and there is more sophisticated and deeper supply chain integration.

A foundational culture of trust, teamwork, and innovation is essential to produce the synergies and synchronicities between owner, A&E/EPC, contractors, and suppliers for success. This is done in two ways: first by screening out any potential providers that are of questionable integrity, and second, by the joint creation of operating covenants signed by all the participants that set a high standard of trust and teamwork (see Figure 24, page 63).

The commercial contract terms in alliances are less onerous than is typical. The framework is designed to minimize conflict and penalties; win-win

When Not to Use Collaborative Construction

Collaboration is not the right vehicle for the *adversarial* Design-Bid-Bully-Build approach to construction.

Squeezing the vendor for the lowest price possible is not the collaborative way of getting prices and schedules under control.

If you believe that the only way to gain advantage is to squeeze vendors, that playing your cards close to your chest is essential because contractors are the enemy and can't be trusted, and that hiring an army of lawyers to concoct an iron-clad, bullet proof mountain of contracts is the best policy, then stop reading any more, put this book away, and don't waste your time in a game that wasn't designed for you.

If, however, you know in the deepest reaches of your head and heart that there must be a better way to do business that isn't so arduous, painful, and frustrating, then this approach is made for you.

And, most importantly, it is profitable.

outcomes are emphasized. Careful alignment of the business interests of the owner, architect & engineering (or EPC), and contractors is a key element of the pre-contract framework. Recognition of the owner's strategic driving forces, such as early delivery, cost of being over schedule, and long term operating costs embraced in the contract by the design and delivery teams. Collaborative innovation, joint problem solving, and teamwork among the owner, designers/engineers, and contractors are both recognized and rewarded.

Power of Alignment

The power of *alignment* can be dramatic when all the stakeholders are playing in tune with each other. One extraordinary example of this alignment is the reconstruction of the Santa Monica Expressway in California after the 1994 earthquake (see Figure 12). What makes this example important is that it was that a government agency, constrained by "low bid" regulation, found a way to produce dramatic results by cooperating closely with high integrity, high innovation construction companies. The Australian government has also uniquely designed a similar approach (which will be outlined in the section on the Collaborative Construction Mindset).

The "Aligned Construction Enterprise"-- Next Generation Model for Mega-projects

With the commitment to produce a world-class model for construction that will set the standard for excellence and make Alberta the most desirable region in the world to undertake construction, Productivity Alberta has designed a powerful new model we call the "Aligned Construction Enterprise" (ACE). It is aimed at producing excellent results for large scale projects (over \$100 million) and for Mega-projects (over \$1 billion) where complexity, risk, cost containment, and speed to completion are critical factors for success. (We will describe the ACE model here briefly. Go to page 79 for more detail.)

The ACE model is a *next generation* set of strategies, structures, best practices and process flow architecture designed for roping in bloated overruns. The ACE advantage comes from three sources:

First: we have examined the best of the best from the Canadian and American "Partnering" models, and the Australian and Global "Alliancing" models. From these sources we have chosen the "best of breed" practices. Many of these "best of breed" practices are universally applicable to any scale construction in any form – vertical, infrastructure, and industrial. (These universal practices are outlined in the next section. Those practices applicable to large scale and Mega-projects are outlined later.)

Second: we have examined the multiple causes of failure in Mega-projects to determine why they continue to fail and what must be done to remedy the situation. We identified key problem areas that have caused failures, such as inadequate planning, integration/management of complex interfaces, supply chain breakdowns, selection of delivery contractors, impact of adversarial culture on performance, aggressive estimates and optimism bias, myopic risk management, ineffective project management, human resource development, and adversarial legal/contract management. We then addressed these areas of difficulty directly with *systematic success practices* and *organizational design innovations*.

Third: we integrated the existing "best of breed" practices with the new systematic success practices and organizational innovations into one advanced guidance system – a unified *systems architecture* -- which includes: business philosophy, alignment

Part One: Basics of Collaborative Construction

mechanisms, best process flow, intercession/facilitation at key trigger/inflection points, operational best practice methodology, critical success factors, metrics, early warning systems, rewards system alignment, tools, and diagnostics. (The process flow architecture is outlined later in this handbook, and the systems architecture is detailed in Volume Two: Aligned Construction Enterprise Best Practice Workbook.)

Those that choose the ACE approach can expect to invest more human resources on the front end of the project, but the investment is worth the effort in reaping much greater rewards on the back end, with projects designed more accurately and coming in on-time and on-budget (or cost effectively if appropriate).

Part One: Basics of Collaborative Construction

Case Study: Collaborative Construction Tackles California Earthquake

This picture depicts just one small segment of the Santa Monica Expressway in Los Angeles after being hit by a massive earthquake. Most of the highway is eight lanes or more. It is one of the most complex highway systems in the world. The State of California's Department of Transportation (CalTrans) calculated it would optimistically take at least two years to complete reconstruction:

- one year for design planning & contract award +
- one year for actual construction = Total 730 days

Time was of the essence. It was calculated that the economic cost of the highway being out of commission would be at least \$1,000,000 (million) per day. Caltrans offered a new approach, called 'A+B' Contracting:

Contractors submitted bids based on "A:" the projected construction costs, and "B:" the estimated number of days they would need to reopen the road. The state set a very aggressive schedule ceiling of 140 days (= 20% of 730 days, their optimistic schedule estimate).

Each day of "B" was valued at \$200,000, which was one fifth the estimated direct cost to the public of having the highway closed. The bidder with the lowest total costs (A&B) won the contract. The contractor's guaranteed payment, however, was only for the "A" amount. Then, for every day the firm came in early on its time estimate, it was to receive a \$200,000 bonus. For every day it went over, it had to pay a \$200,000 penalty to the state.

Contract approval took one day, as opposed to the typical 30 to 60 days. The winning firm was northern California-based C.C. Myers, which pledged to complete the project in the allotted 140 days.

In fact, working collaboratively with all the subcontractors, the designers, and the government, Myers reopened the freeway in just 66 days(= 11 times *faster* than the optimistic estimate!). The 66 days included demolition, reengineering, reconstruction subject to new 'earthquake proof' standards, and time for the concrete to cure. Myers earned an additional \$14 million in incentive pay on top of the \$14.9 million it had bid in construction costs.



Figure 12: 1994 North Ridge Earthquake's impact on Santa Monica Expressway

Part One: Basics of Collaborative Construction

Generally the ACE model requires key stakeholders (Owners, Designers, Contractors) to establish specialist alliancing groups to lead, coach and participate in alliances, which are required as evolved very high 'conditions of entry' standards through the alliance bid and selection phases.

Is ACE cost effective, especially considering that addition costs involved in people and time?

The answer is "yes" for large, complex, high value projects. Consider that the all-in cost for a delay of schedule to a Mega-project can be as high as \$1 million/hour.

If the ACE method saves just one hour on the delivery cycle, it has more than paid for itself.

Productivity Alberta also provides excellent alliance facilitators and coaches to assist teams across the whole spectrum of alliancing from bidding through to delivery.

Without trust, teamwork is a delusion

In the following section we outline the key approaches to Collaborative Construction that are "universal" to any construction project, regardless of size or type.

C. THE COLLABORATIVE CONSTRUCTION MIND SET

The first thing that distinguishes the Collaborative Construction model from other forms of construction is the clearly different “mind set” that underpins its effectiveness.

It is important to note that having competent construction skills is simply not enough – construction competency without the right collaborative mindset will produce poor results.

Trust, Teamwork & Innovation as Central Organizing Principles:

Collaborative Construction is a not just a change in construction delivery methodology; it is also a “cultural change” -- which traditionally is not an easy adjustment, particularly for older, “seasoned” managers who may have had to adopt the hard-nosed mindsets of the adversarial and transactional models of construction.

High performance organizations that sustain their advantage over the long term place great value on their people and project teams. They are not “soft” on results, however. High performance teams are strong willed, always pushing the envelope seeking new ways to work together to produce more value for their customers, their company, and their alliance partners.

Role of Culture

When people are constantly being bombarded with negativity and aggressiveness in there world, they become distrustful and dysfunctional. Collaborative leaders understand that people’s actions are determined, in large part, by what is “top of mind” – how they see priorities, how understand what’s valued and rewarded, how they perceive the world around them, and whether feel safe and secure in their work environment. Culture is how the leader influences what’s “top of mind.”

For some, the idea of collaboration in construction is going to require a reprogramming of the culture of the design or delivery team.

Cultural change is not necessarily as difficult as it is often made out to be. If senior leadership *makes trust, teamwork, and innovation* the “central organizing principles” of the new culture, and then *aligns performance measures and rewards systems* to support these principles, the cultural shift can often be successfully attained in as little as several months.

Let’s examine these three central organizing principles: (see Figure 13)

- **Trust** is the essential behavioral foundation of all collaborative enterprise. High performance teams require an unshakeable foundation of trust. Remove the trust and teamwork withers and is replaced by a lot of dysfunction and self-oriented behavior. Without trust, the teamwork necessary to execute in complex projects is extremely difficult,

We recognize that as soon as most readers with engineering and construction backgrounds see the word “culture” their eyes roll accompanied by a sigh or painful moan, and think,

“Oh no, here we go again with that soft stuff again! I’m a hard-nosed, nuts-and-bolts person; that *culture* stuff is for academics, not for me.”

Given what we’ve seen written about “culture” in most books, frankly we don’t blame you.

However the issue is so important that we wrote about culture from an engineer’s point of view. It’s a whole new approach. Please take a look at *Appendix Four: Culture as a Force Field* and the extraordinary case study that shows the dramatic impact of culture. It will also inspire you and give you a good reason pay attention to this issue.

if not impossible. To ensure the success of Collaborative Construction, we have developed highly effective trust architectures that embrace the interpersonal, operational, and economic issues that support, sustain, and rebuild trust. We have developed impactful tools and frameworks for building trust that have been used by thousands of collaborative leaders over the last two decades. One tool that can be used for diagnosing the level of trust is the Trust Ladder (see Figure 14).

- **Collaborative Innovation** is the source code for all construction companies that exist in highly competitive environments where the onslaught of continuous improvement must prevail. Collaborative Innovation enables companies to be regenerative – to transcend their past and reinvent their futures. Collaboration is necessary to unleash the mutual creative potential of people. Collaboration requires a foundation of trust to empower the team to work together. When provided with the right collaborative innovation architecture, the team becomes highly co-creative, willing to share insights, solve problems and utilize resources in very efficient ways without the fear of retribution or personal degradation.
- **Teamwork** is the coordinated effort through which high performance organizations deliver their value. Trust and teamwork enables value to be created, invented, or transformed. Without trust and teamwork, value can only be transactional at best – exchanged, negotiated, or bartered. Most think of teamwork as primarily an internal function; this is an over-simplification. Teamwork is just as important externally with suppliers, delivery partners, and customers – external teamwork takes the form of strategic alliances.

Great teamwork has a dual meaning: teams that work internally (within their own organizations) are highly productive and enjoy their work; teams that work externally (outside their own organizations in alliances with others) provide excellent coordination, cross-boundary problem solving, and fresh ideas for new ways to work together more effectively.



Figure 13: Key Factors for High Performance People & Teams

Collaborative innovation is the cornerstone of success for the future of construction

Part One: Basics of Collaborative Construction

One very critical element that is so often missed is to be sure the measures of performance and rewards systems are realigned to support the new culture. In the ACE model, a reward system is established for all stakeholders to incentivize on-time, on-budget delivery.

When leaders don't pay attention to these factors, the consequences are usually either mediocrity or failure, which manifest as overruns in time and budget.

Ladder of Trust

The Trust Ladder ranks trust on a scale of 0-10, describing trust and distrust in clearly differentiated forms. A team or alliance typically makes a commitment to play “above the belt,” meaning that all behaviors are honorable and above-board. Anyone that plays “below the belt” is called out and strongly urged not to engage with others at that level again.



Teams and alliances also create a charter of Operating Principles to guide their interactions. These form the foundation of both individual and team trust. These become increasingly important in a complex project in guiding the interaction of different organizations, many of which have had no relationship with each other. A common set of Operating Principles enables cross boundary teams to interact with assurance that they can trust each other.

Figure 14: Trust Ladder & Operating Principles

Senior Executive Commitment

Collaborative Construction is a major change in mindsets, culture, and operational functionality. In other words, this type of initiative is a major, multi-organizational transformation effort. It cannot be successful unless the senior leaders of each of the essential stakeholders are fully committed and engaged.

Implementation of Collaborative Construction will trigger resistance to change, which at times can be daunting. Unless senior executives are willing to provide leadership, encouragement, guidance, and rewards, there will be no path to success.

Champions

In effective partnering and alliancing, each organization designates a project “champion.” The champion is a project leader who is passionate about the project, has both technical and human skill sets, leads with the champions of the other stakeholders, and intercedes when problems occur. It’s been our experience that collaborations without champions from each stakeholder are short-lived.

In the Aligned Construction Enterprise model, we provide selection criteria for champions and short training sessions to enable champions to maximize their effectiveness.

Collaborative Leaders are Enlightened Realists

Collaborative Construction requires more than managers with a certification in Project Management. Managers may be skilled in the mechanics of projects, building responsibility charts, allocating work schedules, addressing scope changes, skills training, or squeezing out non-value added work.

What’s also required are *leaders* who understand how to align multiple organizations, how to create high performance teams, how to motivate people, how to respond to pressure and stress, and how to guide an alliance in times of change and ambiguity.

The collaborative leader who selects people to serve on a team is, in the broadest sense, an *enlightened realist* who knows how to bring the best in good people, while recognizing there are evil and dishonorable people who cannot be trusted. Rather than try to protect oneself from evil and dishonorable people with onerous legal contracts, the enlightened realist screens inappropriate people out of the game at the outset, then puts a firm, fair, trustworthy culture in place to enhance productive behavior.

Another characteristic of the enlightened realist is their view regarding the nature of humans; they are neither cynical nor jaundiced. They seek to build positive, productive work environments to bring out the finest qualities in human nature. They do not believe in a “survival of the fittest” world (that’s the domain of the *adversarial* mindset – see Figure 15: Misconceptions about Darwin). In this way they recruit, hire, and train only the best, most cooperative work force that produces on time, on budget, on target.

Team Selection

Collaborative Construction relies heavily on the quality of the people and their commitment to performance. This is not a “soft” program that’s easy on people. It requires highly competent hard-charging people who like to excel, are deeply trustworthy, and work well in teams. It is not for loners, lonesome heroes, antagonists, and people who lack the interpersonal skills to work together.

High Performance and Creative Inquiry

Part One: Basics of Collaborative Construction

Collaborative Construction, because it is typically working on complex projects, requires a high performance team that is willing to engage in planning and can envision the multitude of tasks with all its steps, twists, and turns, all the way to completion *before* commencing the project. People who know the *right questions* to ask are often far more valuable than those who think they *already know the right answer*, only to find out that someone else had critical information that would have avoided difficulties if only someone had asked.

What Darwin really said about the Source of Competitive Advantage

If you think Darwin said this is a 'dog-eat-dog world' where 'survival of the fittest' reigns supreme, you are not alone. Most people hold this belief. But the facts are quite different. The term: "survival of the fittest" was coined by another man, Herbert Spencer, who failed to understand Darwin's view that humans are unique in the animal species. Over the last century Darwin's insights about the lower animals have been twisted to mean only the strongest and ruthless humans will survive.

To the contrary, Darwin observed that humans were much more enlightened than the rest of the animal kingdom. Here's what he actually said about the human species:

Reason: Of all the faculties of the human mind, reason stands at the summit. Hardly any faculty is more important for the intellectual progress.

Imagination: Without the higher powers of the imagination and reason, no eminent success can be gained.

Conscience: Of all the differences between man and the lower animals, the *Moral Sense of Conscience* is by far the most important. It has rightful supremacy over every other principle of human action.... The moral faculties are generally and justly esteemed as of higher value than the intellectual powers.

"As you would have men to unto you, do you unto them likewise;"
...is the foundation stone of morality.

Cooperation: Man is a social being... endowed with social instincts to take pleasure in one another's company; [humans] warn one another of danger, defend and aid one another in many ways.... these instincts are highly beneficial to the species.

Courage is the most noble of all the attributes of man, leading him without a moment's hesitation to risk his life for that of a fellow creature; or ... to sacrifice it for some great cause. No man can be useful or faithful to his tribe without courage. This quality has been universally placed in the highest rank.

Teamwork in Competition: When [groups] come into competition, the [group] with the greater number of courageous, sympathetic, and faithful members... will succeed better and conquer the other.

Self Interest: Selfish and contentious people will not cohere, and without coherence nothing can be effected.... A man who possesses no trace of sympathy and social instincts [is] an unnatural monster.

The misconception of Darwin, specifically the myths about "dog-eat-dog" and "survival of the fittest" as the nature of humans, is the basis of most *adversarial* business models. Hundreds of scientific studies have proven that normal humans have a conscience, work best in cooperation with other, compete effectively when working in teams, and are most creative when in a trustworthy environment. Just as importantly, in a business context, these characteristics produce extremely successful, resilient, innovative companies.

Source: Darwin's book: *Descent of Man*, 1872

Colla The ability to ask insightful questions that draw on the ideas and creativity of others is called

Figure 15: Misconceptions about Darwin

“creative inquiry.” It’s an essential ingredient in the collaborative innovation process.

Qualities of a Great Team Member

Not everyone makes a good teammate; some people are better off as “lone rangers;” others are too cynical to be great team members. Collaborative leaders are careful to select the right people to work within a complex project. The wrong people will drag every aspect of project delivery down.

There are many highly *competent* people who simply have poor character or lack other critical characteristics for high performance teamwork. The best companies look for the “7 Cs” (see Figure 16)

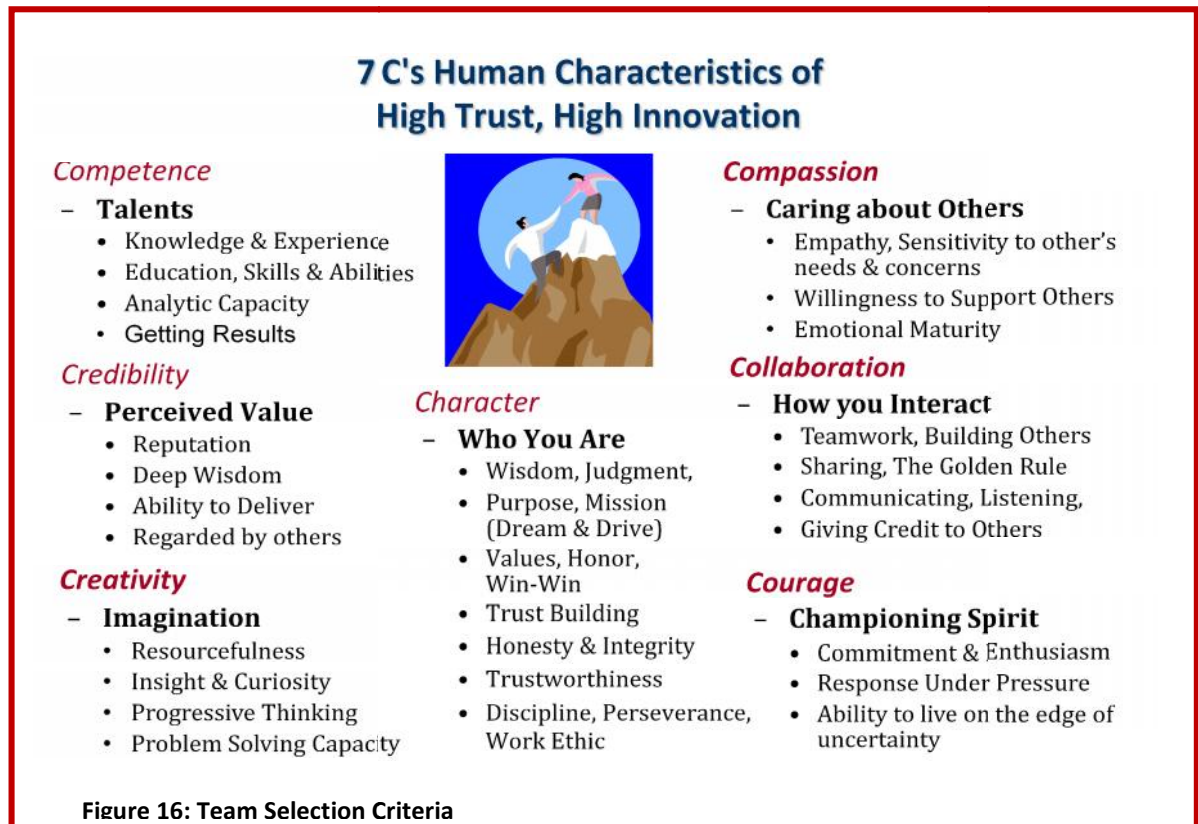


Figure 16: Team Selection Criteria

While this list of the 7 Cs sets forth an optimistic profile for a team member, it makes clear the importance of choosing the right people. Some of these qualities can be trained and reinforced, but one – character – is something that is inherent in the person and very difficult to train.

Bad selection of people will result in bad performance, distrust, and ultimately failure.

Projects run into severe difficulties when poor quality people are put in the field. They can't work together as a team; they don't learn even when trained; they produce poor quality; they quit before the job is complete; they argue about how the job will be accomplished, time and effort is wasted as productivity falls. Often the poor employment practices result in continual turnover and rework.

This is why the Human Resource component of Collaborative Construction is so vital.

Manage Complexity by Emphasizing Planning & Integration

Many people are itching to move swiftly, wanting to get to work right away, charging ahead with the conviction that rapid action is the pathway to rapid completion. Perhaps this may work in simple projects, but in the arena of complex Mega-projects, wisdom dictates the use of insight, planning, and anticipation of problems before they become catastrophic.

Seasoned leaders know the higher the complexity, uncertainty, and risk in a project, the greater the need for planning and managing the intersection of multiple organizational and technical interfaces. More time spent on the “front-end” design and project development means that later in the project delivery phase there will be significantly fewer change orders, fewer breakdowns, better coordination, quicker handoffs, more accurate anticipation of needs, better trained people, less wasted time, and less non-value added work later in the project.

The better the front end planning and integration, the greater the chances of being on-time and on-budget.

It's NOT the “Art of the Deal”

Many alliance professionals are very careful NOT to refer to alliances as “deals,” because a “deal” refers to a “transactional exchange,” which is very different from a “strategic relationship.”

Traditionally a “deal” is consummated at a closing with a fixed, strict, legalistic contract, whereas an alliance is an ever-evolving set of interactions based more on vision and trust than strictly on the terms and conditions of a contract.

Referring to an alliance as a “deal” confounds the underlying realities involved in designing a successful

Beware of “DEALS” and Deal Makers

Those companies that consistently show poor trying to make the shift into collaborative models typically see the collaborative world from the *transactional* mindset. They tend to regard contracts, negotiations, and interactions as “transactions.” This transactional approach views all such economic interactions as “deals,” driven by the terms and conditions in a legal contract. During the “deal making” process, each party negotiates for the best deal they can achieve, often “keeping their cards close to their chest,” while creating distrust through posturing. What’s more, often those who will be closely involved in the ongoing management of the future relationship are left out of its formation, to be brought in only after the “deal” is done.

This deal-making tactic is often taken by people who are also well versed in contracts, legal agreements, and licensing; it tends to relegate the actual management of the Owner-Partner to an afterthought or into a dogmatic set of terms and conditions.

Despite the strong body of evidence that the application of alliance best practices produces significantly higher alliance success rates, the transactional-deal approach lingers on. We encourage leadership to bring the best practices outlined in this series of books to their “deal” teams and strongly advocate for their consistent application. In developing the partnering or alliancing agreement, insist that the deal makers are replaced by people with the collaborative mindset who recognize the great potential of the architecture of alliances – the entire *system* composed of key principles, practices, strategies, structure, systems design, management processes, roles, interrelationships and interfaces, conceptual frameworks, critical issues, early warning signals, vital signs, and alternate pathways and contingencies.

In adopting collaborative systems, you will be called upon to design the architecture of a collaborative venture. This will not be a “cookbook” process—instead, as a systems architect, you will follow a set of best processes, practices, and procedures that will greatly enhance your success and be applicable to virtually any collaborative venture you design, regardless of the form it takes.

Shifting from Vendors and Supply Chains to Partners and Value Networks

One of the most important but overlooked mindset shifts in Collaborative Construction is grasping an essential difference in *transactional* versus *collaborative* approaches to the issue of *value*. In the *transactional* approach, value is *exchanged* between buyer and vendor in a *chain* from one supplier to the next to the next, and finally to the customer. Presumably every supplier will *add value* the chain by applying their proprietary methodology before transacting their goods and services to the next buyer in the chain. In the *transactional* perspective anyone who provides a product or service is regarded as a “vendor,” a demeaning term that signifies a “peddler,” or an impersonal interaction, as with a “vending machine.” In a transactional framework, the trust and integrity across the buyer-seller interface is relatively low, the exchange of vital information about supply, demand, and competitive advantage is held close to the chest, and price is the primary differentiator among vendors. (see Figure 17)



Part One: Basics of Collaborative Construction

When companies work *transactionally* they “bargain” for the exchange of goods/services in exchange for money. There is nothing ‘wrong’ with this approach, but it does not generate a strong flow of innovation from supplier to customer. The customer only gets what the ‘bargain for,” nothing more.

Transactional engagement between customers/owners and suppliers/designers-contractors, establishes a relationship referred to as a ‘supply chain.” (see

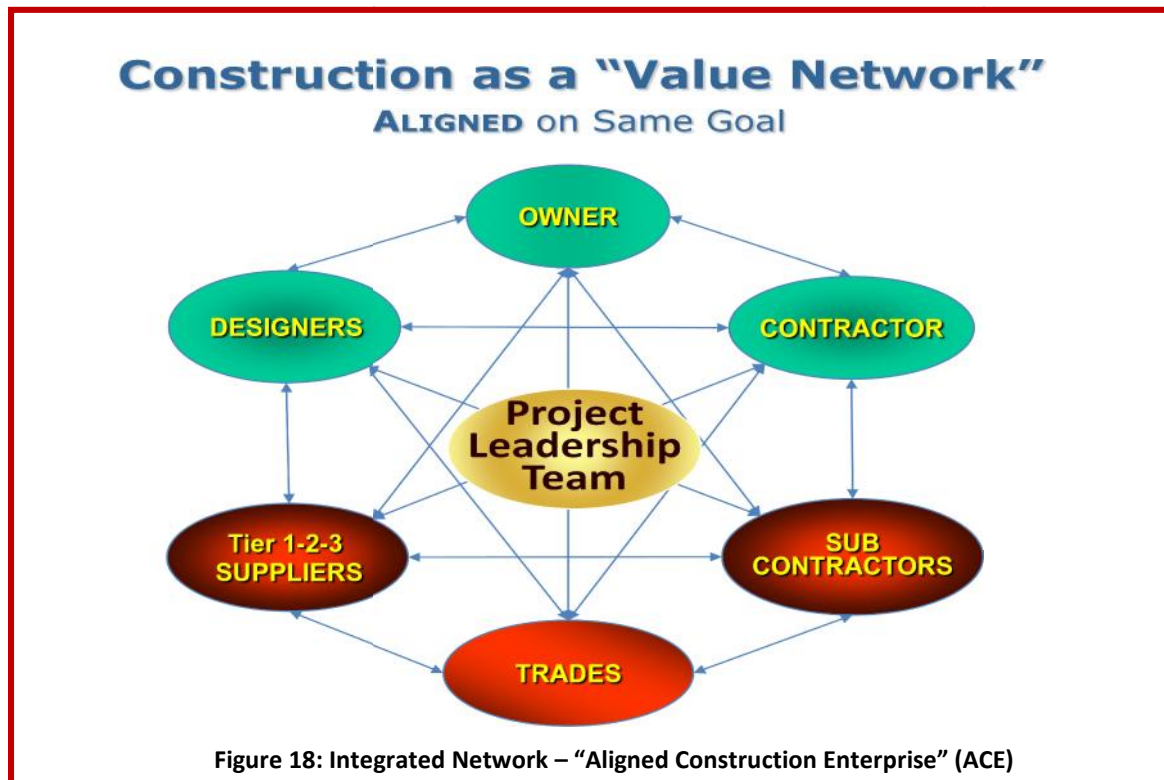
Figure 17)

In contrast, the mindset and the methodology are dramatically different in the *collaborative* approach:

First, value is not just *transacted*, it is also *created* during the interactions between buyer and seller teams. Because trust is paramount, the parties insist on integrity before the exchange ideas, information, insights, and innovations.

Second, this shift is not just a new use of words; it is a fundamental change in beliefs, thinking, perceptions, intentions, expectations, responses, skillsets, rules of engagement, methodologies, measures, and rewards. It takes discipline to master. It is certainly not for those who advocate a “dog-eat-dog” world.

Lastly, as *transactional* walls are replaced by tighter *collaborative* linkages, the linear aspects of the chain transform into an interactive *network* where all members, acting as *partners* jointly solve problems, develop plans, and align their interests. (see Figure 18)



Coordination and Systems Integration

The 'chain' approach is inherently slow, cumbersome, and filled with non-value added work. A better approach is to interconnect all the organizational parts into an integrated network (like the brain or the internet) which communicates, coordinates, synchronizes, and responds rapidly. (see Figure 18)

The Collaborative Construction mindset shift is dramatic when viewing a relationship with a contractor, EPC/A&E firm, or subcontractors.

To be fair, the chain approach is more *simple* in that an organization need only deal with one link forward (customers) and one link backward (suppliers) in the chain. It is generally quite effective in situations where both risk and complexity are low. (see Figure 7, page 25).

However, using an analogy: just as a prop plane can't be scaled up to supersonic speeds, and a jet can't fly out of the earth's atmosphere, the "chain" strategy will not scale up to high risk, highly complex rollouts.

When a linear chain of organizations acting transactionally shifts into a network of coordinated, symbiotic, integrated network focused on a common objective. This is a central theme in all Collaborative Construction, and especially in the Aligned Construction Enterprise (ACE).

In the Aligned Construction Enterprise, while the alliance may *formally* be agreed upon between only with the Owner/Designer/Contractor, the alliance members expect and treat *the other members of the network* (suppliers, subcontractors, and trade unions) *as alliance partners* as well.

In a network alliance structure, organizations agree to share their complementary assets and strengths to create a "win-win-win" (multiple win) situation that increases value for *Owners* while increasing the rewards for *all partners involved*. Supply's value is recognized and becomes a *strategic* function. Communications, based on high trust, become interactive and interconnected among the various nodes, creating a "network effect."

Thus the alliance structure aims to capitalize on using the entire network's assets, knowledge, experience, creativity and capabilities effectively, creating value along the way -- the whole is greater than the sum of the parts -- resulting in true synergy. (see Figure 18)

Collaborative Supply Relationships

In the collaborative framework, key distinctions are made between "vendors," "preferred suppliers," and "alliance partners." (see **Error! Reference source not found.**)

In capital acquisitions, the amount of expenditures to critical suppliers can be massive, often exceeding 50% of total expenses, and, in some cases, up to 80-90%. This makes key suppliers *strategic* in the value creation process. But, all-too-often, these suppliers are treated like *vendors*, not like *partners*. The vendor mentality renders the procurement process totally inadequate for the magnitude and complexity of large construction. Some of the critical issues are:

- Low cost bidding: In *transactional* systems, the main buying tactic is to send out tender offers, receive competitive bids, play the vendors against each other, use tactical bargaining techniques to squeeze the vendors, then issue purchase orders based on the low-cost bidder. Issues like quality, collaboration in planning, development of unique innovations,

Part One: Basics of Collaborative Construction

- coordination and integration with other key suppliers, aligning multiple levels of the supply tiers, timely delivery, warranty, availability, and service/support after the sale.
- Inadequate personnel: While the supply chain may be a very substantial part of the budget, the level of personnel assigned to the task seldom matches the magnitude of the job. Procurement managers are trained and rewarded on price and logistics, not on collaboration and innovation.
 - Transactional relationships with critical suppliers: Supply managers seldom *triage* there supply chain into those suppliers that are truly critical to the project from those that are just commodity vendors. Critical suppliers should have close working relationships with good interactive communications, and discussions about how to create value.

Part One: Basics of Collaborative Construction

Factor	Vendor	Preferred Supplier	Alliance Partners
Viewed as	Replaceable commodity	Unique specialty	Integrated, customized specialty
Level of Integration	Low/not integrated	Loosely integrated	Highly integrated or inseparable
Number of Suppliers	Many	Several	Very few
Distinguishing Features	Mainly price driven within minimum quality standards	Price plus unique offering (e.g. technology, service, etc.)	Synergistic value proposition (e.g. mutual growth)
Style of Interaction	Tactical transaction	Preferred and/or tactical relationship	Strategic synergy
Duration of Term	Short-term	Medium-term	Long-term
Value Proposition	Price and acceptable quality	Price, superior quality, and excellent service	Strategy, cost, quality, reliability, speed, innovation, etc.
Framework for Winning	Winning is essential for me—what happens to you is your business	A win is essential for me and I know I should let you win too if the relationship is to survive	A win-win is essential for both of us and is critical if the relationship is to thrive continually
Competitive Advantage	Low	Moderate	High
Build, Buy, Partner Decision	Seldom produced internally (not a core competency)	Often produced internally (debatable core competency)	Frequently has been an integral part of the internal value chain
Trust Level	Distrust prevalent (caveat emptor)	Trust is important to managing the relationship	Trust is essential to generating a continuous stream of new value
Difficulty of Exit	Low impact, excellent ability to switch vendors quickly	Moderate impact	High impact; switching may have detrimental impact due to disintegration of systems
Strategic Environment	Cost driven Low product differentiation TCO is noncritical Relationships not important	R&D is a distinguishing value Application focus Provider of performance	Discontinuous change in buyer's industry Fast time to market is essential Innovation and integration are essential

Table 4: Differentiating Vendors from Partners

- Lack of information: there is often very little data about what’s occurring several tiers down in the chain. Forecasting of supply and demand cycles is essential for lower tier suppliers to have knowledge of what will be required in the future.
- Serial interaction: supply chains are exactly what their name implies – a linear transactional chain that impedes interaction between different suppliers in the chain. Information about product performance, customer needs several links forward in the chain, or emerging new technologies seldom moves across the links in the chain.
- No innovation flow: Being competitive means suppliers need to create a flow of innovation into to customers. However, seldom do supply managers ask for new innovation, nor do they guide suppliers about future innovation needed.ⁱⁱⁱ

Beware Back Loaded Planning

Supply “chain” thinking causes projects to develop ‘linearly’ in a fragmented manner. Key people who have value to contribute are often left out of the design, or are consulted only after a breakdown occurs. The most obvious result of linear chains in a construction project is a condition called ‘back loading,’ which brings subcontractors into the project too late to have an impact on the design phase. (see Figure 19)

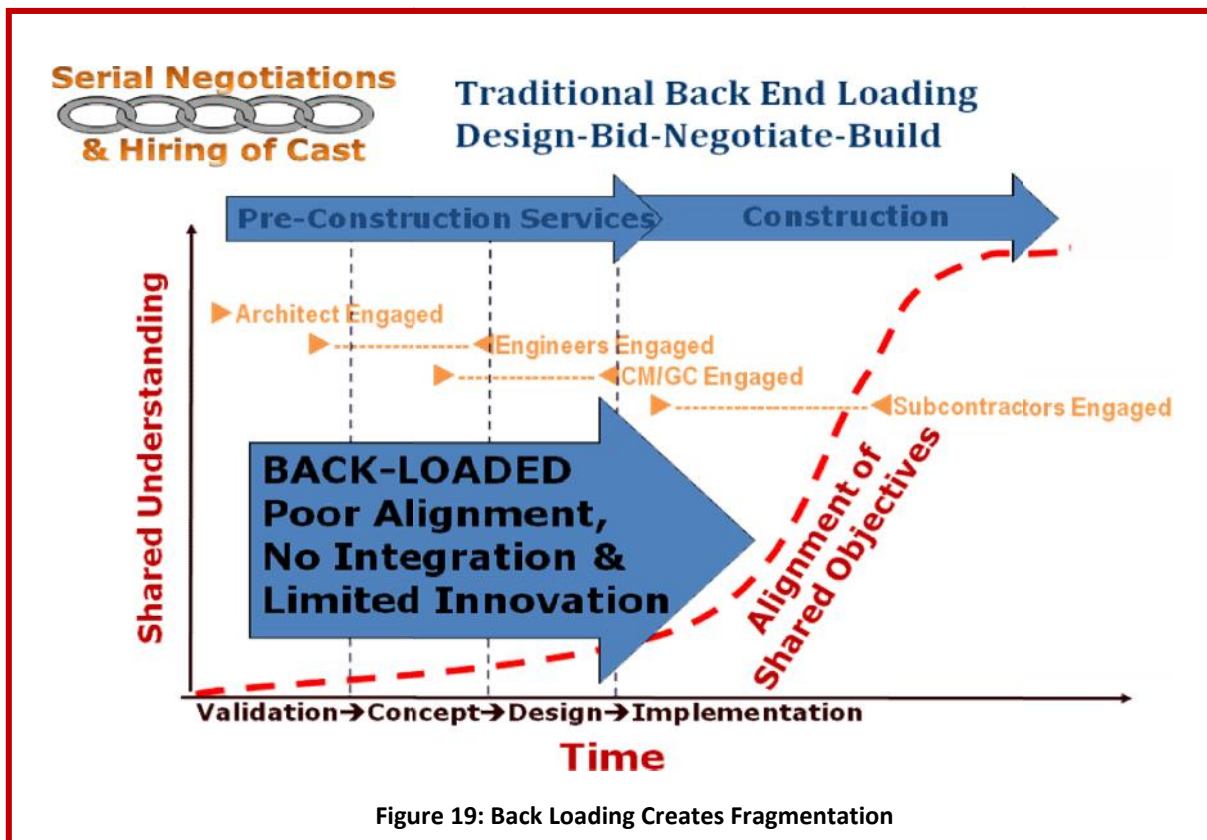


Figure 19: Back Loading Creates Fragmentation

For example, electricians who understand the interrelationships with plumbing and HVAC systems may not be involved in the design stage with architects and engineers in a “linear” set of transactions. Consequently problems that involve the interfaces

between the professions in the field that could have been foreseen and averted or planned around end up as a crisis, with all the turmoil and delay that results.

Not only does back loading prevent the knowledge of the construction team to be stifled, but it also creates a multitude of change orders, field installation breakdowns, which attack the schedule and budget.

Front Loaded Planning

Conversely, in a “network” approach, all are brought together early on to anticipate and plan around problems. It takes a little more time up front, but avoids bigger problems later.

The objective of an integrated, high performance, high trust team is to bring the entire team on board at the outset, and get their insights into the design and delivery. (see Figure 20).

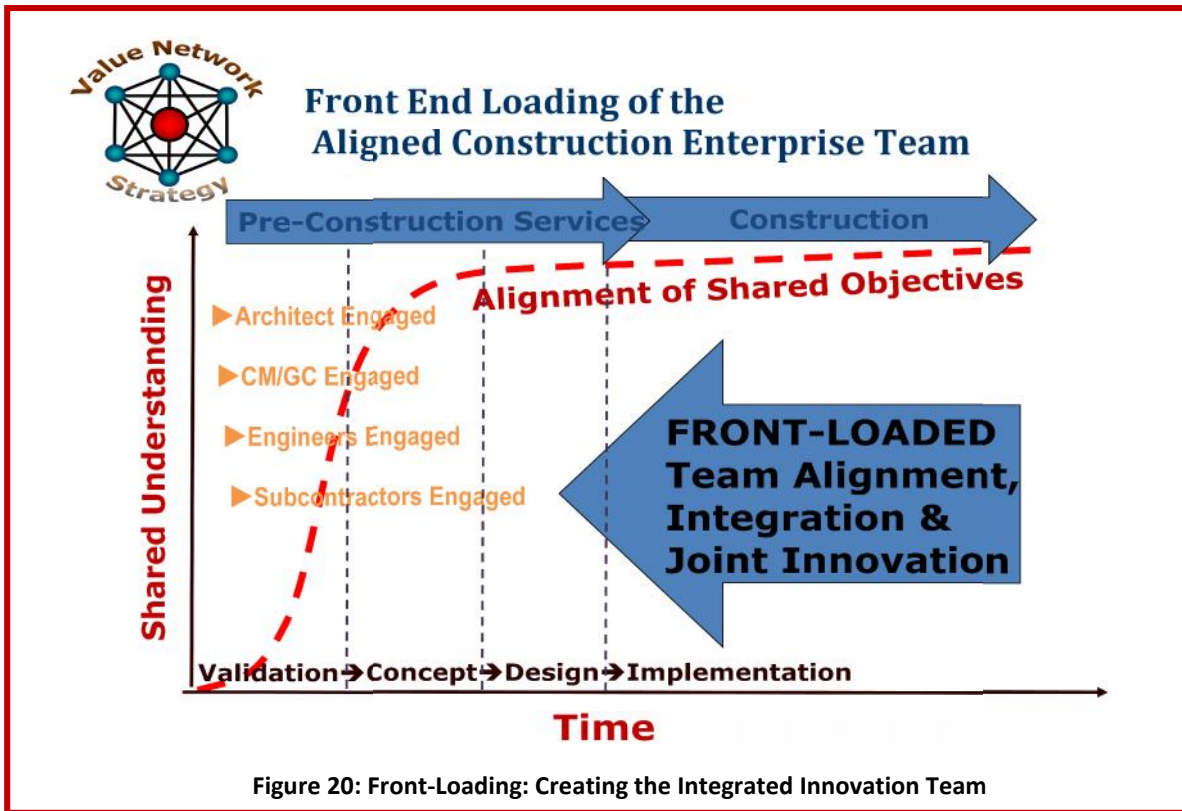


Figure 20: Front-Loading: Creating the Integrated Innovation Team

For example, by having sub-contractors and trades involved in the design stage, suggestions for better constructability, sequencing of activities, and potential conflicts can be identified and incorporated in a redesign before committing to materials and labor.

To illustrate, an electrician may suggest that conduits be laid under concrete and wiring run early in the project instead of later to enable portions of the lighting system to be installed earlier, which will provide better illumination for other trades during their portion of the build.

Because the cost of design changes escalates dramatically once construction begins, (see Figure 21) using the mind-power of both the design/engineering team and the construction team to suggest

innovations and better coordination early in the design-build cycle, the higher the likelihood of coming in on-time, on-budget, while creating sufficient profit for all the partners to want to work together in the future. And, in future projects, since the relationships are already in place and the learnings of one project create a step-stone for future projects, the design-construction teams are

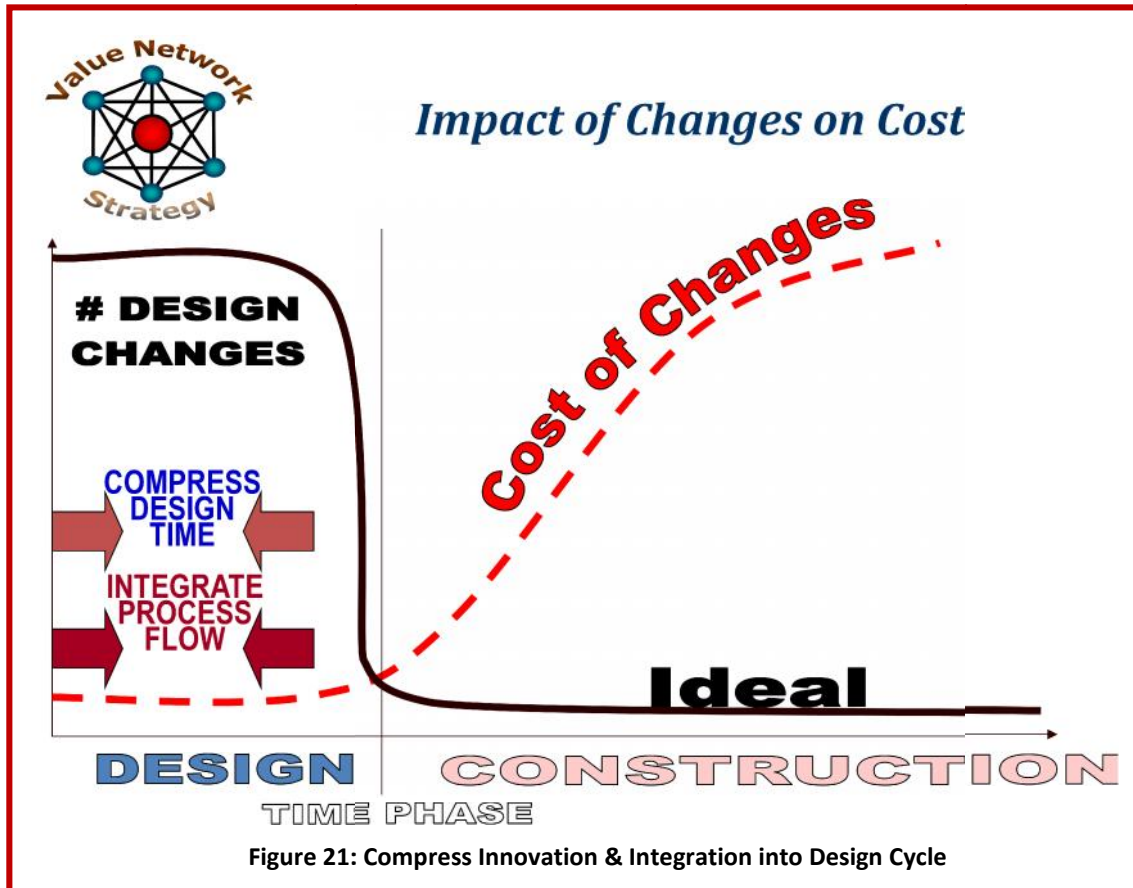


Figure 21: Compress Innovation & Integration into Design Cycle

better able to improve significantly on future projects – a “programmatic” perspective.

In this way, all the players become collaborative innovators early on, setting the stage for other advanced methodologies such as Building Image Modeling (BIM), GPS, Lean, and Fasttime, to be used effectively throughout the construction period.

Early engagement in planning is an important new mindset in Collaborative Construction.

Plan Thrice, Measure Twice, Cut Once

Every carpenter’s apprentice is taught “Measure Twice, Cut Once.” This old adage means many things at many levels. The young apprentice quickly learns to “think ahead,” “haste makes waste,” and “look before you leap.”

There’s also an adage for complex projects: *Plan Thrice; Measure Twice; and Cut Once*. It’s a metaphor for how the planning and design of complex construction project should be initiated.

Plan Thrice

Plan Thrice is absolutely required in situations of complexity, such as lots of moving parts, changes during construction, many handoffs or joint efforts, multiple interfaces and connection points, new technologies being tried, a new team that's never worked together, new skills or tools needed but people don't have much experience or training, and so forth. In these circumstances, it's vital to think, organize, and anticipate difficulties at the beginning instead of having to reconfigure a major project after breakdowns occur midway through. Plan Thrice implies three levels of planning for all key stakeholders (see Figure 21: Compress Innovation & Integration into Design Cycle):

1. First, ensure all those engaged in executing the plan understand the *concept* of the plan:
 - What is the purpose/key objective of the project?
 - What does success look like?
What measures of success will people be evaluated on?
 - What should the final product do effectively?
What are the parameters for proper functioning?
When must this project be completed?
What are the consequences if it is not built on time?
Who is the end use customer and what do they really need to be satisfied?
Who will be operating the facility or site when completed?
 - Have all the pieces of the plan come together properly?
Is there anything missing?
Is a competent & complete team involved in the planning?
2. Second, plan the *integration* and *fast-time execution*:
 - How does everything come together?
Do different components fit together?
Do the different specialties and technologies integrate well?
Do all the measurements coincide?
 - Who is going to do what?
Are roles and responsibilities clear?
What information must cross organizational or functional boundaries?
When should cross-boundary issues be jointly planned?
 - How can the whole process be fast tracked?
What things can be done simultaneously or interactively?
What coordination, decision making, and communications will be required?
What "rules of engagement" do we need to enhance teamwork & trust?
3. Third, *plan for a breakdown*. (Most breakdowns happen at interfaces between differing units, specialties, functions, or structures.)
 - Where could things go wrong?
How can weather or ground conditions affect our plans?
What's the worst that could happen if.....?
Is there anyone who could misinterpret, misunderstand, misread?
Have critical suppliers notified their next-tier suppliers of their needs and timing?
 - Do we have all the information we should?
What are the early warning signals that would tell us a breakdown will occur?
What protocols are in place that will allow us respond rapidly?

What must we *not* do when a breakdown is ready to happen?

How will we be sure not to exacerbate the breakdown?

- How could we turn a breakdown into a breakthrough?
What have we learned from previous breakdowns that need to be applied here?
Who are the best people (or team) to respond quickly and effectively?
What behaviors must we exhibit that will create a breakthrough?

Measure Twice

Measuring does not just mean “using a measuring stick.” In the context of complex construction it means a different mindset:

- Are we all using a common set of measures to keep us coordinated and aligned?
- Are we measuring the things that really count beyond physical measures, such as:
 - the number of innovations we create,
 - the new learnings attained,
 - the speed improvements made,
 - the rapidity and accuracy of handoffs, the level of quality,
 - the amount of cross training,
 - the new best practices created,
 - the number of pre-empted problems,
 - the quality of the coordination and problem solving sessions,
 - the level of engagement and trust of the team, etc.
- Are we rewarding the:
 - key measures of success?
 - teams that achieve excellence?
 - effectiveness of collaborative innovation?
- Are we sharing rewards fairly with those who extended themselves to attain excellence?
- Are we assessing and understanding:
 - why we are doing things?
 - what is the best way to do it?
 - who composes the best team to do the construction where should certain practices be applied that will produce great results?
 - how can the Owner, Designer, Contractor, and the Trades work better as a team to produce a highly profitable, win for each of the stakeholders?

Rethinking the Risk Management Model

Traditional risk management calls for handling risk by insulating, insuring, avoiding, or shedding risk. These risk management models that may be effective for simple, small scale projects, but they unravel under the burdens of the high risk, complex Mega-project ventures. Risk managers are often myopic when assessing the development of a Mega-project, inadvertently overlooking two key factors: 1) compounding interfaces and 2) quality of relationships.

1) Law of Compounding Interfaces

The fundamental problem that differentiates large projects from smaller ones is the *complexity of the interfaces* of differing organizations, specializations, functions, cultures, trust levels, rewards systems, and priorities.

The “Law of Compounding Interfaces” prevails for complex projects. It states:

**As Interfaces Increase in *Number and Unreliability, Uncertainty, or Instability*,
Risk Accelerates**

Figure 23 illustrates a simple interface of three elements and six points where something can go wrong – two people may distrust each other, different organizations may not be aligned on a common purpose, time schedules may be completely out of synchronization, or communications channels may not yet be established.

The future breeds complex projects, multi-party relationships, and sometimes entanglements which are the step-children of uncertain risks and ambiguous opportunities.

Many inexperienced large-scale project developers and joint venture managers fall into the trap of inadvertently compounding risks. The larger the project, the more complex the interfaces, as illustrated by Figure 22. Here four new factors are compounded: 1) new location with 2) new supply chain using 3) new technological processes with 4) a new team. Rather than the risks adding arithmetically, they compound by the square of the number of new factors!

Law of Compounding Interfaces

Risk Increases Dramatically as Interfaces Increase in Number and Unreliability

*Risk & Complexity Increases by Double the number of New Interfaces**

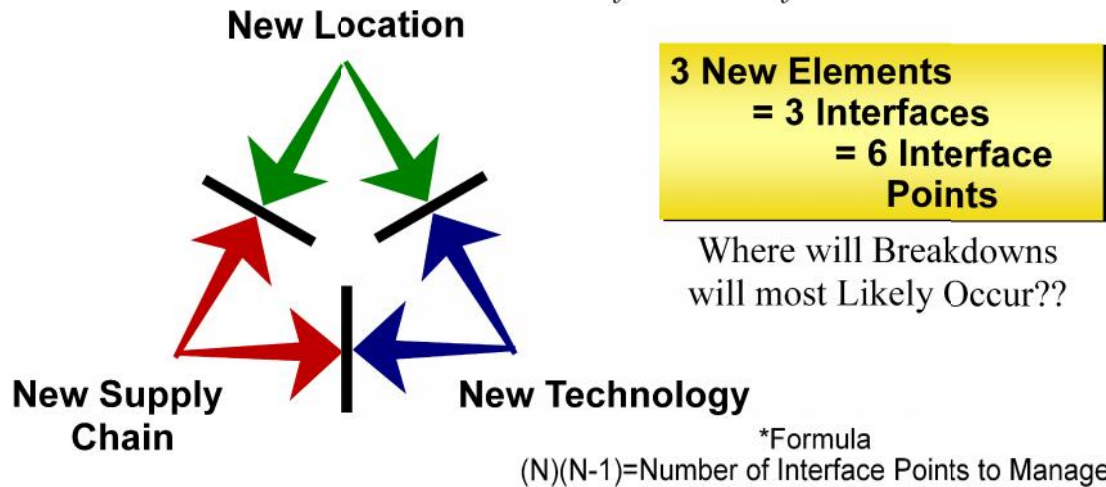
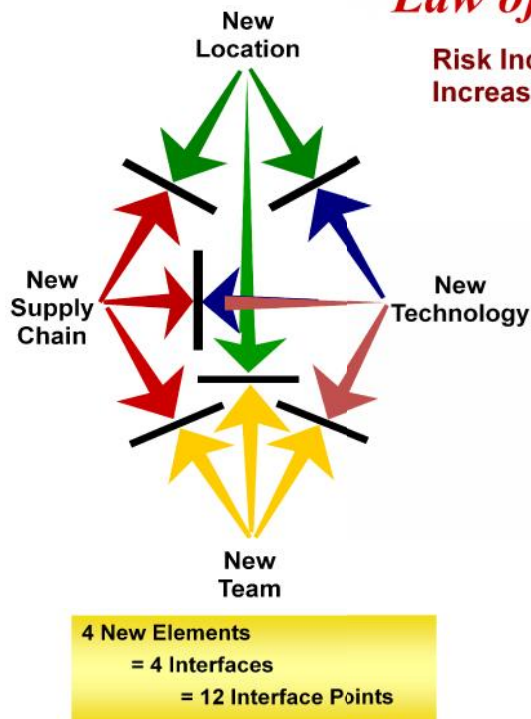


Figure 23: Example of 3 Elements = 6 Interface Points

In this case, it's far safer to enter a known marketplace with a tried and true product with a new partner. This is a very frequent occurrence in joint ventures which create a new, start-up corporation. Typically none of those forming the start-up joint venture have ever experienced the

Law of Compounding Interfaces

Risk Increases Dramatically as Interfaces Increase in Number and Unreliability



Let's now introduce a NEW TEAM.

With Four NEW ELEMENTS there are now 12 different Interface Points to integrate, manage, and synchronize. Each one presents a point of a potential Breakdown, which can trigger more breakdowns. Using "Big Bang" Mega-Project Rollouts increases the chance of a total systems collapse.

Some of the Options are:

- Predict the Breakdown Points in advance
- Reduce the Number of Unknowns or the improve the Reliability of the Interface
- Use tried and true People who are experienced at handling these breakdowns with tested Processes and Protocols
- Sequence the Rollout to enable corrections to occur before the next phase
- Use Pilot Projects at a small scale to test the system.
- Commit to turning Breakdowns into Learning to trigger Breakthroughs

Figure 22: Greater Number of Interfaces Increases Complexity Dramatically

entrepreneurial agony and ecstasy of a start-up. Instead they believe their project management software to plan and schedule tasks and responsibilities.

Compounding Interfaces Case Study: Metal Fabrication

An excellent example of this compounded risk trap was a joint venture in the auto industry. An American exhaust component manufacturer opened a joint venture plant with a new and untested partner in Brazil. The JV then secured an order from a European auto manufacturer with a car assembly plant in Brazil.

The American's new Brazilian partner was in the industrial metal fabrication business, and had excellent labour and supply relationships, but did not have experience in the automotive marketplace. The American firm decided to set up their JV factory with very new machinery, state of the art technologically, and advanced production process that had been used for only a limited time in the US. Inadvertently the seeds of a massive breakdown were sown.

The requirements called for the fabrication of the exhaust systems in stainless steel, which is a very difficult material to bend and weld.

No one in Brazil had experience with this metal for automotive exhaust systems, and the procurement of the material was improperly handled when specifications were not accurately spelled out in the bid spec. The order for stainless steel was placed with a new Italian supplier who had underbid the competition and did not recognize the problems that would soon occur.

Timing of production was critical, because an entire Brazilian automobile assembly line needed the exhaust components in their entire line of cars. As soon as the Italian stainless steel was put on the bending machines, it cracked and split. Neither could it be welded with the new machines. The American-Brazilian JV could not deliver an acceptable product.

As a consequence, the auto assembly line had to be shut down for nearly a week, at a horrible expense to the car manufacturer. Heavy penalties were in place for late delivery, which cost the JV dearly.

Ultimately the problem was resolved on an interim basis by the American firm having to go to one of their friendly competitors, asking their competitor to supply the parts -- at an obvious profit to the competitor.

The project integration was built like a house of cards with too many new and unreliable interfaces; the project management and risk management architecture was seriously flawed. Had the new venture limited the introduction of the number and complexity of new risks into the rollout, the result would have been far different.

Assess Compounding Interfaces & Risks

To improve the chance of the project being on-time and on-budget, reduce the number, and complexity, while increasing the reliability, trustworthiness, and collaborative quality of management of the interfaces. If possible, incrementally add new risks or use trusted people with experience, knowledge, and human skills. Reduce adversarial and transactional behavior in planning, contracting, and managing complexity.

Part One: Basics of Collaborative Construction

Start with a realistic assessment of risks, as outlined in Table 5: Compounding Interface Risk Analysis.

Table 5: Compounding Interface Risk Analysis

Increased Risk at Interface		Decreased Risk at Interface
Large # and/or High Intricacy	COMPLEXITY OF INTERFACES	Small # and/or Low Intricacy
Long Distance or Difficult Location	DISTANCE/LOCATION	Short Distance or Near / Easy Location
Long Duration or High Endurance	DURATION/ENDURANCE	Short Duration or Low Endurance
Untried & Untested Interfaces - New Technology/Methodology - New/Difficult Location - New Untrained Team/Organization - New Market/Customer Base - New Product/Service	TRIED & TESTED @ INTERFACE - Technology/Methodology - Location - Team/Organization - Market/Customer Base - Product/Service	Tried & Tested Interfaces - Well Tested Technology/Methodology - Little Difficulties @ Location - Tested, Trained Team/Organization - Known Market/Customer Base - Existing Product/Service
Unknown or Distrustful	INTERACTION TRUSTWORTHINESS	High Trust, High Teamwork
High Ambiguity, Many Changes	AMBIGUITY/UNCERTAINTY	Low Ambiguity/Uncertainty
Highly Adversarial/Legalistic	ANTAGONISM COOPERATION	Collaborative, Collegial Communication
Corruption & Dysfunctionality	CORRUPT/DYSFUNCTIONAL	Transparent, Trust, Fairness, Truthful
Poor Early Planning/Interaction	FAST/ACCELERATED INTERACTION	Well Planned Interaction from start
Many Signoffs/Approvals Needed	# OF STAKEHOLDER SIGNOFFS	Standard Signoffs/Approvals Required
Highly Political, Very Visible	LEVEL OF POLITICAL INVOLVEMENT	Not Controversial, Not Highly Visible,
Poor/Unqualified Interface Mgmt	INTERFACE MANAGEMENT	Excellent, Qualified Interface Mgmt
Hierarchical Complexity Mgmt	ORGANIZATIONAL STRUCTURE	Interactive/Network Complexity Mgmt

RISK: Variance with precise probabilities for well-defined activity.

UNCERTAINTY: Unknown probabilities for somewhat ambiguous activities.

2) Quality of Relationships – Trust as a Risk Mitigator

It is not a coincidence that the idea of “team/alliance culture” seems to be in the vocabulary only of those leaders who advocate *collaborative* construction, but is tragically absent from the mind-set of those who engage in *adversarial* or *transactional* practices.

Collaborative leaders understand something their *adversarial* and *transactional* counterparts fail to grasp: *culture risks* may be among the biggest risks of all -- a risk that is amplified and magnified the more complex the project.

Failure to put a high trust/ teamwork culture in place triggers massive risks which include: grievances, sabotage, labor strikes, employee disengagement, absenteeism, employee turnover, disengagement, non-value added work or value destruction, poor communications, and coordination, low performance and productivity, silo mentality, lack of innovation, and slow speed – all leading to project overruns and schedule breakdowns.

To put this in perspective, refer back to Figure 14: Trust Ladder & Operating Principles on page 41. It is not hard to see that the behaviors at the bottom the Ladder – such as betrayal, manipulation, aggression – will destroy value. Conversely, behaviors at the top of the ladder – good listening, teamwork, co-creativity – will generate value.

Excessive risk aversion can also actually backfire, causing severe distrust, which counter-productively *increases* risk. Contracts filled with pages upon pages of excessive legal protections and penalties can actually backfire, causing people protect themselves rather than take actions that would advance productivity on the job. Risk premiums added by contractors and legal and litigation costs are two consequence of excessive risk management that can drain profits and executive energy. We have found that risk is escalated in adversarial construction and conversely decreased in collaborative construction.

The inherent complexities of oil sands Mega-projects are severely exacerbated in distrustful environments. Our studies of the economics of trust^{iv} have demonstrated that trust dramatically improves speed, innovation, forecasting, joint planning, and reduces cost among other factors.

Ironically, Canada is inherently one of the 10 most trustworthy countries in the world;^v *trust is a national asset*; but Mega-Projects often craft legal contracts armed like a battleship ready to fight. Instead we should exploit Canadian’s natural propensity for fair play, and be very selective about who gets to play on the project management field, excluding those few who can/should not be trusted.

Once risk management gathers momentum, often it becomes the universal solution to everything. *Risk management then is mis-applied to any issue of uncertainty,^{vi} for which innovation would be the proper approach.* But because trust is missing, innovation is overlooked as the best solution. What’s more, while risk management can be written into a contract, neither can trust nor innovation.

In Collaborative Construction, companies who are not trustworthy are screened out of the qualification process early on.

Trust is embraced by a mutually agreed upon *charter* or set of *operating principles* (see Figure 24: Joint Charter from Woodlawn Bio Reactor in Australia and Figure 25), and innovation processes are imbedded as a daily routine in the course of operations.

The “bad culture risk” could be as high as 30% of the entire risk profile, but is totally overlooked by adversarial/transactional risk managers.

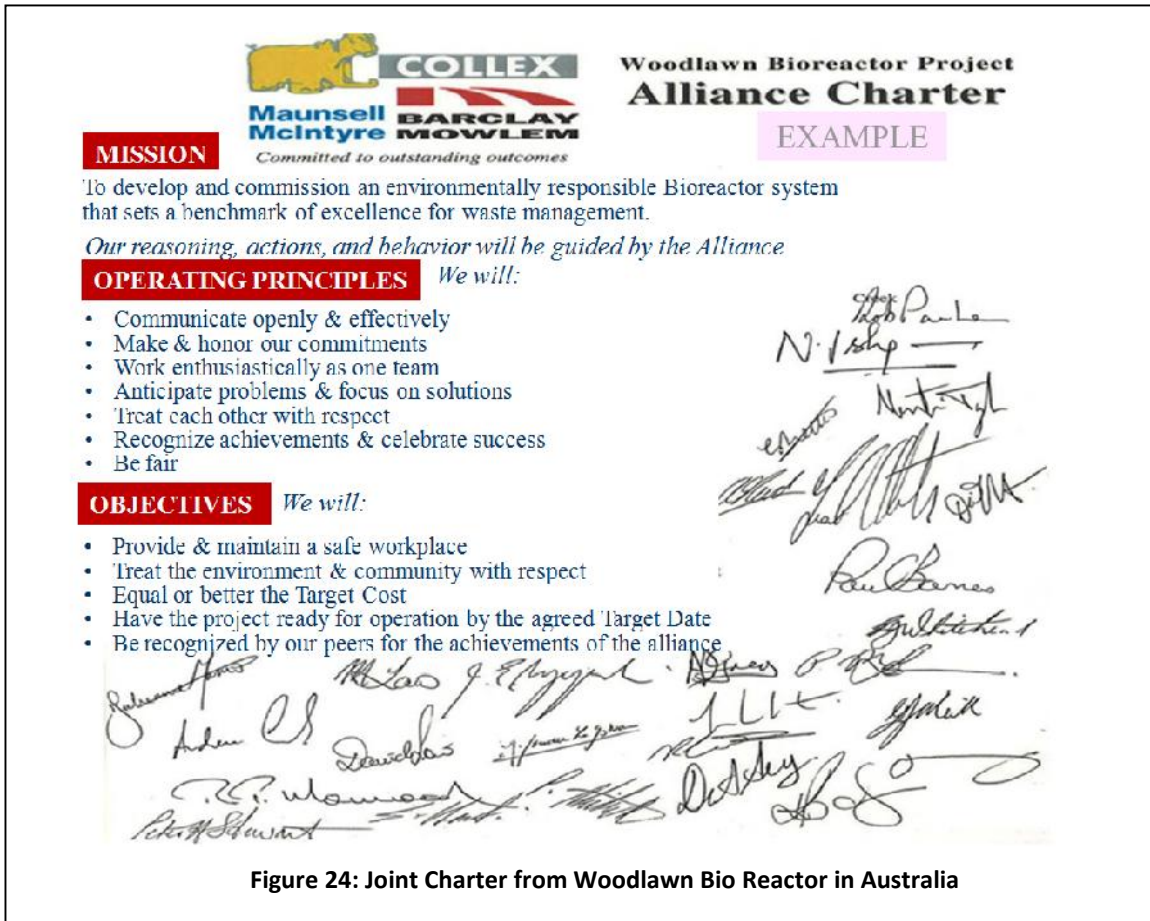


Figure 24: Joint Charter from Woodlawn Bio Reactor in Australia



Figure 25: Woodlawn Bio Reactor

Myopic versus Holistic Risk Management

It is not a coincidence that the idea of “team/alliance culture” seems to be in the vocabulary only of those leaders who advocate *collaborative* construction, but is tragically *absent* from the mind-set of those who engage in *adversarial* or *transactional* practices; they don’t see the magnitude of risk in front of them. Collaborative leaders see the idea of risk far more holistically.

In the Collaborative Construction model, many construction risks are dramatically lower than in traditional approaches. (see Table 3: Collaborative Construction – Best- In-Class Results, page 21)

- First, because trust levels are higher in collaborative environments, communications, problem solving, and innovation increase, reducing risks of failure in the field. Trust also eliminates massive amounts of non-value-added work, such as redundancy, cover-your-backside, etc.
- Second, by creating a high performance team utilizing the ‘best people for the project’ principle, higher productivity creates lower risk.
- Third, by integrating all the creative thinking up front (front-loading) into the design cycle, opportunities for innovations are identified, field problems are reduced significantly, and early warning systems are established for averting major catastrophes.
- Fourth, for the workforce to become fully engaged in the first three issues – trust, teamwork, and innovation – they must feel management cares for their personal safety. Safety programs are usually a primary means to generate lower risk. As an added benefit, a safe work environment is typically more productive and more profitable.^{vii}
- Fifth, there is a strong emphasis on a fair risk-reward balance which incentivizes co-creation, collaborative innovation, and collective action for the ‘good of the project.’ (Note: the risk-reward structure is not finalized until all the members of the alliance are engaged in identifying potential risks and finding ways to resolve them *before* they impact adversely.
- And lastly, because most collaborative agreements reject litigation as a principle means of resolving difficulties, the back-end legal costs are eliminated. (Resolution of differences can be handled with Alternative Dispute Resolution. However, in the cases of hundreds of collaborative construction projects in Australia, litigation was never necessary.)

Collaboration Begins with Safety

For most construction companies, ‘safety first’ is where risk management begins. Safe job sites not only save workers from injury, but also save on insurance premiums from workers compensation costs. And, as an important bonus, when workers feel safe, their morale increases along with productivity. A worker worried about his or her chance of being injured is focused on personal protection, not innovation.

*Align the Interests
of the Stakeholders
and Fairly Apportion
the Risks & Rewards*

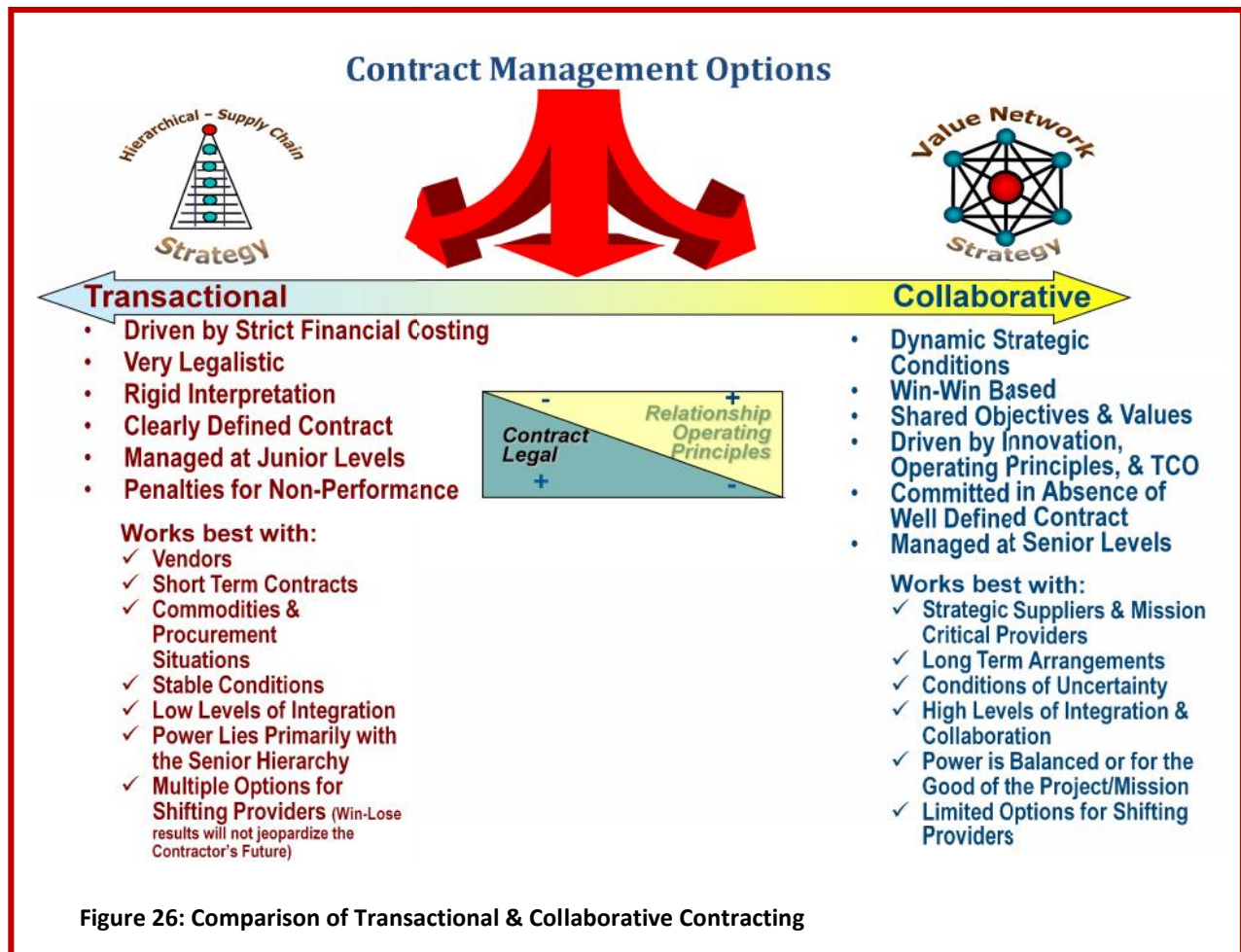
Collaborative Contracting

Traditional (transactional) contracting evolved over the years as a means of protecting the interests of parties, and to enable enforcement of the provisions, terms, and conditions of delivery of a product or service in exchange for money. Most contracts are designed to lock in stability, not embrace change. The central role of a lawyer is to protect their clients, thus shedding risk onto another party is central to most lawyer's views about "protecting their client."

This approach to business relationships tends to work best in short-term, arms-length, one-off *transactions* where a discreet, definable product or service is delivered once, and the product or service needs no customization, integration, or innovation.

As business has become more litigious, the contracts followed the same course, filled with onerous *strictures* and over-loaded with shields, swords, and escape tunnels as the parties to the contract instruct their legal counsels to built more castle walls to protect themselves. Layers of non-value added work were introduced into the construction industry to ensure every party comprehensively protected themselves. In Figure 26 we outline this condition on the left side of the chart.

In Collaborative Contracting, beware of the contract that becomes the dumping ground for every risk shedding, exculpation, and adversarial clause setting the stage for future litigation. These clauses will kill trust, deter frank communications, and pit parties against each other rather than align their interests.



However, in projects with complexity, multiple interfaces and uncertainty, contractual *strictures* become major barriers to adaptability, flexibility, and innovation. The ultimate result is to destroy any semblance of trust, teamwork, and positive, open communications as larger contractors pass the defensive strategy of the owner onto their subcontractors. What started off as a *transactional* contract often ended up in an *adversarial* battle in court later.

Purpose of Collaborative Covenants/Charters and Contracting

Collaborative contracting in high takes a dramatically different contracting path in conditions of high risk, high uncertainty where alignment, integration, and cooperation are essential. Collaborative contracting seeks to put in writing a mutually agreed upon set of documents that:

1. **Align the interests** of the Owner, Designer (EPC, A&E), and Contractor (and then, based on this alignment, ensure the alignment of subcontractors, suppliers, and other service providers).
2. **Create a collaborative** (partnering) **relationship** (culture) between the Owner, Designer, and Contractor that is built on three central organizing principles to create trust, teamwork, and collaborative innovation.
3. **Fairly apportion the risk and reward** structure to support the alignment and culture, and to ensure all principle parties make a powerful *joint* commitment (“skin in the game”) to mutual success (“best for project”).
4. **Use of best practices** on a disciplined basis for execution of all aspects of the project, thus insuring the highest chances of success (thus minimizing risks and chances of failure).
5. **Establishing a governance structure** and leadership team to sustain alignment, resolve difficulties, make adjustments, and set strategic direction.
6. **Avoid adversarial conflicts** that might result in the destruction of the value creation potential of the alliance, misalignment and mistrust, and ultimately lead to litigation.

This requires a totally different mindset regarding the purpose of a contract. In collaborative contracting, the agreement serves more deeply as a *covenant* (or *charter*) the embraces the *spirit and purpose of the relationship*.

Creating the covenant/charter is the *essential first step*, before any contract negotiations begin. (See Figure 24: Joint Charter from Woodlawn Bio Reactor in Australia on page 63 for one simple covenant agreement, signed by all principle parties.)

The objective is to base decisions on what is “best for the project” (the good of the whole), rather than favor any one party or individual.

In other words, the alliance wins or loses together as a team (just like in sports) –one for all, all for one. Trust, Teamwork, and innovation/adaptability are the key mechanisms to deal with uncertainty, multiple interfaces, unforeseen obstacles, and changing situations.

While a *contract* traditionally has served to clarify economic exchange and protect the interests of the parties, a *covenant* is designed to establish a strong *relationship*, *unify interests*, and create a foundation of *trust*.

Several of the distinct features of a collaborative covenant include:

Seasoned alliance practitioners know that Best Practices are the most reliable means of preventing failure. No alliance ever succeeded because of the quality of the contract.

- Statement of the Purpose and Value Proposition of the Alliance
- Strategic Drivers for the Owner
Alignment of Goals
- Governing Principles of Collaboration (see example in Figure 27) and Trust Principles
- Risk –Reward Sharing
- Project Governance & Role of Alliance Leadership Team
- Principles of Target Costing & Creation of Value
- Principles of No Blame, No Dispute, Early Problem Resolution, Win-Win Culture
- Assignment of High Trust/Teamwork Personnel & Longevity of Personnel Assignments

This approach avoids the *transactional* contract that becomes the dumping ground for every litigious, risk shedding, exculpation clause imaginable that no one wants to read or be held responsible for. Once these principles are mutually agreed upon by the partners, *then a collaborative* contract designed to *support and reinforce* these goals can be drafted. In the end, regardless of the length, cost, or detail of the agreement, it is only as valuable as the trust of the parties behind it and their commitment to mutual success and fairness.

Governing Principles in the Collaborative Covenant

Before creating a contract, best practice calls for developing a mutual covenant that sets the cornerstone of trust and teamwork, and raises the standards of personal and organizational interaction. Here is a sample of the typical headings from a recent collaborative covenant in the construction industry (summarized here)

1. Fiduciary Relationship:
2. Reciprocity:
3. Respect Your Alliance Partner's Business Relationships:
4. Walk the Talk:
5. Commit to Continuous Enhanced Performance:
6. Be Accountable:
7. Effective communication:
8. Share the Risks and Rewards Equitably:
9. Respect Intellectual Property:
10. Confidentiality:
11. Provide for Effective Resolution of Differences in Advance:
12. Disengage Honorably:

Figure 27: Example of Governing Principles of a Construction Alliance

Collaborative Risk – Reward Sharing Model

One distinguishing feature of alliances (in every industry) is the sharing of risks and rewards. In Collaborative Construction, especially in large complex projects, fairly apportioning and sharing risks and rewards enables significant *alignment* of interests, objectives, and operations.

Sharing risk is important because it creates ‘skin in the game;’ each party is obligated to put forth its best efforts to reduce risks, and to share in the rewards for creating value. This aligns the incentive system; everyone pulls in the same direction for the greater good: the “best for project” principle.

Aligning Interests and Incentives

In the collaborative value model, the Owner makes an up-front commitment to create a close *alignment* with the “Partners” -- Designer (EPC or A&E) and Builder (or Contractors) – by creating a cooperative environment with an *incentive structure* that ensures both the Owner and Partners (Designer and Builder) will all be rewarded if they beat the budget (often there will be incentives for

beating the schedule). This reward structure can also be extended to sub-contractors, the trades, and others who contribute to ‘beating the target.’

In Collaborative Construction, a three tiered Risk/Reward financial structure is established for ‘pain and gain sharing.’ (see Figure 28). It is a “three tiered (or limbed)” approach that ensures neither the Designer nor Contractor will be bankrupted by the formula.

– **Limb 1: 100% Reimbursement of Direct Costs**

This includes direct costs and project specific overhead incurred in delivering the works, irrespective of the performance of the alliance and the outcomes of the gain share/pain share regime. This reimbursement includes rework where aspects of the work change, fixing errors or mistakes, and any wasted effort. Reimbursement of direct costs should make no contribution to administrative or support functions that are not directly related to the performance of the works.

– **Limb 2: Normal Profit and Corporate overhead** (non-project specific)

An outside accounting firm determines what has been normal historic overhead and profit, above and beyond that included in the direct project overheads. This is placed at risk should the alliance members underperform.

(Subcontractors that are not part of the pain/gain arrangement are excluded unless the Contractor makes special arrangements within the alliance).

Typically Limb 2 percentages are lower for Contractors than for Designers, because of the different ways each allocates overhead. The fair share percentages are negotiated among the Owner and Partners and agreed upon mutually before launching the project.

– **Limb 3: Gain Share**

This represents the amount of money that is offered to the Owner and the Partners to ‘beat the target cost.’ Typically the owner retains about 50% of the savings, and the Partners split the remaining savings as a bonus. The Partners engage in robust principles-based decision making to ensure a real win-win and that performance is not sacrificed in order to achieve gains.

Bonus Pool

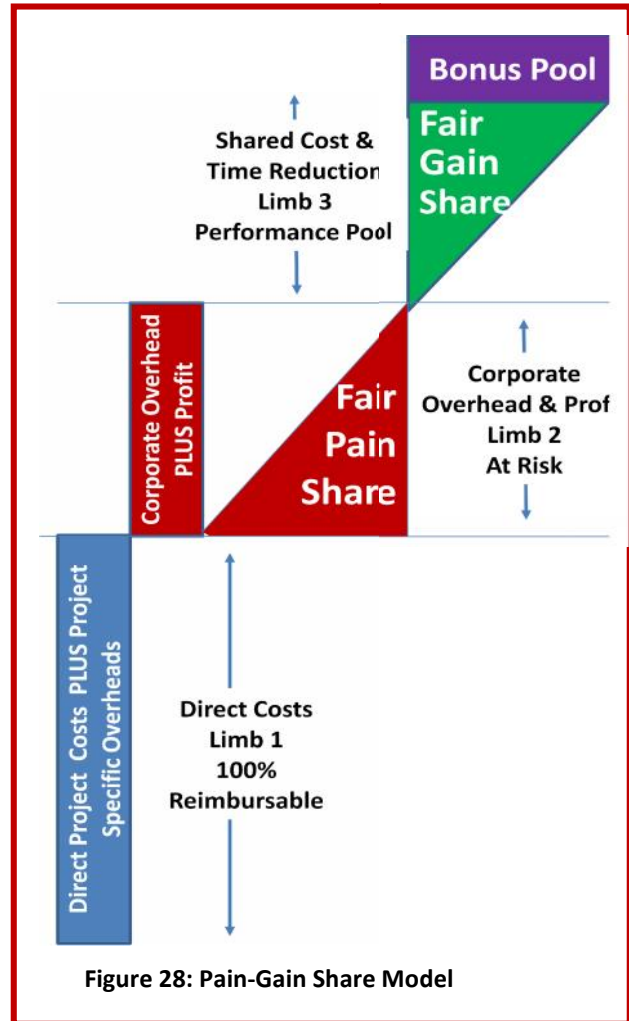


Figure 28: Pain-Gain Share Model

In projects where completion ahead of schedule is an important part of the Value Equation, a Bonus Pool is established to incentivize “fasttime” delivery. The Bonus Pool is determined before project commencement. It can be either a fixed amount, or a percentage of the total project. (see Figure 12: 1994 North Ridge Earthquake's impact on Santa Monica Expressway, page 36 for an example of a Bonus Pool)

The Collaborative Value Bidding Process

Everyone is familiar with low-bidding. On the surface it appears to be the best way to pay the least for what one needs. Low bidding works well in simple, straight-forward situations where all the variables are easy to master, where there are few interfaces with other contractors, the bill of materials are easily acquired, specifications for performance are standard for that job, and where the plans are easy to understand.

Problems with Low Bid

But the low-bid model breaks down under stress. Low bidding begins to show cracks and flaws as a methodology when *complexity* increases, when *on-time/budget* or cost effectiveness is essential, or when long term *operating costs* are more important than low price, or when *time to completion* has major value. What’s more, customer dissatisfaction is the hallmark of project completion.

Experience has shown that low cost bidders all-too-often deliver poor quality, have problems retaining quality employees, are poorly managed, seldom deliver on time, and often end up in litigation.

Everyone is familiar with the horror stories of low bidders, strapped for cash, hiring poorly trained workers that perform shoddy work requiring rework, running over schedule because they didn’t pay their subcontractors, procurement of second-rate materials that fail in the field, shaving on specifications, often requesting more

For this reason, the collaborative mindset takes a very different view of the bidding process. There are five distinguishing characteristics:

1. Focusing on *creating the value equation* than grappling with the illusion of *component pricing*. The value equation typically includes multiple factors in addition to price, such as rapid time to completion, lower operating costs after completion, and no exposure to litigation upon completion, to name a few.
2. Ensuring only high *quality collaborative contractors* are in the running, while screening out unscrupulous, disingenuous, low-quality bidders ahead of time.
3. Establishing the *alignment* of stakeholder interests, the fair *apportionment* of risks and rewards, and the collaborative *culture* necessary to meet the strategic goals of the owner.
4. Integrating the design, delivery, and supply chain teams *early* in the project evolution.
5. Building a culture from the outset of based on three central organizing principles emphasizing trust, teamwork, and collaborative innovation.

Careful Selection of the Delivery Team

Prequalification of engineering, contracting, and major supplier companies is a critical factor for success. The emphasis is on selecting delivery team members who are not just competent, but also capable of high performance, innovation, and teamwork.

Because trust is the glue that holds the delivery team together, only those with high character can be allowed to bid and deliver. While cost is always a factor, this is balanced with other key considerations such as a history of delivering on time, a track record of little or no litigation, strong customer satisfaction and repeat business, aptitude for innovation, positive working relationships with subcontractors, and the ability to retain quality personnel who will remain on the job.

Bidding Options

In Collaborative Construction, typically the stakes are high, time is critical, and thus the bidding process is oriented to produce high value results, which are, quite frequently actually much lower in cost than the low-bid approach.

There are two different bidding options for collaborative bidding:

Option One: Cooperative Value Model

(typically used more by private sector)

Step One – Selection:

Rather than first bidding on a project, the Owner pre-selects the best, most innovative, most cooperative team (Designer, Contractor, Subcontractors) at the outset, using a sophisticated selection process that takes into consideration: trustworthiness, reliability, teamwork, and innovation. Sometimes several teams are selected at the beginning, and each presents their best approach, the best team becoming the finalist.

Step Two – Cost Estimation:

Based on plans and specifications (which may only be 15% complete), a ‘typical business as usual’ cost estimate is generated, which then becomes the Target Cost Estimate (TCE). The TCE is based on costs which are characteristic from the region on similar projects. The game-plan is to use teamwork, innovation, removal of non-value-added work, and coordination to ‘beat the target.’

Step Three – Risk/Reward Structure:

Together, the Owner/Designer/Contractor Team creates a win-win-win structure for each of the partners to work together to ‘beat the estimate.’ Often an incentive is also offered by the Owner to beat the time estimate as well, especially when early completion has major economic value.

Option Two: Competitive Value Model

(typically used more by government)

Step One -- Tender Offer:

Owner issues a tender offer (Request for Proposal) to 3-5 (or more) pre-qualified Design-Build Teams.

Step Two – Risk/Reward Structure:

A Risk/Reward structure is proposed that creates a ‘reward pool’ to incentivize collaboration in achieving on-time, on-budget delivery, or better.

Step Three – Value Based Bids:

Design-Build Teams submit proposals emphasizing their quality, collaborative skills, innovations, and capability to beat the numbers and reap the reward.

Step Four -- Selection:

Owner selects based on the most qualified team, the lowest cost and the highest likelihood of

beating the numbers. (Remember, the Designer & Builder, if they beat the numbers, get paid twice: the amount they bid, plus the bonus represented by the reward pool)

In the competitive value model, it is not usual for the owner to have two or more of the bidders form an alliance or joint venture between them to bring together a hybrid of the best of both worlds. For example one bidder may have superior relationships with the local subcontractors while another contractor may have more sophisticated building techniques for the unique specification of construction. Because the bidders are preselected based on their collaborative skill sets, forming an alliance or joint venture generally is not a difficult interim step to win the business. Often these construction relationships then carry forward beyond the immediate project into other joint-bidding arrangements in the future.

Success Rates for Collaborative Construction

Does this work? Is the devil we know in adversarial and transactional contracting a better bet than shifting back to a collaborative model many have not experienced in recent generations?

The Canadian Experience

Here’s what the studies have shown in Canada:

George Jergeas, University of Calgary’s top authority on success and failure factors in Mega-projects is a world-renowned expert. He and his team have studied over ninety major construction projects throughout Canada. Table 6 (repeated here again) shows success rates of each type of construction model based on his analysis of ninety Canadian projects.

Table 6: Typical Success Rates	ADVERSARIAL Construction	TRANSACTIONAL Construction	COLLABORATIVE Construction
% chance of being delivered On-Time, On-Budget, On-Target	Under 10%	20-30%	80-100%

This is a compelling case that must be taken into consideration because of the potential impact on any project development planning, risk analysis.

Professor Jergeas’ analysis supported by over 400 medium to large scale projects in Australia which turned in extraordinary on-time, on budget project deliveries without any subsequent litigation, as well as a multitude of successful Integrated Project Delivery (IPD) rollouts.

Best-In-Class Collaboration Results

Part One: Basics of Collaborative Construction

These estimates and results are supported by other research at the Construction Industry Institute at the University of Texas at Austin. Their research team examined those companies that were truly committed to a collaborative relationship in construction projects. These “best in class” companies had a profound competitive advantage. (see Table 7 repeated here again and Table 8)

Cost	
Area	Results
Total Project Cost (TPC)	10% reduction
Construction Administration	24% reduction
Marketing	50% reduction
Engineering	\$10/hr reduction
Value Engineering	337% increase
Claims (%TPC)	87% reduction
Profitability	25% increase

Table 7: Collaborative Construction – Best-In-Class Results

Safety	
Area	Results
Hours without lost time accident	4 million vs. 48,000 industry standard
Lost Work Days	0 vs 6.8 industry standard
Number of Doctor Cases	74% Reduction
Safety Rating	Top 5% of National Average
Schedule	
Area	Results
Overall Project	20% reduction
Schedule Changes	48% reduction
Schedule Compliance	Increased from 85% to 100%
Employee Morale	
Area	Results
Employee Job Satisfaction	30% Increase
Claims	
Area	Results
Number of Claims	83% Reduction
Projects with Claims	68% Reduction
Quality	
Area	Results
Rework	50% Reduction
Change Orders	80% Reduction
Direct Work Rate	42% Increase

Table 8: Collaborative Construction Best-in-Class Impacts

Supply Chain Impacts

For several years Productivity Alberta has been conducting a supply chain simulation. Over 500 procurement managers have gone through the simulation to test the impact and advantages of *collaborative* relationships versus *transactional* relationships in multi-tier buying arrangements.

Comparing the results of *transactional* interactions where bargaining was prevalent and trust was low against high-trust *collaborative* interactions, in the latter circumstances, communications and problem solving improved dramatically.

- Fulfillment rates improved from an average of 50-60% in the *transactional* simulation to 90-100% in the *collaborative* simulation.
- Impact on actual costs of operating the multi-tier supply chain (in terms of inventory-on-hand and operating costs) dropped by factors of 50-75%.

Why such a dramatic difference between the transactional and collaborative supply chains?

Innovation, communications, joint problem-solving, and planning and coordination was missing in the *transactional* supply chain were vibrant and powerful in the *collaborative* situation, enabling trust and teamwork to produce far more effective results.

Companies who sent teams of procurement professionals through the simulation and training saw the same dramatic results when they brought the collaborative supply chain model into their field operations.

Bottom Line: Industry shift

While Collaborative Construction is clearly the winner in the competitive construction industry, it has not been accepted deeply by construction practitioners. A full embrace of the power of Collaborative Construction will not happen until five realizations converge in the leadership ranks:

1. **Fertile Ground:** leaders must recognize the three faces of construction (outlined in Table 1: Spectrum of Three Competing Models of Project Delivery & Their Characteristics on page 11) and make a firm commitment to play the collaborative game when appropriate for the benefits to flourish. Any effort to implant *collaborative* systems into a *transactional* or *adversarial* environment will result in depriving the growth factors of any nourishment.
2. **Conditions for Collaboration:** knowing when to use the collaborative game depends very much on who else is in the arena and what the risk and complexity conditions dictate (see Figure 7: Evolution of Partnering & Alliancing on page 25). There are conditions where *transactional* construction is appropriate.
3. **Mindshifts:** leaders must then transcend their commitment to collaboration with a comprehensive shift in the way they think and act. (see The Collaborative Construction Mind Set on page 38) In other words, it is essential to “walk the talk.”
4. **Professional Acceptance:** Several different professions, each with their own standards and mindsets, intersect in the rollout of a major project, including: 1) Architecture & Engineering, 2) Project Management, 3) Contract Management, 4) Supply Chain

Management, 5) Risk Management. Each profession has a very well-defined paradigm that justifies *transactional* engagement. For a shift to occur, these professions adopt a similarly well-defined strategy, system, and methodology for *collaborative* engagement. This shift does not require decades to accomplish if thought-leaders in the profession become strong advocates of collaboration and utilize the many resources already available.

5. **Owners Endorsement:** Ultimately the most important influencers in the decision to use Collaborative Construction are the project owners and developers. Their endorsement of the *collaborative* strategy and insistence on its use is

Accomplishing these five convergences is not as difficult as it might seem. There are hundreds of successful examples, numerous studies and an abundance of best practice methodologies available, and a cadre of effective thought leaders and champions of the cause.

But why has their message been difficult to get across to the industry?

Attempts to get the message across has been done piecemeal, with the belief by those unfamiliar with the nature of organization behavior that change occurs as long as there is a sound rationale for the change; shifting an organization, profession, or an industry requires a much more systematic approach.

Transforming your company, team or project

Advocating and Operationalizing the Transformational Shift

Here's a very brief overview of what anyone who advocates the shift to Collaborative Construction needs to know about getting started transforming organizations into new modes of operation:

Fertile Ground: First, the issue of *fertile ground* is very critical. As stated above, efforts to implant *collaborative* systems into a *transactional* or *adversarial* environment is inherently difficult. Those who champion the collaborative shift will be most effective in a corporate climate where the conditions to nourish the ideals, values, and skillsets are favorable.

Hostile, *adversarial* cultures will not spawn *collaborative* initiatives. Fortunately most organizational cultures are not hostile, but they are a *mixed muddle* of competing and conflicting beliefs and values. Strong internal leadership is essential to create clear strategies and messages and protect those who champion the cause from being undermined from within by non-believers.

10 Key Steps: Second, there are 10 key steps necessary to affect a strong transformational effort. (If one does not abide by these, the chances of success are dramatically reduced.) Each requires senior leadership's direct engagement and delivery.

Step 1: Urgency and Compelling Rationale

All organizational shifts must be first founded on a sense of urgency – a need to move forward or our future will be in jeopardy.

The urgency must be backed up by a compelling rationale that makes sense both on the surface and when one digs deeper into the issue. This handbook outlines many of the rationale a leader can use to create a compelling case.

Step 2: United Leadership Team

For the entirety of an organization to hear and respond to the message to shift gears, all the senior executive team and influential middle managers must be signing to the same tune.

Disparities in commitment or half-hearted endorsement will send muddled signals to the rank and file, resulting in low levels of commitment and interest.

Step 3: Clear Vision, Value & Strategic Pathway

A compelling rationale must then be articulated in a clear vision of what the future will look like, the value this new vision will create, and a strategic plan that lays out the path to the new future.

People need to know the role they will be expected to play and expected results to be achieved.

Step 4: Create Rapid Results

Long, arduous, drawn out programs are neither exciting nor demonstrative of how the objective will be achieved.

Find an early adopter team and a powerful champion who will start a pilot project that will produce quick results, measurable impact, and demonstrable value. This will create important momentum to turn skeptics into believers.

Step 5: Trust & Teamwork - Foundation of Collaborative Culture

People want to know they can trust each other as they move to a new set of beliefs and skillsets. They want a sense of teamwork that reinforces they need to belong to a worthy effort.

A move to higher ground must carry a strong set of messages that everyone will be treated fairly, with respect, and they need to know they will be secure in their jobs in the new future they are creating.

Step 6: High Performance & Innovation – Culture of Success

The shift to a *collaborative* model requires the co-creative abilities of teams to innovate, problem-solve, and design new methods and processes for carrying out their work.

Success may require training workshops for people to become skilled at new ways of thinking and performing. The more the opportunity for those affected by the change to design the system of execution, the greater their commitment to the results.

Step 7: Reduce the Risk & Resistance to Change

All organizational change involves risks and evokes resistance. Take the shift in manageable bites; integrate new ideas and methods in ways that small mistakes can be turned into learning.

Fear is the basis of all resistance to change. Therefore, don't try using threats as a form of motivation, it just backfires. Identify fears (real or imagined), lessen the fear, increase the personal safety and security factors, and use those who have made the jump as role models.

Step 8: Celebrate and Promote Victories

Moving from the old to the new is a process of creative destruction. Many would rather be wed to past, despite its inadequacies. Be sure to retain the good from the past, give a funeral to the parts of the past that didn't work; be sure to celebrate victories that accelerate a bold future.

For those who have succeeded, let them become mentors, trainers, or promote them to positions where they can continue creating successes.

Step 9: ReAlign the Organization

Any time an organization embarks on a journey to change, it must acknowledge the powerful existence of an old culture filled with old values, old measures, and old rewards that have been used to sustain the former way of doing things acts. These act like an invisible magnetic force field to keep the old system in place.

To make the new way stick, leaders have to systematically realign values, measures, rewards, processes and structures to sustain the new effort – otherwise everything reverts back.

Step 10. Refine, Measure, Learn & Innovate

Transformation occurs not in a direct path, but in experimental cycles, learning experiences, and feedback loops. Be sure to take the word "failure" out of the vocabulary and turn every experience into learning.

Measure results, publicize learnings, promote the winners, and set the standards for the next generation of improvements. Keep building the foundation of trust, teamwork, and collaborative innovation to spur further gains.

Failure to abide by these factors explains why so many change efforts, like the implementation of IPD and Lean fail to take hold.

The Australian Experience

After having shifted to a Collaborative Construction model twenty years ago, and having experienced extraordinary levels of success, here's what the Aussies say about its effectiveness:^{viii}

As well as the traditional drivers, today's alliances also resonate with clients, because of their capacity to deliver significant community and social benefits and legacies. Increasingly this is a major requirement for clients whose vision transcends the historical project delivery outcomes of time, cost and quality, and whose own clients, often the public, expect community-focused, sustainable development.

Today's high demand for alliances is also being driven by a resource-constrained market. Owners are seeking resource certainty and want to develop and retain people on their projects.

Experience has shown that when alliances are used for the right project and given appropriate management focus they can provide better outcomes and a higher level of satisfaction than if these traditional adversarial delivery methods are utilised. The reasons for this include:

- Price Certainty – alliances are typically delivering to within (+or-) 5% of the Target Cost

- Solutions-Focused Approach within complex, challenging project environments
- Project Team's Energy focused on achievement of project goals
- No Costs incurred in Litigation
- Better Project Delivery Certainty
- Evolved Value For Money (VFM) proposition incorporating transparency, time and quality criteria, as well as long-term sustainable (community, environmental and stakeholder) legacies
- Focus on responsibility and accountability
- Greater community and stakeholder engagement
- Superior prospects for achieving environmentally sustainable solutions through a whole-of-project approach
- Improved professional and personal growth
- opportunities for skills and knowledge exchanges between the Owner and Partners
- Constant benchmarking of project outcomes.

Insurance shift

In Australia, the insurance industry also responded positively to this improved risk structure in the construction industry. Professional indemnity policies are now tailored by the international insurance industry for 'no blame, no litigation' culture of alliances. It reflects new thinking about the impact of trust and collaboration on risk management.

Saga of the Oil Sands

Jeremy Heigh, in his insightful report *Embracing Complexity, Productivity Alberta's Options For Influencing Heavy Industrial Productivity* explains the nature of the of the Mega Project:

With coarse and blunt strokes, let's walk through the general trajectory of a mega-project in Alberta:

- Projects start by being put out for bids. This seems like a good move for the owner but it instantly sets up a zero-trust environment. It's a cut-throat process where engineers, constructors, and manufacturers battle their peers to provide the lowest bid, within the tightest schedule, at the highest quality.
- The winning companies are rarely given enough time to pull the ideal team together. They cobble together a group of readily available individuals and throw them into the project.
- The project team stumbles around trying to figure out each other, the other companies they're partnered with for the project and the owners.
- The owner almost always starts by changing the schedule and the plans, immediately making the carefully crafted planning irrelevant.
- Plagued by schedule changes, budget volatility, input constraints, labour shortages, safety violations and regulatory uncertainty, the project teams toil doggedly through the five to seven-year process of producing the project. Inevitably, the zero-trust environment flourishes, seeded by the bidding process. Owners complain about engineering, engineering complains about construction, construction complains about schedules and materials, and manufacturers complain about the burden of inspections.
- Exhausted, the management teams of all the partners and any associated executives finally complete the project. The almost universal response is that it's over budget and past schedule. The teams are dismantled. Scapegoats are fired. And the process starts again.
- The learning, strategic implications, and experience within that specific project is dispersed and ineffectively captured. The individuals are often thrown into new projects where nothing is the same and the learning is only partially leveraged.
- The consequence is that executives tell us the projects today are no better, no faster and far more expensive than they were 10 years ago. Management is full of holes. And too few of the companies we interviewed trust anyone else.

Processes are needed to short-circuit this cycle. We need rigorous processes that mechanize the record of learning, make components available for new projects, translate implications for leaders, and make timeless the experience of projects. We need tools that test tactical choices for strategic consequences. We need to systematize learning too. --Jeremy Heigh

-- email sent to Robert Porter Lynch, April, 2013

Figure 29: How Transactional & Adversarial Thinking Causes Breakdowns in the Oil Sands

PART TWO: THE MEGA-PROJECT CHALLENGE

For companies that are committed to making the shift to the Collaborative Construction model and will be engaged in small and medium sized projects, the strategies, principles, insights, and methods outlined to this point will serve as an excellent foundation for successful implementation of partnering relationships. A variety of collaborative methods and technologies, such as Building Image Modeling (BIM), Integrated Project Delivery (IPD) and Lean Construction will be easier to use and produce more far better results.

But stakeholders engaged in large scale (over \$100 million) projects or those with high levels of complexity, risk, uncertainty, and integration required, such as major industrial development projects, a more sophisticated system is required to be cost effective and bring meet tough schedule requirements.

Massive Mega-project Challenge

Mega-projects such are mega engineering and construction undertakings ranging between \$8-10 billion in capital investment each and employing thousands of workers, engineers, suppliers, contractors and support staff.

These developments are facing many challenges including those associated with environmental impacts, water requirements and supply, labor availability and construction productivity, energy requirements, infrastructure constraints and market conditions.

Mega-projects are characterized by:

- Magnified cost,
- Extreme complexity,
- Increased risks some of which are outside the control of the project management team or even the executives,
- Environmental, regulatory and community impacts,
- Interface management issues,
- Labour availability and management,
- High visibility, and in most cases....
- Cost over-runs frequently exceeding total project values.

Major industrial development projects are mega engineering and construction undertakings ranging between \$8-10 billion in capital investment and employing thousands of workers, engineers, suppliers, contractors and support staff.

The problems that plague Mega-projects are massive. (see Figure 29: How Transactional & Adversarial Thinking Causes Breakdowns in the Oil Sands on page 78) It is common for these projects to experience cost overruns of up to 100% of the original cost estimates and schedules.

Although reining in galloping overruns is the goal of all project stakeholders, it has been difficult to achieve; 50-100% overruns in budget and time are the norm. Investors are shifting their capital to other, more efficient areas of the world. Literature is flowing with documents and papers about repeated global cost overruns and delays.

The causes of the overruns have been researched, studied, analysed, and dissected. (In Appendix One we include a short overview of some of the many reports and analyses.)

Numerous authorities, developers, universities and consulting companies have joined in the call for ideas to fix the problem.

Why Cost & Schedule Overruns on Mega Industrial Projects?

In 2002, a study conducted for the Government of Alberta, Canada by Bob McTague of Hatch Engineering and Dr. George Jergeas of the University of Calgary, found that cost and schedule overruns on large oil and gas construction projects were the result of the apparent “management” deficiencies in managing scope, time, quality, cost, productivity, tools, scaffold, equipment, materials and lack of leadership, among other things.

An investigation by Dr. Jergeas shows that the overruns continue to be a major challenge facing industry and reveals the following reasons for cost and schedule overruns:

1. Unrealistic or overly optimistic original (AFE- Authorization for Expenditure) cost estimate and schedules

The underestimation of project costs may be explained by many reasons including:

- The under appreciation of project complexity, interfaces, interdependencies and risks associated with the mega project environment. Some of the risks are outside the control of the project management team.
- Under estimating the cost to attract and maintain the labor (craft) work force (including camp development and operations cost and costs to transport personnel into and out of the remote regions of Mega-projects).
- Underestimating the direct and indirect costs of overtime including additional premium and loss of productivity costs.
- Craft wage increases to attract personnel to the location that possess the local governmental requirements to work in the region.
- Regional and national demands on labor, including that from other Mega-projects, restricting the availability of craft labor.
- Under estimation of the labor productivity loss associated with working in cold weather climates and locations with severely shorter daylight hours in northern regions
- Shortages of skilled labor and lower than anticipated labor productivity due to mismanagement of the construction phase.
- High labor turnover mainly due to the harsh working environment and competition between employers attracting labor.
- Transportation costs (including custom cost) are generally underestimated for permanent materials, construction equipment, personal, staff, etc.
- Environmental and regulatory compliance costs are not given sufficient consideration during the contract negotiation.
- Material cost for both permanent facilities and temporary facilities are not sufficiently escalated during the project budget development phase.

- Requirements for local content can add inefficiency and additional training cost to staff a project.

2. **Incomplete scope definition or inadequate Front End Loading**

Incomplete scope definition and inadequate Front End Loading are mainly due to the fast-tracking nature of Mega-projects and ongoing changing customer requirements result in scope changes throughout the life cycle of the project. Lack of understanding of the cumulative impact of scope changes on project cost and schedule add another dimension to this issue. The client's and engineering firms' practice of pushing work to the field early puts construction under an unrealistic compressed schedule with increased overtime requirements and often with little or no cost consideration for the field cost.

3. **Inappropriate project strategies for the mega oil sands environment**

Some project strategies deployed do not properly consider the level of scope definition, the fast track nature of the mega project environment, market condition, owner participation, owner control and owner risk. Improper or late consideration of the following project strategies adds to cost overruns:

- Project management strategies such as risk management, project control, change control, communications, organization and responsibilities.
- Contract strategies relating to management, design, construction and commissioning services.
- Design strategies such as contributions from client business, operation, project team, contractors and suppliers.
- Procurement strategies including preferred suppliers, progressing, inspection and expediting, receipt, storage and management, spares and documentation.
- Construction strategies including site management and organization, site layout, power, utilities and drainage, work breakdown structure, construction method, off-site prefabrication and assembly, schedule and milestones, industrial relations, and pre-commissioning.
- Commissioning strategies including responsibilities, schedule and integration with construction, resources, training and validation, engineering and trade support, and provision of operating materials.

4. **Mismanagement of the construction phase**

This may be caused by:

- Later than anticipated engineering, vendor data, equipment and material deliveries.
- Poor project controls.
- Inadequate plan of execution and poorly defined tasks and division of responsibility.
- Lack of knowledgeable leadership in the engineering, procurement, construction and start-up of mega/major facilities.

- Inexperienced or poorly equipped project management personnel and supervisors coupled with the inability to understand, plan, adapt, implement project management procedures or systems.
- Lack of standardization and fit-for-purpose including inadequate use of shop fabrication, modularization strategy and constructability reviews.
- Poor communication, team work and alignment between the players leading to adversarial relationships and protracted disputes.
- Poor site organization and layout leading to excessive time wastage and productivity loss during construction.
- Joint venture (JV) of project partners, contractors and engineering firms that are not aligned or not set up to work effectively due to different cultures, internal JV conflicts and diverging visions of the way that the EPC project should be structured and managed.

What becomes very obvious after reading the numerous studies over the last two decades is how impervious to change the mega-industrial construction industry has been – trapped doing the same thing over and over again expecting a different result.

Systemic-Strategic Obstacles to Improvement

Evidently, the problems facing the mega-industrial construction industry cannot be fixed by isolating each individual problem and then fixing the problems one-by-one. If this were to be true, the problems would have been corrected by now. The difficulty in the Mega-project construction industry is multi-fold:

First, historically the industry has grown up from a ‘cottage’ industry, where many got their start building homes or commercial structures. It is a “dirty fingernails” industry (no demeaning criticism intended here) where top managers today often got their start in the apprentice system beginning as laborers, then learning to climb the ropes as supervisors, then site or project managers. From this perspective they were not trained to see the strategic and systemic issues in their industry. Thus the mindset of the industry is still oriented to “projects” and their expeditious completion, not to “systems change.”

Second, structurally the industry is deeply fragmented between Owners, Designers, and Contractors, with divided interests, little trust and limited collaboration, thus having no foundation for joint problem solving, fast-track delivery, and innovation. Adversarial relationships plague the field, disputes are too frequent, productivity rates are falling, and there is little organizational innovation. Everyone is unhappy, but few do anything but point fingers, defend their castle walls, and hire lawyers.

In such an adversarial environment, any attempt to “fix” the problem usually ends up in “affixing the blame on others.”

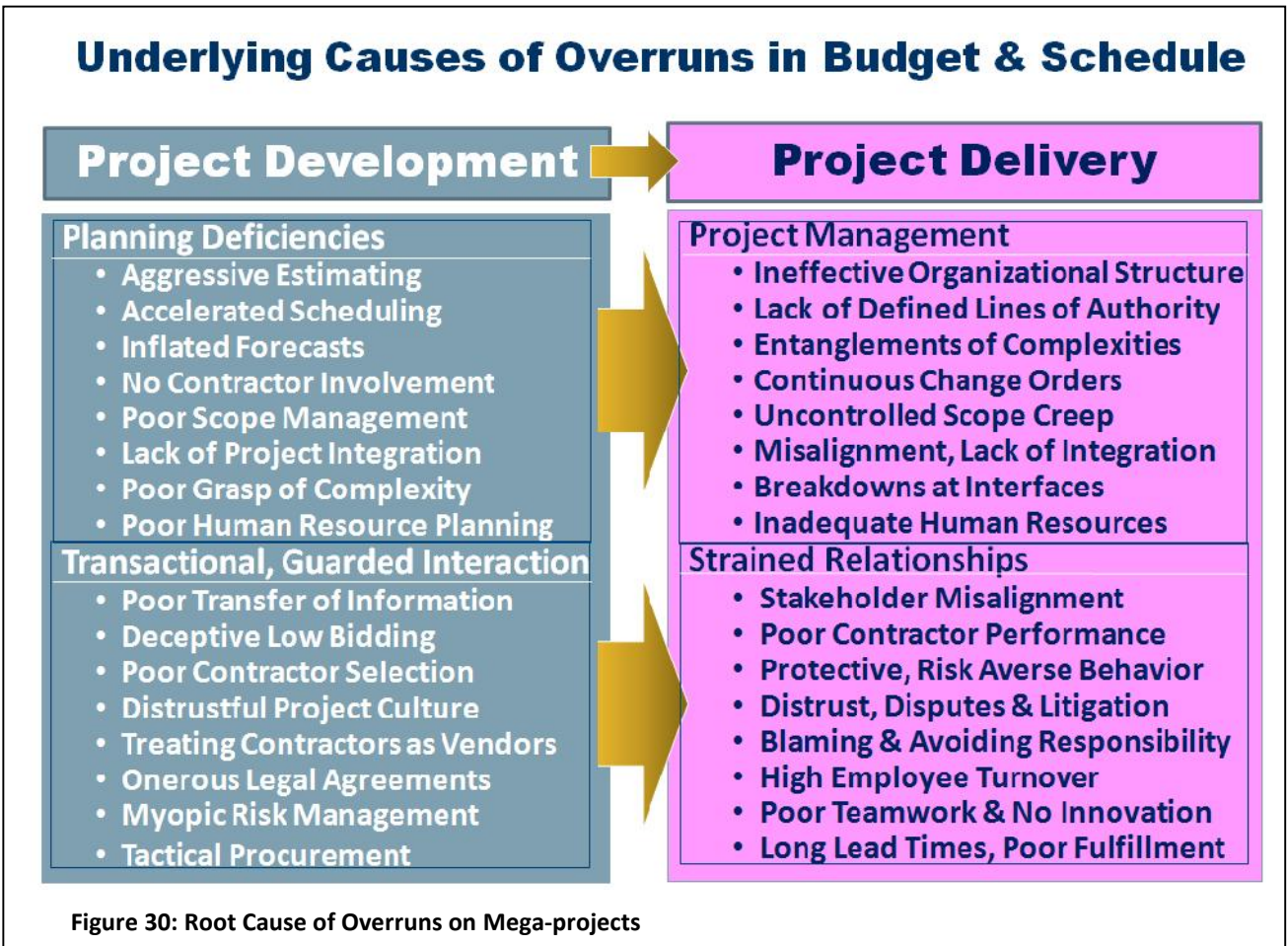
Third, a large component of the problem is invisible – it’s in the “culture.” (Be sure to read Appendix Four: “Culture as a Force-Field” to understand this problem and how to shift the forces that have caused the adversarial relationships.) A fearful culture locks people’s perceptions, limits creative mobility, traps thinking into narrow paradigms, and causes stereotyping that hoist barriers to solutions to the problems.

Fourth, the problem(s) are not within the scope and realm of responsibility of any one stakeholder group -- neither Owner, nor Designer, nor Contractor – thus the problems slip through organizational cracks. In other words, it is a “systems” problem that all stakeholders have to solve to their mutual benefit. Because all the “parts’ are connected together, when aligning one part of the system, the other parts have to be realigned too.

To compound this systems problem, none of the members of the system have the internal core competencies to take charge of the solution.

Simply recommending that someone do something different is often naïve. It’s like saying that an engineer must be good at producing video training films – it’s better to bring a movie maker alongside to work with the engineer. In other words, go find the people who are imbued with the new competencies, don’t try to train them into people who are not natural at these things.

Fourth, the systemic problems outlined above manifest in two distinct and discrete stages in a project’s evolution – Project Development and Project Delivery. (see Figure 30). Reigning in the



galloping costs and sprinting over-runs must be initiated at the Project Development stage and done holistically, addressing the multiple systems issues impacting at this point.

Lastly, the management of risk must embrace three new factors that current models have neglected:

1) the Law of Compounding Risks (see Law of Compounding Interfaces, page 56) to assess the “interface reliability,”

2) the Impact of Trust on the ability of the Project Stakeholders to adapt to change, embrace innovation, and respond positively to uncertainty.

Whenever *adversarial* or *transactional* models (see Table 1: Spectrum of Three Competing Models of Project Delivery & Their Characteristics, page 11) come to bear in Mega-projects, all the difficulties predicted by the Law of Compounding Interfaces become magnified and amplified, bogging the project down, turning would be partners into adversaries, and spinning out of control as each tries to maximize their self-interest.

3) the Destructive Power of Adversarial Bargaining and legal practices which produces excessive protective behaviors, mountains of page upon page of excessive legal contracts and unproductive non-value added work, which backfire by causing people to seek the legal protection rather than take actions that would advance productivity on the job

4) the Aligning Power of Shared Risk & Reward, which expands traditional thinking that directs risk managers either engage in actions that insulate risk, insure risk, shed risk or shed risk.

The tragic result is the a *drop* in productivity in the construction industry over the last forty years despite computers, better equipment, and new technology, (in dire contrast to virtually every other industry that has seen significant productivity increases). (see Figure 31)

Believing that just “fixing the problem by attacking the pieces of the problem” clearly has not, and cannot work. Every attempt at solving the problem piecemeal has failed. Inherently the current method of delivery of construction services is misconstrued and misaligned. These misalignments then manifest as *symptoms* of having “broken parts.”

Robust Systems Design Architecture Needed

Similarly, what’s needed to address the malaise in the Industrial sector’s Mega-projects is a ‘rocket-propelled strategy’ – a “Robust Systems Design Architecture” that meets the following ten success criteria:

1. Provides Excellent Value for the Money Invested for Owners, Designers, & Contractors
 2. Ensures Fast delivery which is On-Schedule, On-Budget *or better*
 3. Produces High levels of:
 - collaboration,
 - innovation,
 - integration
- that are paramount to success

Collaborative Innovation is sourced from the basic principle that the best new ideas come from differences in thinking – people who challenge the status quo, ask difficult questions, and iteratively postulate new possibilities. The interplay of differences fostered in a trusting, honoring environment, yields co-creativity and synergy.

4. Creates coherent Alignment of:
 - mutual interests & shared responsibilities
 - fair allocation of risks & rewards for innovation, time & cost savings
 - joint vision and value creation
 - design-delivery interfaces which are embraced from start to finish
5. Built on a Foundation of Trust that facilitates:
 - rapid decisions and readjustments
 - effective joint decision making & value based solutions
 - efficient deployment of resources
 - high levels of collaborative innovation
6. Works in an environment where:
 - Climate is Adverse
 - Risks are difficult to define
 - Scope may be uncertain or changing
 - People are considered a critical resource needing development & attention
7. Costs can be managed through a rigorous and innovative target costing process
8. Public Stakeholders and Environmental Drivers are embraced
9. Attracts Resources (Capital, Human, Mechanical, Technical) in a tight market
10. Produces Productivity Growth to reverse the trend of the last forty years (see Figure 31: Productivity Loss in ConstructionFigure 31)

Lack of Productivity Growth

In the last fifty years, according to many analysts, productivity in the *construction industry declined* (by contrast, the productivity rate within the *manufacturing & industrial market sectors has more than doubled*).

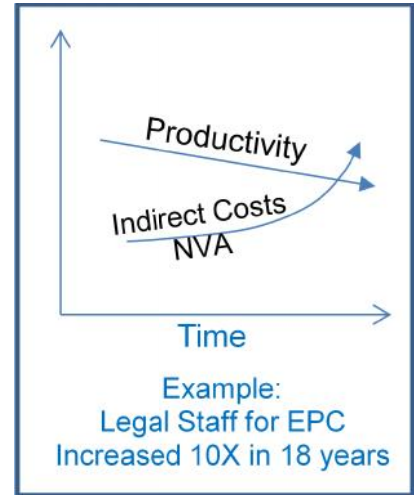


Figure 31: Productivity Loss in Construction

Many attribute this decline to the introduction of layers of Non-Value Added (NVA) work from excessive accumulation of *transactional* and *adversarial* protection mechanisms over the years.

Two perplexing strategic questions must be addressed:

First: What “Robust Systems Design Architecture” will meet the above 10 success criteria?

Second: With all the study devoted to analyzing the problem, what approach will encourage organizational systems innovation in an industry that has been so impervious to change?

D. STRATEGY & PURPOSE OF THE ALIGNED CONSTRUCTION ENTERPRISE

The Aligned Construction Enterprise (ACE) is designed to be the *next generation* in alliancing for the construction industry for aimed at curbing the massive overruns for large scale projects and complex Mega-projects.

Based on the Strategic Alliance Model

Meeting the criteria of a Robust Systems Design Architecture is no easy task. The Aligned Construction Enterprise is based on using strategic alliances as the means of creating tight *linkages* and powerful *alignments* among stakeholders. It is also a *hybrid* of the most advanced and effective forms of Collaborative Construction, with several critical new elements. It is designed to address all 10 criteria (above), reversing the disturbing trends while aiming to create a bold new future.

To better understand the ACE model and how it is formed, aligned, managed, governed, and operated, it's helpful to know some core aspects of alliances first:

In the most basic sense *alliances are about alignments* – aligning interests, strategies, mindsets, skillsets, practices, metrics, and rewards, -- all in the interests of creating *synergy* (*definition: from Greek – “syn: aligned + energos: energy”*) and *synchronicity* (*aligned timing*). Without critical alignments, the system is out of balance and dysfunctional, and will crash under stress. Here's an example:

In many ways, construction is a unique kind of business. It's very much like making a movie – every project is unique, and requires a very intricate cast of characters that must come together quickly, align on their scripts, innovate to solve unexpected problems and opportunities, and bring it all together neatly in a polished finished product.

Imagine, however, if you were making a movie, and the producer was at odds with the director, who was embroiled in argument with the key actors, who didn't like the set designer, who couldn't get along with the musical writers. The movie would be a disaster, run over budget, and be destined only for mediocrity at best.

So too with the production of a building, highway, or oil sands excavation. The synergy and synchronicity between the production crews must be elegant and exquisite. This calls for a high degree of collaboration.

Adversarial and *transactional* systems can never experience the critical alignments; it would be like trying to dance with a partner that was trying to make you look bad, or a partner with whom you had to negotiate every move.

Synergy and synchronicity only comes from trust, teamwork, and willingness to embrace new ideas.

The Nuances and Terminology

For those unfamiliar with the terminology of Collaborative Construction, it is very easy to confuse the terms “partnering” and “alliancing.” They are both part of the Collaborative Construction “genre,” but different just as a violin is different from a guitar.

Over the last two decades, different forms of Collaborative Construction have evolved based on regional and industry dynamics. All these forms have the same underlying philosophies, principles of success, and key methods of delivery. They vary only in terms of scope, level of discipline, and rigor of application. (Because these are continuously evolving models, these distinctions explained below are generic. Particular nuances emerge after each time they are used on a project, and the learnings from one project modify the next project.) Here are some differences, which are worthwhile to understand to avoid confusion.

Partnering generally refers to a project methodology where the Owner, Designer (i.e. A&E) and Contractor agree to work together in a collaborative relationship on a design-build project to innovate and coordinate their efforts to beat time and cost estimates. High trust, joint problem solving, and close coordination between owners, architects, and all subcontractors are the key attributes of partnering. One highly touted method for partnering in Integrated Project Delivery (IPD), which, according to the American Institute of Architects:^{ix}

It's a project delivery approach that integrates people, systems, business structures and practices into a process that collaboratively harnesses the talents and insights of all participants to optimize project results, to increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction. IDP principles embrace:

- Mutual Respect & Trust – value of collaboration and teamwork
- Mutual Benefit and Reward – compensation based on value added and rewarding “what’s best for project” behavior
- Collaborative Innovation & Decision Making – free exchange of ideas, teams evaluate and decide best ideas
- Early Involvement of Key Participants – the combined knowledge and expertise is most powerful during early stages where informed decisions have greatest effect.
- Early Goal Definition – in a team/innovation culture, project goals are developed and agreed upon early by all major participants
- Intensified Planning – increased efficiency and savings are derived from better planning to streamline the construction effort.
- Open Communication – teamwork requires open, direct, and honest communications among all the participants. A no-blame culture ensures disputes are reconciled early.
- Appropriate Technology – cutting edge technologies are used to maximize functionality and interoperability. Open standards enable sharing of data.
- Organization & Leadership – the project team is the center of the organizational structure. Leadership is allocated to the most capable members. Specific roles are clearly defined without creating artificial barriers that might stifle communications and risk taking.

In a *partnering* arrangement, generally the contract is much more “relational,” designed to engender trust, coordination, and teamwork. Regular coordination and planning meetings are held. The contractors and subcontractors have early input into the design to suggest ways to

lower costs, improve functionality, improve ease of construction, and lessen difficulties in coordination of the construction specialties. Third party facilitators are sometimes used at critical junctures to assist in moving the project forward and preventing misalignment.

Partnering relies on a charter, or agreement, signed by all parties involved, expressing their desire and intent to work collaboratively on a project; the process is generally not memorialized in a contract. In partnering, there exists a commitment between the client and the contractor(s) to cooperate in order to meet separate but complementary objectives.

Partnering is best used when:

- Timing is Predictable,
- Risks & Complexity is manageable/known and key leaders have experience
- There is some Project Uncertainty (such as a Design-Build project), but the uncertainty can be forecast within reasonable boundaries
- Supply Chains present nothing out of the ordinary
- Overruns are not acceptable to the Owner because of demands for opening on time

Alliancing, on the other hand, embraces all the philosophy of partnering, but takes a more strategic and more formal, systematic approach. It is applied to very large, complex construction situations where risks and uncertainties are significantly higher.

Alliancing is best used when:

- Very High Budget (typically over \$100 M) and cost control is very important
- Overruns are extremely costly (thus Intolerable) and early delivery is a major advantage
- Complex Technologies and Multiple Organizational Interfaces (such as multiple contractors, complex supply chains, and new technologies) are major factors
- High Levels of Project Uncertainty, or Project Difficulty, or Plans/Specs in Flux (such as unanticipated difficulties may arise that could not be assessed accurately until the project is underway)
- Speed & Synchronicity Essential (running over schedule has major consequences)

In the *alliancing* form, the collaborative contracting starts with a covenant/charter to align the parties (see Purpose of Collaborative Covenants/Charters and Contracting, page 66), upon which other collaborative arrangements are jointly developed, and then a contract is developed to support the alliance strategy. A great deal of time and effort goes into developing the commercial framework which is carefully constructed to align all parties involved – Owner, Designer, and Contractors – around a common goal, and then reinforcing that through appropriate commercial drivers that provide the financial incentives for good (but preferably outstanding) project performance. Together the Covenant and Contractual frameworks reduce the propensity for parties to blame each other and then litigate; instead it focuses efforts on the resolution of problems and delivering innovative solutions.

Whereas *partnering* seeks to *operationally maximize project efficiency*, *alliancing* seeks to create *competitive advantage for the Owner/Customer*, while aligning interests to impact the *long-term*

strategic and *operational performance*, recognizing that owners have a lot at stake in a highly competitive environment.

Alliancing is most powerful in situations that require an interactive design-build alignment, high levels of coordination with all stakeholders, supply chain integration, and frequent adaptation. Because of the high risk, *alliancing* generally relies on a shared risk/shared reward incentive and a bonus for savings and rapid completion.

A foundational culture of trust, teamwork, and innovation is essential to produce the synergies and synchronicities between Owner, Designer (A&E/EPC), Contractors, and Suppliers for success.

Typically the alliance model calls for dedicated alliance management for managing interaction at interfaces, 3rd party systems integrator throughout, and deep supply chain integration.

Alliancing started in the construction industry about twenty years ago, whereas *strategic alliances* is a term that evolved in the North America and Europe about thirty years ago to enable two or more companies in any industry to collaborate on a long term (hence *strategic*) basis without either one acquiring the other.

Strategic alliances are long-term, multi-project alignments that produce a powerful competitive advantage, impact each organization's long-term destiny, and have significant consequences when they are not successful. *Strategic alliances* have been used effectively in a wide variety of industries, including construction, pharmaceuticals, high tech, insurance, manufacturing, and consumer goods.

Strategic alliances have been codified with a deep understanding of principles, processes, and practices. When used by disciplined practitioners, strategic alliances produce very high rates of success.

Strategic alliances evolved from a unsophisticated idea in the middle 1980s into what is now a highly effective form of business interaction. Because of their powerful systems integration and manner of using the differentials in culture to generate innovations, this form flourishes across the globe. (This author wrote the first books on strategic alliances beginning in 1987 and conducted best practice studies globally. In 1998 the proliferation of best practices evolved into the Association of Strategic Alliance Professionals, which has over 3,000 members in 20 chapters across the world which continually update and share best practices.)

In designing the evolution of the Aligned Construction Enterprise, we have built a "best of breed" hybrid that has taken the best practices from "partnering," "alliancing," and "strategic alliances."

The Aligned Construction Enterprise (ACE) embraces *partnering* concepts, but is fundamentally founded on the principles and practices of *alliancing* and *strategic alliances*.

Aligned Construction Enterprise (ACE) refers to the *next generation* of alliances specifically for the construction industry. It builds heavily on the key principles, processes, and practices from *alliancing* and *strategic alliances*, as well as innovations from *Integrated Project Delivery*, human behavior, collaborative innovation, and systems integration. The ACE approach was designed specifically to address the problems of very large scale projects (over \$100 million) and Mega-

projects where, historically, there has been a great propensity to go heavily over time and budget predictions.

From a practical perspective, the operational skill sets required for any of the collaborative models are very interchangeable. A person skilled working within an alliance framework would have little problem working in a partnering arrangement – much like Canadian and American football have somewhat different rules, but use the same basic plays because they are basically the same sport.

No matter what form is chosen, it is important to understand that all Collaborative Construction models have much in common. These approaches are distinctly different from the *adversarial* approach that hallmarks much of construction today. The *adversarial* model is distinguished by strong armed negotiations, conflict between the major stakeholders (Owner, Designer, and Contractor), poor communications and coordination between the stakeholders, legal contracts that often get in the way of getting the job done the best way, and high costs for insurance and litigation.

The cooperative approach is still highly competitive, just as the competition for positions on a sports team is highly competitive, but once on the team, cooperation is the essence of good teamwork. As on a sports team, when the team wins, everyone wins.

Distinguishing Joint Ventures from Strategic Alliances: Joint Ventures are very prevalent in the construction industry. Often two contractors with different skill sets will jointly agree to build a project. For example, one company may have the technical skills to build a high-rise office building, but not have the local knowledge or trust of the governmental authorities or trade unions. The partner company may have these local relationships, but not the technical experience or bonding authorization of the larger, outside firm. Together they can form a Joint Venture to bid on and build the project.

In the strictest sense, while Joint Ventures are not always a Strategic Alliance, they are collaborative relationships. However, being good at a JV does not imply that JV experience can be transferred fully into a Strategic Alliance. (see Table 10 in Appendix Three to fully understand the difference between a JV and an Alliance)

Strategic Power

The word “strategic” is not just a fancy word to make something sound important. Strategic is one of the first things that gives power and impetus to the Aligned Construction Enterprise (ACE).

Strategic means that you will be operating a way that will powerfully affect your “long term destiny.” The idea of “strategic” implies that:

- The members of the alliance recognize that one of their priorities is to create a competitive advantage for the Owner, which is expressed as part of the Value Proposition of the alliance, otherwise known as the “Value for Money Equation.”

For example, in an Oil Sands Mega-project, the Value Proposition may call for delivering the project ahead of schedule, because early delivery can be worth millions of dollars in terms of productive use of the facility. In other projects,

such as hotels, resorts, hospitals or stadiums, coming in under budget can allow the Owner to add more features and amenities to the project, making it more attractive to customers, or bring the project on line to meet seasonal demand cycles..

- The trusting relationships formed between the key stakeholders (Owner, Designer, Contractor, Sub-Contractors, Trades, etc.) are frequently intended to last *beyond* a single project – which give the alliance a “programmatically” orientation.
 - the bonds of cooperation will extend well into the future, enabling a synergy to evolve that produces higher profitability for the companies involved, higher customer satisfaction, and greater well-being for the employees
 - the learnings and innovations derived from one project will become the foundation for the future projects.

Strategic Alliance Definition

The term “strategic alliance” is used by many organizations to encompass a broad spectrum of relationships. For the purpose of this handbook, our definition of an alliance in the construction industry is:

- a close, collaborative relationship between an Owner/Client (private or public sector) and two or more entities (including at least a Design Team and a Construction Team). It can include other stakeholders, including an operator, major subcontractors, trade unions, and other stakeholders.
- created for the joint delivery of one or more capital works projects (typically commercial, infrastructure, or industrial)
- characterised by:
 - a mutual commitment to operate in a high trust, high performance, high innovation manner
 - unanimous principle-based decision-making on all key project issues
 - a fair, pre-agreed gain share/pain share regime where the rewards of outstanding performance and the pain of poor performance are shared equitably among all alliance participants
 - an ‘everyone wins or loses together,’ no fault, no blame and no dispute agreement between the alliance participants (except in very limited cases of default)
 - an integrated project team selected on the basis of best person for each position.
 - a governance system that enables rapid problem resolution and ‘best for project’ guidance

While typically the alliance is guided by an Alliance Executive Committee which serves to guide direction. The members of the alliance (other than the Owner) typically hold no equity ownership in

the venture, however, sometimes two or more of the stakeholders will form a Joint Venture and hold some equity.

There is a big difference between *defining* something and *creating* something. While these definitions may be technically correct, if one tries to create an alliance from this definition, failure will result. Why? Because an alliance is a 'living organism' that represents the dynamic interplay of many forces and functions. A simplistic definition may be good for a theoretical understanding, but it doesn't build a powerful "design structure" to produce high performance results. In the following sections, we provide more detailed insight into the nature of strategic alliances and the Aligned Construction Enterprise(ACE) model.

Designing an Alliance -- Systems Architecture

Unlike approaches that are intended to improve efficiency, which focus primarily on *methodology* (i.e. six sigma, lean, etc.), alliances are a complete *system*, including a philosophy, a strategy, a culture, a set of core principles, process flows, methods, practices, cross-boundary alignments, metrics, rewards, diagnostics, and regeneration loops. For this reason an alliance is founded on a complete *systems design architecture*, which makes it well suited for addressing the complex problems of a Mega-project in a collaborative fashion.

Alliances easily embrace other collaborative methodologies such as Integrated Project Delivery, Lean Construction, Building Image Modeling, Six Sigma, and others.

The skill sets required for alliances are rigorous, and can be used in many other venues, including strategic planning, team building, internal alliances, organizational transformation, and collaborative innovation, to name a few.

The real power of the alliance framework is that it integrates three essential dimensions: *strategic advantage*, *human behavior*, and *high performance operations* into its 'systems design.' (see Figure 32) In designing an alliance, first think in terms of a '3-dimensional alignment' of:

Strategic Drivers that are pushing on the Owner and other partners to think and act in a manner that collectively creates Competitive Advantage. The alignment of *Strategic Drivers* ensures the cast of characters are working in the same direction and understand the fundamental meaning and purpose the owner has in mind. If and when the Strategic Drivers change, the entire alliance must be prepared to shift to stay in tune.

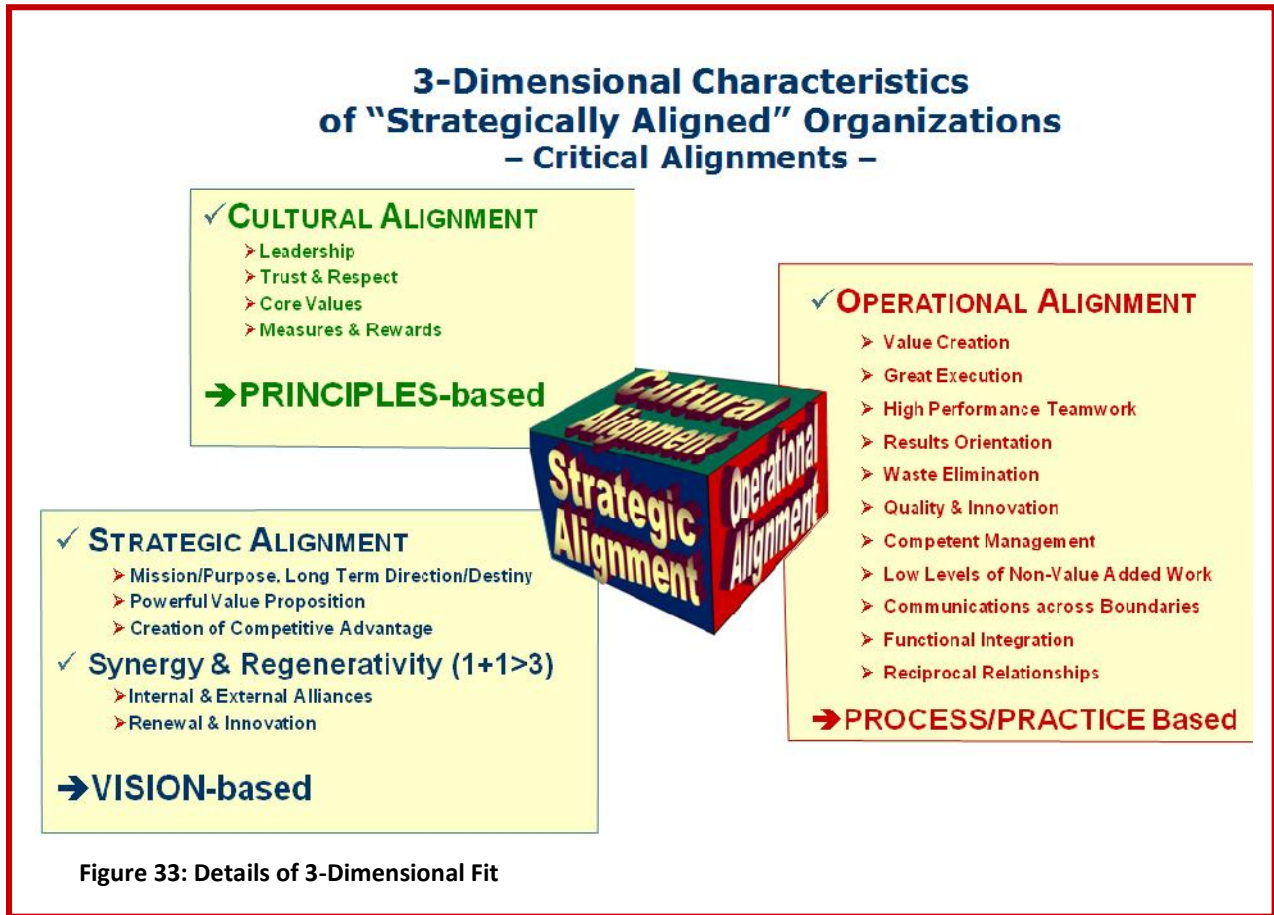
Culture of human interactions that create great chemistry among people. The alignment of the *Culture* ensures that critical issues like trust, decision making, communications, leadership styles, values, protocols, and reward systems are compatible so that people can work together in teams, and create together to innovate and solve problems rapidly without blame and discord.

Operational Functions that must produce results. The alignment of *Operations* means that the human and technical delivery systems and the mechanical functions can be implemented in the field in a highly effective manner.



Figure 32: 3 Dimensional

Figure 33 provides a more detailed overview of the core elements in each of the three dimensions.



Because every alliance is uniquely designed for the unique requirements of the partners, the creation of each alliance is guided by a set of principles and best practices used in the formation. (described later). Frequently an alliance professional is used to facilitate the design. But ultimately it is the stakeholder group that crafts their win-win arrangement. The idea “People Support What They Help Create” prevails at every step in the design and implementation.

It is important to understand from the outset that these three dimensions are crucial to long term success. This 3-Dimensional Alignment framework is highly successful because it integrates strategic, human, and operational systems into a highly effective, holistic approach to doing business.

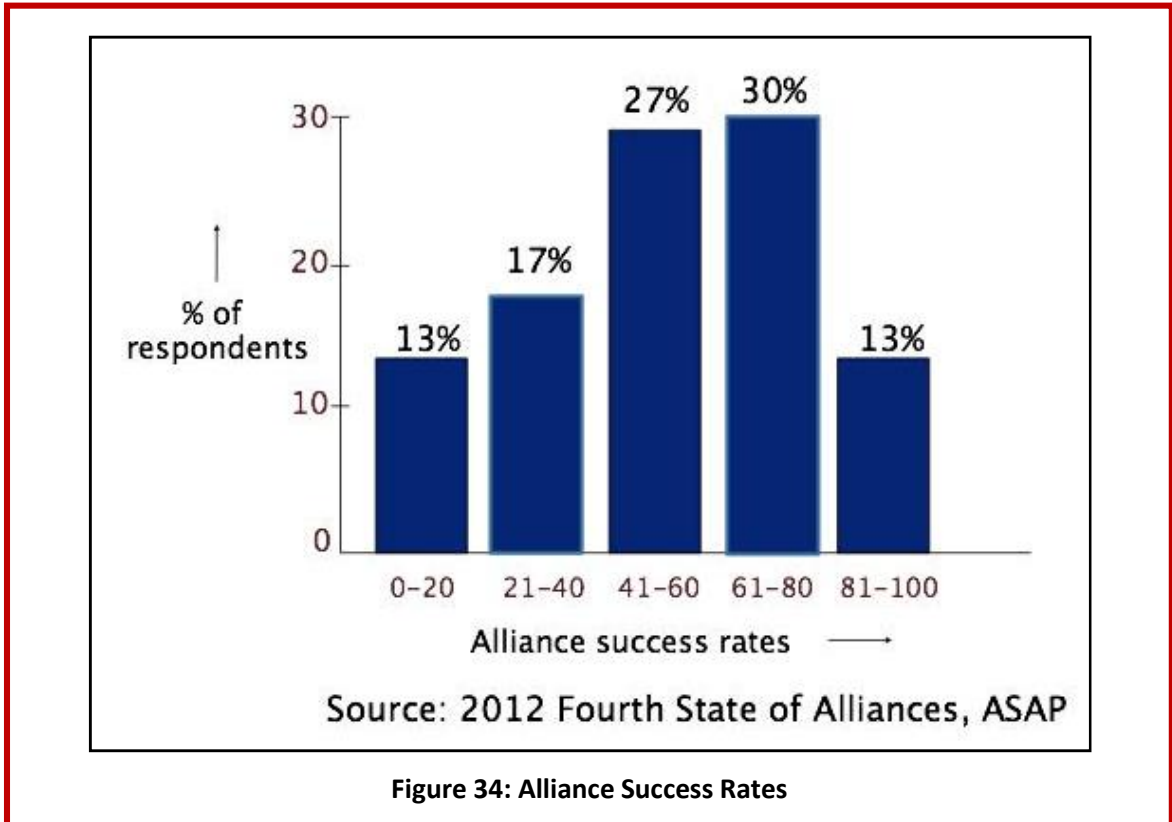
Supporting these three dimensions, must be a *compatible* cast of legal/contractual/financial instruments, as well as a fair and effective means of governance. (In Book Two, the Best Principles, Processes, and Practices are described in detail that enables the 3-Dimensional Alignment to materialize.)

Advantages of Alliances

Alliances have the potential both to outperform other strategic investments and to transform the way companies do business by enabling the flow of innovation and high performance from all the members. By the nature of the design architecture of alliances, they enable both collaborative innovation and collaborative integration.

Alliance Success Rates

Although the definition of an alliance is relatively straightforward, successful alliances are the result of the rigorous use of a well established set of processes, cultural attributes, and competencies. The overall performance of alliances depicted in Figure 34: Alliance Success Rates is testimony to how



difficult managing alliances can be, particularly for the uninitiated and unprepared.

According to the Association of Strategic Alliance Professionals' *4th State of Alliance Management Study*, the average success rate of alliance portfolios was 53 percent in 2011. Some companies (13 percent) have success rates of 80 percent or higher; others (also 13 percent) have success rates of 20 percent or lower. It is important to understand precisely the main difference between the high and low-performing companies:

According to the study the high-performing companies are disciplined in following alliance Best Practices. They have implemented more of the alliance management tools and processes (discussed here in this book and Volume Two) than the low-performing companies.

But just as importantly, it is this author's personal observation over thirty years working with alliances that companies that truly understand, support, reward, and reinforce *collaborative* culture consistently produce excellent alliance results (high levels of success). The alliance professionals who use best practices rigorously, but try to use them with *adversarial* or *transactional* partners, ultimately fail. And those same alliance professionals that suffer from "muddled" leadership (a mixture of transactional and collaborative cultures) are laden with the burden of poor executive support, producing less than stellar results.

One of the underlying themes of this book is that it pays to invest in strong alliance management. From a risk management perspective, the best means of preventing failure is by ensuring success using Best Practices.

Stated another way: Emphasis is placed on rigorous Best Practices to ensure the highest chances of success from the outset; while legal agreements are seen as a means of limiting losses in the event of failure.

In the pages that follow, we will describe some of the best practices that have been found to help companies achieve high alliance success rates.

Characteristic of Well Structured Alliances

Regardless of industry or other factors, a well-conceived alliance will have a set of common essential characteristics. Any alliance missing these characteristics will likely be beset with problems. Use the characteristics listed in Table 9 as a checklist to assess current and prospective alliances. (Each characteristic is described in more detail in the Volume Two.)

<p>Table 9: Characteristics of a Successful Alliances</p> <p>The Ten Characteristics of Successful Alliances Checklist</p>
<p>1. Strategic Alignment: Every company is defined by its relationship to its purpose & strategy, its value to its customers, and its competitive edge in the marketplace. Critical market forces compel the company to be strategic: to act, react, or not act at all, in a way that creates competitive advantage into the future. In an effective alliance, the driving strategic forces for both companies are complementary, and there is a long-term strategic outlook. Alliances are not seen as “deals”; they are long-term relationships formed in pursuit of strategic objectives. Successful alliance partners have realistic expectations regarding the time it takes to build trust, structure an alliance, and manage it to the realization of a strategic outcome.</p>
<p>2. Synergy: All alliances are founded on the basis that the strengths of one partner complement the weaknesses of the other. Complementary strengths will yield strategic synergy. At the outset, the stakeholders acknowledge they truly need each other’s abilities to perform successfully. The two allies should have more strength when combined than they would have independently. Mathematically stated: $1 + 1 > 3$. Mutual advantage must exist, contributing to a powerful <i>value proposition/equation</i> that benefits each partner and ultimately produces a product or service that benefits the customers or client.</p>
<p>3. Great Chemistry: Each partner must have the managerial ability to collaborate efficiently and effectively with another company, and they must have an equally collaborative spirit. Companies with <i>adversarial</i> or <i>transactional</i> cultures generally make poor alliance partners. Great chemistry is the result of positive, team-oriented, trust-filled relationships between the individual participants from both partnering companies on the alliance team. This will be reflected in the leadership of the alliance and its ability to bring different organizational cultures together successfully.</p>
<p>4. Reciprocity: Alliances are based on a shared risk-reward foundation. Shared risk is important because it constitutes “skin in the game.” The operations, risks, rewards, and</p>

costs of an alliance must be fairly apportioned. There is an underlying belief that success comes from working cooperatively together through sharing investments and returns, and ensuring that all metrics and rewards are aligned to reflect this win-win reciprocity.

5. Transformational Flexibility: Allies must be willing to address new risks, be committed to flexibility and creativity, and be ready to transform the alliance structure in response to changing business and strategic imperatives and to take advantage of new opportunities. This is why a collaborative environment is so important – *adversarial* and *transactional* approaches only change when either power or bargaining is used to change course. The best alliances last because they are able to transform to meet new conditions.

6. Effective Governance: Governance is the joint mechanism the alliance leadership uses to guide the alliance journey, from formation through operational excellence into adaptability and innovation. The Alliance Executive Committee (AEC) is made up of key leaders from the stakeholders who jointly solve problems, set policies, and manage difficulties before they escalate. The AEC establishes a system to manage risks, allocate rewards, and ensure performance excellence within the alliance. Alliance governance is different from internal corporate governance in that influence and consensus are essential components for decision making and conflict resolution. Effective governance is dependent upon tight operational linkages at multiple levels within both partnering organizations so that decisions can be made at the appropriate operating level.

7. Trust , Teamwork & Commitment to Mutual Benefit: Trust is fundamental to all relationships. Without trust, alliances fail. Trust in the personal relationships among the individuals who constitute the alliance team enables them to overcome conflict and adversity. Trust within an alliance is a faith that each organization is also looking out for the interests of the other organization and of the alliance as a whole. Alliances set up a set of operating principles, procedures, and diagnostic feedback mechanisms to ensure the sustainability of trust. There is mutual agreement and alignment of metrics, rewards, and to play a win-win game, ensuring each party's success is a function of everyone's success.

8. Executive Sponsorship: Leadership is essential to successful alliances, and leadership begins at the top with an engaged and empowered executive sponsor, or champion from each of the stakeholders. Executive sponsors are ideally very senior within the organization and can promote cross-functional cooperation and engender support and buy-in to the alliance mission and its objectives at all levels of management. If disputes occur that cannot be resolved at lower levels, the executive sponsors hammer out the resolution together.

9. Joint Planning & Response to Challenges: This is the process of translating strategic vision to reality. Joint operational planning creates the road map that derives value from the resources, commitments, and efforts dedicated to the achievement of alliance objectives. Complex projects always run into unexpected difficulties. By establishing early warning systems and leading indicator protocols, planning takes a very proactive perspective.

10. Continuous Innovation: Innovation is a facility for bringing new ideas into the alliance and continually finding ways to adapt to evolving competitive and technical shifts in the environment, thus keeping the alliance fresh and enlivened. The best innovation comes from the “differential energy” of the stakeholder – seeing things from a diversity of perspectives. Continuous collaborative innovation enables the alliance to make a many incremental changes along the way, reducing the chances of a cataclysmic shock wave later in the delivery cycle. Terms of the alliance agreement are often broad and unspecific because of future uncertainties that will require innovative solutions.

These ten essentials are the fundamental building blocks of all alliance architectures. Elimination of, or inadequate attention to, any of these characteristics will reduce the likelihood of alliance success. Gaining and sustaining alignment on these ten characteristics is essential to ensure expectations and realities are on the same track.

Alliance Failure Factors

When companies embark on building alliances without the guideposts of best practices and instead simply adopt practices ad hoc, their success rates tend to be abysmal. Such alliances typically reflect some of the worst practices, as described below and illustrated in Figure 35:

Trust & Teamwork Essential

Trust is the foundation of all collaborative enterprises. Trust is the spirit of teamwork and the essence of collaborative innovation. Without trust, organizations perform poorly, have low productivity, and are unable to generate any semblance of human motivation. Earlier we outlined several of the key issues about the absolutely essential importance of trust (see Trust, Teamwork & Innovation as Central Organizing Principles:, page38 and Figure 14: Trust Ladder & Operating Principles,page 41). Here we will add deeper insight.

High Levels of Trust Enable:

- *Very High Performance*
- *Greater Innovation, Creativity & Synergy*
- *Expansion of Possibilities*
- *Enhanced Problem Resolution*
- *Faster Action/Implementation and...*
- *Lower Transaction Costs*
- *Ability to Sustain Synergy*

RESULTING IN HIGHER PERFORMANCE, PRODUCTIVITY & PROFITABILITY

Every authority on alliances, partnering, Integrated Project Delivery, and Lean management will proclaim the importance of trust to the achievement of success.

The design of the Aligned Construction Enterprise (ACE) is deeply rooted in a trust ‘architecture’ that ensures trustworthiness in the key alliance membership. The multi-dimensional framework is represented in Figure 36.

However, many initiatives, such as Lean Management^x and Integrated Project Delivery have had relatively high failure rates. This can be attributed to the fact that each of these methodologies lacks a powerful trust building

‘architecture’ that systematically addresses how to build trust, how to use trust as the underpinning of innovation, and how to ensure that trust is sustained.

Ultimately, trust is the glue that holds the alliance together.



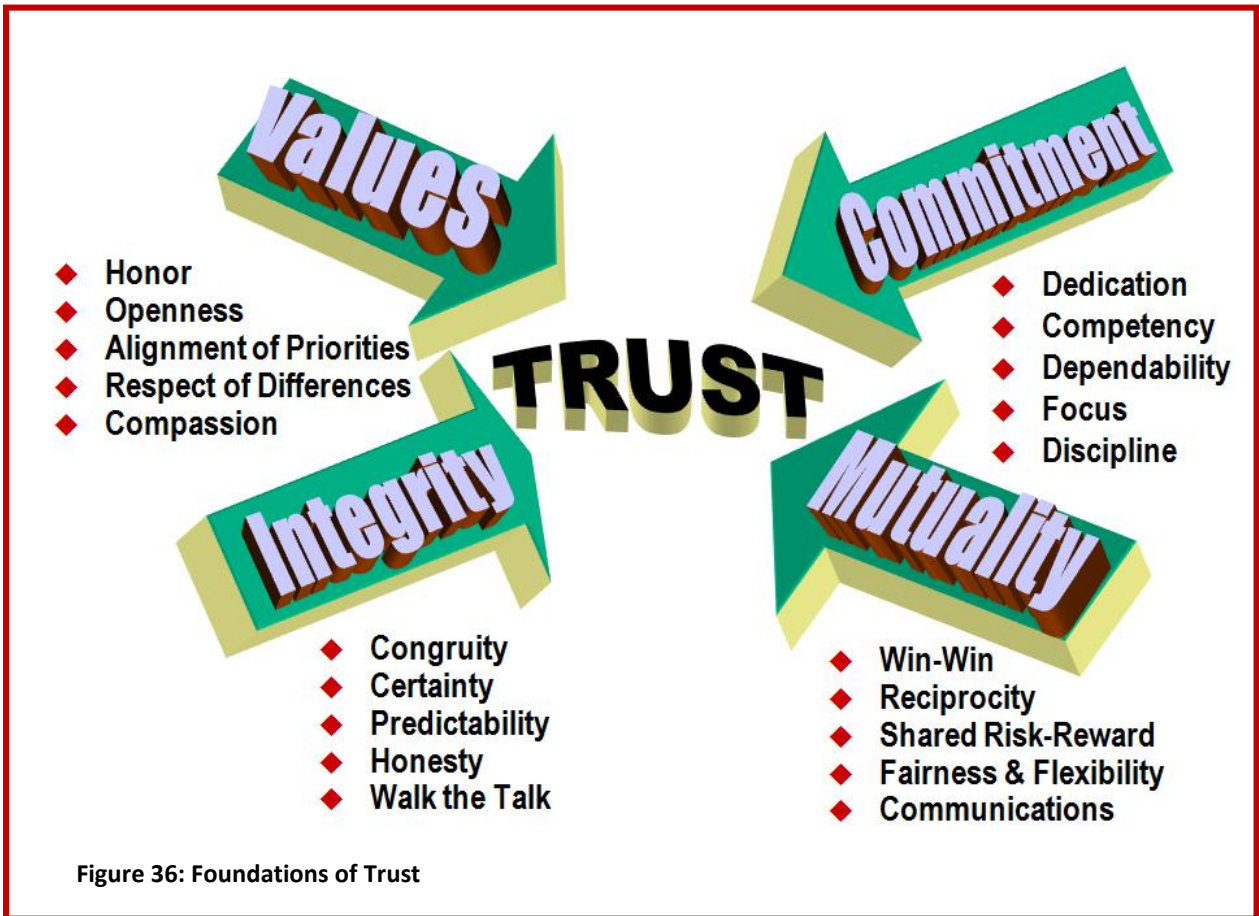
Typical Causes of Failures

- Matching companies together which inherently have adversarial or transactional cultures, without giving the alliance the autonomy to work collaboratively.
- Failure to secure the commitment of senior executives and ensure that commitment extends down into the ranks.
- Failure to assign good leadership and implementation teams to the alliance.
- Assuming an alliance is just another transaction or “deal” or joint venture, then rewarding the deal makers for the number of “deals” they close.
- Too much legal posturing, or getting the contract signed (assuming the contract embodies the “agreement”), not enough on building trust and teamwork.
- Treating partners as ‘vendors,’
- Keeping those who will actually manage the alliance at bay until after the closing—i.e., not allowing alliance managers and operational people to “complicate” the negotiations
- Maximizing the financial impact of the venture on paper without examining the operational issues, where unchallenged assumptions may increase risks
- Turning the alliance over to alliance management and operational people after the contract is signed as a “done deal,” (known as ‘throwing it over the transom’) and praying they will succeed because it’s all in their hands now
- Launching the alliance without getting proper goal alignment among the operational people
- Attempting to make critical operational decisions without an effective governance structure and the active commitment of senior sponsors
- Having a vague communication plan that provides uneven flow of information across operational people and stakeholders and/or between the two partners
- Underestimating the criticality of recognizing and addressing cultural differences that become evident as the partners work together
- Using a system of metrics that simply looks at financial outcomes without also incorporating measures for alliance health and process effectiveness
- Ignoring the importance of lessons learned throughout the alliance and especially after the project completion phase.

Figure 35: Typical Causes of Alliance Failure

Those who studied the Toyota manufacturing system to model Lean management failed to see the powerful methodology that preceded Lean – the creation of trust between labor and management that empowered collaborative innovation. (see Appendix Four: “Culture as a Force Field” to see some of the key initiatives Toyota took at NUMMI to generate trust *before* launching Lean.

In the Aligned Construction Enterprise, we utilize a robust and powerful ‘trust architecture’ that ensures the underlying trust is ensured, sustainable, and helps teamwork and collaborative innovation (such as Lean) produce powerful results. The trust architecture is woven deeply into the fabric of the alliance culture, ranging from developing the alliance’s operating principles to the selection of high trust people for the alliance.



The classic problems of territoriality, working in isolated silos, and protecting one's interests with mountains of legal documents is eliminated in a high trust environment.

Alliances as Engines of Innovation

One of the great advantages of the alliance structure is its ability to generate innovative solutions using the power of the diversity of the partner's perspectives, thinking, and insights. (This doesn't happen in *adversarial* systems, because differences become the source of conflict; and in *transactional* systems participants tend to bargain, trade, or compromise in the arrival at solutions.)

Because of the alliance architecture's holistic design based on a foundation of trust and teamwork, collaborative innovation becomes a natural process emerging from joint problem solving efforts.

Collaborative innovation is sourced from the basic principle that *the best new ideas come from differences in thinking* – people who challenge the status quo, ask difficult questions, and iteratively postulate new possibilities. The interplay of differences fostered in a trusting, honoring environment, yields co-creativity, synergy, and synchronicity -- enormous creative energy -- which ultimately translates into important competitive advantages.

Alliances provide the environment to produce value by “creative destruction,” the old constantly being replaced by the new. Thus innovation is a major component of the future of Mega-project delivery. However, innovation is easier to advocate than it is to execute. The principle reason is that all great innovation needs three foundational principles upon which to lever its advantage:

- **Trust:** Highly innovative organizations must focus their energy on transforming new ideas into commercially viable products and services. This means energy cannot be siphoned off or channeled into work that is non-valued added (or worse, destructive). Trust fosters a climate of sharing, creativity, value-added work, and a willingness to challenge the status quo without repercussions. If no trust exists, innovation becomes confined to every person protecting themselves, organizational silos, and self-interest prevailing.
- **Differential Energy:** If two people in the same room think alike, one is unnecessary for innovation. All great innovation comes from the frictional energy of people who do not see alike. In environments of distrust, this frictional energy manifests as conflict; but with high trust the differential energy is enlightening. This is while the idea of *fertile ground* – a *collaborative* culture is so vital.
- **Perpetual Dissatisfaction:** Nothing fails like success, because success brings complacency and over-emphasis on risk management, which then eventually become the roots of decline. Great innovators engage in championing the cause of *creative destruction* -- continuous evolution -- living in a perpetual state of enlightened dissatisfaction – a leadership mode that can be very frustrating to those seeking the quietude of complacency. The wise innovator is also well aware of what *not* to destroy – what must be preserved and protected as well as what must be improved.

By creating a culture that nurtures the challenging of the status quo in favor of new thinking, alliances can, if used effectively, become real “engines of innovation.”

Ultimately, in today’s complex world, the most powerful innovation is collaborative innovation, which engages multiple stages of transformation from idea to design to development to commercialization and operations.

The Multiple Forms of Innovation

When most people think of innovation, they think of the latest new *technology* – a new smart phone, GPS, computer, or wireless device. Technology is only one form of innovation. There are several others and they are just as important in the innovation game.

First, let’s define *Collaborative innovation*: it’s about.....

People co-creating *any* structure, system, strategy, process, product, or service that *creates value*.

Anything that doesn’t create value is not innovation – it’s just spurious creativity, and the world is littered with miscellaneous widgets and useless ideas that were rejected in the market.

Part Two: Aligned Construction Enterprise

In Figure 37, we outline eight separate forms of innovation that can be considered by any innovation team. The best innovations tend to incorporate multiple forms of innovation, thus gaining powerful competitive advantages that rivals find difficult to match.

For example, when Apple launched its first iPhone, there were multiple innovations (see Figure 37):

1. New Strategy for Apple, entering the crowded phone business,
2. New Technologies all put inside a small space,
3. System Solution incorporating many integrated functions,
4. Product Improvements a jump ahead of the competition,
5. New Business Model for iTunes that enabled songs to be bought individually
6. New Customer Experience and support from local stores
7. Social Networks Engagement making use of Facebook, Twitter, etc.

These multiple innovations left Apple's biggest competitors (at the time: Nokia, Motorola, and Blackberry) flatfooted, and unable to catch up.

The construction industry, this innovation framework is very applicable to help generate multiple forms of innovation. For example, the Aligned Construction Enterprise (ACE) is a socio-organizational innovation; new technology innovation (e.g. BIM) is always being introduced into Mega-projects, Lean techniques focus on process innovation, Integrated Project Delivery is both a socio-organizational and systems solution innovation; better cross-training between the trades can produce a whole new customer experience, supply chain integration can accelerate speed and fulfillment rates dramatically while lowering costs. People who are innovating in high trust teams are more engaged, more productive, and have very low turnover rates.

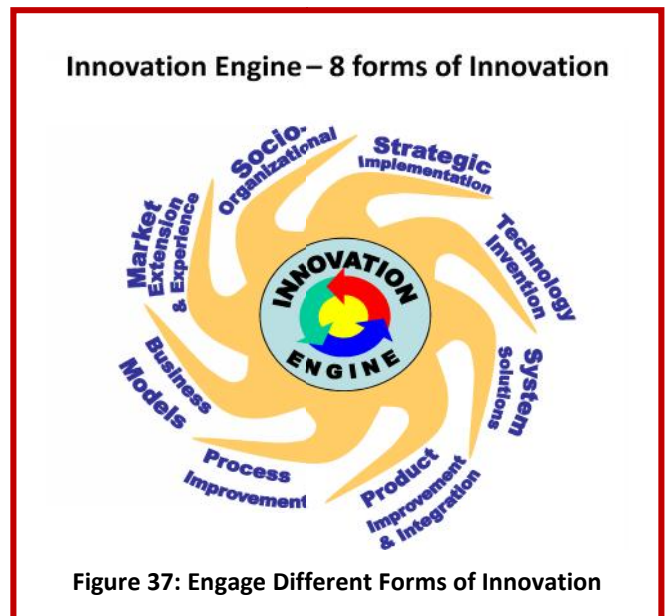


Figure 37: Engage Different Forms of Innovation

It's an Alliance—Not a “Partnership”

The term “partnership” has serious legal implications in some countries which link one firm's obligations to legally binding commitments on the part of the partner, and vice versa.

Recently, one very large U.S. corporation told one of its suppliers it wanted to engage in a cooperative partnership. The supplier made major capital investments based on this commitment. When the market changed unexpectedly, the large corporation canceled its orders, and the supplier sued based on the supposition that a “partnership” existed. The court upheld its claim.

Use the term *alliance* or *partnering* instead of “partnership” to be on the safe side.

E. OVERVIEW OF THE ALIGNED CONSTRUCTION ENTERPRISE (ACE)

In this section we provide a “big picture” view of the design architecture of the Aligned Construction Enterprise, which aims at being the *next generation* alliance model, targeting large scale and Mega-projects. (Much greater detail is provided in Volume Two).

The ACE model evolved from two converging pathways:

1. **Best Practices Hybrid:** Study of the best practices in construction that produced the highest likelihood of on-time, on-budget delivery and high productivity. This analysis examined cases and methods from around the world, seeking the lessons learned from world-class project deliveries. The best practices from each were extracted and recombined into a high-performance hybrid.
2. **Failure Factor Analysis:** Analysis of the major studies done on Mega-project failures. Key failure factors were identified from numerous studies (all of which had very common themes).

Several conclusions were drawn from these two approaches:

- **Systems Architecture:** The solution required a complete systematic architecture; a piecemeal fix would not suffice.
- **Missing Competencies:** The critical factors identified in the studies as causes of failure were not being fixed in subsequent project deliveries. Why? Because the key stakeholders did not have core competencies in those areas. A new set of competencies needed to be brought into the Mega-project arena to cure the failure rate.
- **Collaborative Environment:** None of the solutions could be applied inside either an *adversarial* or *transactional* construction environment. Only a *collaborative* system would have a chance of aligning all the stakeholders.
- **Scalability:** Of the two major approaches to collaboration, only the *alliance* model had sufficient integration of strategic, cultural, and operational elements to be scaled to the magnitude of the Mega-projects.

Distinguishing Features

What distinguishes the ACE *Next Gen* model from prior *partnering* and *alliancing* models includes (see Figure 38):

- Owners/Operators, Engineers/EPCs, and Contractors plus Major Subcontractors, Trades, & Supply Chain are tightly linked and aligned in an interactive network.
- Service Provider – Systems Integrator is added to provide the core competencies that fill the gaps not provided by the key stake holders.

However, because each organization in the network has its own unique drivers, goals, and financial objectives, it has the tendency to actualize its future *independently, unless it makes a commitment to the ‘greater good of the whole,’*—known as the *‘best for the project.’* And the more members of the network, the higher the complexity, the more vital it is to pay attention to network alignment. This is the role of the Service Provider/Systems Integrator.

Aligned Construction Enterprise with "Service Provider-System Integrator"



Figure 38: Aligned Construction Enterprise with Service Provider-Systems Integrator

Conditions that Encourage Use of an Aligned Construction Enterprise

As stated earlier, here are the conditions that give senior decision makers the cues that ABC will create the best Value For Money and is the best way to proceed:

- suits complex projects where risks are difficult to define
- suits projects which require managing *uncertain or changing scope*
- provides cost management through a *rigorous target cost* development process
- encourages innovation as a means to smarter, *value-based solutions*
- facilitates the incorporation of community, stakeholder and environmental drivers
- facilitates speed of delivery through an *integrated owner/design/construction team*
- *attracts resources* in a tight market.
- *promotes innovation* at all stages of construction
- holds the promise of finishing projects *on-time, on-budget, or better*

Alliance Governance & Leadership Team

The alliance founding members establish the Alliance Governance & Leadership Team (AGLT) (sometimes called an Alliance Executive Committee) to keep the network members in alignment. The AGLT equates to a board of directors charged with the responsibility to provide corporate governance and leadership to the company (but does not have the legal standing of a Board of Directors).

Each of the members of the AGLT members should be a ‘champion’ of the ACE strategy; be willing to advocate the idea and the core practices to others; and to fight to protect the interests of the greater good of the whole project, while maintaining the highest standards of excellence and trust across the network.

Governance Role

The Alliance Governance and Leadership Team works together to provide governance:

- Set policy and delegation responsibility
- Monitor performance and coordinate with the Alliance Management Centre(see below)
- Provide high level leadership/support to ensure full engagement of the best resources from within their own company
- Resolve issues and tensions within alliance
- Create and inspire trust, open, honest communications, & high performance
- Target Innovations
- Reduce Risks of over budget/over schedule

Members of the Alliance Governance and Leadership Team are empowered to make decisions on behalf of their parent companies based on ‘best for the project’.

Increased Complexity requires increased Systems Integration

In large-scale projects, the number of companies involved requires *full-time* professional systems integration to add more value to and to fill in any weaknesses and ‘missing’ elements that are not the purview of any of the partners.

The more the number of members of the network, and the greater the complexity of the project, and the more intense the risks and unknown factors, the more important the systems integration role.

In smaller, shorter term, less complex projects, the alliance governance, leadership, and management functions can be performed as an ancillary task of the leaders of the each stakeholder’s project managers.

However, in long-term, high risk, complex projects, like those in the Oil Sands, the systems integration role becomes even more important. Any “missing” capabilities in the system will be magnified and cause the system to malfunction, which will drive higher costs and missed deadlines. The more impactful the list of missing pieces, the more important it is for the Alliance Governance and Leadership Team to bring in professional systems integration management, who can also hire other expert resources to assist in providing skillsets such as Lean Construction, Data Management, Human Resource recruiting, or other competencies the network needs to function at full force. In

Figure 39 is a partial list of the roles of the Alliance Management Centre (AMC) designed to address a number of the weaknesses that are endemic to large scale oil sands projects. The role of the systems integrator is to get in front of these problems, and direct attention and resources to limit their impact. In this way, projects can stay on-budget, on-time, and show ample productivity gains.

Further, long-term projects can change dramatically over the course of time as corporate policies change, governmental regulations and royalties change, people change, and technologies change -- a dynamic state of evolution.

As these changes occur, the alliance must *adapt, evolve, innovate* and *realign*. The *systems integration* role is pivotal to this adaptation and realignment process.

Because alliances are flexible nature, they are more easily rechartered or reconfigured if conditions/circumstances change. This agility in meeting business challenges can become a competitive advantage to an organization that becomes alliance savvy.

Alliance Management Centre (AMC)

The Best Practices Alliance Management Centre acts as the *service provider & systems integrator* for the entire network of value-added providers. It is this feature that enables the network to become an Aligned Construction Enterprise and not just a bunch of misaligned, fragmented organizations struggling to preserve and protect their individual self interest.

The AMC's role is to:

- Align stakeholder interests and strategic direction
- Connect and link all stakeholders
- Ensure fair apportionment of risk and reward
- Deliver core competencies that are not within the realm of the stakeholders
- Ensure a *collaborative* culture flourishes within the network

Creating Productivity Improvement

Numerous studies have isolated a number of causes and contributing issues for poor project results and the major cost and schedule overruns for Canadian oil sand projects. Here are *some* of the issues the Alliance Management Centre monitors to ensure success:

1. Ensuring only experienced, trustworthy contractors bid on projects, thus improving the quality of contractor management capabilities
2. Establishing effective organizational and alliance structures for Mega-projects
3. Appropriate delegation of responsibilities to contractors, service providers, or the Alliance Management Centre
4. Clear definition of lines of authority and management responsibilities
5. Early engagement of contractors in design efforts and changes
6. Disciplined control of project definition and scope
7. Ensuring top employees are engaged, trained, and rewarded. Coordinating with other Mega-projects to prevent pilfering of employees, while preserving employees' rights to employment.
8. Ensuring compliance with safety requirements, environmental constraints, governmental regulations, construction practices
9. Establishing standards for Collaborative Contracting arrangements
10. Interceding when adversarial relationships emerge

Figure 39: Roles of Alliance Management Centre

- Day-to-day management of coordination and communication
- Provide leadership to the wider team when needed
- Facilitate the resolution of all alliance conflicts
- Monitor leading indicators and take pre-emptive when budgets and schedules are off target
- Ensure that the problems typically encountered in similar type projects are avoided
- Access required resources that are either embedded within the alliance members or are missing but essential to success

Issue of Control

Many managers perceive a lack of control as the largest disadvantage of alliances. The traditional ‘command & control’ hierarchical model of leadership is ineffective in alliances.

Actually, alliances can be controlled, but the concept of alliance control is very different from the classic style of control, which is enacted through hierarchical power and authority. Alliances are managed through shared control and acknowledgment of common interests. Alliances exercise control through:

- Alignment of:
 - Inspiring vision, value, and trust
 - High-performance operational processes
 - Empowering metrics and rewards
- Coordination and communications
- Creative adaptations and continuous innovation
- Governance structures that make continual adjustments to the changing competitive environment and resolve operational issues in a fair, win-win manner.

Some believe that alliances are cumbersome and slow to respond to problems. But the ability to correct problems quickly is actually more a function of selecting the right partners at the outset, leadership, good governance, a culture of trust and teamwork, and good governance. By ensuring peer-to-peer functional reviews and empowering employees closest to the problem, companies can resolve issues quickly in alliances.

Legal conflicts often arise when you lose trust in your partner and problems are not rapidly resolved. The adage that has survived the test of time among alliance professionals is:

“If you have to pull the contract out of the drawer to resolve an issue, then the alliance is failing.”

Not all Companies are Great Alliance Partners

The idea of an Aligned Construction Enterprise, while wonderful in theory, can only be carried out in practice by organizations and people who have developed a strong inner culture that emphasizes collaboration, Companies that are rigid, hierarchical, or dictatorial make poor alliance partners.

Distinguishing “Systems Architecture” from Methods & Tools

One of the primary reasons for the success of the alliance design systems architecture is that it uses, at its core, a holistic, integrated, behaviorally based set of philosophies, strategies, principles, processes, practices, rewards, metrics, and alignment mechanisms, all based on sound and tested rationale. (see Figure 40)

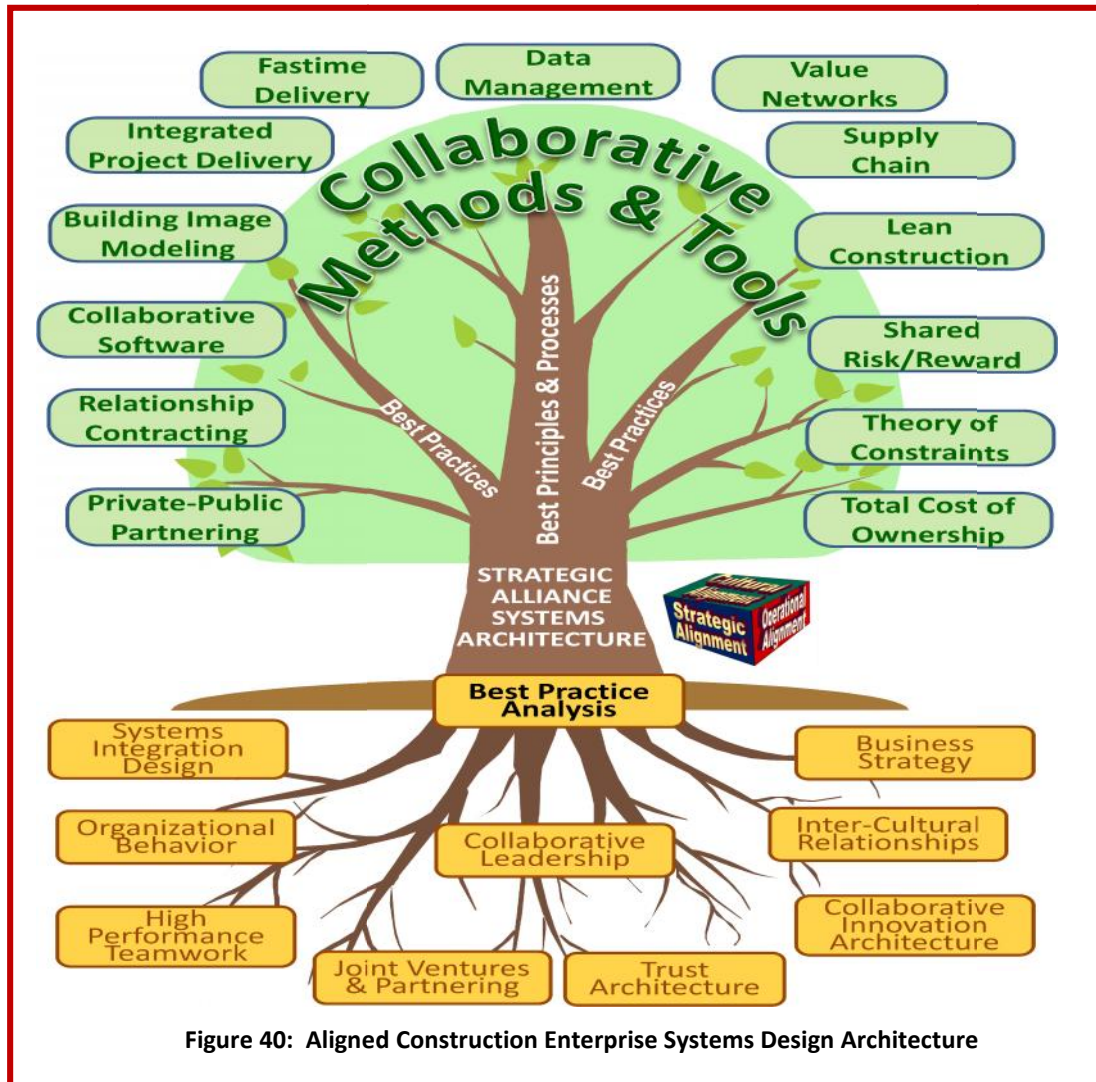
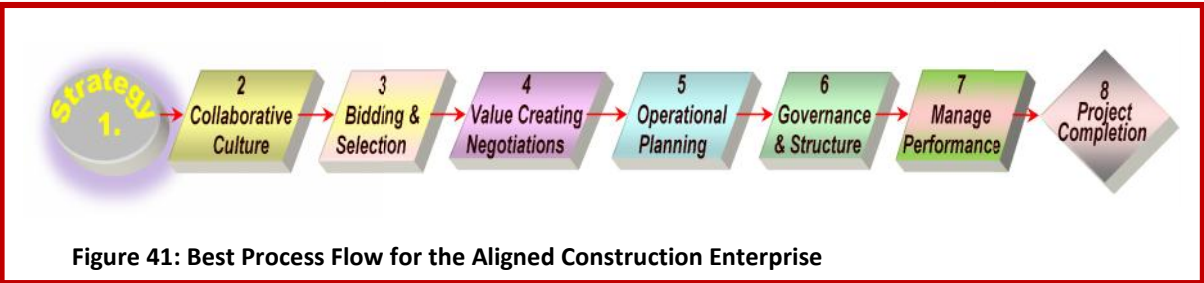


Figure 40: Aligned Construction Enterprise Systems Design Architecture

First, the alliance systems architecture is deeply rooted a multiple set of disciplines, including business strategy, systems integration design, organizational behavior, inter-cultural relationships, collaborative innovation, collaborative leadership, high performance teamwork, joint ventures & partnering, and a system of trust. This makes the alliance systems architecture extremely holistic, and thus well suited to address the highly fragmented world of Mega-projects.

Second, the ‘trunk’ of the systems architecture is built around the three-dimensional alignment system of strategic alignment, cultural alignment, and operational alignment.

Third, the core of the system is a highly effective and tested Best Process flow map that takes the development of the alliance from concept to implementation to completion. (see Figure 41)



Fourth, onto core Best Process Flow are literally hundreds of tested and valid Best Practices, which ensure a powerful, fluid, and successful means of moving through each phase of the process map.

Fifth, onto the Best Process/Best Practice map a number of collaborative methodologies and tools can be utilized, including Lean Construction, Fasttime, Private-Public Partnering, Value Engineering, Supply Management, Building Image Modeling, Total Cost of Ownership, Collaborative Relationship Contracting, Collaborative Software, and other Integrated Project Delivery methods and tools.

By combining the best process with best practices (see Figure 42) the alliance professional or practitioner managing a complex organizational system by utilizing an extremely powerful methodology for alliance success.

Overall, the alliance systems architecture is profoundly simple, but capable of handling highly complex situations in multiple industries. It is constantly evolving, being upgraded by several thousand professionals who contribute and share new approaches through the Association of Strategic Alliance Professionals (ASAP). (see www.strategic-alliances.org)

Distinguishing Best Process from Best Practices

Often people are confused when hearing the words ‘best process’ and ‘best practices.’ These expressions are closely linked, but are not synonymous.

A *process* is a distinct stage or phase in the conversion or transformation or adding of value to product or service.

Each process is composed of a series/sequence of practices that enable the process to perform its function.



Figure 42: Best Process & Best Practice

The following pages provide a high-level overview of each phase of the Alliance Based Construction Life Cycle Framework depicted in Figure 41.

ACE Best Practice – Best Process Life Cycle

To ensure success in launching a highly successful Mega-project, we created Book Two: Aligned Construction Enterprise Best Practices User’s Guide, which is a highly detailed description of how to form, align, and manage the multiple alliances.

In this section, we give a high level overview of each of the process phases, mapped in Figure 43.

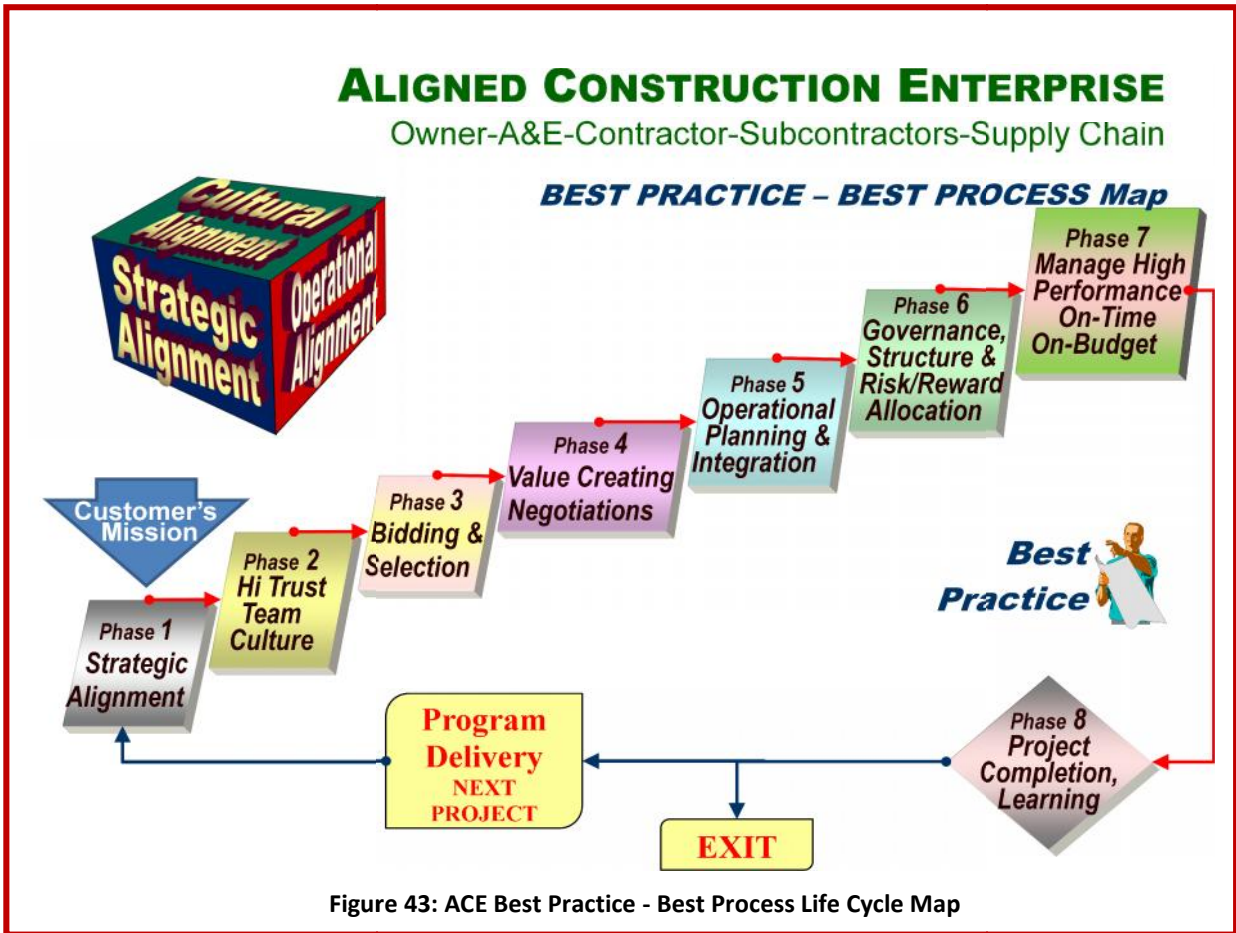


Figure 43: ACE Best Practice - Best Process Life Cycle Map

Phase 1: Strategic Alignment

Alliances, and in particular the Aligned Construction Enterprise model, make sense only in the context of understanding the Owner’s business strategy.

Mega-projects have, in the past, been plagued by companies choosing to In do business as totally independent entities, and engage in an *adversarial* strategy with their competitors and a *transactional* strategy with their customers. Often the *adversarial* strategy extended to customers, suppliers, and even to labour.

Over the last twenty years, many businesses have realized it makes more competitive sense to have an *adversarial* strategy only against their arch rivals, but a *collaborative* strategy with suppliers, customers, and other companies that can add value with complementary products, services, and solutions.

In the construction industry, this is a highly important strategic decision affecting one's long-term destiny: to opt for stand-alone, independent delivery approach that pits companies against each other, or to choose a collaborative, integrated delivery approach that seeks to create synergies by joint innovation and sharing risks and rewards.

This choice cannot be taken lightly, because it has major implications about how one will create competitive advantage for years to come.

Once companies have a clear vision as to their strategic requirements and thus what they want from an alliance, then they can formulate their value proposition for the success of the alliance and a sustainable strategy for continued growth and profitability.

When companies come together in an alliance, they must be deeply aware of the strategic driving forces that bear upon the principal members. This is distinctly different from typical transactional relationships where each of the participants tries to maximize for their own self interest, and uses legal devices to protect themselves from predatory behavior.

For example, if a governmental agency is the Owner in an infrastructure project, protecting the public interest may be the strongest driving force. Designers and builders must be extremely sensitive to this issue.

In an industrial oil sands project, the price of oil and a short construction cycle that delivers the first barrel quickly may be the most powerful set of strategic drivers.

Similarly, Owners should understand the drivers for their partners, because, ultimately, strategic drivers will heavily influence the decisions of the participants.

Understanding strategic drivers is essential to defining the joint Value Proposition for the alliance and the Value For Money equation.

At the beginning of this phase the Owner establishes the Alliance Management Centre to help guide and facilitate the subsequent phases.

Phase 2: Collaborative Culture

An essential ingredient to the success of any the Aligned Construction Enterprise will be the involvement of executive management and key individuals within the stakeholder organizations who will come to share the vision of the alliance strategy.

But a stakeholder cannot just jump into a collaborative strategy in business without building some sort of *internal* collaborative infrastructure/culture to support the *external* collaborative strategy.

A collaborative culture begins with building a system of trust inside the stakeholder company that then extends externally to customer and suppliers. This then sets the cornerstone for other companies to link together in a "collaborative enterprise."

The selection, training, and promotion of people is also central to the collaborative culture. Selecting and promoting honest, hard working, team oriented people is especially important. (see Figure 16: Team Selection Criteria, page 45)

Promoting dictatorial leaders will destroy collaboration. An alliance champion should be assigned, ideally at a senior level, to serve as an executive sponsor to provide leadership, guidance, and teamwork throughout the alliance life cycle.

Also building a culture that supports innovation, new ideas, and continuous improvement is essential to building a business and alliances that are sustainable in the long term.

Phase 3: Pre-Qualification, Bidding and Selection

The Bidding and Selection phase begins with finding partners who, together, can work and create a project that produces real Value for Money. The selection of great partners should be done carefully by Owners, Designers, and Contractors before bids are requested. The Alliance Management Centre can assist with this process of pre-qualification of bidders.

In the new alliance world, it can be expected that Owners will pre-select teams based on their ability to produce great results through collaboration. Clear measures of alliance success will be established at this phase. Any lesser standard will be counter-productive.

Selecting an appropriate partner requires more than simply viewing financial statements. It requires learning about their organizational structure, operational functions, and culture.

Understanding how various providers fit together is important, because their collaborative skills are just as important as their technical know-how. Ultimately can each of the organization with different cultures come together to fashion a successful team?

We cannot underestimate the importance of this phase to the ultimate success of the alliance.

Phase 4: Value-Creating Negotiations

The Value-Creating process stands in contrast to *transactional* negotiations, which focus on the exchange of value rather than its creation. The whole concept of Value for Money is explored by all parties during this phase.

Value-Creating Negotiations provides a different methodology with which to engage prospective alliance partners. In this negotiations model, two elements that are traditionally missing in *transactional* negotiations models take center stage: *building trust* and *co-creative innovation*. These are essential to the formation of the ACE alliances.

Operating Principles are jointly created at this stage. (see Figure 24: Joint Charter from Woodlawn Bio Reactor in Australia, page 63)

The prospective partners then address how they can work together to create an on-time, on-budget, on-target project delivery together. Target Costing Estimates are used as a basis for designing an operational plan in the next phase.

A risk/reward system is then designed that aligns all interests.

The parties develop a policy to ensure they can cooperate, govern themselves, and resolve problems without resorting to litigation.

This phase ends with the creation of a collaboration agreement as the foundation for a future commercial contract, which occurs later in Phase 6. Most seasoned alliance managers will resist the pressure to get a contract done too early in the process and will try to ensure that the alliance operations and structure are properly understood before a formal agreement is drawn up. The end result of this phase will be a relatively short, DRAFT Alliance Agreement (written in non-legal English) (see Figure 44) that stipulates the purpose, core operating principles, and requirements for success.

This document, jointly created, will lay the foundation for the operational plans to follow and the final contract.

Phase 5: Operational Planning

The Operational Planning phase is where the alliance partners sit down with functional groups from the various alliance stakeholders, including the Owner/Customer, the Designer (Architects & Engineers), Contractor/Construction Manager, and key Subcontractors to explore the nuts and bolts of the project. This is a key element in early engagement – front-end loading (see Figure 20: Front-Loading: Creating the Integrated Innovation Team, page 53).

At this time the operational teams identify all of the operational issues that may occur, during pre-construction, launch or implementation. Any potential problems that are identified can then be addressed. Typically, if not already done in the previous phase, a Target Costing approach will be done to set the stage for ‘beating the numbers.’

In the Operational Planning phase, the teams jointly establish a day-to-day operational plan that documents how the project management processes will operate.

In addition the plans will establish preliminary designs for control systems, reporting systems, and the interfaces that link the functional teams. The creation of these plans should be viewed as a ‘pilot project’ that provides a ‘reality check’ on the assumptions and projections made during the Value-Creating Negotiations phase.

Core roles, responsibilities, and risks are examined in detail. Everyone gets a chance to suggest better ways to proceed.

Once risks are identified, the Risk-Reward structure can be formalized and finalized.

The Alliance Management Centre (AMC) should be participants in the joint risk/reward structure, thus keeping their measures and rewards in complete alignment with the all the other partners.

Phase 6: Structuring & Governance

The Structuring and Governance phase focuses on finalizing operational plans and formalizing a fair risk/reward apportionment that motivates all parties to work together to make the relationship

DRAFT Alliance Agreement

The Alliance Agreement is very different in form and function than a standard legal contract. The purpose of the Agreement is to support the multi-dimensional aspects of the 3-dimensional alignment that holds the alliance together through the twists and turns of time and change.

Some of the components of an Alliance Agreement include:

- Vision & Purpose
- Value Proposition clarifying the Value For Money equation
- Operating Principles to guide decision-making and sustain trust
- Operational Plans for various aspects of project delivery with roles, responsibilities, and expected time lines
- Governance Structure
- No Blame/No Litigation dispute escalation & resolution process
- Risk/Reward Sharing formula, including metrics for success.

This is revised after the teams finish their Operational Planning (Phase 5) and it sets the foundation for a commercial contract that aligns and supports the Alliance Agreement.

Figure 44: Alliance Agreement

succeed. In conjunction with the Alliance Agreement, a contractual commercial framework is created.

During this phase the governance system is established, and the stakeholders ensure good leaders and key managers are in place for the long haul. The Alliance Governance and Leadership Team, composed of executive champions from each of the major contributing parties (generally determined by their participation in the risk/reward sharing) is put in place. Their role will be to guide policy, review the relationship's performance, and be generally responsible for keeping on schedule, budget, and target.

Structuring culminates in the signing of the Final Alliance Agreement and any commercial contractual relationships necessary.

Phase 7: Managing High Performance

In the Managing High Performance phase, the alliance is launched, and the Alliance Agreement (established in the prior Structuring & Governance phase) is implemented and managed over time. Payments are made in accordance with the commercial terms of the contract.

This phase will involve the various operational teams, the guidance of the Alliance Governance and Leadership Team, and the Alliance Management Centre (AMC), acting in the systems integration role, ensuring that all the pieces of this highly complex system are inter-connected and coordinated.

The AMC is also responsible for ensuring that the Alliance Agreement is implemented and managed. Missing capabilities are brought in by the AMC to augment what any of the partners might lack, handling issues in a timely manner.

The Operational Teams (established in Phase 5) focus on achieving key targets.

Because of the complexity, risk, and uncertainty accepted at the beginning, the stakeholders will be expected to adapt, innovate, and coordinate. If at any point, because of totally unforeseen events that could jeopardize the alliance relation, the risk/reward formulations need to be rebalanced, the partners are expected to work collaboratively in a trustworthy manner to accomplish these adjustments. The Alliance Management Centre is expected to play a pro-active role in facilitating these adjustments with foresight and fairness. As market conditions change, the alliance will have to be proactive in changing with them to remain vibrant and healthy.

Phase 8: Project Completion

A significant aspect of the project completion will be devoted to two things:

- a. Capturing the learnings from this project so that these can be applied to the next project
- b. Allocating the Reward Pool as a bonus for beating the numbers.

The partners have two choices at this point:

- Separately move on to other projects as independent agents
- Collectively go for more projects as an experienced high performance team.

Because the decision to enter into the Aligned Construction Enterprise was a strategic decision that involved an investment of time, money, and emotional energy, if successful at the first project, many of the partners can expect to opt to make the ACE approach a powerful competitive advantage, thus moving from a project-to-project orientation to a strategic programmatic

orientation. As they do, the teams will be responsible for identifying new opportunities as well as adjusting the requirements of the existing ones.

Note

This Alliance Life Cycle Framework is only a guide. As a practitioner of the framework you will have to decide how much or how little of it is applicable to a given alliance scenario.

For example, medium sized or less complex construction projects may be able to manage very successfully with a more “lightweight” application of this framework because their business organizations and processes are not overly complex. In this case, when collaboration is still warranted, the ‘partnering’ approach may be more appropriate than the ‘alliancing’ approach.

Prelude to Book Two: Aligned Construction Enterprise Best Practices User's Guide

Book One – that you are holding in your hands -- is the Handbook of Basics for Collaborative Construction and introduction to the Aligned Construction Enterprise (ACE). It is a primer providing the underpinnings of the key frameworks, critical mindsets, and compelling rationale for Collaborative Construction.

Purpose of Book Two: ACE Best Practices User's Guide

The purpose of the ACE User Guide is to enable you to design, form, and manage alliances in the most successful manner possible. The ACE Best Practices User's Guide is the result of years of experience, analysis of successes and failures, and surveying of the most profitable approaches used by alliance experts among the top companies in America. The material contained in the ACE User's Guide reflects the learnings gleaned from well over 1,000 alliances, both domestic and international.

However, it is not the intent of the User's Guide to provide a "cookbook" about construction alliances, with precise formulations and ingredients, because every alliance is different — one size will not fit all. Neither is it valuable to attempt to transform practitioners into alliance "mechanics," because mechanics understand only the "nuts & bolts."

Rather, because every alliance is unique and must be customized to the alliance partners, alliance practitioners are "organizational design architects" who align the strategies and cultures of the partners to create synergy and synchronicity.

Therefore, the ACE Best Practices User's Guide should be viewed as a **guidebook, not a cookbook.**

The User Guide is designed to prevent those involved in deal making from committing significant mistakes typical to business developers that are the cause of alliance failure. In particular: too much emphasis on legal agreements; too early a focus on structure without understanding and, the driving strategy or functional integration requirements; lacking a sense of continuity between the negotiating team and into the alliance operational planning and implementation.

Findings from Best Practices Benchmarking

The contents of the ACE User's Guide have evolved from benchmarking studies of the Best Practices used among practitioners currently involved in alliance formation, alignment, and management throughout the world. You will see many words of advice from seasoned veterans who have made many mistakes in the course of mastering their profession.

A Best Practice then results from comparing a number of different ways for achieving the same output. The "best way" (or Best Practice) is the one that achieves a superior output in the most efficient way at the least possible "total" cost to the organizational partners.

Part Two: Aligned Construction Enterprise

An important consideration to remember is that a Best Practice today can be replaced with a “better” Best Practice tomorrow that improves upon the results of the output of the process being performed. Thus we also focus on the evolution next practices – called “bext” practices.

It is important to know that alliances that do not follow best practices have a very high likelihood of failure. But for those who diligently adhere to best practice usage, the rewards are enormous, resulting in much higher success rates as shown

Appendix One: Summary of Failure Findings in Mega-projects

Systemic-Strategic Obstacles to Improvement

The problem in the construction industry is not one that can be fixed by isolating each individual problem and fixing the problems one-by-one. If this were to be true, the problems would have been corrected by now. The difficulty in the construction industry is two-fold.

First, historically the industry has grown up from a ‘cottage’ industry, where many got their start building homes or commercial structures. It is a “dirty fingernails” industry (no demeaning criticism intended here) where top managers today often got their start in the apprentice system beginning as laborers, then learning to climb the ropes as supervisors, then site or project managers. From this perspective they were not trained to see the strategic and systemic issues in their industry. Thus the mindset of the industry is still oriented to “projects” and their expeditious completion, not to systems change.

Second, structurally the industry is deeply fragmented, with divided interests that have little trust in each other, and thus limited collaboration, which is the foundation to joint problem solving, fast-track delivery, and innovation.

University of Calgary Engineering Studies

In 2002, a study conducted for the Government of Alberta, Canada by Bob McTague former President of Optima Engineers and Constructors (now Hatch) and Dr. George Jergeas of the University of Calgary, found that cost and schedule overruns on large oil and gas construction projects were the result of the apparent “management” deficiency in managing scope, time, quality, cost, productivity, tools, scaffold, equipment, materials and lack of leadership, among other things.

Another investigation by Dr. Jergeas showed that the overruns continue to be a major challenge facing industry and reveals the following reasons for cost and schedule overruns:

5. Unrealistic or overly optimistic original (AFE- Authorization for Expenditure) cost estimate and schedules

The underestimation of project costs may be explained by many reasons such as among many, the under appreciation of project complexity, interfaces, interdependencies and risks associated with the mega project environment. Some of the risks are outside the control of the project management team and company executives.

6. Incomplete scope definition or inadequate Front End Loading/Planning prior to AFE

Incomplete scope definition and inadequate Front End Loading/Planning are mainly due to the fast-tracking nature of Mega-projects and ongoing changing customer requirements resulting in scope changes throughout the life cycle of the project. Lack of understanding of the cumulative impact of scope changes on project cost and schedule add another dimension to this issue. The client’s and engineering firms’ practice of pushing work to the field early puts construction

under an unrealistic compressed schedule with increased overtime requirements and often with little or no cost consideration for the field cost.

7. **Inappropriate project strategies for the mega environment**

Some project strategies deployed do not properly consider the level of scope definition, the fast track nature of the mega project environment, market condition, owner participation, owner control and owner risk. Improper or late consideration of the project strategies relating to design, procurement, construction, prefabrication and assembly and commissioning adds to cost overruns.

8. **Mismanagement of the construction phase**

The mismanagement of the construction operations in particular later than anticipated engineering, vendor data, equipment and material deliveries, inadequate plan of execution and poorly defined tasks and division of responsibility, inexperienced or poorly equipped project management personnel and supervisors coupled with the inability to understand, plan, adapt, implement project management procedures or systems, lack of standardization and fit-for-purpose including inadequate use of shop fabrication, modularization strategy and constructability reviews, and poor communication, team work and alignment between the players leading to adversarial relationships and protracted disputes, are dramatically contribute to low labour productivity and cost overruns.

Numerous other studies have isolated a number of causes of low construction productivity and cost overruns. In Figure 30: Root Cause of Overruns on Mega-projects, we summarize the underlying causes and the contributing issues for the poor project results. (in In our analysis of complex projects that ran over the projected time and budget targets, many of problems occurred in two time-spans separated by the Final Investment Decision (FID) or the Approval for Expenditure (AFE) Gate – Project Development and Project Delivery.

Labor-Productivity Declines in the Construction Industry

Stanford University Civil and Environmental Engineering Research Professor Emeritus Paul Teicholz and University of Melbourne Senior Lecturer in Construction Matt Stevens have commented on the nature of productivity losses in the Construction Industry.¹

“If you look at ... labor productivity, the manufacturing industry has been taking off for quite a long time at a rate of five to six percent a year, ... [but] for the whole construction industry, if anything, labor productivity is getting worse,” states Teicholz. “Generally, the negative changes over the last three decades have outpaced the positive changes,” comments Matt Stevens. The principle causes Stevens and Teicholtz say:

¹ Teicholz, Paul; Stevens, Matt; *Construction Productivity in Decline*, National Society of Professional Engineers, June 2014, page 13; AECbytes Blog, Labor-Productivity Declines in the Construction Industry: Causes and Remedies, March 14, 2013

- **Poor Stakeholder Alignment:** “Lack of consistent engagement by construction project stakeholders to each other has made project information flow unevenly, causing chaos.” “The main thing is ...[we need] “better engagement and team[work] so problems and solutions are discussed fully and compensations agreed to with less legal people involved.”
- **Poor Planning & Integration:** “Inconsistent, uncoordinated documents, hugely prone to inaccuracies, omissions, clashes and basic technical errors, simply cannot reliably convey the detailed scope of a significant package of work. Demonstrably comparable, definitive bids are impossible to derive from this sort of material.... The result is that contractors interpret the scope as they wish; bid low, deliberately or inadvertently, win the job and spend the duration of the project scrambling for the extras on which their profits depend. The upshot is an industry in which the force of competition plays out, not between contractors’ operational capabilities, but between their marketing, estimating and claims management capabilities. Contractors compete to win work, not to deliver projects. This is a crucial and crippling feature of the construction industry. And it is this, more than anything, else that explains Professor Teicholz’s productivity problem.
- **Adversarial Contracting:** “The contracts continue to be draconian, so each party acts with as much legal insulation as possible.” Friendly contracts would be mutually beneficial. One example of this is Japan and Korea, where contracts are shorter and people are expected to interact with each other with the project in mind,”
- **Procurement Based on Competitive Rather than Collaborative Teams:** “... lack of integration of design and construction, and often poor collaboration among team members. This leads to risk-averse behavior as team members try to protect themselves from the impacts of changes caused by errors, omissions and owner modifications. These issues are frequently present on design-bid-build and even design-build projects where some team members submit bids (typically sub-contractors), the low bidders receive awards and then try to benefit from extra work. The results are projects that are over budget, behind schedule, and more claims. It is not surprising that labor productivity suffers under these conditions,” states Teicholz.
- **Poor Teamwork:** “If you have the right team members and they have the right kind of contract, that makes... the biggest difference,” Teicholz says.

Problems Magnified in Mega-projects

The difficulties outlined above only get worse when played out in a Mega-Project, the magnitude of the multi-billion dollar such as those encountered in the Oil Sands. Whereas in Commercial or Infrastructure Construction sectors, a cost over-run may be in the hundreds of thousands or millions of dollars, an over-run in a Mega-Project is measured in the billions of dollars.

Believing that just “fixing the problem by attacking the pieces of the problem” clearly has not, and cannot work. Every attempt at solving the problem piecemeal has failed. Why?

Because this is a “strategic systems” problem, not a “fix the broken parts” problem. Inherently the current method of delivery of construction services is misconstrued and misaligned. These misalignments then manifest as symptoms of having “broken parts.”

Similarly, what’s needed to address the malaise in the Industrial sector’s Mega-Projects is a ‘rocket-propelled strategy’ – a “Robust Systems Design Architecture”

Causes of Productivity Difficulties

Numerous studies have isolated a number of causes of these declines. Jergeas (2008) and Elliot (2005) listed several of the reasons and contributing issues for the poor project results and the major cost and schedule overruns for Canadian oil sand projects. Elliot (2005) provided the following reasons:

1. Lack of experienced owner and contractor sources
2. Overall quality of owner and contractor management capabilities
3. Ineffective organizational and alliance structures for Mega-projects
4. Inappropriate delegation of owner responsibilities to contractors
5. Lack of clear definition of lines of authority and management responsibilities
6. Lack of discipline and ineffective control of project scope
7. Complexities of major expansions to existing operating plants
8. Customization of owner specification requirements
9. Level of project definition and proximity not well understood
10. Lack of familiarity with the northern Alberta climate, safety requirements, environmental constraints, governmental regulations, construction practices
11. Scarcity of qualified craft workers, high labour costs, inconsistent productivity
12. Many completing mega-projects affecting resources and labour availability
13. Ineffective contractual arrangements and lucrative contracting environment
14. Ineffective material management plans and premature field mobilization
15. Inappropriate management influence of cost estimates to meet economic hurdles and ignoring project reality
16. Ineffective project control systems and project development practices
17. Lack of discipline and consistent application of project code of accounts to allow effective control and collection of actual costs
18. Lack of owner front-end estimating capability and project control personnel
19. Lack of appropriate risk analysis expertise
20. Lack of owner historical project systems and databases which reflect northern Alberta conditions.

Productivity Factors

University of Calgary research (Liberda et al. 2003) identified the relative importance of 51 productivity factors, which were classified into three groups: External, Human, and Management. The following are the productivity factors identified by

- External factors such as
 - adverse weather conditions,
 - union rules and influences,
 - noise, dust, radiation, congested work area,
 - change in drawings and specifications,
 - changes in contract,
 - demand for over- quality work, and
 - the nature of project (size and complexity).
- Human factors such as
 - worker motivation,
 - worker boredom and fatigue,
 - worker attitude and morale,
 - worker’s physical limitations,
 - worker absenteeism,
 - worker learning curve,
 - worker experience, and
 - worker skills as well as the team spirit of crew.
- Management factors such as
 - protective gear,
 - unrealistic schedules,
 - overtime,
 - multiple shifts,
 - excessive shift length,
 - disrespectful treatment of workers,
 - parking facilities,
 - salary and benefits,
 - site layout,
 - necessity to re-do work,
 - discontinuity in crew makeup,
 - failure to use worker’s skill,
 - incompetent personnel,
 - overcrowded work areas,
 - poor inspection programs,
 - unsafe working conditions,
 - inadequate equipment,
 - inadequate supervision,
 - crew composition,
 - constructability,
 - out of sequence survey work,
 - interruption and disruption,
 - adequate site facilities for workers,

- lack of co-operation between crafts,
- inadequate communication,
- lack of worker training and education,
- cleanliness of construction site,
- lack of procedures for construction methods,
- subcontracting,
- changes in foremen,
- lack of detailed planning and
- non availability of information, materials, tools and equipment.

With the exception of the first factor – adverse weather – all these factors are manageable.

The question remains:

- With all the study devoted to analyzing the problem, why has the construction industry been so impervious to change?

Without a clear understanding of why these critical things are “impervious to change”, it is close to impossible to effect any major innovation.

The role of the service integrator is to ensure that these critical factors are addressed and resolved early in the process, not after a crisis has occurred.

Ernst & Young’s Analysis of Mega-projects

In area of Project Development & Project Delivery the Ernst & Young study of Mega-projects² found:

The delivery of Mega-projects is an expensive, highly complex task that entails the combination of leading-edge technology, operation in new geographies and multiparty governance. The sheer size and scale of current and proposed projects present challenges for the project team and owner organizations throughout the project life cycle, especially in delivery, where capital expenditure and schedule demands are at their greatest. Key challenges:

1. **Inadequate planning:** failure to appropriately consider design, construction, commissioning and operational issues (including external factors such as cycles of extreme weather) during project initiation and FEED stages has a detrimental effect in subsequent project phases. This often leads to changes in project scale or design (including revisions to key target markets and sources of supply) and typically results in significant rework for both the company and contractors
2. **Procurement of materials and delivery contractors:** selection of contractors and the contracts through which an organization engages with its third parties are key to project success, because poor selection decisions have significant consequences. Frequently we see decisions based too heavily on cost, with insufficient emphasis

² Ernst & Young, Spotlight on Oil & Gas Mega-projects, 2014

placed on quality, despite the known impact of quality on project cost and schedule performance later in the project life cycle.

3. **Aggressive estimates and optimism bias:** linked to contract cost forecasts, a key question when assessing project performance to cost and schedule targets is whether the targets set out at the preceding milestone (most critically at FID) were accurate or achievable. The mechanism by which projects are proposed and selected within organizations, frequently through sponsorship individuals closely involved in project development, means that selection is open to the risk and influence of optimism bias and an underestimation of project risk and complexity. Where optimism bias goes unrecognized or unchallenged, there is a risk that projects with unsound commercial grounding are taken forward, creating problems for project teams later in the project cycle and adding unknown and unnecessary risk to an organization's wider project portfolio.
4. **Ineffective Project Management:** project plans often leave out the necessary schedule management elements of schedule development, acceptance, progress measurement and reporting, and their relationship to and interdependence with other project disciplines, meaning that project teams fail to fully understand critical activities and the full effect of change on the schedule and other work packages. The challenge of working with multiple contractors, each with separate but often interlinked work scopes, exacerbates this planning problem as real-time data is challenging to recover. As a result, performance and the impact of change are difficult to model and assess. Best-practice examples exist where effective, interlinked work breakdown structures exist with real-time data input; however, these are too often set up as a response to poor project performance, instead of as a pre-emptive measure.
5. **Poor Contract Management:** inadequate equipment capacity and poor quality of service from vendors are common challenges for large projects. A surge in upstream activities worldwide has resulted in a sharp rise in demand for equipment and services, particularly for high specification equipment and specialized services. Against this backdrop, a lack of adequate suppliers, including Engineering, Procurement and Construction Management (EPCM) and Engineering, Procurement and Construction (EPC), contractors with requisite capacities, processes and systems — has created bottlenecks in the entire supply chain, Inadequate contractor supervision at each stage of the project life cycle increases supply chain risk, exposing projects to excessive variations or contractor claims, often without the resources or expertise to challenge them.
6. **Human Capital Deficit:** heightened project activity in the global oil and gas sector has been exerting pressure on key resources such as labor, and as a result, companies are struggling to secure the capabilities, capacity and expertise required to effectively manage their most challenging projects. The challenge of securing resources is aggravated by the rising complexity of projects, increasingly stringent

Part Two: Aligned Construction Enterprise

local content regulations in emerging economies, and a gradual shift in focus from conventionals to unconventionals, where the talent pool is under even greater strain.

Appendix Two: Case Studies

Australian Cases

Case 1: Alliance beginnings in Australia

Project: Wandoo B Offshore Oil Platform

Owner Participant: Amploex Limited

Non-Owner Participants: Brown & Root, Keppel Fels, Leighton Contractors, Ove Arup & Partners

Value: \$364m

Duration: December 1994 to March 1997

This project was to develop a marginal high-risk oil field 75 km north-west of Dampier in Western Australia.

Outcome:

The Wandoo Full Field Development was an outstanding success. Amploex was able to bring a significant asset into production in a time that was at least seven months faster than benchmarked world performance for similar platforms, and at a cost where savings of \$13 million against the sanctioned project budget were realised.

Amploex is on record as saying that "... a properly formed alliance will deliver exceptional savings in project time and project cost to the client, resulting in exceptional profits for all participants and satisfaction to each individual employed within the alliance."

Source: Relationship contracting: optimising project outcomes, ACA 1999

Case 2: Alliance selection process breakthrough

Project: Northside Storage Tunnel Alliance

Owner Participant: Sydney Water Corporation

Non-Owner Participants: Transfield P/L, Connell Wagner P/L, Montgomery Watson Australia P/L

Value: \$465m

Duration: 1997 to 2001

Sydney Water needed to significantly reduce the volume of wet weather sewage overflows into Sydney Harbour prior to the start of the Sydney Olympics in September 2000 to ensure the events being held on the harbour were not going to be affected by wet weather sewage pollution.

Author's Note: we may need to get permission from AECOM to use these Cases

The project involved the design, manufacture, fabrication, supply, construction, testing and commissioning of a 16 km storage tunnel and 3.5 km branch storage tunnel, overflow connection works and upgrades to the North Head Sewage Treatment Plant. The tunnel is up to 160 m below ground level and between 3.8 m and 6.6 m in diameter, and can store up to 500 ML.

Outcome:

By the beginning of 1997, Sydney Water had developed a high level concept of how to address the three major point sources of wet weather sewage overflows.

The construction of a facility of this magnitude across prime residential suburbs of Sydney in a timeframe not previously achieved was going to be challenging. Existing contracting methods would not have delivered the result in the timeframe, and the other Key Result Areas (KRAs) of cost, community, environment and safety would not have been achieved to the standard required for this project.

Sydney Water has commented that:

“The project was very successful and groundbreaking in many areas. Despite many constraints and difficulties, the project:

- achieved its targeted outcome of being ready for the Sydney 2000 Olympics
- was delivered as a fast-track project using the alliancing contracting method, a first such public sector contract in Australia
- was innovative in linking financial rewards to achievement on non-cost objectives
- achieved exceptional results in its delivery of community relations, environmental management and safety systems
- was completed at a final cost which represented an increase of only 3.3% over the original Target Cost Estimate (TCE) – adjusted to include escalation and accounting policy changes – despite significant technical, environment and social problems and delays.”

Historic Notes:

After the Northside Storage Tunnel success followed other significant alliance projects like the BP Bulwer Island Refinery Queensland Clean Fuels Project (1998 to 2000), and the National Museum of Australia (1998 to 2001).

Alliancing came to the attention of the Queensland Main Roads Major Projects Office General Manager, Derek Skinner, who drove the uptake of alliancing within the Queensland public sector. Queensland’s first alliance was the Norman River Bridge Alliance (1999) in far north-western Queensland. Derek was the champion for this catalyst project, a small (\$5 million) but significant and award-winning alliance which involved designing and constructing a new bridge over the Norman River near the Gulf of Carpentaria. The bridge had to be completed within a very tight six-month timeframe prior to the arrival of the wet season. Derek’s foresight and confidence in this approach led to many more transport infrastructure projects being identified as potential alliances.

Part Two: Aligned Construction Enterprise

One of these projects was the Pacific Motorway, The project began in 1998 using traditional contracts to deliver six packages. Subsequently two packages fell behind schedule such that the overall completion date may have been delayed by six months later than the critical opening date of 7 October 2000. These packages of the Pacific Motorway project were converted from traditional contracts to alliances in February 2000 with outstanding results. The project was completed five days ahead of the opening day, cementing the role of alliancing in challenging projects in Queensland and providing an excellent case study for the rest of Australia.

Building on its alliance success, Main Roads also delivered another milestone project, the Georgina River Bridge Alliance in North Queensland.

These projects were followed by the Port of Brisbane Motorway alliance which successfully completed the design and construction of the \$110 million Stage 1 six months early and under budget.

Appendix Three: Distinguishing Joint Ventures from Strategic Alliances

Table 10: Comparing a Joint Venture to a Strategic Alliance

	Joint Venture	Strategic Alliance
Objective	<p>Joint <u>Project</u> Bidding & Construction</p> <p>Potential Joint Ownership after construction completion</p> <p>Maximize Profit from the <u>Project</u></p>	<p><u>Long Term Strategic Alignment</u> combining strengths of two organizations to produce a highly competitive, unified set of joint capabilities that will bid on and complete many projects over the lifetime of the alliance</p> <p><u>Strategic intervention</u> into the marketplace to capture strong market position</p>
Competitive Advantage	<p>Brings strengths of two companies together for increased chance of success in Project Bidding & Construction Delivery</p>	<p>Strengths of two companies are combined for Long Term Market Penetration, Higher Value Delivery in Bidding, Construction, Innovation Evolution, and Customer Satisfaction to maximize profitability, market share, & value delivery</p>
Structure	<p>Joint Project Construction Agreement that divides responsibilities, risks, and rewards among the partners</p>	<p>Multiple levels of Strategic, Relationship, Operational, & Financial Integration</p> <p>Evolving Strategic Plan that adapts to Market & Competitive Conditions</p> <p>Committed Leadership at senior and middle management</p> <p>High Levels of Trust based on Personal Relationships of Integrity</p> <p>Individual Construction Projects are often separate JVs based on specific conditions</p>
Contract	<p>JV Contract defines the Legal Structure & Allocation of Responsibilities, Risks, Profit Sharing, and Conflict Resolution, etc.</p>	<p>Contract is only a Portion of the Agreement, often intentionally broad.</p> <p>Operational Teamwork & Interpersonal Integrity more important than contract</p> <p>Maximum Flexibility as times and market conditions change,</p>
Key Factors for Success	<p>Best Project Management Practices (cost, quality, and time control)</p>	<p>Best Alliance Management Practices, including Project Best Practices</p> <p>Requires intimate knowledge of the customer’s needs & high value inter-action between A&E, suppliers, subcontractors, & others</p>
Duration	<p>Construction Cycle (or longer if JV operates the facility)</p>	<p>Long Term Commitment to mutual success (no defined endpoint to the relationship)</p>

Appendix Four: Culture as a Force Field

CULTURE AS A FORCE FIELD

UNDERSTANDING HUMAN BEHAVIOR

By Robert Porter Lynch VERSION 2.1

ALIGNING THE HIDDEN FORCES IN ORGANIZATIONS

Over again leaders of *collaborative* organizations emphasize the critical importance of “culture.” Yet advocates are far less articulate when it comes to being lucid about how and why culture is so important. In this section we will expand this understanding, moving from an intuitive sense to substantive clarity.

Culture is somewhat a mystery because a cluster of *hidden forces* are almost always at play -- invisible and thus seldom ever acknowledged – but they are the *first cause of failure or success* when any leader tries to improve an organization’s performance or change its direction.

These forces are potent and ever-present. As an analogy: the earth is powerfully influenced by *gravitational, electro-magnetic, and atomic-nuclear forces*; all three are invisible; they cause systems on earth to act in very specific ways; their impact, though invisible, is indelible.

Similarly, underlying and imbedded within all organizations are hidden forces driven by a set of *belief systems* supported by *inherent values, symbols, and behaviors*. These reflect leadership’s ideas about survival, human interaction, and how to operate effectively without losing your job, your position/status, and your perceived importance in the organization. These organic, interconnected beliefs, behaviors, rewards, passed on knowledge, and norms form the basis of what’s known as an organization’s “culture.”³

The *beliefs, values, symbols, operating principles, rewards, and behaviors* are so powerful in *driving direction and critical decisions* that they influence every aspect of the *destiny* of the organization. Thus, because they determine *destiny* and *direction*, they are *strategic* in nature.

³ For most people the word “culture” conjures up images of something that’s too vague, fuzzy, and amorphous. Talking about “culture” makes many tough-nosed leaders squirm because it feels like a big, entangled Gordian Knot. The idea of “culture” seems to mask over the core phenomenon that are really at play – a strategic set of implicit forces that guide the direction, destiny, and interaction of all parts (systems) of the organization. Moreover, sociologists tell us that changing “culture” is difficult, and extremely time consuming. Our studies and experience show that changing culture, if done effectively, takes no more than 12-18 months. (see NUMMI Case Study). Personally, I like the idea of thinking about “culture” as “force fields” much better, because it more accurately describes what is happening and how to influence its impact.

Many cultural forces are *invisible*, thus they tend to be *implicit* and somewhat *covert*. But like magnetic or gravitational forces, they are a *powerful force* impacting everything.

Organizational systems (all the working components of an organization) are held together in the presence of a *coherent* force field (or broken apart by *conflicting* force fields).

If there are *multiple* cultural force fields conflicting or colliding within the system (i.e. organization), turmoil results. (Again using the physical analogy: gravitational force pulls objects downward; but this can be counteracted by an electro-magnetic force (such as an electric motor) which can pull that object upward, which in turn could then be blown apart by a nuclear explosion.)

The Cultural Force Field impacts behavior more powerfully than one's personality


Leadership is about Influencing Behavior

Virtually all definitions of leadership speak about *influencing behavior*. What every leader must know is that leaders, more than anything else, *create the cultural force field* that draws forth or suppresses either good or bad, wanted or unwanted behavior. (see NUMMI Case Study on next page to see how different force fields dramatically impact the very same people yielding totally different performance results). Leaders can influence behavior if they understand what drives it.

That's why it's so important.

Three Types of Cultural "Force Fields"

For the sake of simplicity⁴ this article will distinguish and categorize three basic types of strategic force fields that are typically found in the construction business.. (Simplicity at this point makes it a lot easier to lay out key steps that enable a leader to alter and align beliefs and behaviors to substantially improve productivity, performance, teamwork, and innovation, while also weeding out counter-productive influences in the force field.) Three basic cultural force field options emerge; each has its place, pitfalls, strengths, advantages, and liabilities. (see Table 1: Spectrum of Three Competing Models of Project Delivery & Their Characteristics **Error! Reference source not found.**)

- 
- Collaborative Culture**
Working together, sharing ideas, fast innovation
 - Transactional Culture⁵**
Bargaining, trading, price-driven exchange
 - Adversarial Culture**
Positioning to fight, Win-lose gaming, protection and conflict

Not all strategic force fields are created equal; different force fields produce totally different results.

⁴ Too many "experts" take pride in making culture too complex, which then makes it totally unmanageable.

⁵ *Transactional* cultures can have real value in certain circumstances, such as in internet commerce (e.g. eBay, Amazon, Facebook, etc.) where simple, efficient movement of goods is the core objective.

Because virtually no one makes the distinction between these three *cultural force fields*, thousands of journalists, academics, and leaders grab a chunk of *adversarial* systems thinking, mix it with a smattering of *transactional* processes, and then counter-balance things with an eloquent dose of *collaborative* philosophy and admonitions. This creates a guidance system concocted of incompatible strategies, processes, and misaligned priorities resulting in a “muddy” organization that darts left, right, up, down, and all around searching for a “magic” solution to its problems.⁶

*Culture communicates
what’s “top of mind,”
how people perceive their world,
and what they should value.*

For example, General Motors was peppered with this muddy amalgam for years, treating its suppliers and unions with *adversarial*, power-based threats, making buying and selling decisions *transactionally* to get the lowest price (paying a few cents less for an ignition switch that cost billions of dollars in recalls), and admonishing its workforce to work together *cooperatively* to produce innovation and lean work processes. The three different strategic systems negated each other, like a set of grinding gears driven in contradictory directions. The NUMMI Case study illustrates a “muddy” versus “clean” approach.

NUMMI Case Study: GM & the Union from Hell

Why Do People Behave Badly?

All of us can recall situations where we’ve been in the presence of someone who just drove us crazy, bringing out all of our worst qualities. And we’ve all experienced the converse. Why can some people draw forth our ugliest most vile character and others bring forth the divine? Are our identities so ill-defined that different people can manifest radically different responses?

After twenty frustrating years, in 1982, General Motors threw in the towel on its plant in Fremont, California. A new sense of reality hit senior executives after GM, Ford, Chrysler lost \$5.5 billion to overseas competitors in 1980-81. The Japanese, led by Toyota and Honda, were making better cars at lower prices. GM was convinced that the plant, looming like a “big battleship” of three million square feet, had become simply a battleground for labor and management to tussle and squabble daily. Each focused on dominating and attacking the other. (Their drives to *Acquire* and *Defend* were in overdrive.)

⁶ Note: While we have separated and distinguished the three key themes – *adversarial*, *transactional*, and *collaborative* -- in order to provide a better understanding and diagnosis of their impact, in reality these three themes act as interwoven threads in the fabric of the construction industry. The result is the organization traps its employees in a cross-fire: the “muddle” of different philosophies, objectives, and ways of management. The end result is misalignment, distrust, silos, defensiveness, blaming, and fragmentation resulting in missed deadlines, excessive non-value added work, bloated budgets, unclear objectives, poor teamwork, confusion, and conflicting directions.

GM blamed the union for all the problems, after all it was the union that was instigating all the turmoil, and protecting the jobs of “hippies, drug-addicts, and scoundrels.” The absenteeism was so high (often over 30%) that frequently the production line couldn’t even be started. It was, by far, the worst of GM’s plants in terms of quality and productivity: double-digit defects in every car, and far higher than average hours to assemble any vehicle. Even worse, many cars were sabotaged as workers put ball bearings in frames and coke bottles in doors, knowing it would drive customers and dealers crazy. Distrust ran so high that the labor contract was wielded as a weapon crammed with over 400 pages of legal doublespeak as each side tried futilely to protect their interests. There was a backlog of over 5000 grievances. Thousands of Fremont workers received pink slips as GM tried to cut its losses.

Toyota approached GM in 1984 with an offer to establish a Joint Venture in the United States to reopen and manage the Fremont plant. Toyota offered to up-grade the manufacturing line, and take back most of Fremont former employees along with their labor union, but only a handful of the GM management. GM saw the alliance as an opportunity to learn the Toyota Lean Management System and accepted the offer.

A Remarkable Transformation

*Compete Externally,
Collaborate Internally*

Toyota rehired 85% of the Fremont hourly union workforce, empowering workers to use their creative talents to improve daily plant operations. Security was assured with a no layoff policy along with a fifteen page labor contract. Instead of hundreds of job classifications designed to protect jobs, the new contract called for only four. Toyota spent \$3 million train 450 new group and team leaders in Toyota’s production system, which was based on continuous improvements and trust in the workforce. Team members were trained in joint problem solving and quality practices to become experts in their respective operations.

Collaborative innovation was the focal point, as employees’ roles expanded to enable their participation in work-related decisions. Ideas for improvement were quickly implemented by team members, with successful solutions becoming standardized. Cooperation and creativity replaced coercion and conflict.

By the time the facility was fully operational, quality defects and dropped to only one per vehicle, which were assembled in just half the time, and absenteeism plummeted to only 3%. Workforce satisfaction soared.

By engaging teams in problem solving, Toyota unleashed the energy of collaborative innovation. New ideas and problem solving took off like a rocket with over 90% of employees engaged in the improvement program. Nearly 10,000 ideas were implemented at the outset, and the flow of ideas continued on.

After two years in operation, the once antagonistic NUMMI workers had built more than 200,000 cars and were winning national recognition. The United States Department of Labor highlighted NUMMI as a model of positive labor management relations. Newsweek magazine spotlighted it as “a model of industrial tranquility.” Fortune pronounced it “the most important labor relations experiment in the US today.” Industry Week ranked the plant among America’s 12 best manufacturing plants.

Why could the same people, the same union, and the same equipment produce such a radically different result in under two years?

*NUMMI is the place where Lean
Manufacturing begins in the United States.
And it begins on a Foundation of Trust.*

Part Two: Aligned Construction Enterprise

By focusing on aligning the entire organization within a *collaborative cultural force field*, bringing people together and letting them innovate in teams, both Toyota and the labor union became more secure and each profited enormously, both financially and personal well-being.

However, even though the handful of GM managers trained at NUMMI learned Toyota's production system, GM was still unable to implement it successfully in the rest of their U.S. operations. Why? Because the "invisible" part of the Toyota system was about trust and collaboration, which GM management was unable to replicate because its management culture was unsupportive, filled with conflicting force fields.⁷

The NUMMI example shows how great teamwork is based on all human energy flowing in a single, unified, aligned, and integrated collaborative direction. This is the leader's most important task --- aligning the force field: building trust, creating teams, building bridges across functional boundaries, generating innovation, and achieving high performance.

NUMMI shows how two different cultures can draw forth completely contradictory behaviors from the same work force.

Great Leaders are "architects" who design, mold, shape, and align their organization's cultural force-field strategically into a high performance collaborative engine.

Each of the three force fields – *adversarial*, *transactional*, and *collaborative* – has a set of advantages and disadvantages, and a right time and place for using them. An adroit leader knows how to mix them together appropriately – but only if they are overt, appropriately positioned, and skillfully implemented.

How a person behaves is determined more by culture than by personality

For example, in dealing with highly *unethical* people, an *adversarial* approach may be appropriate. A business model like eBay or Amazon benefits from an efficient *transactional* system. But dealing in a prolonged adversarial manner with a critical union relationship will ultimately end in a *lose-lose* for both parties; a *collaborative* engagement will ultimately turn far better results.

Great leaders make Trust, Teamwork, and Innovation the Central Organizing Principles of Culture

⁷ When GM declared bankruptcy in 2009, it forced the end of the joint venture. The plant was temporarily closed, and Toyota, in conjunction with Tesla Motors, a manufacturer of new generation electric cars, now occupies the facility.

How Senior Executives Unintentionally “Lock Gears” – Muddled Leadership

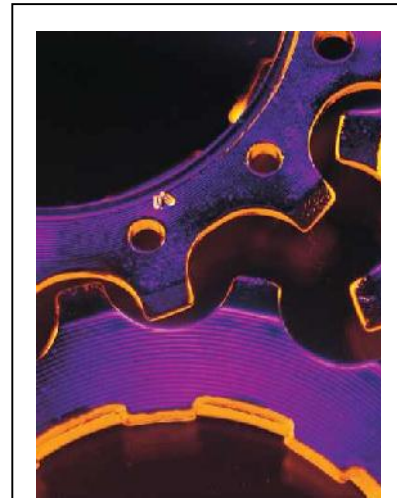
The grinding of the three systems of thought about cultural force fields is often seen in the following real example from a multi-national client company:

*In the Big Picture of Leadership,
the day to day creation of a coherent culture
is the foundation upon which
high performance is built.*

- the Chief Financial Officer comes from a *transactional* world seeking to *maximize profits and shareholder value*,
- the Chief Legal Counsel believes in *hard-nosed litigation, risk-shedding contracts, and rough and tumble bargaining* with the unions, promoting an *adversarial* frame of mind.
- the Operations Officer is fixated on *efficiency and lean production*, teaming up with the Procurement Officer, who squeezes vendors, to lobby the CEO for *lowest cost of production (transactional)*. The holders of these views then lobby and find supporters within the senior ranks.
- the Chief Human Resources Officer is promoting a *collaborative* strategy embracing *teamwork* and *profit sharing* with employees.
- the Chief Innovation Officer is launching programs with customers to engage in *collaborative innovation* for better product/service creation and delivery to give the customer base more competitive advantage in the marketplace. In turn, the heads of Strategic Planning and Research & Development advocate forming alliances with disparate organizations to flow innovative ideas and solutions to the customer base
- the Chief Marketing Officer strongly holds an *adversarial* view of creating competitive advantage, believing in *wiping out the competition* and playing her direct reports off *against each other* to determine who will rise to be the “alpha male/female.” However, the Head of Sales believes that the best way to increase revenue is *build trust* with the customers and imbed *customer relationship* representatives inside key customer accounts to *understand customer needs* and *improve communications and coordination*.
- the Chief Executive Officer (who is never neutral in this kind of scenario) was most concerned about increasing profits to drive up stock value (he was the largest shareholder), causing him to look at every action *transactionally*.
- the Founder & Chairman of the Board wanted high creativity, commitment, and teamwork from his organization (*collaborative*), and years before had set up an Employee Stock Ownership Program (ESOP) to engage employees and share the rewards.

At this point you must be asking:

“How does this dysfunctional company stay in business?”



When Adversarial, Transactional, and Collaborative Systems thinking is mixed, willy-nilly into an organization, the human energy is conflicted like grinding gears, causing stalemate, lots of effort with little leverage, resulting in non-value added work

Trust will flourish in a Collaborative Culture; it withers in a Muddled Culture, and dies in an Adversarial Culture. This is what makes trust so fragile.

Simple: Their competition is worse!

This is not an isolated example – in my experience it is the norm, not the exception.

Align the Senior Executive Team, then the Organization

At the outset of any transformation process, leadership must make a distinct decision as to the type of cultural force field interaction to be deployed. This is often overlooked, with dire consequences; all-too-often the choice of the “game” is a crude admixture of all three approaches, which “grinds the gears,” muddles messages, and divides an organization against itself. For example, if the transformation intends to create more teamwork internally (*collaborative*), but beats up suppliers (*adversarial*), while showing little care and service for customers (*transactional*), managers and employees will be thoroughly confused as core values become disjointed.

Many businesses evolved willy-nilly, patterning an unholy, even perverse, admixture of *adversarial*, *transactional*, and *collaborative* cultural force fields. This perverse concoction can be seen in the construction industry, in the airline industry, and the auto industry. For example, compare the performance of Toyota, which aligned on a *collaborative* culture, with General Motors, that has been a confounding witch’s brew of muddled cultures for years. Their 2009 bankruptcy had been fomenting for decades; it just took a recession to push it over the brink.

Let’s be blunt: *adversarial* systems are highly dysfunctional, too filled with non-value added work, silos, useless control mechanisms, unproductive layers of management, and lack of customer-focused innovation, making them unsustainable and not competitive in the long run.

The primary way strategic force fields (culture) are developed and sustained in any organization is through *leadership*. Thus one of the first tasks of a senior executive is to *align* the senior leadership team and middle management into a coherent *collaborative* unit that promotes working together by:

1. Determining the **Core Beliefs** of senior leaders (see **Error! Reference source not found.**), then replacing any senior leaders⁸ that are committed to *adversarial* or *transactional* thinking. This builds unity in the organization, teamwork across functional unites, and trust in both the leadership and the workforce. It takes a tough leader to decide who makes the cut.
2. Developing a set of **High Performance Values, Metrics, & Rewards** that support a *collaborative* force field. Then live by these, don’t just give them lip service.
3. Establishing **Core Operating Principles** that guide *trustworthy interaction* between people, teams, cross-boundary/functional units, and external alliances.

⁸ Often this will require the removal/replacement of up to 50% of the senior leadership who are so engrained in *adversarial* or *transactional* thinking that they cannot support a new *collaborative* system. (see Gordon Bethune’s book *From Worst to First -- Behind the Scenes of Continental's Remarkable Comeback* for an excellent example of organizational transformation from a CEO’s perspective, shifting from an *adversarial* to a *collaborative* system. He didn’t mix messages and confuse his team. And the turnaround was done in less than 18 months. (When a “clean” system is created, it doesn’t take long. Long transformations are the result of not clearing understanding the nature of a clean collaborative strategic force field.

4. Making **Collaborative Innovation** the source of co-creative energy, adaptation to changing environments, and competitive advantage in meeting emerging customer needs.
5. Linking the company into/through a **Value Network** that flows value, innovation, and competitive advantage from strategic supplier alliances, through the company into strategic delivery/customer alliances, resulting in the creation of unique value that increases customer competitiveness.
6. Ultimately making *trust, innovation, and teamwork* the “**Central Organizing Principles**” of high performance, high profitability, and high sustainability.

The Four Drives of Human Behavior

The NUMMI Case presents a dramatic example of how different cultural force fields can draw out totally different behaviors from the same human beings. How can this be? How does this happen?

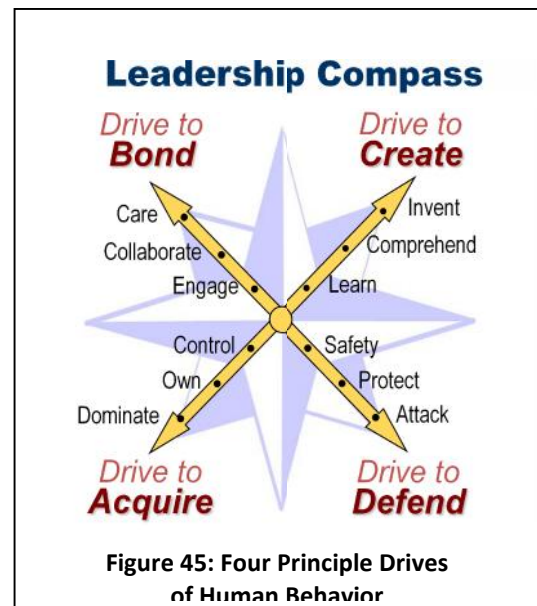
Let’s go back to the analogy in the physical world where there are gravitational, electro-magnetic, and atomic forces. Each of these forces has a set of pivotal elements and laws that determine how something responds to the force field. For example, in the gravitational force field, force is a factor of mass and velocity, governed by Newtonian laws. Similarly, the electro-magnetic force field is determined (in simple terms) of the power of the charge (voltage), distance, rotation/changing fields, and current flow.

Shifting the perspective back to human beings, based on extensive research into the neurological process of the human brain, along with the best evidence from psychology, sociology, and anthropology, we can conclude that while our brains are the most complex mechanisms on the planet, there are some basic circuits that control/drive our behavior, and different parts of the brain are assigned responsibilities for performing these functions.

Nearly every individual on the planet is imbued with four innate “drives” [see Figure 45] (these are the most important drives). These for the sake of simplicity have been arrayed in the form of a set of “vectors.” The four drives are easy to remember: A, B, C, & D.

Each individual has their own distinctive blend of these four drives and typically manifests them in a manner that reflects their unique culture and personal experiences in life. These drives must each be reasonably satisfied and are independent of one another in the sense that fulfilling one does not contribute to the fulfillment of the others.

- 1) Drive to **Acquire** – this is the goal-seeking instinct, which includes seeking food, shelter, reproduction, pleasure, status, and control over one’s environment. Attached to this drive are certain very *basic emotions* such as *desire, greed, and lust*.
- 2) Drive to **Defend** – the safety and protection instinct, defending ourselves from threats and aggressors, and assessing risks. Attached to this basic drive is the basic emotion of *fear*, and its derivatives such as *anger and vindictiveness*.



These two basic brain functions together are often termed “self-interest” or “self-preservation,” and mostly use evolutionarily-old brain regions that humans share with fish and reptiles. When a leader triggers these two drives excessively, they become the primary drives of behavior – survival, anger, retribution, and revenge become paramount, while the *trust circuitry in the brain is severely inhibited*.

In the NUMMI Case, when GM ran the plant, management created a *force field* (culture) that consistently triggered the drives to **Acquire** and **Defend** in the workforce, resulting in the aggression, vindictiveness, reprisals, walkouts, and strikes.

Teams and alliances formed between groups whose culture is primarily based on the Acquire and Defend drives will inevitably be more distrustful – they lack the collaborative spirit.

However, there are two more drives that come into play. Our brains share certain functions that are common among all mammals. The most important one for our immediate purpose is:

- 3) Drive to **Bond** —the yearning to live and work in groups, such as teams or herds.⁹ This “communal instinct” is extremely important because it provides the natural desire for humans to *collaborate*, coordinating their actions for their mutual benefit, and the desire to work for the “greater good.” Scientific studies have clearly demonstrated that this drive must be reinforced if trust is to be present. Associated with this drive are some of emotions exhibited by humans and a few higher mammals –*love, empathy, caring, happiness, playfulness, loyalty, honor and gratitude*, to name a few

A leader must consciously work to meet the needs of every human to balance or align the drives to *Acquire* resources and *Defend* one’s turf (self-interest) with the needs of humans to *Bond* with others to achieve something they could not accomplish alone (mutual-interest).

By focusing on the *collaborative values, operating principles, trust systems, teamwork rewards, and measures* that influence the drive to *Bond*, a leader can begin to turn the tide and build a collaborative system

Humans also have high-order cognitive capacities:

- 4) Drive to **Create** – the unceasing impulse of humans to comprehend the world around them, to find meaning, to imagine a better future, to solve problems and puzzles, and to build new and better things. We see the drive to *Create* manifesting in children at a very early age; people are just naturally innovative. Attached to this drive are emotions we often call *spiritual* such as *inspiration, wonder, and awe*. It embraces the power of learning and the quest for knowledge.

This cognitive capacity to *Create* enables us to weigh, balance, and align the drives to *Acquire, Bond, and Defend*.

⁹ Scientists have studied this quality going back all the way to the ancient Greeks and have concluded time and again that these characteristics all have served very important evolutionary functions to give mammals a competitive advantage over reptiles. A very small percentage of any species of mammal seems to be born without this quality. In humans we call these psycho- or socio-paths.

It is this very human drive to *Create* that every leader seeking *innovation* needs to support and catalyze along with the *collaborative* drive to *Bond*. In tandem, these two drives give people a deeper sense of meaning and purpose.¹⁰ This gives leaders a "win-win" way to stimulate innovation: it benefits both the individual and the group. When the *Bond & Create* drives are mutually reinforced, trust and teamwork grow.

While the four drives operate interactively, each must still be satisfied in some reasonable proportion, otherwise people feel unfulfilled and empty. And if people feel unfulfilled, they will seek fulfillment of the drive that's lacking in some other way, even if it's a perverse application.

Designing Force Field Interaction with the Four Drives of Human Behavior

Recall that virtually all definitions of leadership call for the *influence of behavior*.

*Leadership counts;
and trusted
leadership counts
highest.*

That influence can be exerted:

- *adversarially* with fear, threats, and strong arm tactics,
- *transactionally* with bargaining and cold efficiency, or
- *collaboratively* with teamwork, trust, and innovation.

The leader's task is to *design* the most effective cultural force field to bring out the best performance in the organization. A leader's every action either reinforces, suppresses, balances, or aligns the four drives with rewards and punishments. That's why the same individual may behave quite differently in different organizations, or why changing top leaders (or sports coaches) can produce radically different results within the same group of people.

In the NUMMI Case, under GM's leadership, the *force field* caused the **Acquire** and **Defend** drives to become predominant, while the drives to **Bond** and **Create** became subordinate (but not dormant), showing up in the formation of a tight-knit group called a "union" and imaginative sabotage techniques.

Toyota dynamically altered the force field, instilling a high **Bond** and **Create** culture in the plant based on trust, teamwork and innovation. In turn, the work force's drives to **Acquire** and **Defend** became *supportive* drives, manifesting as goal setting, quality control, and safety on the job. Toyota was careful to change the rewards, measures of success, and training programs to reinforce the new high trust/teamwork culture.

¹⁰ Psychopaths are defined as people without conscience; they lack empathy because their brains have an impaired capacity to process a specialized neuro-transmitter called "oxytocin." (Note: Darwin maintained that a conscience was the primary feature that distinguished humans from other animals. Darwin never intended the idea of "survival of the fittest" to be applied to human beings. See his book *The Descent of Man* for more details)

While personality and environment certainly do have an influence on behavior, probably fully two-thirds of all human behavior is more powerfully influenced by the *interaction* of the four drives of human behavior with the cultural force-field.¹¹

Power of Collaborative Cultures

In my nearly fifty years studying and building high performance organizations, there are four overriding conclusions:

1. High Performance organizations start with *highly collaborative strategies to engage all parts of their value chain* – internal and external in a collaborative way – which transforms the value chain in to a value network. Their competitiveness against external rivals is derived from the cooperativeness within the value network.
2. High Performance organizations that sustain their advantage over the long term place great value on their *people, culture, & the drivers of human behavior*. In particular, they emphasize *trust, collaborative innovation, and teamwork*, always pushing the envelope with new ways to work together to produce more value for their customers, their company, and their alliance partners.
3. *Leadership is the primary means of affecting the cultural force field in any organization*. This is why leadership is more important than management, and maybe more important than anything else.
4. *Organizational Transformation efforts will fail with muddled leadership*. When the senior leadership team is composed of *collaborative, transactional, and adversarial leaders*, the signals sent to the work force about what is important and how the organizational should function will be confused and ineffective.

Note: In today's global economy companies must continually grow their core business, innovate relentlessly, and continue to create new competitive advantage. In the face of global competition and continuous technological invention, where state-of-the-art technology is sometimes superseded in a matter of weeks, the race may not go to the swiftest new technology, or the largest corporation, or the slickest marketing campaign. Rather, it will be won by the team delivering the most compelling, valuable solution to everyday users. To do this, especially during economic ebbs and flows, companies will need to find opportunities to leverage and expand their core competencies into leading-edge markets. According to a 2011 study by Bain & Company, "Management Tools and Trends," strategic alliances figure prominently in the top twenty-five tools companies intend to leverage to invigorate growth in the unfolding economic recovery. Strategic alliances were the fifth

¹¹ This explains behavioral conundrums like: why there was such a flourishing of innovation during the era of the Greeks, why the Dark Ages were so bleak, how the Renaissance came about, and how the German people could commit such heinous acts as genocide under Hitler's influence, to illustrate a few examples.

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most used tool, with a projected usage of 73 percent among the survey respondents for 2011—a 26 percent increase from 2010.

ⁱ “Evaluating the performance of Mega-projects” in this report is based on the review of 365 projects with a proposed investment of above US\$1b in the upstream, LNG, pipeline and

ⁱⁱ Source: Western Australia/Victoria Government, Dept of Treasury & Finance website

ⁱⁱⁱ Note: When thinking about what kind of supply relationships are optimal, use **Error! Reference source not found.** as guidance. No company will fit perfectly into any of the three categories. Alliances are not for every business relationship; there are innumerable situations where a supplier should only be considered as a “vendor.” Don’t go overboard; be selective, and choose only those who truly produce value, are honorable and trustworthy, and are collaborative. Many companies may currently be considered Vendors or Preferred Suppliers, who should be Alliance Partners. In this case, the Best Practices in Book Two will prove invaluable in making the shift to an Alliance Relationship.

^{iv} Study conducted in workshops throughout Canada and the U.S. Over 3,000 senior managers evaluated the impact of trust on key operational factors. Universally executives reported a minimum of 30% advantage in each of the factors when evaluating high trust over low trust organizational cultures.

^v Source: Transparency International. See www.transparency.org. High Corruption (Low Trust) Countries are ranked as higher risk. When making financial assessments, High Trust countries receive better financial terms.

^{vi} This sets the foundation for making more distinctions, which we should perhaps elaborate upon. “Risk” is often attached to “discount or premium factors” which can be quantified. Insurance companies do this with extreme precision – such as the risk that a flood will happen in a specific location. Uncertainty is not nearly as precise, being unquantifiable and statistically unverifiable. Uncertainty, because it is a psychological phenomenon, has greater impact on contingency planning, trust building, and clarity of roles & responsibilities.

^{vii} Numerous studies have found a link between safety and profitability. For example, see: *The Link Between Workforce Health and Safety and the Health of the Bottom Line, Tracking Market Performance of Companies That Nurture a “Culture of Health”* by Raymond Fabius, MD, R. Dixon Thayer, BA, Doris L. Konicki, MHS, Charles M. Yarborough, MD, Kent W. Peterson, MD, Fikry Isaac, MD, Ronald R. Loeppke, MD, MPH, Barry S. Eisenberg, MA, and Marianne Dreger, MA; *JOEM*, Volume 55, Number 9, September 2013

^{viii} From AECOM Best Practices,

^{ix} American Institute of Architects, California Council, Integrated Project Delivery Guide, excerpts adapted from forward, 2007

^x According to the Lean Management Institute (John M. Bernard, Oct 29, 2012), “Sadly, 80 percent of Lean initiatives are abandoned within three years of their launch. In addition, only two percent of organizations that venture into Lean get the results they expected.” Bernard goes on to state, “...Lean fails primarily becausemost management teams don’t understand Lean. When we don’t understand something it is next to impossible to support it. This lack of understanding of Lean by management allows even the most subtle of things to derail Lean efforts.” According to Bernard, “management is a collection of interconnected processes, which need to be treated as its own system.”

[Author’s Note: the idea of management being a collection of interconnected processes is only partially correct. Here it is important to distinguish the difference between ‘leadership’ and ‘management.’ Leadership

(and its derivatives such as innovation) is driven more by *principles* than processes, whereas management tends to be more *processes & practices* guided. The development of a high performance 'culture' for the alliance does not come from processes, but from principles, strategies, and beliefs about people that drive core values. Engineers in particular tend to view the world as a set of mechanical systems that can all be broken down into core processes. This leads to the false expectation that human systems will behave like mechanical systems and follow mechanical/logical rules of behavior. This is extremely relevant to managing complexity. In mechanical systems, the mechanical/logical route says *simplify – reduce, eliminate, and accelerate*. However taking this route inside human systems will trigger high levels of distrust, anger, and resistance to change because people will see their jobs threatened as their sense of security is undermined by the thought that management is instituting Lean production because each worker is producing "fat and waste." In human systems, it is smarter to start not logically, but intuitively, focusing on *synergy – collaborate, innovate, synchronize, integrate.*]