WHITE PAPER

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The Architectures of Collaborative Systems Excellence

for the 21st Century Engineer working Cross-Functionally in Design Teams

Complete White Paper

The Collaborative Shift is, in its essence, a Paradigm Shift requiring "Systems Architecture" to fuel and sustain it.

Purpose

Powerful forces in global business are driving the need for far greater collaboration by engineers between all types of businesses, functions, and technical specialties. But there is a massive chasm between the level of collaboration needed for innovation and the university's capability to deliver what's required.

- What are the realities … the obstacles, the opportunities and the necessary shifts required?
- What's needed for Engineers to spur engagement and lead more effectively?
- What can Engineers do to be more impactful in solving the great problems we face today?
- What can be done in universities to deliver higher levels of innovation?
- What new levels of thought and action are needed?
- What is the new paradigm for the future?

Critical Issues

The business world has been clamoring for more innovation and anticipating a *collaborative shift* for more than two decades. Despite the verbal interest by CEOs in numerous surveys, the reality has been far from stellar -- more talk than action, more smoke than fire, more heat than light.

While well poised for engagement, Engineers have largely not been the leaders; often being marginalized and isolated; too few have gone on to become corporate CEOs. This must change. Opportunity is beckoning. University Engineering Programs should be leading the way into the future.

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This White Paper is a special adaptation for the Engineering Profession
derived from a forthcoming book on

Collaborative Excellence for Leaders

By Robert Porter Lynch

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WHITE PAPER

The Architecture of
Collaborative Systems Excellence

21st Century Engineer

By Robert Porter Lynch with commentary by my colleagues.

This paper is divided into Three Parts

Part 1 – WHY?

Part 2 – WHAT?

Part 3 – HOW?

Part 1: WHY Engineering and the *Collaborative Shift*

The business world is changing at a bewildering pace. In no other period in the history have we encountered so much change so fast (with the exception of wartime). Collaboration plays a central role in this change – it's termed the *Collaborative Shift.*

With the advent of strategic alliances in the 1990s, a burst of enthusiasm emerged. Senior business executives began to recognize the value of collaborations, partnerships, alliances, and the need for better cross-functional/boundary integration to increase quality of

problem solving, speed of competitive advantage, development and delivery of innovation, and applications of solutions from one field/industry to another.

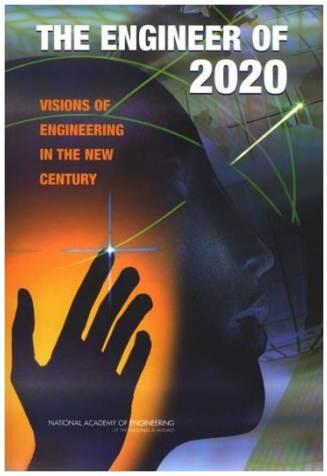
> Today, about 90% of senior executives echo this need for better collaboration, but the desire has largely been unfulfilled in most industries (bio-pharma and some elements of technology being the exceptions).

Vision for the Engineer of 2020

The National Academy of Engineering issued a two visionary books in 2004-5:

- *The Engineer of 2020, Visions of Engineering in the New Century* and
- *Educating the Engineer of 2020, Adapting Engineering Education to the New Century*

The Academy's insights were illuminating, prescient, and certainly worthwhile reviewing as the foundational introduction to Collaborative Systems Excellence:



Excerpts from Visions of Engineering in the New Century (more text is in Appendix 1)

Engineering Must Adapt to Change

> *In the past, changes in the engineering profession and engineering education have followed changes in technology and society. Disciplines were added and curricula were created to meet the critical challenges in society and to provide the workforce required to integrate new developments into our economy.*
> *……..*
>
> *Today's landscape is continually changing, and engineering must adapt to remain relevant. We must ask if it serves [society] well to permit the engineering profession and engineering education to lag technology and society, especially as technological change occurs at a faster and faster pace. Rather, should the engineering profession anticipate needed advances and prepare for a future where it will provide more benefit to humankind? Likewise, should engineering education evolve to do the same?* [1]
>
> *… Most importantly can the engineering profession play a role in shaping its own future? How can engineers be educated to be leaders, able to balance the gains afforded by new technologies with the vulnerabilities created by their byproducts*

[1] Educating the Engineer of 2020, Adapting Engineering Education to the New Century, National Academy of Engineering, Page 1

without compromising the well-being of society and humanity? Will engineering be viewed as a foundation that prepares citizens for a broad range of creative career opportunities?[2]

While certain basics of engineering will not change, the global economy and the way engineers will work will reflect an ongoing evolution …..The economy in which we will work will be strongly influenced by the global marketplace for engineering services, a growing need for interdisciplinary and system-based approaches, demands for customerization, and an increasingly diverse talent pool.[3]

The attributes [of the future engineer] include such traits as strong analytical skills, creativity, ingenuity, professionalism, and leadership.[4]

The rate of change of scientific and knowledge is [accelerating at a bewildering pace). Product cycles continue to decrease, and each cycle delivers more functional and often less expensive versions of existing products, occasionally introducing entirely new disruptive technologies making older technologies obsolete at an increasing rate. [5]

Leveraging Inter-Disciplinary Interaction

Engineering schools [must] consider organizational structures that will allow continuous programmatic adaptation to satisfy the professional needs of the engineering workforce that are changing at an increasing rate. Meeting the demands of the rapidly changing workforce calls for reconsideration of standards for faculty qualifications, appointments, and expectations. [6]

The challenge for the profession and engineering education is to ensure that the core knowledge advances in technology [with similar advances in organizational leadership, innovation, and cross functional integration] so they can leverage them to achieve inter-disciplinary solutions… Innovation is the key and engineering is essential to this task; but engineering will only contribute to success if it is able to continue to adapt to new trends and educate the next generation of students so as to arm them with the tools needed for the world as it will be, not as it is today.[7]

[2] Ibid, Page 2
[3] Ibid, Page 3
[4] Ibid, Page 4
[5] Ibid, Page 24
[6] Ibid, Page 24
[7] Ibid, Page 25

Systems Perspective[8]

[Rapid technological advances] have spawned new micro-disciplines within engineering …. Increasingly requiring a systems perspective. Systems engineering is based on the principle that structured [socio-technical] methodologies can be used to integrate [diverse] components and technologies [rapidly with far less chance of failure either in installation or in operations.] The systems perspective is one that looks to achieve synergy and harmony among diverse components of a larger scheme. This requires new ways of doing engineering.

Working in Inter-Disciplinary Teams

Because of the increasing complexity and scale of systems-based engineering problems, there is a growing need to pursue collaborations with multi-disciplinary teams of experts across multiple fields. Essential attributes for these teams include excellence in communications (with technical and public audiences), an ability to communicate using technology, and an understanding of the complexities associated with a global market and social context. Flexibility, receptiveness to change, and mutual respect are essential.

Strategies for ensuring effective in inter-disciplinary engineering teams … and how they can best be assembled through other disciplines, such as business, psychology and other social sciences.

These challenges will continue to grow in importance as systems engineering becomes more pervasive.

Complexity

Engineers must know how and when to incorporate [socio-technical] elements into a comprehensive systems analysis of their work.

This changing landscape for engineering …. is not just ….. a narrow technical challenge but the legal, market, political, etc., landscape and constraints that will characterize the way the challenge is addressed [and] how and why engineers approach problems

Continuous Learning

It is imperative that engineers become life-long learners …, not only because technology will change quickly, but also because the career trajectories of engineers will take on many more directions…..

[8] *Engineer of the Future: Visions of Engineering in 2020*, Chapter2 (Please refer to **Appendix 1 – Excerpts from Engineer of the Future** for more detail)

The Focus of this Paper

The aim of this White Paper is to transform this enlightening vision into reality with concrete approaches that will produce rapid results.

The National Academy is calling for what we term "Collaborative Systems Shift"—which by its nature, is a Paradigm Shift requiring a new Design Architecture to fuel and sustain it.

In addition, we will identify obstacles that have blocked the shift and how to overcome them. We will introduce a whole new view of leadership and collaboration that potentially will forever change the way you view the world in through the lens of this paradigm shift. So beware, reading more will probably change your life and the way you experience interaction with yourself, your friends, your family, your teams, and how you interpret leadership actions, even what you experience when you read a book or watch the news.

From Vision to Strategic Execution

The National Academy proposed a compelling rationale for a transformation of the Engineering profession. Reading the Engineer of the Future 15 years retrospectively, one must remark at the quality of their clairvoyance.

However sound the vision, the strategic execution has faltered.

Vision without Execution is Hallucination

Why?

It's not because they were wrong about their vision.

But several other major impediments got in the way.

This part of the paper will examine many of the obstacles; then we will propose practical solutions.

Collaborative Systems Shift

First, it must be understood that the 2020 vision of the Engineer of the Future is actually part of a much larger *Collaborative Systems Shift* that has been attempting to launch for about 20 years.

This shift has been very rocky, not just for the Engineering Profession, but for many other professions as well. The authors of this paper have championed the *Collaborative Shift* for years, and have experienced the elation of success, tempered by the disappointments of failures and the heartbreak of regressions.

What we have come to understand something fundamental to our thinking about the future:

Because the *Collaborative Systems Shift* being prescribed is a ***Paradigm Shift***, by its nature it needs a new ***Systems Design Architecture*** upon which to construct the new vision for the profession and the education of engineers.

It is for the lack of a Collaborative Systems Design Architecture that the thousands of books, millions of individual efforts, and the excellent collaborative practices launched during the last fifty or more years have failed to take permanent root.

As professionals who have worked with engineers, and numerous other professions in complex projects, businesses, and alliances, it should come as no surprise that those inside the current paradigm would find it difficult to break outside their frame of reference.

It actually takes a multi-disciplinary team of insiders and outsiders to understand the National Academy's vision and to crack the code to shift the paradigm. Collectively and independently we have been chipping away at the issue for years, each time adding to our collective wisdom.

To further compound the difficulty, the structure of the university has not lent itself to solving the *Collaborative Systems Paradigm Shift.* The university departmental structure of insular departments never developed the systems design thinking that could be used to facilitate the breakthrough.

The Best and Worst Engineers

- While the best engineers are intuitively adept at embracing *systems*, the worst address *components*;
- the best are filled with *insights* and *questions*, the worst with *knowledge* and *pronouncements*.
- the best are *practical*, the worst are *theoretical*;
- the best are *integrators*, the worst are *defenders*;
- the best *engage*, the worst *repel*;
- the best *find a way*, the worst *say no way*;
- the best work *seamlessly* with other professions, the worst *polarize*;
- the best are *collaborative*, the mediocre *transactional*, the worst *adversarial*;
- the best are *innovators*, the worst *resist change*;
- the best are *wise with common sense*, the worst *fail to listen and inquire*;
- the best incorporate technology with *humanity*, the worst advocate that science and technology are the best or *only answer*, and humanity must conform.

Becoming the best is the focus of our Paper

The authors of this White Paper seek to provide new insights,[9] new perspectives, and a way forward for university education to fulfill the National Academy's 2020 vision.

> This White Paper represents a perspective on the Collaborative Systems Design Architecture – what it is, why it's a breakthrough, and how it can be practiced.

But first, we need to examine the unique conditions of our times and the obstacles to achieve this vision.

The New Era of Change, Speed, & Complexity

Change, speed, and complexity are the by-words of our age. This is one of the core themes of the National Academy's vision.

In workshops conducted over the last twenty years, our team has asked over twenty thousand senior executives all over the U.S. Canada, and Europe to express, graphically, the impact of the rate of change/speed/complexity since 1970.

[9] The authors of this paper are largely systems thinkers and "pracademics" with deep field experience implementing successful programs, graduates of both academic programs and the many schools of hard knocks. Several of us have been fastidious in chronicling our learning and teaching others in the field as well as in universities. Through over 150 collective years' experience, we have researched, designed, developed, field-tested, refined, piloted, and delivered *collaborative systems* excellence across a very wide variety of industries and professions

Amazingly, for well over 90 % of the executive responses, the curve looks like Figure 1:[10]

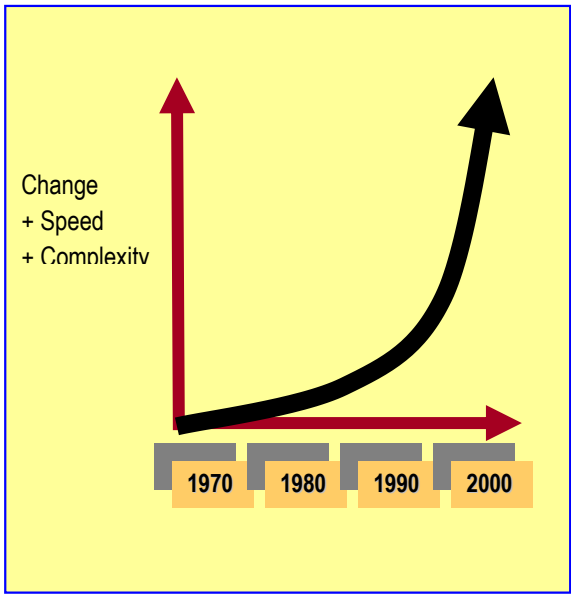


Figure 1 -- Graphic Depiction of the Rate of Change in the Business World

The implications of this phenomenon, from a relatively more predictable, slow-time world where businesses were largely autonomous, to an integrated fast-time world are massive. It affects every aspect of strategy and operations.

This astounding concurrence represents the dazzling shift that has rocked the very foundations of organizational thinking. But with this shift, executives, professions, and academicians have been caught flat-footed.

In the first half of this era (1970-1990), the business world was slower moving, a period of relative predictable change, characterized by five and ten year strategic plans and three year sales forecasts. Organizations stood as independent entities that *transacted* business independently, alone, and predominantly hierarchically. The rules of management in this earlier era have been developed from years of experience, handed down through generations of tradition, built into corporate culture, and augmented by the esteemed learning from our business schools.[11]

Paradigm Shifts require a powerful new Design Systems Architecture to underpin it.

[10] The only difference among these 90% was the point of inflection where the curve changes direction radically. For those in very rapid change industries, such as high tech, the point was generally between 1986 and 1990. For those in slower changing businesses, such as petro-chemicals the point tended toward 1995-1998. The primary reasons for the shift cited by executives were: computers, faxes, globalization, cell phones, then the internet, each compounding upon the other. This curve is a "Baby Boomer" perspective. Ironically, those who entered into the business world after about 2000 draw only the skyrocketing part of the curve – they have no perspective on what the world looked like in the 1960-1980 period.

[11] It's worthy to note that Business Schools (which began to evolve after WWI) still grant Masters in BUSINESS ADMINISTRATION. This belief that business is an "administrative" endeavor keeps us trapped in an old paradigm.

The Great Tectonic Paradigm Shift

However, the quantum nature of the shift has massive impacts on the nature of business. The conditions of rapid change, increasing speed, and heightened uncertainty have created a set of conditions where many of the old rules simply don't apply. (see Figure 2). Study this Figure because it tells a compelling story about the complex nature of the paradigm shift.

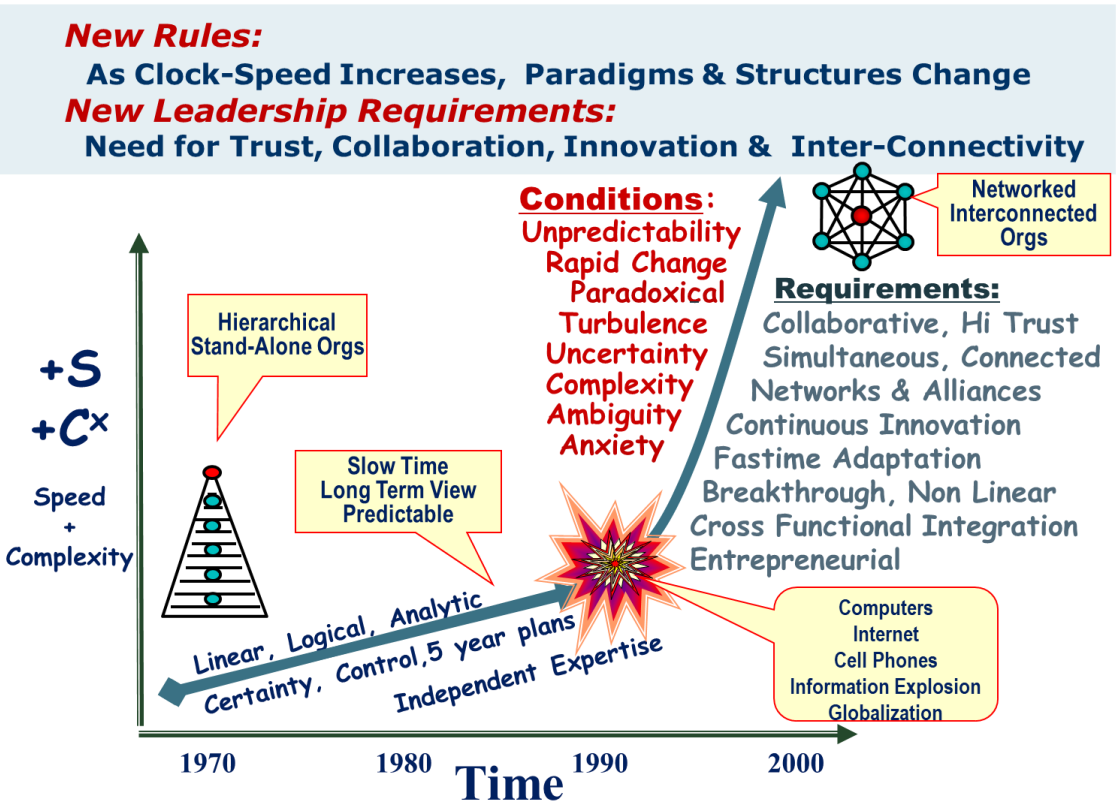


Figure 2: Paradigm Shift: Acceleration Curve in a Rapidly Changing World

Note: the Curve is drawn as a composite of the inputs from over 20,000 executives over the past two decades. The graphics and notations on the chart have been added to explain the phenomenon. Bottom Line: Old style hierarchical leadership is more effective in stable environments, whereas collaborative leadership is necessary in highly complex environments where ambiguity and uncertainty prevails.

First, it's important to understand the shift in the frame of reference before the shift is the struggle most leaders, professions, and institutions struggle with. Second, It's vital in understanding this chart that business *conditions* determine what kinds of *requirements* are needed as this chart describes:

Conditions:	Requirements:
• **Unpredictability, Rapid Change, Paradox** • **Turbulence, Uncertainty, Ambiguity, Complexity, Anxiety**	**Collaboration, High Trust, Continuous Innovation, Simultaneous Connected Networks & Alliances, *Fastime* Adaptation, Breakthrough, Non Linear Shifting, Rapid Obsolescence, Entrepreneurial**

These requirements are a major ***Paradigm Shift***, and thus necessitate a powerful new ***Design Systems Architecture*** to underpin it.

- Most Corporate Leaders where never equipped for this shift.
- Business Schools are not providing new levels of thinking.
- Nor have Engineering Schools adapted to the shift.
- Thus leaders remain trapped in an old paradigm, unable to cope with a new world that works in new dimensions of thinking and rules of engagement.

READINESS FOR A SHIFT

When great intentions yield mediocre results,

When the tried-and-true ceases to work,

When every attempt to fix things
is met with frustration and failure....

Then probably the life cycle's design has
reached its limits,

The paradigm is ready to shift.
Opportunity is present,
Creative vision is called for,

And bold action in new dimensions
is the nature of things to come.....

Critical Questions for the Future of the Engineering Profession

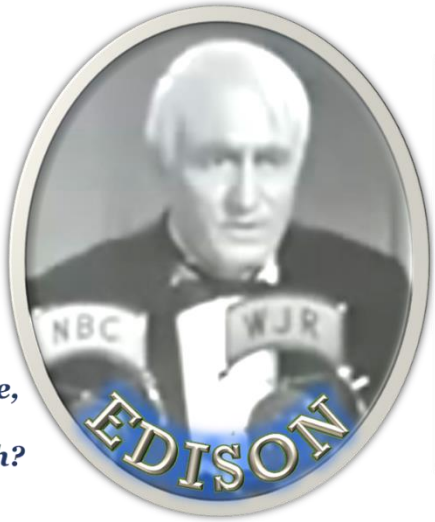
Edison's Admonition

In the late 1920s, Thomas Edison was heralded for his lifetime achievements as the greatest inventor (he used collaborative innovation teams). At that time he highlighted the dilemma engineering faces today:[12]

It's a troubled world -- full of doubt and uncertainty.

Men of science have been helping it.

Are we going to discover, too late, that science was trusted too much?



Has science turned into a monster whose final triumph is man's own destruction?

It's a problem of balance and alignment.

[12] Author's note: I saw the 1940 movie, *Thomas Edison – the Man,* starring Spencer Tracey (from which this quote is taken) on TV in 1967 while studying to be an electronics engineer at Brown University. Edison's words shifted the direction of my life. The following year I changed my major to International Relations, and that choice brought set a very different course in life that now comes full circle with a new message for engineers.)

The dynamo of man's God-given ingenuity is running away with the dynamo of his equally God-given humanity.

We must put those dynamos in balance, make them work in harmony as the Great Designer intended they should. It can be done; what man's mind can see, man's character can control.

Man must learn that. Then we need not be afraid of tomorrow.

And man will go forward toward more light.

How must the engineering profession go forward in light of addressing the future challenges and Edison's admonition?

- How do does the Engineer of the Future think and act in the most productive and powerful ways to act as an innovator, champion to rise to their highest and best destiny?
- What new approaches must the profession embrace to solve the not just the great problems in the world today, but also the day-to-day practical assignments of being an engineer?
- How do engineers become more valued by non-engineers in their organization?
- How do engineers "tear down the castle walls" that creates isolation and ultimately dysfunction – such as engineers battling with R&D, manufacturing, or sales in so many companies?
- How must engineers lead or participate in innovation teams needed to solve problems, generate new value, or create competitive advantage?

These are vital issues going forward if engineers are to be deeply revered and central to the solution of vital problems facing our world today and in the future.

The engineering profession must do more than adapt reactively; it must be proactive, visionary, and integrated into the fabric of the future.

As the business world evolves into a Networked Eco-System, there's a far greater need for collaboration as a foundation for handling the speed, innovation, coordination, and adaptive agility needed in a fast-moving, rapidly changing world.

This requires journeying deep into collaborative systems thinking, which must be proliferated widely throughout the network to ensure sustainability.

- ***What is necessary to unleash the power of collaboration?***
- ***What's holding things back?***
- ***What shifts in thinking are required?***
- ***Who should be leading the shift?***
- ***What's necessary to make it sustainable?***

Finding the Elusive Synergy

What we have also learned from the last thirty years on the front lines and in the trenches is that heightened levels of speed, complexity, and change are handled far more agilely in collaborative environments.

> Synergy, once thought to be elusive in most organizations, is quite likely to manifest and flourish in collaborative systems (and least likely to survive in adversarial systems.)[13]
>
> However, it would be naïve to think that lofty ideals alone will produce grand results; if it were true, the National Academy's 2005 vision would already have provided the fuel to generate transformational change.

Also, we have learned over the last 30 years that the introduction of a healthy smattering of collaborative "best practices"[14] is insufficient to address the magnitude of the collaborative shift. Despite excellent results, the impact has, in the long run, been marginal. Best practices just don't have the horsepower to sustain the magnitude of the marathon needed to fuel the Collaborative Systems Shift.

> Perhaps this analogy is applicable. At the end of WWII, every conceivable best practice was applied to propeller/piston-driven fighter planes. But despite the advances, the paradigm had peaked. Enormous energy was expended by engineers to break the 500mph limit, and then the sound barrier. From a practical perspective, nothing worked. The propeller/piston paradigm had reached its limits.
>
> Only by shifting the paradigm to jet turbines (or rockets) could the sound barrier be broken. When the aviation industry made the shift, it became the aero-space industry.
>
> It is this same type of paradigm shift the engineering profession is facing today with the Engineer of the Future.

Wisdom guides us to examining the obstacles, misconceptions, and impediments that have blocked an enlightened road to the future. We will explore these in detail:

Imagination is Infinitely Expandable in a Culture of Trust & Creative Inquiry

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[13] For more on understanding synergy from the perspective of Bio-Economics, please see the works of Peter Corning (Brown '64) on Synergy such as *Winning with Synergy*, *Holistic Darwinism – the BioEconomics of Evolution*," or *Synergistic Selection: How Cooperation Has Shaped Evolution and the Rise of Humankind, &Synergistic Selection – How Cooperation has Shaped Evolution and the Rise of Humankind.*

[14] The authors of this paper, alongside hundreds of other champions, authors, professors, and management consultants have travelled this path over the last 50 years or more. While are results have often been stellar, our long-term impact has been marginal.

Critical Misconceptions, Obstacles, & Shifts in Thinking

Stagnation from Legacy Thinking

Legacy thinking refers to using obsolete perspectives to solve future problems. It's like trying to drive focusing on the rear view mirror. An "installed base" of *legacy thinking* limits both the power and impact of collaboration and the acceptance of a new systems design.

As we've seen from *Figure 2: Paradigm Shift: Acceleration Curve in a Rapidly Changing World*, by the 1990s the idea of the networked enterprise began to take hold – a revolutionary shift to deeper complexity where connectivity plays a central role as "collaboration," "partnering," and "alignment" became the top of mind issues for generating competitive advantage. While CEOs have emphatically proclaimed their high priority needs for both more innovation and collaboration, CEO intent has largely been unfulfilled -- Strategic Execution lags horribly behind Strategic Vision.[15]

Why? The answer lies in human nature's tendency to have us to act according to what we *believe* is true. Legacy thinking is based on beliefs deeply rooted in the heritage of our culture and its institutions – corporations, education, government, law, media, and religion. (In Part III we will address how educational institutions must deal with legacy thinking.)

Core beliefs occupy precious real estate in the brain;
it's called "mind share" or "top of mind."

Science has been less constrained by legacy thinking than humanity. Science can test a new theory with concrete proofs; humanity will debate and argue ad-infinitum, either reaching no conclusion or polarize or display abject disinterest. Over the last half-century or more, there has been very little more than new incremental thinking about how leaders function, and how to achieve the highest performance from people and organizations.[16]

In this great age of information to understand why, , there have been so few breakthroughs in human behavior and leadership, we first need to understand the impediments and replace these faulty beliefs with mindsets that actually produce the best results.[17]

Throughout this paper we map out the counter-balancing truths required to engage and energize people and trigger a quantum jump that's in sync with the tune of the times.

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[15] Depending on the study, between 67-80% of Strategic Plans fail due to poor execution. (The National Academy of Engineering 2020 Vision books fall into this category.)

[16] There are some new breakthroughs in neuro-science of the brain, but these new approaches have yet to fulfill their potential, mainly because these new learnings are injected into old paradigms.

[17] There are also times when the legacy thinking works better, which will be discussed in the section on Certainty vs Ambiguity

Intuition versus Architecture[18]

Every engineer knows that there are basic laws of physics, electronics, and chemistry that govern the universe – Newton's Law, Universal Gas Law, Ohm's Law, Laws of Entropy, and so forth. These laws are essential to understanding the "design architecture" of the physical world, which enables the creation and testing of products, structures, and tools.

> Science and Technology are founded on a basic premise that all of human intuition must be tested and revised when necessary in order to build a solid *design architecture* that can be used to explain the "behavior" of physical things. The ancients' intuition led them to believe there were only four elements: earth, water, air, and fire. Scientific rigor proved differently.
>
> This is because human intuition is highly fallible. In many cases what we believe and experience is 1) often not actually not true, or 2) sometimes true, or 3) true only in certain conditions, or 4) true in an older paradigm, but outmoded/obsolete in a new frame of reference. What we choose to believe and understand can be strongly influenced by our culture and leadership – what is valued and rewarded.
>
> To illustrate, dating back to the 3rd century BC, the evidence that the world was round was proven by the Greek mathematician Eratosthenes, who calculated the circumference the earth within about a 15% of its actual size. Despite the facts, many people still believed the earth was flat for nearly two thousand years.
>
> Why? Fear, illusion and commonly accepted thinking got in the way.

A century ago, two of the most insightful breakthrough thinkers of the era were the practical Edison and the theoretical Einstein. They shared in common a quest to discover the inner design architecture of things.

Their quests resulted in opening multiple pathways to whole new visions and opportunities for billions of people, and fundamentally changing the future of the human race. Both Edison and Einstein were wise systems thinkers who understood power of inquiry to unravel hidden secrets of complexity and connectivity.

The same cannot be said for human systems; it's why the collaborative shift has failed to take root; it's why Edison's admonition to put the dynamos of man's God-given humanity in balance and alignment with technology has failed. This must change if we are to progress.

[18] See **Appendix 3 – The Nature of Architecture** for more detail and ideas

Failure to Create a Systems Design Architecture for Humanity

For the most part, progress on the human side of the equation has bogged down. We are still fighting stupid wars; we are still distrustful of others; we still polarize around issues we should unite; we still build siloes to protect our integrity; we still cannot create wealth for all.

> Science and Technology have progressed at an enormous clip,
> but humanity has lagged with unfulfilling turbidity

Beginning more than three hundred years ago, the discipline of science began its rise to preeminence because of the rigorous foundational underpinning of design systems architectures. Certainly the same cannot be said of the humanities.

> A parallel design systems architecture has never been attempted for the human side.[19]
>
> *"The fault is not in the stars [to hold our destiny], but in ourselves"* observed Shakespeare.

Some of the fault can be traced back to faulty intuition about why and how humans behave. Those who have chosen to start collaborative initiatives have made it a rather ad-hoc affair – launched and managed by champions who believed they could get people to work together for a common goals.

Nearly all the collaborative champions were classic "intuitives" who were naturally quite adept at getting people to work together, setting a common vision, and building the foundation of trust necessary for all collaborative enterprises – internal and external, and building teams and alliances to bring the dream into reality.

Looking at the last fifty years retrospectively, the evolution of the collaborations tended to follow three typical paths:

1. As the collaborative champions moved on to new jobs, their replacements – usually successful operational managers – lacking the intuitive insights and passionate commitment of the initiator, allowed the collaboration to erode, and pass into disuse.
2. Many collaborative champions were supported strongly by a senior executive. But when the senior executive retired, the organizational "immunal rejection response" kicked out the collaboration, just like an oyster spits out a grain of sand, not realizing it could spawn a pearl, resulting in *Senior Executive Post-Partum Implosion*.
3. The collaboration was so successful that it garnered more support, generated more collaborations, and produced sustainable competitive advantage/profits. [20]

All the Great Problems in the World Today will be Solved on a Foundation of Collaborative Systems Excellence

19 This Paper, and subsequent Book, intends to put science and humanity in balance by creating a fully integrated systems design architecture.

[20] This is what happened in the bio-pharma industry, but has yet to be embraced by most other industries.

Misconceptions & Misguidance

- ***Greed is Good:*** The last five hundred years of humanity has been warped by very misguided, if not twisted and manipulative promulgation of erroneous information, mythology, and hoaxes.21 During the 19th and 20th Century, the writings of several highly influential authors, such as Darwin, Machiavelli, and Adam Smith, were selectively interpreted to validate less-than-ethical behavior of powerful people.

  The unfortunate result was the sinister creation of a horribly twisted web "myths," [22] while desecrating the reality of the power of collaboration. Because most people simply never check the validity of the "authority" but accept the opinion of someone they respect, the myth becomes perpetuated, and further ingrained society's deepest belief systems, accepted as truth, which, in turn, erroneously guides thousands of decisions and actions every day. It's imperative to set the truth straight.

  This problem is further exacerbated by the lack of a *collaborative systems architecture* that can screen out corrupted thinking from the truth. The "greed is good" debacle over the last fifty years is a perfect example. It was started by Ayn Rand and Alan Greenspan, elucidated in this quote by Greenspan in 1966 in validating that rational self-interest should be the basis for trustworthy relationships:

  > "*It is precisely the 'greed' of the businessman or, more appropriately, his profit-seeking, which, which is the unexcelled protector of the consumer. …. Protection of the consumer against "dishonest and unscrupulous business practices" … it is alleged, businessmen would attempt to sell unsafe food and drugs, fraudulent securities, and shoddy buildings….. What the collectivists refuse to recognize is that it is in the self-interest of every businessman to have a reputation for honest dealings and quality products. Since market value of a going business is measured by its money-making potential, reputation, or "good will" is as much an asset as its physical plant and equipment."*[23]

  These words, written in a chapter solely attributed to Greenspan, represent *trans-actional*, idealistic naiveté run through a faulty belief system about individualism versus cooperation. It filtered out all truthful data and empirical evidence about human be-havior and trustworthiness that directly contradicted his economic philosophy. The ideal of Rational Self-Interest spawned more faulty thinking, like that advocated by Milton Friedman, who advocated corporations existed solely to maximize investor returns.

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[21] When we dug under the surface, three hoaxes had been foisted on our civilization that were either terribly erroneous or a major distortion of the truth: See **The Darwin Hoax** by Robert Porter Lynch and Paul R. Lawrence , **The Machiavelli Hoax** and **The Adam Smith Hoax**

[22] A myth is a half-lie wrapped in a half-truth, parading as the whole truth.

[23] Rand, Branden, Greenspan & Hessen; Capitalism, the Unknown Ideal; New American Library, p 110

- ***Survival of the Fittest***: Too many leaders are guided by fallacious myths like "survival of the fittest," which creates a "dog eat dog" "win-lose"[24]mentality, all the while destroying systems value it its wake.

  Reality: Darwin wrote (in the *Descent of Man*) that *collaboration was the primary cause of human evolution*.

  Further, we now know that *Culture*, (not personality) is the *#1 determinant of human behavior*; (note: leaders are the primary determinant of culture). Few grasp the magnitude of these opportunities. While *adversarial* interaction makes good drama, it seldom produces innovation, teamwork, and value creation.

  There is something emotionally satisfying from the adrenalin rush in the Winner Take All approach, particularly if you win – domination, elimination of an enemy, and self-righteous indignation.

My colleague, ***Steve Rogers comments***:

- ***Winner Take All***: As its basis, unbridled capitalism has an attitude of all out competition with a "winner take all" aspiration. While collaboration can indeed allow a company to win and gain competitive advantage, it takes time and is more complex to manage. Adversarial approaches are far easier to understand conceptually – if I take it away from someone else, I win.

  This is not to say capitalism does not work with collaboration, just that it is easy to extrapolate 1:1 relationship win/lose outcomes into I win - You lose. Business is far more complex than that and it is that complexity that makes collaboration a powerful way to win in a complex world. The problem is that it is often more subtle and less obvious, requiring "beneath the surface" thinking (mental calculus) rather than the simple mental arithmetic of adversarial action.

- ***Alpha Male Allure of Combat:***[25] Playing John Wayne in business is magnetic for some; it certainly looks and feels macho bravado. It's filled with passionate intensity – revenge, heroic materialism, power and control. Combat is often the fast fall-back position when people don't get what they want from normal negotiations. Angry, frustrated, greedy, and insecure leaders will likely travel this route. They may choose an outside "enemy" (e.g. competitor) to focus attention away from their own weakness.

  Reality: Adversarial leadership and cultures foster the alpha-male syndrome.

  Collaboration is significantly more difficult, requires restraint, honor, self-control and courage. It takes wisdom, forbearance, discipline, ethics, and trust-building. These higher order qualities use more brains and heart than brawn and force; more astuteness and alignment than bluster and bravado, and more leverage than raw power.

[24] See **Beyond Win-Win and the Myths of Win-Lose** by Robert Porter Lynch

[25] Note: This paper's primary author is a former Naval Officer with combat duty in Vietnam. Those who have actually experienced real combat generally want to avoid this path because of the horrible consequences.

There is an adrenaline rush when competition shifts from "doing your best" to "annihilate the enemy" – the ***adversarial*** realm of combat and conflict. It's the same allure that attracts people to the wrestling matches or watching a movie with killing and explosions. The Romans' Gladiatorial Games exploited this perverse instinct. We see it today in the polarization of politics into the good and bad guys.

Reality: Fear, anger, and combativeness, as a general rule, produce far more heat than light; at best it's wasted energy, and destructive at worst. The optimum approach combines and aligns the energies of collaboration and competitiveness, as every great sports team understands.

The difficulty from a professional engineer's perspective is: in order to have a psychically rewarding experience, given the lack of internal collaborations, they must build a "castle wall" around their internal organization to isolate and protect it from incursions from internal strife inside their parent companies, such as rampant internal politics, and prolific mis-alignment between divisions.

Why? Because most engineers can neither see nor understand the human systems dynamics that underpin *adversarial* and *transactional* systems (which appear irrational, unreasonable, illogical, and therefore nonsensical and totally without merit). Not being positioned to make a difference, engineers opt to choose isolation over combat or devaluation.

Steve Rogers comments:

- ***Fluidity & Rapid Change****:* Even more problematic is that the fluidity of business results can change a collaborative partner's business reality which can result in inability or unwillingness to continue to honor the initial agreements that formed the basis of the collaboration.

  Changing business reality can also trigger people churn and apply quick-fix adversarial reactions.

- ***Businesses are focused on results:*** Pressures from the stock market and venture capital investment returns reinforce short term results more often than longer term results. More importantly, cause and effect is easier to see in the short term. However, this often only sees the symptoms of a problem or cause of success. Collaborative results typically take longer to emerge and the various elements that come together to deliver those results are less clear and harder to identify because some are quantitative changes and others are qualitative relational interactions that encourage people to apply their talents in unexpected ways.

  Wall Street analysts and even academics often overlook the underlying root causes that cause success, seemingly wearing polaroid lenses that filter out methods, only to see results.

- ***Churning Downward***: When key players who champion collaboration leave their positions, the loss of leadership and sponsorship and constancy of purpose makes it easy for their successors to return to adversarial norms which almost everyone is familiar with.

Shifts in Thinking

There is something very powerful that's been "missing." It requires a major shift in thinking to embrace a bold new paradigms

- ***Beyond Strategy***: While strategic thinking aims at seeing the "big picture" and converting it into a game plan for the future, strategy can easily miss the mark because its aim is narrow: to create competitive advantage, while overlooking the systems design necessary for strategic execution. It's like the sound of one hand clapping – strategy must be married to a design architecture that can be executed fast and flawlessly. ***Reality***: By making Collaborative Excellence a core strategic design strength, leaders can adapt strategy to fit existing strengths while exploiting the competition's weakness.

> ***Steve Rogers comments***:
>
> - ***Narrow Scope*:** Engineering professionals typically work in a narrow band of projects, often in isolation from other functions in the organization, such as marketing, sales, research, supply chains, alliances, distribution channel functions, or customer relationships. This isolation makes broader business-wide influence more difficult because many engineering professionals have never been trained or have the experience in cross-functional environments.
>
> General Managers are dealing in a multiple entity world of many suppliers, customers, internal businesses, functions, and stakeholders. They seldom see engineers bringing them broadly applicable, integrated solutions when dealing complex projects or programs.
>
> RPL: In complex project management, the linear "stage gate" methodology accentuates the isolation. Rather than operate in integrated design - development - operations teams, engineers often are limited by a quarantined design process and then *transactional* hand-off the design to others.

Collaborative Excellence enables any organization to perform with aplomb both externally – engaging partners, suppliers, and customers – and internally – tearing down the internal walls (silos) that divide and separate functions. With Collaborative Excellence engineers can expand their horizons to "dance" with a wide array other teams no matter what the tune.

Corporate leaders are looking to engineers to provide value beyond the narrow boundaries of technology, something more applicable to a broader realm, including superior teamwork to accelerate innovation and enable agility in a fast moving world, ultimately resulting profitability. These executives are yearning for something they can't quite pinpoint; and engineering professionals are generally not rising to meet this challenge. Collaborative Excellence holds the strategic key to open the doors to an entirely new level of competitive advantage.

Based on examining truly high performance organizations, it's our estimate that most leaders only elicit little more than fifty percent of most of people's real potential, and if they did, the workforce would be enormously more satisfied with their work.

- ***Beyond Management***: Realizing the power of collaborative systems starts with champions of change – leaders who recognize the value of a highly integrated system to buttress the organizational structure. This is initially a leadership function.

  Whereas the essence of *management* has been to *seek the efficient use of resources,* the nature of leadership is to *change things, innovate, redesign systems, reengineer functions, develop competitive strategies*, and (something that is consistently over-looked) *sculpt a culture that energizes people and uplifts the dignity of the human spirit* .

  The critical distinctions between leadership and management tend to be blurred, as illustrated in Figure 3: Management & Leadership Comparison (below). Even most

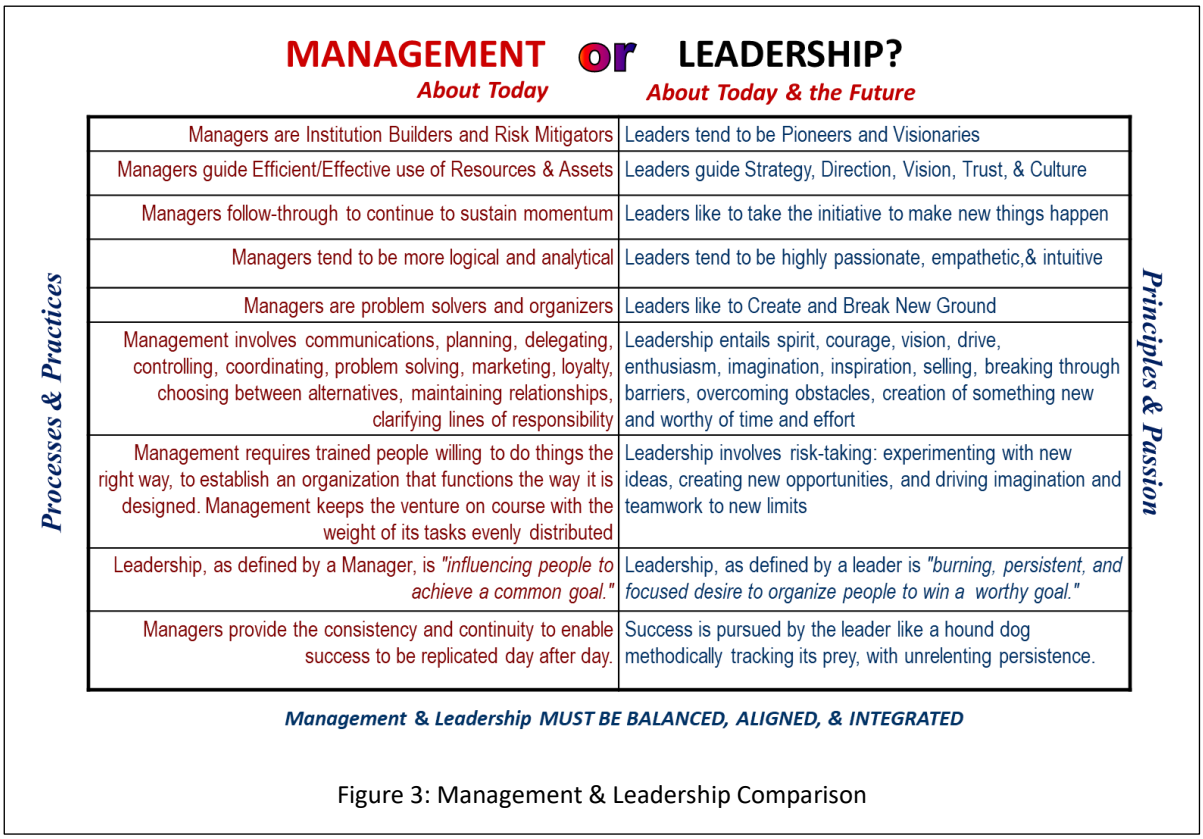


Figure 3: Management & Leadership Comparison

MBA's[26] trained in management are not clear.

Leadership creates high performance organizations that can innovate and sustain adversity in the future. While management seldom catalyzes change, it is certainly needed to sustain positive change. The importance is that *both* are valuable, and *both*

[26] The idea of "business management" began emerging after WWI. Business Schools created Masters Degrees in "Business Administration" which is based on the key functions of business management & public administration: Reflecting a classic view of organizational theory, the acronym **POSDCORB (P**lanning, **O**rganizing, **S**taffing, **D**irecting, **C**o-**O**rdinating, **R**eporting and **B**udgeting) was envisioned to be the common denominator between business & public service professionals, echoing the *administrative* perspective on management.

are required for success. Management creates efficient organizations that will function well in the short run.

If the distinction between *management* and *leadership* becomes confused or convoluted, trouble lies ahead. While the distinction between these two functions seems rather straight-forward, when overlaid with three distinctly different cultures – *adversarial, transactional, & collaborative* – the multitude of complexity and strife can quickly turn an organization upside-down (this issue will be described later in ***Cracking the Code*** – Three Archetypical Cultures).

Collaborative Excellence – working together when the stakes are high -- must come from both leaders and managers working together as champions seeking a quantum jump in thinking, possibility, and performance.

Reality: Engineering professionals who seek to engage beyond the realm of rudimentary technology must start thinking as "architects" designing socio-technical systems, not just technicians. The shift to systems design architecture enables the *design* and *alignment of organizational functioning.*

Then neither leaders nor managers understand this inner architecture, we build faulty structures with shabby interconnections.

> For example, think of a construct-ion company erecting a building. Would they consider moving forward without an architectural blueprint? Absolutely not. (And don't think for a moment that a Business Plan will substitute for a solid design architecture).

Steve Rogers comments:

- ***Beyond Management***: While it is true that Leadership is necessary to *triggering* the shift, Management is critical to *sustaining* it – it's far more than just resource efficiency. Manage-ment must embed and institutionalize the architecture, mindset and the techniques of collaboration into the organization in a way that will last and weather the inevitable people churn at both the operational and the leadership levels.

  Reality: Both Collaborative Leadership and Management Excellence is critical to triggering and sustaining the shift.

  Whether Leadership or Management is more important is not the point – situationally both are vital at different points in the shift. But in today's world Leadership is king and Management it thought of as bureaucratic and a negative trait. Wrong!!! Without both, each applied at the right time, the shift will fail. At some points Leadership leads, but at other points Management leads because leaders can't handle all the nuts and bolts of the shift.

- ***Depletion of Management***: Worse, this issue is a major negative influence on management ranks, even more than leadership. Leaders assume because the organization has "learned" one stage of the collaborative architecture it will be an institutionalized given and retained when the next level of skill is added.

  The problem is that the organization is no longer the same because people churn has brought in people from other organizations, who are not familiar with previously expanded concepts won through difficult collaboration efforts across functions and companies.

  More importantly these new people are not ex-perienced with the collaborative approaches used to change the more common competitive adversarial approaches.

- ***Beyond Best Practices***: Virtually every book written about management takes a "best practices" point of view.

  While practices are useful component in any organization, they can be deceptively alluring, seeming to provide a pathway of improvement, yet at the same time giving a very incomplete framework for leadership to understand, communicate and implement real systems change.

  Additionally, best practices carry an inner weakness – there are too many of them, so only professionals can remember them. Thus those outside the profession can't see the big picture, in simple form. Hundreds of books are published each year creating a galaxy of recommendations, advice, methods, processes, do's & don'ts, and prescriptions. Advice comes from all directions: magazines, blogs, videos, speeches, webinars, podcasts, until one can't process any more data.

  Reality: Best practices work,[27] but often don't stick. The reason: unless best practices are embedded in a *system design architecture*, the practices dangle and float loose like leaves separated from their parent tree, and, in the worst cases, actually conflict with each other.

Steve Rogers comments:

- ***Best Practices***: Making collaborations are less about best practices -- although they can be applied successfully in a targeted fashion -- and more about mindset, influence and organizational culture.
- ***Reality***: The collaborative mindset and culture leads a company to look for business opportunities that provide suppliers and customers prospects to win along with the company and to sustain those approaches as business conditions change, seeking to create innovative solutions, trust and empathy – a tough but fair reputation that requires performance driven results but also understanding of the other entities' needs for results, winning, and value sharing as well.

  At Procter & Gamble the collaborative supply chain initiative failed in the 1990s because there were simply too many best practices (two binders full) to learn and apply to such an extensive range of potential collaborative relationships – nobody but the system owners knew what they all were or had time to figure out how to use them in day to day work where the workload was about solving problems instead of applying best practices.

  The one I installed in 2001 based on the Strategic Alliance architecture was simpler, easier to grasp, and succeeded quite well. It linked best practices to a simple design architecture that we were able to adapt that architecture to our Supply Relationships with the addition of some supply chain concepts.

[27] This author pioneered alliance best practices in the Strategic Alliance Profession with The Practical Guide to Joint Ventures & Corporate Alliances in 1987, Business Alliances: The Hidden Competitive Weapon in 1993, and the Alliance Best Practices Handbooks that underpin the Association of Strategic Alliance Professionals (versions in 1995, 2001, & 2008). In only about 25% of the cases were they successful. Those who adopted *best practices* in a *disciplined manner* found they could increase the success rate to 75%, according to studies done by the Association of Strategic Alliance Professionals (www.strategic-alliances.org)

- ***Beyond Tools***: Although collaboration tools can be helpful, if the design architecture is flawed or incomplete, adding new technological tools is like a mechanic trying to rebuild a blown car engine with fancy computer diagnostics but lacking a set of wrenches.

  Reality: Tools, while valuable, are for enabling the "mechanics" of management, while architecture is for modern age design champions who are dedicated to leading the collaborative shift, then imbedding the design into the management infrastructure, including its tool sets. Too many tools makes the choice of which tool to use too complex and too hard to train into the organization.

  These have been the obstacles and impediments.

But why haven't the solutions been addressed after all these years?

Why the Collaborative Shift has Not Taken Hold

The seemingly ever-nascent collaborative shift hasn't flourished for several other reasons. Each is worth exploring to offer insights into how to achieve sustainable liftoff.

Critical Mass Required

The *Collaborative Shift* is, in the larger context, about transforming an organization's culture. It's no easy task and should never be taken lightly. .

To trigger a shift, we need:

1) **Right Systems Design Architecture** – this paper provides the framework we believe is essential; it works.
2) **Catalytic Rationale** to aim the initiative – we know that the collaborative shift produces both high levels of human engagement, elevated performance, accelerated speed, super-charged innovation, leading edge competitive advantage, and a significant profit boost, plus,
3) **Critical Mass** of key leaders & senior managers who can take quick and wise action to sustain a multi-dimensional competitive edge.

Steve Rogers comments:

- ***Critical Mass***: While critical mass is vital, due to the constantly accelerating change in the business environment, critical mass must still be balanced with the ability to do new things in a "non-critical mass" environment.

  For example, companies should use immersive learning labs and application workshops to test and develop new approaches and practices that can be tailored to the problem, opportunity, specific cross-company engagements, and, in particular to the individual personalities and inherent skill sets involved.

  For important strategic relationships, even more important is the ability to fit/customize, situationally. The approach to the unique the circumstances of each business relationship.Don't use a rigid set of standard solutions, but rather engage in both a strategic and empathetic approach to alignment.

By the nature of their role, engineers have cut too narrow an organizational swath, thus failing to multiply/leverage their essential technical skills more broadly across functions.

Essentially, engineers have lacked the organizational capabilities to get out in front and be proactive about *collaborative innovation,* championing in a leadership capacity.

Those who have tried this route have taken the most obvious path – link an engineering degree with a business degree. While not a great solution, it's better than nothing --the reason the MBA route is sub-optimal is that business schools teach *management*, while what the engineer of the 21st century needs is *Collaborative Leadership Excellence* – the term we use to describe the National Academy of Engineering's Vision 2020.

This is the massive opportunity for engineering profession – for those interested in rising into the leadership ranks and making a massive contribution to their organization and to solving the great problems that face our planet today.

Who will Emerge to Lead the Collaborative Shift?

This is not just a philosophical or academic question. The launch of the *Collaborative Shift* has struggled for twenty five years. The problem has been vexing for many of us who have had the vision, the commitment, and the yearning for a new way for business to strike a more cordant note.

In addition to the obstacles outlined earlier, the world of business is flooded with antithetical views, philosophies, and practices that emerge from the conflicting approaches of adversarial, transactional, and collaborative thinking.

Steve Rogers *comments*:

- Both Leadership & Management are Essential I was in a couple businesses that had excellent dynamic leaders, but no strong managers. The result was catastrophic failure – too many ideas and too little executional management. Both businesses became highly unprofitable because big ideas imploded without strong management and both ended up being sold off piecemeal – lots of lost jobs that did not have to happen.

  The leaders provide the direction and resource allocation but they simply are not and SHOULD NOT be in the trenches grappling with the enemy (complexity) directly.

  Those closest to the action -- closest to the complexities of projects and multi-party collaborations -- are those who understand it better and can create innovative ways to win.

  Uniting the concepts of leadership with management combine to deliver the results.

Who or what institutions or leaders might be the vanguard for moving the Collaborative Shift to a new, bold, sustainable level?

Will Engineers and Engineering Schools be the "lead arrows" for change?

Will the best Engineering Schools offer a special track for those who want to become design systems architects rather than technology specialists?

If not engineering, who will champion the cause?

Engineering can play a significant role *if there is desire* – See Part 3 to learn how.

Steve Rogers Comments on Leading the New Era of Change, Speed, & Complexity:
Where will the new ideas could come from? Leading edge business thinking is trying to cope with this rapidly increasing clock speed through four means:

1) **Academia**, 2) **Business Press**, 3) **Consultants** and 4) **Practitioners & Professions**

1) **Academia** -- Business schools are exploring new approaches but they have to prove everything quantitatively before they publish an article. Academia's publish or perish culture requires lengthy data-based research and, as a result, drives narrow studies that take time to statistically validate, causing them to always be behind the curve. Only a very few ever become strong advocates or publish a practical book.

   More importantly, they focus on the concept but rarely deal with what it takes to apply and institutionalize new approaches. They often get trapped in citing other academics and not understanding what really transpires in the field. This generates very little creativity, and no one with field experience to challenge them with the insights and observations from the school of hard knocks.

   Academia brings an abundance of analytics and quantification, unbalanced by intuition and imagination, leaving them stuck in obsolete paradigms that prevents them from having real foresight and insight. I'm not convinced everything in business can or should be quantified/quantifiable. Because individual humans are a big part of the equation, and the qualitative aspects are simply too big and abstract, so any theory will have so many exceptions and nuances as to be rendered unmanageable.

   And business schools are also terribly fragmented into specialized departments; no group of academics oversees the nature of a collaborative systems design architecture.

2) **Business Press** – This sector is more timely in describing new approaches to deal with this speed/change/complexity curve, particularly in more detailed investigative reporting articles in top end magazines and web sites (think Fortune, Bloomberg-BusinessWeek, Fast Company, Inc. Magazine, Wall Street Journal, New York Times, Financial Times, etc.).

   While much more timely, the issue here is the "knowledge" is far more anecdotal and rarely extrapolated across different company experiences to create a more generally applicable set of principles applicable across industries. The business press, because of the nature of fast publishing, covers a "story" but not an "issue," not to mention doing systematic long-term analysis.

3) **Consulting Firms** -- The major ones (such as McKinsey, A. T. Kearney, Bain, Deloitte, Booz Allen Hamilton, etc.) are revenue-driven but also combine the research, concept development, and the business model/methodology elements that allow a wider set of principles and actions that can be packaged and sold. A couple things should be noted from my experience as a former corporate client:

   a. Once a "package" sells, it has a product life; and the length of that life actually keeps it from being at the leading edge of the speed/complexity/change curve.

b. Each service package is a business-focused effort, but rarely is a systemic approach that crosses all the functions in a company; instead it tends to be *functionally* or *topically* focused – think *functionally* like HR consulting or Supply Chain consulting or Marketing consulting; or think *topically* like Strategy or Change Management or Alliance Management. None of these systemically address, from a holistic perspective, the dynamically changing business environment that companies, managers and leaders face today.

c. Competing consulting firms are fighting for the same customers, so they tend to build multiple models to cover the same concepts or they take each other's models and either add details or additional boundary thoughts to differentiate themselves. The bottom line is that they hype/create a trend and a market, into which they can sell a service; but there's very little breakthrough thinking.

The smaller, independent consultants are more likely to write books and may break some new ground with creative, advanced thinking. But again, this thought leadership tends to be narrow, around single *functions* or *topics* or *additional best practices,* often based on the consultant's unique expertise.

4) **Practitioners & Professions** -- This is the final frontier. We are the ones drawing upon the three groups (above) while combining with our own experience, analysis, and hands-on operation of businesses to deal with this rapidly changing environment.

However, the Practitioner's knowledge is often unique to each company's business situation, or the practitioners involved. In many cases companies do not want to disclose exactly what they are doing for competitive reasons (think "stealth bomber effect"). And they tend to be anecdotal in an environment where very few companies have the time or resources to document and synthesize the approaches they used before being faced with a new emerging issue that consumes their attention. Certainly their goal is not to build a systemic architecture re-applicable across companies and industries, for which few practitioners are equipped.

What's left on the final frontier are the Professions that are most likely to embrace a systems perspective – such as the Supply Chain Management profession, or Strategic Planning, or Strategic Alliances or Organization Development; these two last-noted professions are more likely to embrace systemic architecture than most others. Some of us are "pracademics" – we've excelled in the field, written extensively during our business careers (including books), had very broad experience, and often taught successfully in formal Executive Education. Unfortunately this experience goes largely untapped by academia.

And fundamentally we must finding practical models that work and be integrated into a holistic architecture -- *art and science!* – that's what must be imbedded and engrained deeply into the corporate culture, especially within both leadership and management.

Ultimately, if we are to create the momentum to break down the obstacles to the Collaborative Shift, it will come from a combination of quantitative thinking from academia and

consultants, combined with a systematic synthesis of anecdotal thinking from the business press and practitioners/professionals who have the most at stake.

Senior Executive Post-Partum Implosion

Comments from executives who spent their entire careers on the firing line and in the trenches provides reference points from which we can derive the lay of the land. It also gives us clues why such an extensive array collaborative management best practices have had such an erratic and uneven long-term track-record.

Deep insight can be derived by revealing the phenomenon we refer to as "*Senior Executive Post-Partum Implosion*" – when a senior executive, who has catalyzed and championed highly effective collaborative efforts leaves his/her organization -- the collaborative endeavor collapses behind them (unless his or her successor is a deep believer and skilled in collaboration).

For a Champion, a Complaint is a Prelude to Corrective Action

As one former IBM executive explained:

"I was the General Manager of a division. I worked fastidiously to get our hardware engineers to work with our sales teams, software designers, and our field delivery force.

"It was dramatic to watch, and inspiring as it worked.

"But my replacement was so focused on bottom line results, he drove a wedge between every group, expecting individuals, not teams, to perform.

"The good guys soon left, as the culture became cut-throat. My successor drove them out. Soon the whole organization was a wreck.

"I can only explain my entire time with this example:

> Imagine the organization as a bucket of water. I came in, put my hand in the water, and delicately started stirring the water until it became a well-coordinated whirlpool. When I left, it was like taking my hand out of the bucket. Five minutes later the bucket was just like it was before I started."

My colleague Steve Rogers, (now retired) senior executive at Proctor & Gamble stated it another way: **"Looking back at the many years spent in many jobs, so much felt like I was walking on the beach leaving footsteps in the sand. When the tide changed, it was like I'd never been there. I wish I had driven pilings deep into the company's culture, imbedding it solidly down to the bedrock of management."**

Rogers continued, "With the levels of employee churn today, indoctrination training is just not enough. You've got to reinforce, retrain, and realign continuously. Having a powerful systems design architecture creates a powerful mindset and skillset that can keep the front line tuned into the

Collaborative Excellence is not a new idea, but it is certainly an unfulfilled quest.

Interviews with dozens recently retired senior executives who were champions of collaboration during their very stellar careers revealed some very unsettling commentary:

- *We built a great set of companies –with inspired people, innovative, and highly profitable. When I sold the company, the new owners promptly disassembled everything we built, turned our supply chain alliances into a bunch of angry vendors, quality fell apart, and customers left in droves. Today it's just a shell of its former self.*
- *Our alliance program produced only 30% of our company's revenues, but over 50% of its profits. Unfortunately control was more important than results. The new CEO blew up the alliance strategy because he wanted complete control. Profits and stock prices plummeted. I decided to retire, but, in the end, the taste of losing haunts me.*
- *We changed the culture from adversarial to collaborative, and watched our revenues jump, our profits double, and innovation blossomed everywhere. When I left, everything reverted back to the old habits, and profits dropped dramatically.*

When asked what went wrong, executives lamented that they never had a compelling design architecture they could imbed in the culture to sustain their collaborative initiatives.

We've heard innumerable versions of these tragic stories from scores of executives, from every industry, from every profession. Oftentimes the departed senior executive is holding back tears as they tell their story the sadness is so severe.

Collectively the tragic tales of "*Senior Executive Post-Partum Implosion"* highlights the necessity of embedding a *Collaborative Systems Architecture* into the fabric of an organization's culture to sustain & engrain the shift in the organization's culture and permanent thinking.

This phenomenon is also echoed in the comments of engineers who've spoken in clear terms about their frustrations having served in their profession for many years:

Lamentations of an Engineering Professional:

Looking back on their careers, senior engineers often bemoan spending inordinate amounts of time trying to manage internal politics.

> *"Our engineering group seemed to be in a constant battle with research, manufacturing, marketing, and finance. We were all pulled in different directions, rewarded for different things, and none of our managers got together on the same page. Each group made snide remarks about the others. We didn't meet because the*

meetings were an exercise in futility as we played the blame game. Eventually I got so disgusted, I found other job."

"We were a hard working group and did our jobs well. But our company was super-focused on profits, so the Chief Financial Officer looked disdainfully upon us – we were just a cost-center in his eyes. Constantly we received pressure to cut costs, which was a code word for cutting quality and poor engineering. We outsourced everything we could just to save a buck. We'd warn management about the risks, but no one listened. Eventually one of our products failed miserably in the field, which brought lawsuits and a massive loss of our customer base. To save a few bucks, we cheapened our parts, then hovered around bankruptcy as we tried to recover from the loss of market share."

Others complain about not being appreciated, feeling isolated, neglected, or inadequacy.

"The other departments just kept me at bay, even though I had a lot of great ideas" (Author's note: often we avoided the engineers because they came up with ideas that didn't solve a customer problem)

"The sales force purposely excluded me from joining them on customer visits."

(Author's note: I was the liaison between sales and engineering for a small tech company. We were in the middle of closing a big $3 million deal, when, just as we were getting agreement, the senior engineer piped up – *'Oh, you should see the new model we have on the drawing boards.'* At that moment, the customer balked, and cancelled the sale – we really needed the money to finance the next gen.)

"We wanted to exchange technical innovations with other engineers in other countries to develop new systems jointly with our alliance partner, but management shut us out. It was disappointing – we could have gotten some real competitive advantage."

(Author's note: The engineering department met with Russian counterparts before finalizing a technology exchange. Over dinner and a couple of bottles of vodka, the Russian engineers weedled-out all the intellectual secrets from the company, then walked away from the negotiations after getting all the valuable Intellectual Property they needed for only the cost of dinner and liquor.)

Steve Rogers comments:

- ***Loyalty is passé***. Downsizing and outsourcing has gutted people's loyalty to companies. People do not see a career with one company as a highly sought after professional goal – job and company hopping is seen as the norm and, in fact, does have some advantages because it enables people to learn different approaches in different companies and thus become more adaptable. The result is that people change constantly. Business relation-ships and teams are in constant churn; instability is the norm, making it far more attractive to act transactionally – just get the job done efficiently and quickly, don't spend a lot time on relationships, because they won't matter in the long run.

Digging deeper, it's usually revealed that the organization's or leader's culture was either *adversarial* or *transactional,* or both. Because engineers have been told that "culture is soft" or "if it can't be reduced to a process, it has no value," engineers have been victims of these cultures, and powerless to change the situation, rather than leading the way to a better destiny. Thus, they either:

1. Remain and suffer or
2. Switch jobs.
3. Retire

Second, engineers are seldom positioned to impact the culture, nor have engineers been trained in collaborative leadership practices that can be used across a wide range of situations and strategies to change the outcomes.

Cracking the Code – Three Archetypical Cultures

As the reader absorbs the preceding pages and reflects on the stories of frustration, one might conclude SNAFU – Situation Normal: All Fouled Up. That's where an engineer's eyes roll with a sigh of exasperation.

But must the future duplicate the past? No. To learn why and how, we need to shift the paradigm.

Impact of Leadership & Culture on Engineering Projects

Five years ago I was working with my colleague George Jergeas, Senior Professor of Project Management at the Engineering School at the University of Calgary, we were reviewing his extensive study of the deep difficulties delivering Mega-Projects[28] on time and on budget.

Professor Jergeas' study was professional, accurate, and extensive based on an analysis of 90 large projects in both the private and public sectors. The analysis identified over 450 causes of problems which fell into over fifty categories.

We wondered, "how will the professionals in the Project Management, Architectural & Engineering, and Construction Industries embrace such profoundly extensive study. The first problem was evident: There is too much data, too many best practices, in too many categories.

No one will ever be able to remember this, and it will thus be unheeded. Could we reframe this study to highlight the revelations in a different way?

[28] A Mega-Project is typically several years in length, costs over $1 Billion, and has a very high degree of complexity. They are notorious for exceeding delivery schedules, overrunning budgets, and entangling law suits during and after the project.

We decided to "triage" the success and failure data based on three "leadership/cultural archetypes" [29] to determine the impact on the outcomes measured by on-time, on budget delivery (see **Figure 4** & **Appendix 2 – Notes & Points of** View on Systems Thinking for more

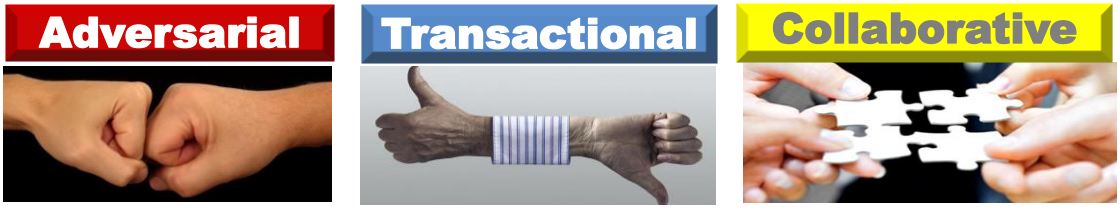


Figure 4: Three Archetypical Modes of Thinking

detail).

Best in Class Collaboration Results

Using the "Three Archetypes" frame of reference on the analysis of the 90 Mega-Projects,[30] we assessed success rates of each type of construction model produced a dramatic distinction, as illustrated in

Project Delivery	ADVERSARIAL	TRANSACTIONAL	COLLABORATIVE
% Chance of On-Time, On-Budget, On-Target Project Delivery	**Under 10% Success Rate**	**20-30% Success Rate**	**80-100% Success Rate**

Figure 5: Success Rates Linked to Archetypal Modes of Interaction[31]

Under the weight of complexity and risk, ***Adversarial*** *and* ***Transactional*** *systems* are far more likely to break down.

In the worst case, the ***Adversarial*** Delivery model (which represented the majority of the projects) produced the very worst results, with many projects delivering 100% over time and 100% over budget, along with extensive litigation, and burning through an average of five project managers over the course of the project.

[29] Leadership, culture, organization structure, economic interaction, and strategy tend to cluster into these three distinct "archetypical" frames of reference (see Figure 4). This is why "best practices" can seemingly be contradictory, because the practices link to one of the three different archetypes. This is why it's extremely difficult to gain "universal" agreement and acceptance, as the three archetypes are inherently so dissimilar at best and contradictory at worst. We know of no professional schools in universities that make this critical distinction, which results in muddled thinking in the field.

[30] See: Future Path of Mega Projects by Professor George Jergeas & Robert Porter Lynch

[31] Our estimates are supported by other research at the Construction Industry Institute at the University of Texas at Austin.

On the other hand, companies that were truly committed to a "partnering" relationship had a profound competitive productivity advantage far exceeding 25%, made more money, produced far less non-value added work, had happier customers, were least likely to end in a tumultuous law suit, and most likely for the project team to be selected for the next project.

The Power of the Tri-Archetypical Framework

What's important about this tri-archetypical approach is that it is *universally* valid and applicable across numerous industries, professions, situations, and regional cultures. It helps explain why nations have risen, why history has taken certain courses, and how value and competitive advantage is created.

And the Tri-Archetypical Analysis enables us to isolate the *Collaborative Systems Architecture,* including the leadership modeling, the value creation principles, and analytic methodology. Leaders must embrace their responsibility from a holistic *systems perspective* – unscrambling the intermingling of the archetypes, creating a real competitive edge.

Archetypical Cultures

Built into the DNA of human cultures all over the globe are three very basic patterns of human behavior: ***Adversarial***, ***Transactional***, and ***Collaborative.***

These are archetypical because they can be observed all the way into the past recorded history of humankind.

These three are universal across all cultures everywhere on the globe, with unique variances that derive from local adaptation.

Organizational cultures, strategies, leadership, and economics follow these three themes.

Think of these three as "primary colors" – just like Red, Blue, & Yellow.

Seldom do we find organizations or people that are purely one "color" – most are a unique colorful blend of the three themes.

Most organizational cultures are tragically muddled – a conglomeration of all three, each popping up at various times, even in same person – which produces large chucks of non-valued work, and erodes joy in one's work.

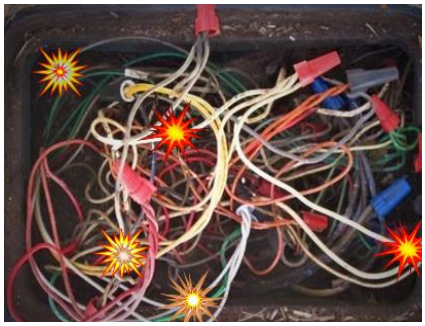
Success Not Necessarily Breed Success

However, throughout the last fifty years, despite a multitude of successes from collaboration, a substantial lessening of risk, the often dramatic production of innovation and high profit margins, muddled thinking prevented collaboration from taking permanent root; thus it was not embedded in the culture of the parent organizations.

This is primarily because organizational leadership simply did not recognize the value contributed by collaboration, and secondarily because the Tri-Archetypical modes of thinking have always be *implicit – under the surface, tacit, unarticulated, indefinite, and intermingled.*[32]

[32] The core problem with implicit thinking is that it become convoluted and polluted over time.

The biggest problem most organizations experience is that these three archetypes form a muddled maelstrom, a concocted witches' brew of the three basic forms, creating a roiling organizational cauldron where leadership churns the organization into muddled management system producing mediocre results.



This paper unscrambles the *implicit* confusion, making the three archetypical modes *explicit – visible, clearly distinctive, manageable, with clear consequences for making decisions.*

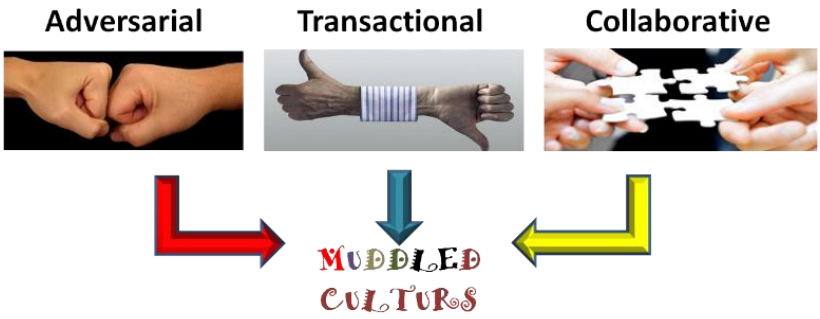
Without and *explicit,* simple, straightforward systems design architecture,[33] organizational functioning tends to be like spaghetti wiring – entangled, convoluted, distrusted, political, and disorganized. Colleagues then subvert the structural hierarchy when muddled leadership clogs the flow of value and communications.

Beware the Curse of Muddled Models

One of the biggest obstacles in creating a Collaborative Systems Architecture has originated from subject matter experts (ranging from professors to authors to consulting companies) that create their own proprietary models -- narrow bands of thinking -- never attempting to create integrated systems architecture.[34] Thus no architecture for collaboration in fields like marketing, accounting, strategy, or leadership ever evolved.

Further, as subject matter experts carved out their little corner of the world, the result was a disjointed set of models cobbled together into a pastiche of often-conflicting or dis-integrated approaches to everything from trust building to organizational transformation.

Most organizations thus evolved embodying "muddled cultures" with different senior executives advocating their pet theory of how to get humans to perform best.



[33] Note: We are advocating using *Collaborative Architecture* for complex systems, such as that being called for by the National Academy of Engineering's *21st Century Engineer*. There are certainly conditions and situations where either *adversarial* or *transactional* approaches work better. There are times when a *Transactional Architecture* is more appropriate, especially where simple decisions are enabled by straightforward exchange. Most commerce (buying & selling) has historically been handled this way. The point is that these decisions should be made with a clarity of purpose, not by unconscious random selection.

[34] Notes: It's also essential to differentiate a "model" which was designed for a specific application from an "architecture" which broadly frames the systems design.

Again, think of the three primary cultures like the three primary colors: *Red, Blue, Yellow.*

When you mix them together you get the color of Mud – that's why performance and productivity is so poor.

The less of the collaborative culture, the greater the defensiveness, the higher the walls – this is called the "silo effect" as each function creates a feudal "principality" behind its castle walls. Engineers experience this frequently.

Collaborative champions then get trapped in the ugly and quagmire of muddled cultures:

- where a *collaborative* third of the company "gets it" and supports their work,
- another *transactional* third of the company doesn't really care unless they don't produce results, and
- the *adversarial* third is openly antagonistic, threatened by what they perceive as naiveté and idealism.

Year after year the three factions battle for supremacy. If the *transactional* and *adversarial* sides team up, the *collaborative* advocates get a stern punch below the belt.

> ***Trapped in Muddled Thinking***:
>
> Too often leaders -- coming from widely different backgrounds, beliefs, and experiences -- fail to realize the negative impact of their amalgam of contradictory beliefs, misaligned insights, fundamentally flawed thinking, fragmented tools and techniques not designed for the enormity of the task of unifying and aligning complex organizations.
>
> ***Reality***: This jumbling problem is multiplied by too many "muddled models" promoted by myopic subject matter experts that actually confuse, confound, and "complexify" the essence of leadership.
>
> Because these three *archetypes* have become so muddled, convoluted, intermingled, and juxtaposed, consequently the real value produced by collaboration has been obfuscating and thus diminished.

***Steve Rogers** comments:*

Adversarial approaches are often the norm because they more clearly map to highly competitive situations. The skepticism is driven by the externally simplistic and short term view that "*if you lose, then I win.*"

Maybe this works in one-time transactions between buyer and seller, (e.g. buying a home, car, eBay, etc.) but it does NOT work in situations with repetitive interchange where the *history* of the relationship influences the *current* relationship.

In addition leaders under pressure look for more control over the situation and collaboration seemingly provides less control, because it requires cooperative not unilateral decision making. Because short- term outcomes can change as the short -term becomes long-term – the short-term is more visible, but the long-term is much more uncertain, so a win today feels better than something that is more sustainable longer term but, by definition, less certain. This is why a powerful trust framework is so essential.

Finally adversarial approaches are more familiar and so leaders find them more comfortable, especially when rivalries drive decisions.

Integrated Design System

The Collaborative Excellence Systems Architecture aims at creating a *fully integrated design system* where all the frameworks have been field tested, documented, and proven in a wide number of industries as diverse as automotive, aerospace, military, airlines, steel, insurance, food, consumer goods, sports, and research & development.

These have proven to create quantum jumps in competitive advantage, often exceeding 20% greater than the norm. In the big picture, it's competitive advantage that ultimately generates sustainable profitability.

Engineering has been far more transactional and even adversarial in its organizational interactions than most professionals will publically admit.

The Future demands this change.

Breaking Through the Clutter

The breakthrough in thinking is to see underneath the surface and *sturm und drang* (storm and chaos) that creates fear and anxiety, and perceive three dimensionally through the lens of cultural archetypes, as illustrated in Figure 6; then, like a Polaroid lens, screen out the clutter and chaff, knowing what's wrong, askew, discordant, and then take corrective action.

Adversarial

- Always Take Advantage
- Manipulation, Distrust
- Win-Lose, Dog Eat Dog
- Survival of Fittest
- Might makes Right
- My Way or the Highway
- He who has the gold, RULES!
- What's Mine is MINE, What's Yours is Negotiable

Transactional

- Everything's a "Deal"
- Hierarchical Power
- Quid Pro Quo, Trade
- Buy Low - Sell High
- Almighty Self Interest
- Tactical Transactions
- Price Price Price
- Positional Power
- Win-win is okay if both sides bargain very hard

Collaborative

- Teamwork & Trust
- Synergy – Strategic Alignment & Integration
- Work Ethic, Integrity
- Value is more than Price
- Cherish Differences as innovation engine
- Mutual Benefit
- Vision & Values Driven

Figure 6: Beliefs & Rules of Engagement: Three Archetypical Forms of Culture, Leadership, & Economics

How do we break the impasse, triggering the Collaborative Meta-Shift?

The next section explains what's needed.

To the engineer, human and organizational behavior looks illogical, political, and confusing.

The premise of Collaborative Systems Architecture is to enable the Engineering Profession to turn what seems fuzzy and perplexing into a valuable framework that makes logical sense, is understandable, agile replicable, and produces excellent results.

Millennial Distrust

What will the future bring? Just at the time when we are beginning to recognize the power of Collaborative Excellence, our cultures are turning sour, polarized, and adversarial.

Will the next generation of Millennial be able to turn the tide and make collaboration a fundamental underpinning of their inner belief system? Millennials (ages 18-29) are rapidly becoming a large proportion of our population and workforce.[35]

All is not well

For a generation that proclaims to be so "connected," their level of distrust is at a traumatic level. Nearly three quarters (73%) of Millennials (see Figure 7), who are rapidly becoming the majority of the workforce, think that *most of the time, people just look out for themselves,* and 71% believe *most people would try to take advantage of you if they got the*

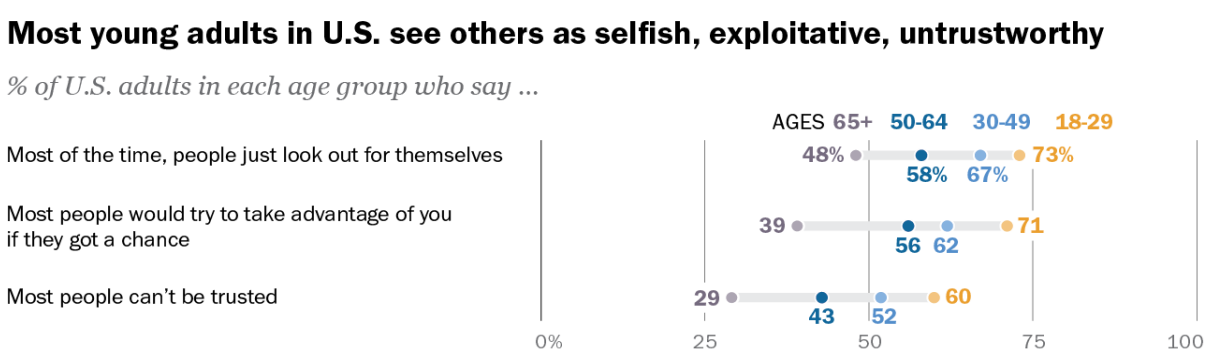


Figure 7: The Millennial Generation is Extremely Distrustful

chance. This is a skeptical generation, bordering on cynical; these are called "Distrusters."

People who are distrustful are more likely to become depressed, angry, anti-social, and even corrupt. Moreover, distrustful people create more distrust, make poor teammates, and are likely to see ill-will as the motive for human behavior, thus becoming engrossed in self-interest.

On the other end of the spectrum are older citizens, many still in the workforce, who see others in a totally different light – far more positively and optimistically, with a more reasoned sense of caution.[36]

[35] Source: Pew Research Center Trust Among Young Americans; 2019

[36] Those with whom I have discussed this chart were either astonished or perplexed. Most would have expected exactly the opposite results: the younger generation would be more trusting and optimistic, while the older generation who'd experienced betrayals and trickery in their lives would be more cynical and

This bodes poorly for future business and community leaders and clergy whose careers depend on teamwork, community, and collaborations for achievement of their vision and goals. Their ability to engage in change and innovation will be severely thwarted, filled with conflict and anxiety. Valiant courage and inspirational exhortations will not be enough.

Self-Fulfilling Prophesies

Distrust is not a benign tumor; it's a malignant cancer that will poison the carrier who will then transmit it to others. At the crux of the problem are the dark self-fulfilling prophesies: early-stage "Distrusters" treat their world in distrusting ways, thus triggering distrustful responses turning their world continuously inward, ego-centric, bleak, caustic, angry, and even revengeful.

> Disillusioned people, with a deep propensity to distrust, experience their world as hard, bitter, and meaningless.
>
> They attract other distrusters, and kill the sense of community and collaboration.
>
> What's more, they make the world around them miserable for others. They are attracted to negative, polarizing media messages, believe in conspiracy theories, and think others are out to take advantage of them. Seeing their world with a jaundiced eye, they treat others accordingly. (Studies by have shown that distrustful people are attracted to authoritarian leaders, rejecting collaboration as a guide-path for life.)
>
> They are more likely to be depressed, over weight, and die sooner.

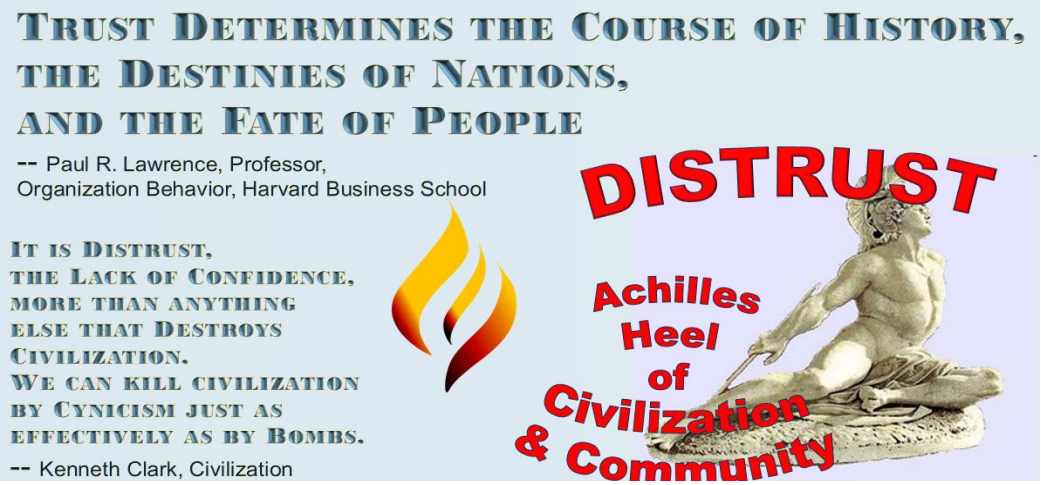
To put this into perspective, the Pew report indicated that Seniors are 3½ times more likely to be "High Trusters" than Millennials, committed to building a collaborative world around them. If something dramatic is not done, things will only get worse, as their toxic world-view in turn poisons the next generation of youth who are in school today.

All collaborative enterprise is built on a foundation of trust.

The collapse of national trust imposes a massive impediment for people trying to solve our most critical problems in the future.

pessimistic. For a generation that is so "connected" it's clear by this chart that connectedness hasn't produced trustworthiness.

It would be imprudent to condemn Millennials for their presumed faults. We created this generation; they are the offspring of our own inadequacies; and we must assume the responsibility for rebuilding our religion, education, and civilization for them and with them.



What Can Be Done?

First, it would foolhardy to bury our heads in the sand, throw up our arms in despair, or wail and complain.

This is the most stressed out generation alive today, and they were not programed to deal with adversity.

Figure 8 FARTHEST Trust Principles

Engagement

Be sure to involve them in things. If they feel excluded they will assume the worst and react very negatively. Don't be overly critical and don't try to show how smart you are. Ask them questions from a perspective of understanding and inquiry. They are like cats, needing to be guided gently, not like dogs that will follow you. Be friendly and open to listening to their point of view.

Wisdom

They are very smart so don't try to manipulate or outfox them. But they lack wisdom, especially thinking out the long-term consequences of short-term reactions. Engage them in assessing options.

Constantly Build Trust

Many Millennials have no framework in their mind for building trust – it's just a word that has mixed connotations to them. Use the Eight Trust Principles – FARTHEST – (Fig 2) to help them know where you are coming from and what you consider trustworthy.

Power of Culture

It's culture, not personality, that's the #1 determinate of human behavior. That's why a person may act civilly in one environment and raucously in another cultural setting. People are very tuned to such things. (see **How Collaborative Leaders Use Culture as a Force Field**)

Boundaries & Standards

Setting boundaries is one thing that must be done at the outset. For example, in my house no one is allowed to smoke, cuss, or bad-mouth others. People are encouraged to ask questions, listen, and respect differences of opinion. If someone steps over those boundaries, I gently explain that such behavior is not appropriate. Teachers do this all the time in class rooms. You might see a sign that says: Listen, Respect Others, Talk only when acknowledged, etc.

Setting standards is important so new people know what's expected, what's acceptable, and what is out-of-line. Silence when someone steps over the boundary line automatically sets a lower standard.

Part 2: WHAT Activates the Collaborative Systems Architecture?

Collaborative Excellence aims at
Raising the Dignity and Spirit of Humanity,
Building Trusted Leaders, and Harnessing Human Energy
to focus on Solving the Great Problems Faced in Today's World

The proceeding pages outlined the *Collaborative Shift* the rationale, obstacles, impediments, and insights to break through the clutter.

Activating Collaborative Systems Architecture requires a major shift in thinking about socio-technical systems integration.

In this section, we will outline what is involved in this shift in thinking:

A. Readiness for a Paradigm Shift
B. Essence & Alignment Power of Systems Architecture.
C. The Influence of Culture on Human Behavior
D. Six Core Frameworks of Collaborative Systems Architecture

Later, in Part 3 we will map out how to implement the Architecture and achieve the Vision of the 21st Century Engineer.

A. Readiness for the Collaborative Paradigm Shift

Empowering the *Collaborative Systems Architecture* is not just a matter of layering on a more extensive set of Best Practices for all the reasons laid out in the previous section.

The reality is that we are really dealing with a *Paradigm Shift.*

For organizations -- whether they be a corporation, architectural & engineering firms, Mega-project, or inter-industry joint venture - to be effective at empowering their organizations to function faster, more adroitly, and symbiotically, collaborative systems thinking must be proliferated widely - both internally and in value networks.

It's a profound journey, not to be attempted superficially. Doing the same thing over and

Paradigm Shifts are not just about "doing things differently"
it's thinking differently,
envisioning differently,
discerning differently,
measuring differently,
designing differently,
speaking differently,
acting differently,
valuing differently,
treating people differently,
asking questions differently,
experiencing your world differently.

A bold new approach is essential.

These profound differences require a fundamentally different "Systems Design Architecture", not merely tweaking old stuff designed for a legacy paradigm.

over again expecting a different result is insanity and just plain foolhardy.

The future hangs in the balance.

How do we know we are Ready for a Paradigm Shift?

When great intentions yield mediocre results;
when the tried-and-true ceases to work,
when every attempt to fix things is met with frustration and failure....

Then it's likely the design has reached its limits,
and the paradigm is ready to shift.

Opportunity is present, Creative vision is called for, and
Bold Action in New Dimensions is the nature of things to come.....

Robert Porter Lynch

B. Essence & Alignment Power of Systems Architecture

Embracing Systems means, first and foremost, comprehending something from a holistic perspective, understanding how everything functions (or malfunctions) as a whole, seeing both the components, the connectivity, and the integrations – the complete architecture.

Great Architecture has critical elements that make it powerful:

- It's a *System* where:
  - The whole is greater than the *sum of the parts.*
  - Core Truths, Key Logical Concepts and Conditions, Guiding Principles, and Key Factors for Success (both universal and situational/conditional) are evident and symbiotic.
  - Diagnostic Analysis and Principles-Guided Prescriptive Corrective Actions are tailorable and applicable to unique situations and conditions
  - The System is integrated sufficiently to be Sustainable Under Stress
  - Essential Principles, Fundamental Rules, and Best Processes/Practices can be used universally to create similar results.
  - Cause & Effect Relationships are logical and understandable.
  - Consistent Language, Powerful Underlying Attitudinal Belief Systems and Consistent Actions are integrally linked the to the core frameworks.

The Quest for Synergy

Synergy has been the elusive dream of businesses and organizations for over a century.

But it has been elusive. Why? What's been missing? What has caused us to miss the mark? What mind-traps have we been caught in? Why is the Collaborative Shift struggling to get out of the gate?

Complex Problems must be solved with a higher level of thinking than that which created the problem. -- Einstein

The problem is first in the conception – attempting to link disjointed organizations or forcing the conflicting cultures without a unifying systems architecture.

Synergy manifests in Collaborative Systems – Synergy is a natural outcome of *collaborative* design architectures, both in nature & business -- beyond practices, tools, and techniques..

However, synergy will seldom manifest without trust between the components in the system. That's why *transactional* and *adversarial* systems seldom manifest synergy (and why Acquisitions Professionals are constantly vexed).

What our minds can conceive, our character can achieve. -- Edison

- It's Leverageable – the following be done to increase and extend its impact:
  - Learnable – it can be taught by a Master who can teach it to others, who can, in turn, teach it to others, enabling it to multiply.
  - Replicable – it will work successfully in a variety of circumstances
  - Reliable – has inherent stability, safety, and certainty.
  - Scalable – it will work in large organizations as well as small scale situations. [37]

Architecture is the design that holds a system together, uniting the system's component and, integrating human and physical functionality into a synergistic whole.

The Design is a series of frameworks, principles, methodologies, and interconnectivities.
Then best practices can be attached to different elements of the architecture as one begins to master the system

A good systems design architecture is easy to understand, apply, and teach to others.

Socio-Technical Systems

From an Engineering Professional's perspective, Collaborative Systems Excellence is like an alloy, melding together different elements into a stronger final material. In this case, we are fusing human systems with technical systems into a *socio-technical systems* architecture.

> Or, in the words of Edison, *aligning the dynamo of humanity with the dynamo of technology*.

The Collaborative Excellence Systems Architecture aims at creating a *fully integrated design system* where all the frameworks have been field tested, documented, and proven in a wide number of industries as diverse as automotive, aerospace, military, airlines, steel, insurance, food, consumer goods, sports, and research & development.

These have proven to create quantum jumps in competitive advantage, often exceeding 20% greater than the norm. In the big picture, it's competitive advantage that ultimately generates sustainable profitability.

Complexity -- Why a New Order of Proficiency is Needed

The business world has been on a twenty-five journey shifting from Stand-Alone Organi-zations to Strategic Alliances to Eco-Systems (aka Value Networks),[38] which are complex "systems:" which:

---

[37] See **Appendix 2 – Notes & Points of View on Systems Thinking** and **Appendix 4 -- Standards of Collaborative Systems Architecture** for more detail

[38] In the Value Network/Ecosystem discussion, the principal difference in concepts is that *entities that are not in the direct value network are included in the ecosystem*. e.g. an outside supplier with an exclusive alliance with our major competitor and doing no business with our company is not part of our Value Network, but would be part of the industry Ecosystem.

- embrace ***quantum jumps in complexity*** with ***multiple partners***
- requiring ***multi-faceted integrations*** to function effectively and adapt to change,
- triggering ***massive leaps in innovation*** to
- create sustainable improvements to their collective ***competitive advantage***.

This, in turn, demands an ***exponential increase in the level of collaboration*** needed to succeed – levels often seen in emergency situations,[39] but not the normal modus operandi for leaders. With these levels of complexity, there's a massive increase in inter-organizational interfaces, the number and level of risks, and uncertainty.

Uncertainty Breeds Ambiguity.
Leaders' primal response to ambiguity is to exercise command and control, typically becoming more adversarial, throwing more lawyers with a fist full of law suits at the problem, which only makes things exponentially worse, like throwing sand into gears.
More Complexity requires More Collaboration, not fist-pounding.

[39] The level of cooperation across organizational boundaries increases dramatically in times of emergency, such as war and natural disasters. The architecture and practices in these situations has been used in the development of this Collaborative Systems Architecture. See **Collaborative Leadership Lessons from Combat** and **WWII's Other Secret Weapon — Proximity Fuse Case Study**

Complexity

The 21st Century Enterprise is a typically a series of complex, interconnected networks as illustrated in Figure 7 which graphically depicts the complex interfaces in a complex network. Each of the sub-networks have a myriad of internal and external interfaces where people manage objectives, outcomes, and risks.

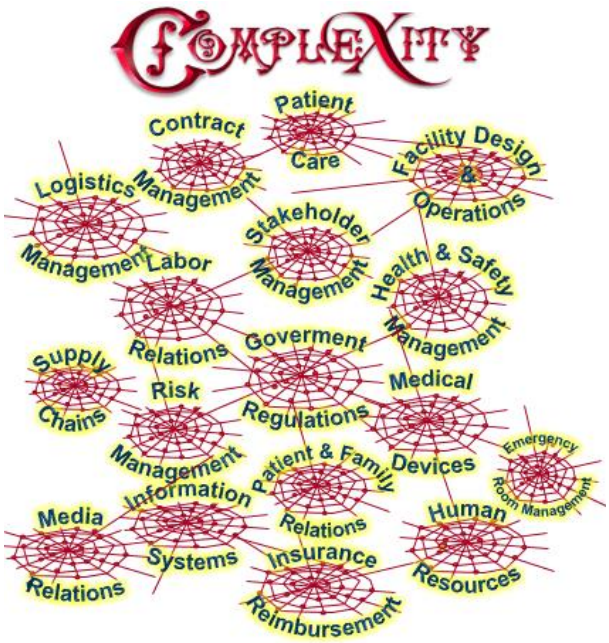


Figure 9: Health Care Example
Each Sub-System is an inter-connected set of processes, systems, rules, relationships, traditions, and technologies.

In collaborative systems, the interfaces are far more likely to flow quickly, create less non-value added work, solve a myriad of problems quickly, and generate innovative ideas.

Adversarial and transactional cannot meet this standard; and adversarial systems actually add more interfaces and more non-value added work.

The more entities in a collaborative venture – whether it be cross-functional integration within a business unit or a value chain integration -- the more complex it is to organize and manage. Understanding the dynamics of a network requires, at a minimum, to grasp the "Law of Compounding Interfaces & Risks." (Figure 8)

Law of Compounding Interfaces/Risks

- The Greater the *Multitude of Interfaces*,
- The Greater the *Levels of Uncertainties & Complexities*,
- The Greater the *Risks of Multiple Breakdowns (Non-Value Work, Overruns, Missed Deadlines*
- Most of the Breakdowns will occur at *Non-Collaborative (Adversarial & Transactional) Interfaces*.

And that complexity accelerates and escalates at a very non-linear rate.[40]

[40] To understand the Law of Compounding Interfaces in more detail, see **Appendix 5 – Complexity**

Any systems architecture that fails to address the fundamental issues of complexity will wither under the stress of real-world application.

C. The Influence of Culture on Human Behavior

One of the most important understandings in Socio-Technical systems is that Culture is the #1 Determinant of Human Behavior. This understanding is a central operating principal the paradigm shift.

> No, it's not personality, although personality is a factor.
> And genetics have minimal influence in the larger picture.

To illustrate, every grade school student has heard the names of famous Greek Thought leaders of science, mathematics, and philosophy – Euclid, Pythagoras, Socrates, Plato, Aristotle, Archimedes, and many more. Why so many Greeks, so few Romans, and virtually none during the Dark Ages?

The genetics of humanity have not changed, but the culture creates the values, expectations, and reinforcements to bring out the best, the worst, and the ugly in humanity.

In the framework of the Tri-Archetypal Culture, the Greeks were highly collaborative, the Romans Transactional/Hierarchical, and the Dark Ages Adversarial.

If you are still skeptical about the impact of culture on behavior, please skip to Appendix 6 – How Culture Determines Human Behavior, and read the case study of General Motors and the Union from Hell.

When Toyota took over the very same workforce in the very same plant, the behavior transformed miraculously from *Adversarial* to *Collaborative*; the productivity soared, quality sky-rocketed, and strikes plummeted to zero. Yes, collaborative excellence transforms organizations.[41] Once the culture becomes *Explicit,* people are empowered to make it better.

Lou Gerstner, architect of IBM's historic turn-around comments on culture:

"Until I came to IBM, I would have told you that culture was just one among several important elements in any organization's makeup and success…..

"I came to see … that culture isn't just one aspect of the game – it is the game. In the end, an organization is nothing more that the collective capacity of its people to create value… Culture encourages and discourages, rewards and punishes… it's part of the company's DNA."

Excerpts from *Who Says Elephants Can't Dance?* by Louis V. Gerstner, Harper, 2002, pp 181-3

[41] See **How Leaders Design Culture for Great Performance**, which was written for Engineers to understand Human Behavior

What is Culture?

While invisible, culture is like radio waves, pervasive and everywhere. Culture tells people what is expected of them, what is valued by leaders, what beliefs they should hold, how people should interact, what they should achieve and protect, how they will be rewarded or punished, and what is important.

Culture, more than any other factor (including personality), will determine human behavior.

Thus *Leadership is the most influential factor in determining culture, and, by extrapolation, human behavior*.

That's why a collaborative leadership model is so vital to performance. And why any initiative to ensure long-term sustainability must be imbedded in corporate culture.

What Impacts Culture?

Steve Rogers comments:

> I submit it is *both Leadership and Management.*
>
> *Leadership makes elements of culture into values and beliefs.*
>
> *Management makes those elements expected in day to day operations.*
>
> *Leadership* is necessary to trigger and spark cultural change. But once the change is launched, *Management* installs and reinforces the behaviors, norms and social activities that embed it into the organization so it actually becomes culture.

Leadership and Management should be more like "dance partners" – in tune with each other, integrating in a "high-team, high-trust" culture that essentially becomes "glue" and "alignment system" that creates a powerful synergy in the organization.

The Plague of Cultural Misalignment

Collaborative Excellence is subverted and deterred because most organizations are miserably misaligned, mixing *adversarial*, *transactional*, and *collaborative* styles into a muddled, confused, culture, and, unaware, try to extending this internal misalignment into their external Value Network.

In the many years I have been a leaders and studied collaboration, it's ironic that the only leaders who talk about the importance of culture are the collaborative leaders

To make matters worse, many new senior executives entering the corporation seem compelled to put their "mark" on the company, often reintroducing non-productive, non-value added programs and policies that are counter-productive or even destructive, leaving

a mess in their wake. Customers, suppliers, and former alliance partners are left with an aversion to reenter the game together because of the reputational stain.

Subverting Muddled Cultures

This example will illustrate the problem working in an organization with a muddled culture where the ***adversarial, transactional,*** and collaborative forces clashed:

> ***Pedro Wasmer*** *paints the picture: I once worked for a large Fortune 500 company. The Marketing VP was always at war with the Finance VP. Each had created impenetrable silos, never sharing information or engaging in joint problem solving, and often engaging in passive-aggressive undermining of the other. They were power hungry, always seeking to aggrandize themselves and diminish the value of everyone around them.*
>
> *The company had stalled, the CEO was frustrated with the lack of growth, but wouldn't change the two intransigent VPs or make their bonus be contingent on cooperation.*
>
> *Trained in both engineering and business, I had to go around the management hierarchy to get anything done. Several of us just couldn't tolerate getting caught in the VP cross-fire of the" blame game;" "it's not my job," and all that.*
>
> *So we formed a "skunk works" – we met regularly in a room in the basement where no one could find us. As a team, we figured out how to innovate, organize, streamline, and put the company back on track. We made a healthy profit.*
>
> *The CEO and his power-hungry senior executives never understood how we did it. They wouldn't want to get bogged down in the details of cause & effect – they just want results. And even if we told them the secret of our success, they would have discounted it because they didn't believe in the power of working together – in their minds, great results could only be attributed to individual effort; there was no room in their minds for the power of collaboration.*

> ***Steve Rogers comments:***
>
> This is a huge issue. I believe that *Reward Systems are what drives this misalignment. Each function and business in a company has its own reward system – often with different what counts factors and KPI's (key performance indicators). No function/business unit gets any points for helping another function/business meet its KPI's at any expense to its own even when the company overall wins.*
>
> The internal boundary issues that require collaboration to overcome are not part of the reward equation.
>
> I led an organizational redesign between R&D and Supply Chain and was nominated for a corporate award, co-sponsored by R&D.
>
> But the corporate Supply Chain leader disqualified it because it was not purely supply chain enough. Sad but true.

The idea of "skunk works" comes from the epic engineering team at Lockheed led by Kelly Johnson. They were a tight, intensely cohesive team of engineers, designers, expert machinists and down-and- dirty shop workers committed to producing breakthrough

engineering that would work reliably in the skies – producing plane after plane on-time and on-budget. It was Collaborative Systems Excellence in action.

> Johnson's skunk works only built planes he believed and was notorious for battling with the Air Force bureaucrats and technocrats that tried to impose their *transactional-hierarchical* thinking with its constraints and limitations into his free-wheeling innovation team.
>
> His team had been together for years, the morale was so high, which enabled them to solve problems that had stumped the brightest mind in the engineering profession.

Dozens of examples like these have been built into the Collaborative Systems Architecture.

The number one factor in generating collaborative innovation is to create a culture that supports, reinforces, and challenges current levels of thinking.

Quantum Jumps Require Systems Architecture

The *Quantum Jump in Complexity* that accompanies *Collaborative Paradigm Shift* requires far more than just Alliance Best Practices, it requires a *New Universal Architecture* to power the shift, and a more *Generic Version of Best Practices* applicable to a wide variety of circumstances.

Thus it's vital to understand the nature of "architecture:" Collaborative Architecture is required for three basic reasons:

Cross-Functional Synergy:
To make a system perform so that the whole -- the outputs -- are greater than the sum of the parts – the inputs.

1. Cross Functional Synergy:
   To make a system perform so that the whole – the outputs – are greater than the sum of the parts – the inputs.
2. Pattern Recognition & Prediction:
   To enable the human mind to comprehend the system through a series of pattern recognitions and predictions, which reduce fear, uncertainty, and chaos, opening the pathway for constructive action.
3. Overcoming Skepticism:
   A very large portion of corporate leaders are *skeptics of collaboration* – they aren't against it per se, but there are so many unanswered questions, concerns, doubts, and risks countered by strong advocates against collaboration. Thus the skeptics' doubt is greater than their belief, resulting in being trapped in analysis paralysis and adversarial reversion.

Architecture is a series of design frameworks, principles, methodologies, and interconnectivities uniting a system's components into a functional, synergistic whole.

Architecture is the synthesis & fusion of Art, Wisdom, and Science, interweaving strategic, human, operational, competitive and technical factors together to create sustainable synergy.

A new strategic line of thinking is necessary.
The Collaborative Shift that has been yearning to jump out of the starting gate has been impeded by trying to solve problems with the same levels of thinking we have used for the last 30 years.

Great Teamwork, Great Collaboration, and Great Success is all about Alignments – getting everyone on the same page, pointing in the same direction, building on each other's strengths for the greater good of all.

Alignment starts with people with the same vision who trust each other.

Without aligned vision and trust, everything defaults to procedures, politics, and power.

D. Six Core Frameworks of Collaborative Systems Architecture

All systems architectures are composed of sub-systems.

A building's architecture is composed of subsystems such as foundation, structure, heating, ventilation, air conditioning, plumbing, electrical, fenestration, fire safety, and so forth.

A human's architecture is composed of subsystems such as neural, pulmonary, vascular, gastro-intestinal, and so forth.

So too must we break the Collaborative Excellence Systems Architecture down into these subsystems. (see Figure 9: Collaborative Excellence Architecture, which will be later explained below in detail. For the sake of clarity, we have chosen to call the subsystem architectures: "frameworks" to distinguish from the larger holistic systems design architecture.

Figure 11: Collaborative Excellence Architecture

Best Practices must Support Systems Integrity

With systems architecture clarity, we can then hang detailed best processes & practices and improve the practices that increase the systems synergy. So too can we isolate those practices that destroy or undermine the integrity of the system because they were actually designed for transactional or adversarial cultures.

While the best practices will change and evolve over time, the architectural principles – the "core truths" remain steady.

What's more, the Collaborative Excellence Architecture provides the frameworks for *any* collaborative endeavor -- alliances, cross-functional integration, project management, etc. -- making it a "universal passport" for much broader application – opening the avenue for engineers to evolve into experts in collaboration – the next generation of organizational transformation.

Business leaders are more likely to seek solutions to broad problems via Collaborative Excellence than via Engineering. Collaborative approaches need to be more broadly integrated with engineering, widely disseminated through the engineering profession, applied across entire

Architecture, because it is holistic, enables accurate diagnostics and prescriptions, whereas Best Practices are too detailed and granular.

value chains and networks, and better recognized for the value they catalyze.

Codifying & Learning the Architecture's Building Blocks

Yes, there is no doubt we need a solid, dependable Architecture of Collaboration, but that alone is insufficient – we need a means of codifying it, teaching & learning it, and transmitting it to thousands of people if it is to be broadly impactful and sustainable. Any design must be, at its core, simple, logical, and easy to comprehend – otherwise no one will remember it. These six frameworks are simple, easy to learn & remember, elegant to use, In Figure 10 the design starts at the "micro" level with the brain and human behavior, and

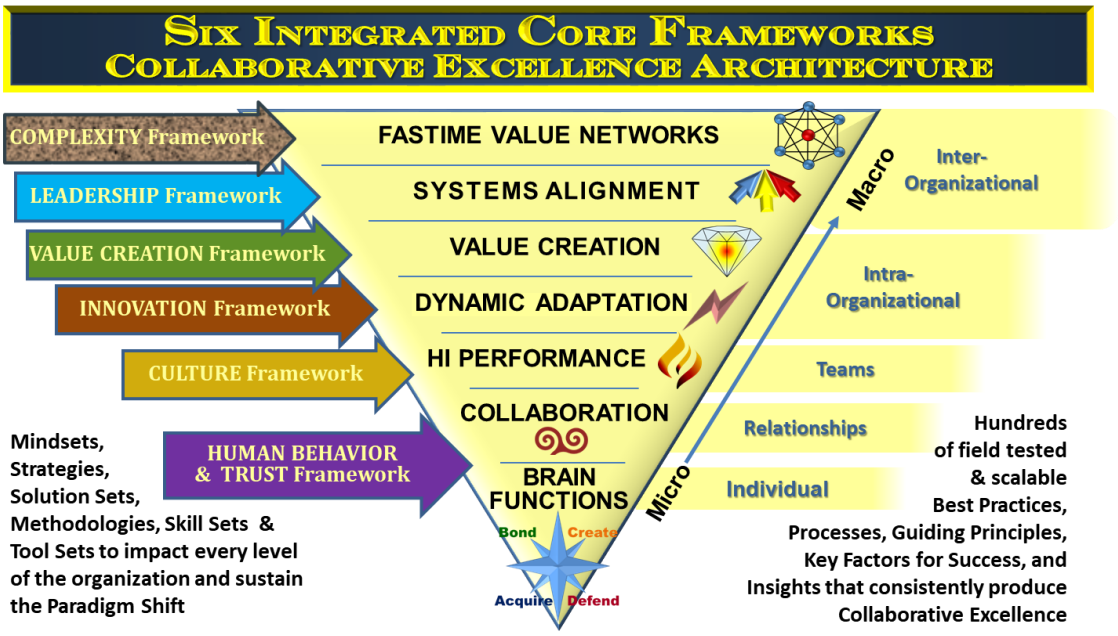


Figure 12: Six Core Frameworks of Collaborative Architecture -- the Learning Model

walks up the inverted pyramid with the elements required for collaboration at the individual and interpersonal levels, with each segment being seamlessly woven into the building block for the next segment, ultimately expanding to complex organizational systems.[42]

30 years in the making to discover, design, develop & test the first fully integrated architecture that elegantly connects six organizational levels to produce up to a 25% competitive advantage.

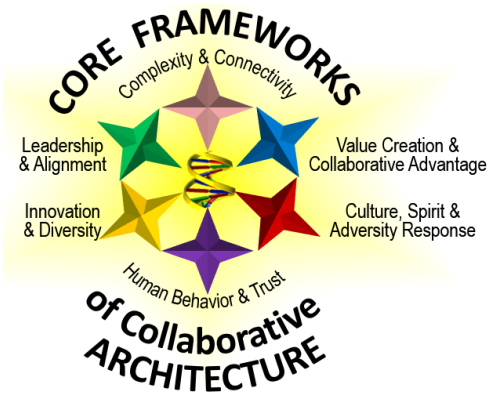
It's been field-tested and produces measurable results, while optimizing time and resources.

Please Note: The following pages of the Six Frameworks are presented in *outline form* because the material is highly proprietary and represent privileged intellectual property reserved for my forthcoming book on *Collaborative Excellence for Leaders*.

strategy, or requirement of Collaborative Excellence.

Overview of the Six Core Collaborative Architectures

Having been engaged in examining the fundamental causes of success and failure in thousands of alliances and other collaborative ventures, large-scale projects, mergers, acquisitions, and turnarounds, we've determined there are six key areas where joint initiatives took the critical path toward success or failure, victory or defeat. These become the basic foundation of the Collaborative Systems Architecture. (Outlined below)



The first, most basic framework is unequivocally TRUST. It is the foundation of all collaborative enterprise. Without trust, a massive psychic vacuum is filled with FUDD – Fear, Uncertainty, Doubt, and Divisiveness.

To understand Trust, we first need a framework for understanding Human Behavior:

#1a: Four-DRIVE HUMAN BEHAVIOR "FOUNDATIONAL" Framework

Developed by mentor and colleague Paul Lawrence of Harvard Business School

- Elegant, simple & straightforward -- the $E=mc^2$ of Human Behavior (Far better than Maslow's Hierarchy)
- Four Drives of the Brain explains why people are "driven" to act, predicts and prescribes behavior.
- Backed up by breakthrough neuro-chemistry research conducted with Prof. Lawrence.

  Neuro-Chemistry of the Brain provides deep insight into Trust & Fear
- Explains how Fear defeats Collaboration – and how to overcome the fear factor
- Flows directly into the Trust & Culture Architectures

Value Delivered

- ➔ **Quickly Understand Dysfunctions**
- ➔ **ReAlign & ReBalance Individuals & Teams**
- ➔ **Foundation of Trust Architecture**

All the Frameworks are based on Science, Research and Tested Practical Experience.

These are guided by "natural" processes based on the DNA programing of normal humans.

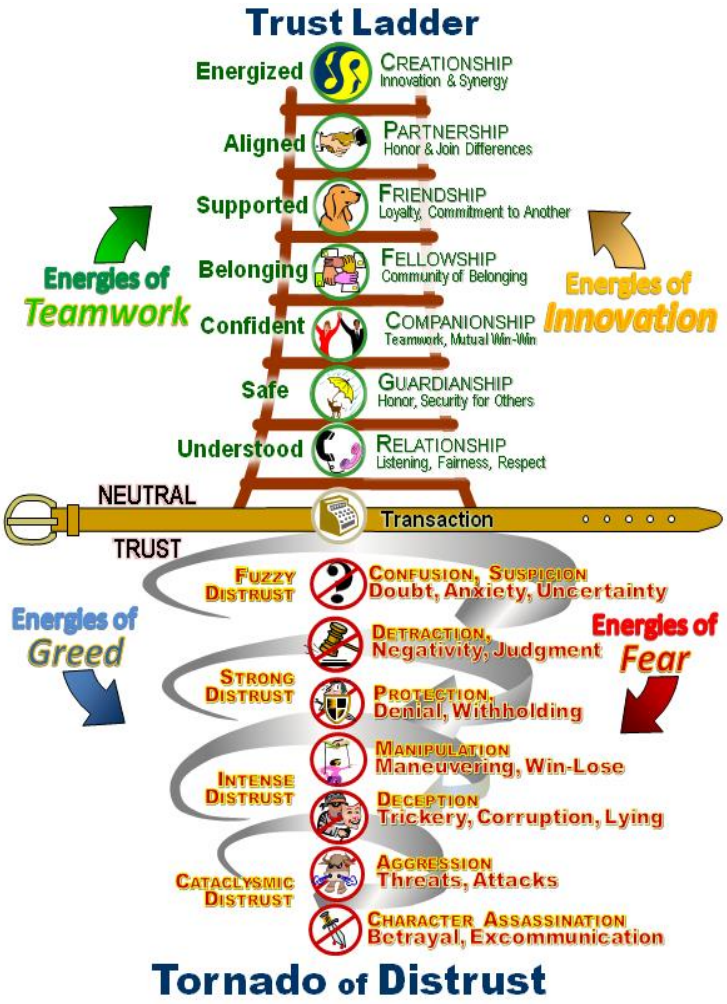
Tip: Ensure these six frameworks are embodied in every organizational function, and especially in recruitment, hiring, and performance review of senior leaders and managers.

#1b: TRUST FRAMEWORK

Human Behavior Framework makes a fluid transition into the Trust Framework

Elegant and simple to use

- Trust Ladder & Tornado of Distrust -- powerful tools to create extraordinary relationships.
- Based on Breakthroughs in Neuro-Chemistry
- Includes quick and straightforward tools to assess and build Trust:
  - 8 Principles of Trust
  - Critical Operating Principles
  - How to Rebuild Trust
- Without trust (Tornado of Distrust):
  - Impossible to generate high performance teamwork
  - Very difficult to produce consistent innovation
  - Risky to attempt developing alliances and collaborations
  - Highly challenging for leader to align organization



- Breakthrough modeling to understand *Economics of Trust*, Value Creation and exactly how trust generates productivity, performance, profitability and competitive advantage.

Value Delivered

- ➔ **Rapid Diagnosis of Trust Breakdowns**
- ➔ **Prescription to Rebuild/Sustain Trust**
- ➔ **Sets Foundation for Understanding How Culture Impacts Behavior**

Without Trust, High Performance Teamwork is an illusion

#2: CULTURE FRAMEWORK

Trust Framework flows seamlessly into the Culture Framework

Enables leaders to "design" culture of the Collaborative System spawning superior high performance teamwork

Why is Culture so Important?

- Between ⅔ & ¾ of all human behavior is determined by *culture* (not personality)
- Leaders are #1 determinant of culture – making Leadership the *Primary Lever of Change,* and Managers are the #2 determinant, embedding and reinforcing cultural principles into the organization.
- Culture Framework enables Leaders to spot flaws and misguided thinking immediately and take rapid corrective action
- The "***START***" Model of Culture (***S****pirit,* ***T****rust,* ***A****dversity* ***R****esponse, &* ***T****eamwork*) is powerful, elegantly simple, and easy to unite teams and alliances.
- Collaborative Cultures:
  - Produce 25% better results (speed, innovation, adaptability, profitability, etc.) than Adversarial Cultures
  - Retain wandering Millennials who experience Collaborative Culture as "family"
  - Propel Innovation & Value Creation in a sustainable cycle of continuous advance

Value Delivered

- ➔ **Provides both Leaders & Managers with Mindsets, Tools, & Frameworks for Building Great Cultures**
- ➔ **Enables Rapid Diagnosis and Correction of Culture Problems such as hiring, rewards, and measures of success**
- ➔ **Easy for engineers and technical people to understand**
- ➔ **Enables pivotal middle and upper middle management to invest their time in communicating and rewarding the mindset shift.**

The idea of Collaborative Systems "Architecture" is that leaders & managers can step back, fully conceptualize the kaleidoscopic dynamics,
not getting bogged down in the details of everyday "sturm und drang" (turmoil & stress), then
assess the situation from a perspective of wisdom and insight, taking corrective action.
From a practical perspective, leaders and managers can run through the 6 Frameworks like a 6-Point Checklist, evaluating which elements are missing or dysfunctional

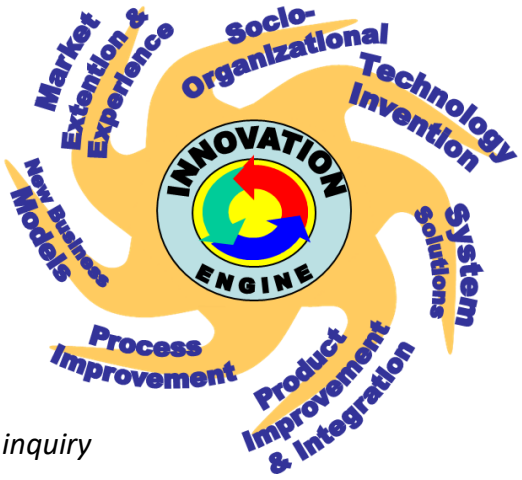
#3: INNOVATION FRAMEWORK

Culture Framework makes a fluid transition into the Innovation Framework

Enables Rapid Adaptation in Fast Moving World

Explains how Trust can enable Diversity of Thinking to produce an "engine" of innovation running on "free fuel" – ideas

Reveals potent framework for unlocking Co-Creative Power of Cross-Functional Teams



- Builds Versatile, Multi-Pronged Innovation Engine to generate expansive Forms & Sources of Innovation to increase competitiveness
- Jump-starts innovation by identifying numerous "Triggers" that spur new levels of insights
- Engages 10 Best Processes for maximizing innovation
- Replicable and easy to understand…. Utilizes *creative inquiry* methodology to unleash hidden ideas
- Uses Creative Inquiry methodology to shift thinking to higher orders of insight
- Produces great results, in high trust, high collaboration cultures
- Transforms Diversity of Thinking, Ideas and Cultures into Massive Innovation Asset
- Uses Collaborative Innovation as a primary mechanism for Collaborative Advantage, Competitive Advantage, and Adaptation to Rapid Change
- Enables Every Employee to become a Collaborative Innovator

Value Delivered

- ➔ **Sustainable Innovation "Engine" that can double innovation**
- ➔ **Generate New Value from Existing Resources**
- ➔ **Maximize Value from Alliances & Collaborations**
- ➔ **Sets Foundation for Value Creation & Investment Decision Making**

Culture is the Hidden Competitive Weapon in the arsenal of Collaborative Excellence. Because it's largely invisible to all (except for those who understand collaborative architecture), it is nearly impossible to duplicate.
When the Innovation Engine is engaged,
the ability of the system to adapt, morph, realign, and create new linkages is compelling.

#4: VALUE CREATION & COMPETITIVE ADVANTAGE FRAMEWORK

Innovation Framework makes a fluid transition into the Value Creation, Collaborative Economics and Competitive Advantage Framework

Profitable Economic Engine for Value Creation

- Creates high levels of Productivity
- Uses Trust & Innovation to reduce Non-Value Added Work & cross-boundary inefficiency
- Reduces Risk and Litigation by up to 30%
- Doubles chances of on-time/budget Project Delivery
- Accelerates End-to-End Value Chain competitiveness
- Turns Breakdowns into Breakthroughs
- Enables People and Organizations with Limited Resources to gain Competitive Advantage
- Value Maximization Model transforms the innovation "engine" into substantial competitive advantage – think of it as "collaborative advantage"

- Powerful Tools to generate new value (Including Trust's Impact on Profit Assessment)

Value Delivered

- ➔ **Sustainable Competitive Advantage**
- ➔ **Generate New Value from Entire Value Chain**
- ➔ **Generates 10-25% better return on human capital derived from the "triumph of small numbers" contributed from each of the collaborative frameworks**

How many times have you heard some executive command a team to "Create Value?"

But have you ever thought about it in depth?
What course in Business School is dedicated to Value Creation?

For the most part, Value Creation has been an elusive dream in the pontifical mind. Our approach capitalizes on collaborative architectures to adapt and maximize value in ways adversarial & transactional systems simply cannot.

#5: LEADERSHIP & MANAGEMENT ALIGNMENT FRAMEWORK

Value Creation Framework makes a fluid transition into the Leadership Framework

Four Alignments approach to leadership is a Systems Breakthrough

Leadership has traditionally been agglomeration of styles, traits, characteristics, and habits. This level of thinking is *not effective* – it sub-optimizes talent and bogs things down.

Our breakthrough is *Reframing Leadership* as an Integrated System of Four Alignments

- Enables Leadership to set new direction & Management to drive in the new direction and spur operational, cultural and dynamic realignment implementation
- Like playing "4-Dimensional Chess"
- Fast to Implement , Easy to Learn, Rapid Returns
- Nearly impossible for competitors to duplicate
- Greatly enhances ability to create synergies – the unfulfilled quest of leaders for centuries – because synergy flourishes *Aligned Collaborative Systems*
- Guiding Framework for how to (& not to) Transform Organizations and overcome Resistance to Change
- Empowers managers to build highly effective cross-boundary collaborations, tearing down silos, and triggering new levels of innovation and productivity

Value Delivered

- ➔ **Synergistic System Producing Massive Advantage & Employee Engagement**
- ➔ **Produces 4-Dimensional Alignment for Complex Systems and Value Networks**
- ➔ **Enables Teams, Cross-Functional Integration, Strategic Alliances & Eco-System Value Networks to function at a higher level**
- ➔ **Protects Collaborative Systems from successful attacks by Adversarial Rivals**

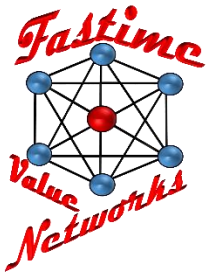
Just as Trust is the Central Organizing Principle for Collaborative Cultures, so is Leadership the Central Aligning Principle for Complex Systems.

Four Dimensional Alignment does for a Complex Eco-System what Gravity does for the Planet – holding the many dynamic driving forces together, preventing disparate parts from flying off in a myriad of directions.

#6: COMPLEXITY & CONNECTIVITY FRAMEWORK

Fluid transition from the Leadership & Alignment into the Complexity and Connectivity Framework

Today's Complex Systems are fluid, with dynamic forces intersecting with strategic aims. Without an understanding of the way the forces interact, leaders typically resort to old, ineffective command and control methods, often turning the system adversarially in upon itself, like an auto-immune disease, foolishly turning partners against themselves, destroying the synergies that nourished them.



Complexity requires collaboration for its successful management

Complexity will cycle into a chaotic, perpetual spiral of conflict without trust.

The Complexity & Connectivity Framework provides:

- Leaders with clear guidance and options on how to address complex projects and multi-member alliances, keeping the system aligned, balanced, & integrated
- Fluid Interaction in the Eco-System, continuous innovation & dynamic realignment
- Create Agreements & Alliances that enhance teamwork and alignment of interests
- Massive Competitive Advantage by doubling innovation flow across the network
- Provides Risk Managers with a Guidance System to assess culture, uncertainty, and alignment. lowering risk by up to 30%
- Redesign complex projects to ensure massive benefits from collaboration and avoidance of drawbacks of the Law of Compounding Interfaces/Risks
- Methods & Tools to Anticipate & Thwart Breakdowns before they happen, diagnose Compounding Risks & Fragile Breakdown Points and Turn Breakdowns into Breakthroughs
- Gain Positive Benefit from the Law of Unintended Consequences
- Utilize ISO 44001 – Collaborative Business Relationship Management – to build high performance Value Networks

Value Delivered

- ➔ **Multiple Applications in a Wide Variety of Complex Organizational Systems**
- ➔ **Prevents poor decision-making and mis-diagnosed Cause & Effect relationships.**
- ➔ **Significantly increases success rates of teams, projects, turnarounds, alliances, and organizational transformations.**
- ➔ **Enables Value Networks to function within internal organizations & entire value chains**
- ➔ **Produces the "elusive" Synergy that has been the quest of competitive advantage by aligning diverse and opposing energies which can be transformed into insights and innovation, speed, and rapid adaptation.**

Value Proposition

Most companies that lose their competitive edge don't suffer a cataclysmic death – they fade away from slow erosion of spirit and creeping corrosion of their essential drive to win.

Inspiration is replaced with perspiration, then exasperation, finally exhaustion.

When measured, this erosion and corrosion certainly manifests in the bottom line (which is actually a poor *lagging indicator* of what are more significant leading indicators) – usually spread across the spectrum of organizational functioning.

This erosion and corrosion is typically a creeping incremental decline, known as the "Tyranny of Small Numbers"

The Rationale and Quantum Value for the Collaborative Shift

Shifting and transforming a company, particularly a very large one, is a massive task for CEOs, particularly because there are so many moving parts, people, processes, and imbedded thinking. Unless a company is in bankruptcy and needs and instant turnaround, a more reasonable collaborative strategy is called for.

The Collaborative Excellence strategy and value proposition aims at restoring vitality and shifting the very foundation of Competitive Advantage creating a supercharged competitiveness through Collaborative Advantage – the capacity to align entire organizations and value chains with the power of Collaborative Excellence.

This is done through the "***Triumph of Small Numbers***"

Here's how it works:

Each of the Six Frameworks produces at least a 3%-5% advantage, which accumulates to 20% or more.

We've tested this in real life, in hundreds of case studies, in over a dozen industries, with data from client engagements, third party experiences, and personal anecdotes.

In complex organizational systems where integration of functions is essential, where speed is critical, and where change is rapid and/or uncertain, a collaborative system producing real synergies is paramount.

Productivity losses in non-synergistic systems (e.g. *Transactional* & *Adversarial*) are far too high, and tend to be crushed by rivals who bring a more collaborative strategy into a market. This is what happened when Toyota and Honda (both highly collaborative) challenge GM and Ford (both overly transactional and adversarial). This is easily measured in terms of Non-Value Added work, escalating costs, and customer dissatisfaction.

For example, in one major North American healthcare system, our team measured the amount of non-value added work. The system was fragmented, showed little collaboration across functions, had proven to be highly resistant to change, and costs were rising extravagantly.

The system's culture would rate somewhere between *transactional* and *adversarial*.

It's not coincidental that the amount of Non-Value Added work (as measured by the amount of actual work that contributed directly or indirectly to the Patient's Health) was an extraordinary 94%!

Conversely, the Mayo Clinic is highly collaborative, produces the highest cure rates, lowest cost-of-delivery rates, shortest times for recovery, and highest customer satisfaction.

If you want to do a quick mental test the assertion whether *collaborative* systems are far more efficient and productive than their *adversarial* and *transactional* counterparts, just assess what happens to Utility Companies during a major emergency.

Everyone works together, cumbersome hierarchies emulsify, assistance teams cross state borders, decisions are made on site, equipment shows up without bureaucratic requisitions, safety considerations prevail over union rules, everyone works together talking across functional divisions, lawyers get out of the way, government regulators stop being a pain in the butt, and decisions are made in a tenth of the time. Employees comment that they often get more done in a week during an emergency than in a year in normal conditions.

Below are areas where Collaborative Excellence will demonstrate significant impacts:

- **Recruitment of Best People**
- **Flexibility/Adaptability**
- **Cross Functionality Integration**
- **Increased Communications**
- **Increased Trust & Teamwork**
- **Increased Employee Retention**
- **Increased Problem Solving**
- **Increased Innovation**
- **Increased Speed & Flow**
- **Increased Value Creation**
- **Increased Operational Performance**
- **Increased Productivity**
- **Continuous Cost Reductions**
- **Lower Supplier Transaction Costs**
- **Lower Employee Turnover**
- **Higher Millennial Generation Retention**
- **Stronger Commitment to Best Practices**
- **Better Quality Upgrading**
- **Continuous Improvements**
- **Future Strategic Positioning**
- **Productivity & Training**
- **More Investment in R&D**
- **Risk-Reward & Value Sharing**
- **User Friendliness**
- **Better Information Sharing**
- **Stronger Customer Retention**
- **Better Customer Service**
- **Increased Alliance Success Rates**
- **More Rapid Market Penetration**
- **Quicker response to Competitive Threats**
- **Better, More Integrated Solutions**
- **Decreased Risks & Breakdowns**
- **Mining Value from Eco-System Partners**
- **Positive Outcomes from the Law of Unintended Consequences (Law of Serendipity)**

All translating into two sustainable, regenerative, long-term line impacts: **Competitive Advantage and Bottom Line Profitability**

Collaborative Excellence is not another new "Management Flavor" of the month, it's been a top-of-mind quest for decades.

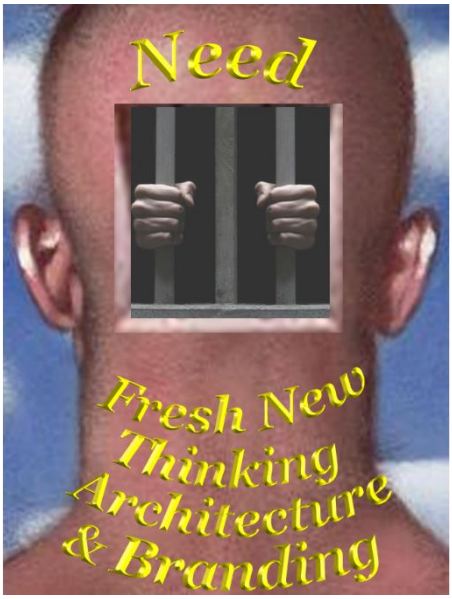
However the quest has been extremely difficult to sustain when senior executives move on.

The Six Frameworks in the Collaborative Excellence Architecture shift the quest to a new level that takes collaboration from a state of "intuitive reckoning" to a systems design that is replicable, adaptable, sustainable, and leverageable across a very wide variety of situations wherever complexity and connectivity is required for long-term success.

Part 3: HOW to Learn & Implement Collaborative Excellence

What the Engineering Profession Must Consider

Generally, Engineering Professionals have been:



- Too Tactical – we need to be more strategic and focused on sustainable competitive advantage
- Too Cost Driven – we need to be more articulate about how we create more demonstrable value
- Too Transactional – we've been trapped in this line of thinking, which has sub-optimized the real power of collaboration among different specialties and different functions
- Too Muddled – we constantly get trapped in the swirling vortex of conflicting and misaligned business philosophies (*Adversarial vs Transactional vs Collaborative)*
- Too Protective – among other professions and functional specialties, we are too protective, isolated, and marginalized.
- Too Managerial – while management is an essential factor in stable operations, there are times when leading and championing is the cutting edge that must be used to cut through the clutter of fuzzy thinking.

The Game Changer Strategy -- Remastering our Future

All-too-often Engineering Professionals are pigeon-holed on fringe of corporate structure, where our talent has been sub-optimized.

We must become *Masters of Collaboration* bringing new levels of value to stakeholders.

We must *migrate/imbed Collaborative Excellence and our new messages in centers of power*

We must be welcomed everywhere *complexity requires trust and teamwork* – every project, department, cross-functional team, supply chain, as well as strictly engineering functions.

We must think of ourselves as *leaders*, as *champions of change*, as *integrators across boundaries*, as *socio-technical system problem solvers*.

We need to change the way people think about *collaboration* itself, the *blockages* -- the changes required to *elevate thought and action* – it's a *leadership challenge* we must meet.

Control & Risk Management

Control will always be a big issue; lawyers and finance -- the controllers of corporate decision-making -- are the guardians of risk and the bottom line.

Nothing is inherently wrong with their roles, but we need to address the fact that, at the current level of thinking, Legal Agreements & Financial Controls do not create successful collaborations and often get in the way of many successful projects.

This is because the Legal Profession, at its core, is based on the belief that *adversarially* pitting two parties against each other in court will yield the truth (a questionable premise); the Financial Profession is based on *transactionally* assessing monetary flow; bolstered by the Risk-Management Profession, which assesses risks *transactionally*, never factoring in the power of *collaboration* to lessen risks by up to 30%.[43]

Engineering Professionals are given the solemn responsibility to eliminate the technology risks of failure, but then become victims of the social risks by enabling *adversarial* or *transactional* thinking to get in the way of good judgement, common sense, and streamlined implementation. Engineers should be able to demonstrate clearly how collaboration actually REDUCES RISKS & TOTAL COST OF OWNERSHIP – which is exactly what is the nature of *integrated systems thinking*.

78% of Mega Projects faced either: cost overruns or delays, a deterioration from 2003, when 50% of the projects were over budget or late.

It's not getting better; it's getting worse.

Source: 2011 industry study by Independent Project Analysis (IPA)

When an Engineer with a *Collaborative Systems* perspective reads this, red lights should be blinking in their brain, and an engineering solution to the project flow would be forthcoming in a flash.

For example, in the analysis of Mega-Project time overruns and budget bulges, we found substantial problems as illustrated in **Figure 11: Underlying Causes of Project Overruns.**

Again and again, as major projects evolved, most traversed either the *adversarial* or *transactional* paths that eventually resulted in project failure.

[43] Conclusion from **Future Path of Mega Projects** by Professor George Jergeas & Robert Porter Lynch, 2015

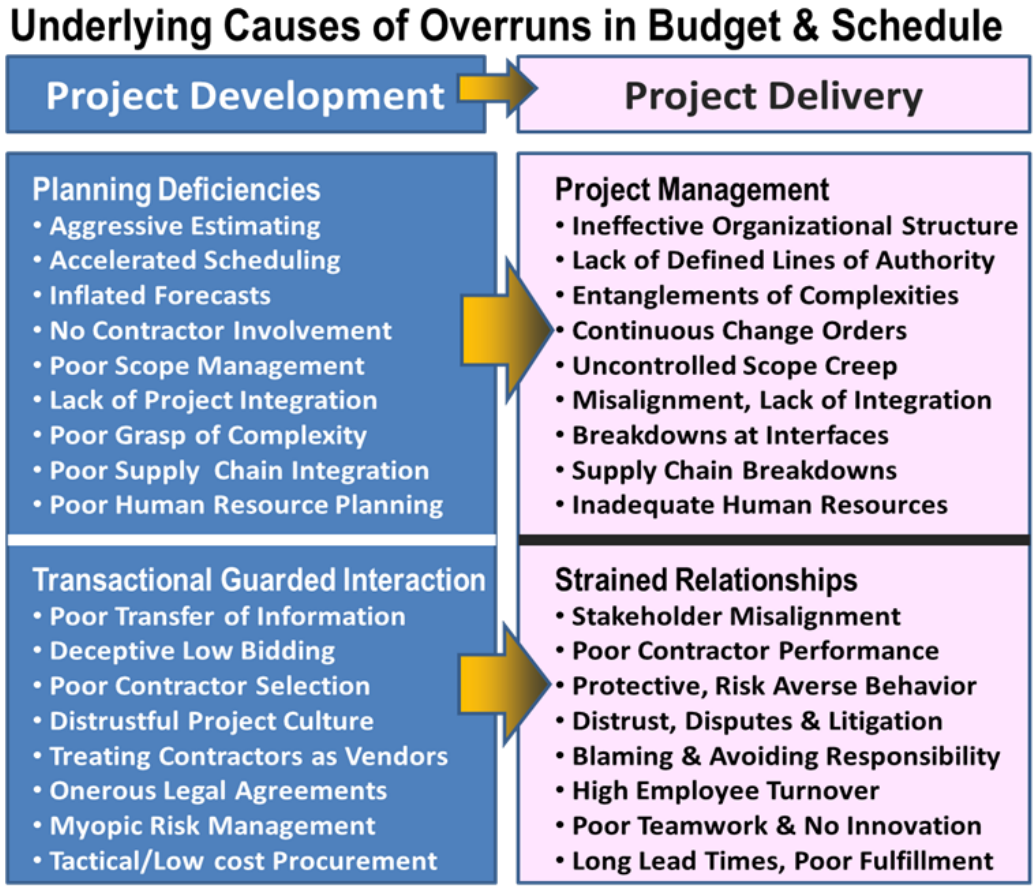


Figure 13: Underlying Causes of Project Overruns

Engineers never interceded, blowing the whistle to avert having their "ship run aground."

The engineers saw their role as "technicians," but never as "managers," "leaders" or "collaborative systems architects." To fulfill the National Academy's Vision of the 2020 Engineer, this must change.

Rethinking the Role of Engineering

We are not advocating that every engineer become a socio-technical systems expert; but all engineers, especially those at a senior level, should have an awareness and alertness to the impact of collaboration on engineering outcomes.

We are advocating, however, that a small cadre of engineers go beyond awareness, becoming adroit at collaborative excellence with the capability to architect, manage, and lead in a world of complexity and connectivity.

The **GAME CHANGER STRATEGY** requires shifting to a more powerful stance …….

- From Engineering Technology ➔ Collaborative Management & Leadership
- From Best Practices ➔ Collaborative Systems Design
- From simply Operational Performance ➔ Strategic & Competitive Leverage
- From Cost ➔ Value Creation & Risk Reduction

The ***GAME CHANGER STRATEGY*** means Engineering Professionals:

1. **Become COLLABORATIVE SYSTEMS Orchestrators**
   Symphony of Synergies -- Not Just Engineering Professionals
2. **THINK, SPEAK & DESIGN Differently – *Shift* the Architecture**
   Advocate, Champion, Demonstrate the Collaborative Imperative
3. **Show LOWER RISK, HIGHER SUCCESS, GREATER PROFIT**
   through Collaborative Strategies, Culture, Operational Best Practices
4. **Demonstrate VALUE & COMPETITIVE ADVANTAGE**
   that is MEASURABLE that becomes MONEY
5. **Interact with POWER CENTERS in your Company**
   Understand Transactional, Deal Mentality - *Shift & Elevate* Game of Business
6. **EDUCATE, BUILD TRUST & BUILD CAPABILITIES**
   in the New ARCHITECTURES – people must feel stronger as a result

Value Delivery & Risk Reduction

We must demonstrate that *collaboration* delivers more value and reduces risks far better than *adversarial* or *transactional* tactics wherever complexity reigns.

Our business colleagues must see us as far more than Engineering Professionals; we must be regarded and positioned as Value Creators, Value Deliverers, and Value Maximizers (see **Figure 12**).

Value Maximization is a Discipline – an integration of key value elements. It must be part of every

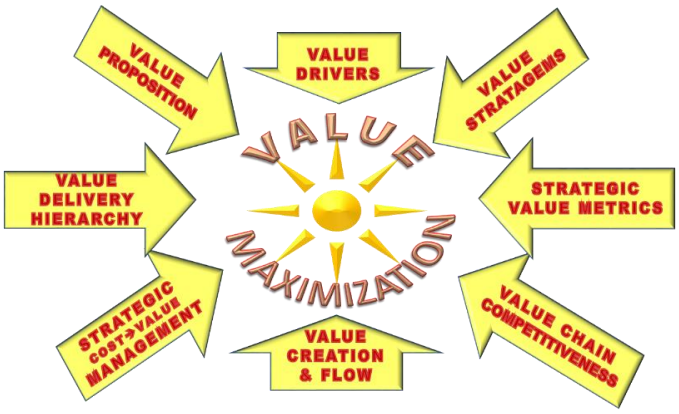
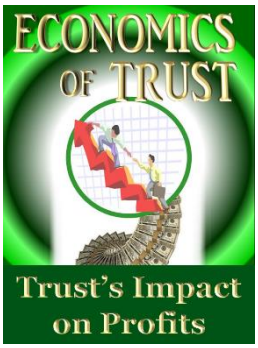


Figure 14: Value Maximization Core Elements

engineering team's core thinking – and mastered by senior management. It should have been part of any Master's Degree Engineering Program – so anyone who is just "good" at Value Max Thinking is better than everyone else.

The value can be achieved rapidly through the *Economics of Trust* which produces significant Increases in Productivity & Profitability from its leverage upon:



- Increases in Speed & Flow
- Increases in Innovation & Problem Solving
- Reduction in Non-Value Added Work (Lean)
- Reduction in Breakdowns @ Interfaces
- Reduction in Job Turnover & Disengagement
- Increases in Simplicity, Synchronicity & Synergy

Implementing Collaborative Excellence Learning

Putting the Six Core Frameworks of the *Collaborative Excellence Architecture* into organizations is not as simple as writing a book about it.

> Studies show that people only retain a small portion of what they read (and fewer people are reading anymore).
>
> This problem of learning is accentuated where a paradigm shift is involved, because it requires a shift in thinking, mindsets, attitudes, conceptions, and skills.

Three things need to be in place for a paradigm shift to occur successfully:

1. **Clear, Compelling "Architecture"** can be conceived, communicated, and operationalized that produces significant improvement/value over the old paradigm. (this has been covered extensively in the preceding pages)
2. **Effective Learning Methodology** is in place for the new paradigm to be *learned* by normal people with reasonable intelligence. This must be a simple *immersive learning* and *action-planning experience* that can be easily scaled/adapted to a broad set of applications.
3. **Critical Mass** of leaders and managers to learn the new system together (as a team) in order to communicate to others in the organization, implement successfully, and self-correct if the results are not up to par. Long-term dependence on outside consultants is not advisable – the capabilities must be imbedded internally to be sustainable.

Here we are going to focus on points 2 & 3: Effective Learning Methodology & Critical Mass.

Collaboration is the Eco-System of the Future
The Frameworks, Best Practices & Tools enable us to see how Architecture creates Reality. Architecture is where you see and solve the problem, Best Practices is how you implement the solution.

Effective Learning Methodology

There are essentially three different audiences for the Collaborative Systems Excellence Architecture:

1. **Colleges & Universities** where students without deep experience in the field are learning education at the Bachelors, Masters, or Doctorate levels.
    a. Learning Methodology: While learning in this context can come partially from books and lectures, because it is a paradigm shift, traditional academic learning must be interwoven with *Case Studies*, *Field Practicums*, and *Team Learning* such as Immersive Learning Experiences (see below and **Appendix 7: Immersive Learning Experience** for more detail).

    The primary focus on *learning*, not *teaching.*

    b. Ideal Engineering Educator: First, here's what we know DOESN'T work – educators with no field experience, educators who are highly logical and analytic, without counter-balancing creativity and social situational skills. (This is known as Left-Brain/Right Brain capability. Note: the author and all the contributors are classic Left/Right brainers.) Often the Learning experience is enhanced by teaming with a veteran, seasoned senior executive engineer with intuitive know-how in collaborative excellence.
    c. Recruiting Students: Just as with the Ideal Educators, the Ideal Student should be a classic liberal arts student with a major in engineering (left brained) with a minor in a completely different area (right brained). A diagnostic device, such as the Herrmann Brain Dominance Test will determine who is best suited for holistic thinking. (see Figure 13)

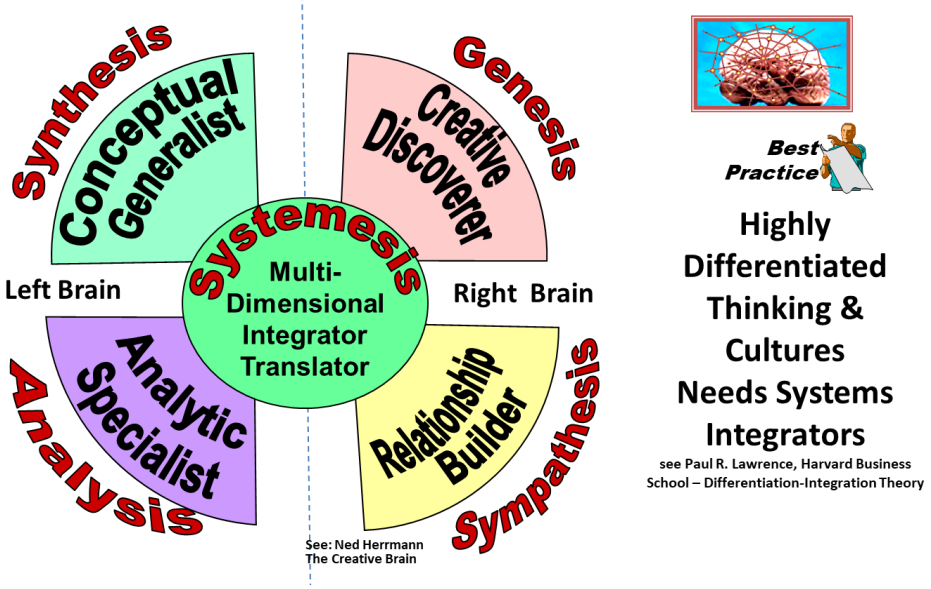


Figure 15: Holistic Left-Right Brain Configuration

d. Instructor must be considered either an honored peer, thought-leader, or trusted advisor. This requires an instructor who is both academically learned, *and* has extensive field experience enabling the instructor to respond with real-life solutions. Additionally, the participants will often challenge the instructor as a test to see how well a response might play in front of a CEO or other senior executive. Instructors whose experience is shallow or naïve will fail this test. Further, experienced instructors, when they hear a question, will have a sense if there is a deeper, underlying issue more profound than the question on the surface. For this reason, team teaching by an academic paired with a senior experienced engineer is valuable.

e. Learning methodologies for Executive Education have to consider that many of the participants come alone, accompanied by no other member of their organization. We've learned that, in these circumstances, it's highly advisable to:
    a. Avoid classroom style seating – roundtables are essential
    b. Cluster participants according to common interests to enable better team learning.
    c. Let participants determine how to apply what they learn.
    d. Adults learn best when they work in teams.

f. Learning Modules should be designed such that each Module follows a Four-Stage Capability Building sequence:

Learning Mythology

The greatest myth in training programs is the false belief that knowledge brings results. Studies show that simply attaining knowledge does not improve performance. Adults learn differently than youth — adults value learning when it can be applied to an immediate problem, opportunity, or objective, which gives it utility and impact…

When adults immediately APPLY what they learn, they retain 80% three weeks later.

When they DON'T APPLY, they've forgotten 80% three weeks later.

Workshops versus Seminars

There is often confusion about the difference between a "workshop," a "seminar," and a "program." Here's our perspective:

- **Workshop:** a "workshop" connects strategies and practices directly to tools and applications aimed at producing real results quickly. A good workshop is aimed directly at Capability Building to produce leaps in performance.
    - The best Workshops are Immersive Learning Experiences, designed to transform teams, enabling them to produce high performance results.
- **Seminars & Roundtable Discussions:** a "seminar" or "roundtable" is a discussion of ideas, concepts, or options.
    - Its purpose is to convey knowledge, exchange points of you, and give advice on how to be successful. But seminars and roundtables *do not aim at building capability for successful implementation*.
- **Program:** a "program" is more systematic – it aims at integrating strategy and implementation.
    - It consists of multiple elements, including briefings, planning, diagnostics, leadership & resource commitments, engagement, implementation roll-out, metrics, action workshops, feedback and learning.
    - We recognize that for Senior Engineers in the field, much of Collaborative Systems Excellence and Leadership training cannot be done solely as an academic exercise; it must be exercised in the heat of a real challenge – in the crucible of action and the tension of emotions.
    - Our programs focus on integrating frameworks & architectures with success factors, tools, coupled with a heavy dose of application. For this reason, for senior executives we do not rely heavily on case studies, but instead use the pressure cooker of real life situations, simulations, and interactive co-creation.
- **Critical Mass -- Team versus Individual Learning**: We emphasize the *importance of building capabilities within both individuals and teams.*
    - A team learning experience has a major advantage by generating a critical mass of people who "get it;" they:
        - Support each other when implementation hits a bump in the road.
        - Build Pilot Projects to demonstrate quick results
        - Convince Senior Leadership that Collaborative Excellence produces real-time value
        - Help prevent "post-partum implosion" by beginning to imbed Collaborative Excellence into the organizational culture.

2. **Corporate Learning**: The other pathway for Senior Engineer Learning is when a company determines that a critical mass of executives, emerging leaders, and managers will benefit enormously from learning new approaches to doing their jobs. In these situations, the company wants their staff to be able to apply learning to real problems and initiates, showing a concrete payback measured in short-term return on investment.

   In this case, Executive Education must get "down & dirty," focusing on *producing results, not just learning.* This means the Executive Education delivery mechanism has two alternatives:

   1. Conduct basic 2-day *Immersive Learning Experiences*, followed up with short advanced "deep dive" learning programs.
   2. Engage in a combination of *Learning* and *Consulting* to ensure the Learning is driven into the essence of the organization and applied with rigor and discipline to produce *measurable results*. A sample effective methodology is delivered in Five Steps: [44]

      Step One: Executive Briefing & Planning– No initiative of this importance can start without Senior Sponsorship and Leadership Team buy-in. They must be briefed on the content of the material, and have sufficient understanding to be able to act as sponsors and champions. Because the organizational language and thinking will shift, senior leaders must be able to conversant, skilled, and ready to lead the charge.

      The outcome of the Executive Briefing is to develop a plan for implementation, with emphasis on target sections within the organization where internal champions already exist and the initiative is most likely to succeed – producing "quick hits."

      Step Two: Diagnostic Health Check – Before launching a program, it's essential to do a health check assessment the organization to determine base-line issues, pinpoint critical areas needing special attention, customizing the approach, and being sure to retain key strengths upon which to build a program.

      Once the assessment is complete, it's vital to feed-back the data, first to senior management and then to those who took the survey to get their input/buy-in, then aim at engaging those affected by the change in developing an action-plan for corrective achievement.

[44] Note: Installing Collaborative Excellence Architecture can be initiated in small or large scale. Any implementation would benefit by understanding **Organizational Transformation**

Step Three: Immersive Learning Labs/Workshops which *both teach and practically apply* the Collaborative Excellence Architecture, addressing real day-to-day objectives, strategic initiatives, and imbedding capabilities in your organization.

Step Four: Establish Pilot Projects that produce quick results to reinforce the value of the Collaborative Excellence program. This provides measurable evidence and core learning for wider applications.

Step Five: Train Internal Capability Builders from the corps of internal trainers, on-boarding specialists, and HR/OD professionals to ensure the program is institutionalized well into for the future.

Immersive Learning -- Multiple Versions Available

The pivot-point for launching a Collaborative Excellence Initiative is the Immersive Learning Experience for essential leaders and managers, augmented by videos, written materials, podcasts, webinars, and other supplemental materials.

We know that people learn three times better when they are able to apply their learning to real-life circumstances, problems, and opportunities.

The issue of Critical Mass must not be overlooked. If Engineers truly embrace Collaborative Systems Excellence, they will be faced with the problem of "corporate immunal rejection response" -- re-immersion back into the host culture and being treated as a foreign body or irritant by those who have not crossed the chasm from traditional transactional or adversarial cultures into the elevated realms of collaboration.

For this reason we've designed a 2-day intensive Master Course (think of this as the "101" level) in six versions (see Figure 14):

- Senior Executives & Emerging Leaders
- Finance & Risk Managers
- Acquisition & Alliance Professionals
- Engineering & Science Professionals
- Supply Chain Professionals
- Human Resource Professionals

Figure 16: 80-20 Configuration for Specific Professional Applications

Download Generic 2-Day Collaborative Excellence Executive Development Brochure

80-20 Configuration

Each version is designed such that 80% of the core architectures are *common to all versions* – enabling different professions to communicate fluidly with each other.

For each version, 20% is custom tailored to the unique context of that profession, using examples each profession can relate to.

Because the Learning Program Design aims at immediate application, rather than use a preponderance of case studies, the participants will apply solutions to their own real-world issues – a real life case study.

We strongly urge leaders to bring teams to the sessions to ensure a critical mass they've of dedicated practitioners can introduce Collaborative Excellence as an orchestrated initiative in a company, team, or alliance.

Advanced "Deep-Dive" Workshops

While the 2-Day Master Course is designed as a robust Immersive Learning Experience, we recognize that many professionals will want significantly more advanced understanding and application. For this reason we have additional workshops (think of these as the "201" & "301" levels):

Value of the Immersive Learning Experience

It's essential to have a powerful value proposition for any target audience:

- We will be using the most impactful world-class adult learning methodologies.
- You will gain insights, frameworks, language, and tools in an intense 2 day session. However, your head will not be force-fed with too much information too fast (the "fire-hose" approach). You will have time to discuss in your teams, figure out the best application pathway, and work out difficulties and obstacles.
- We focus on building your capability to perform in the crucible of action.
- We encourage you to bring several members of your implementation teams to enhance your ability to have a higher impact via a stronger critical mass.

- The sessions are in "workshop" format, meaning you will be applying your learning to real life situation in real time. (Note: this is significantly different from a seminar format which focuses on discussion, but does not aim at building leadership & action capabilities.)

If people can't immediately apply something they've learned, three weeks later they will have forgotten 80% of what they learned.

However, if they can apply learning immediately, they remember 80% three weeks later.

That's how we measure value.

Diagnostics & Support:

- We can provide diagnostic surveys prior to your sessions to ascertain base-line profiles, then feedback this data to your leadership teams, and examine post-learning results to validate our value proposition.
- We can provide coaching support to you or your teams between the program sessions or after the program for follow-up support.
- Upgrade your internal training and change management teams with the new *Game Changer* strategy.

Certification

For Undergraduate and Grad School programs, certification is a given. University-based Executive Education programs are also certified for Adult Learning.

However, it is not necessarily true that a Professor who has taught at the Graduate School level will be skilled at the Executive Education level – mainly because the teaching methods are dramatically different and the expectations of the participants is much higher; "Praca-demics" generally fare much better because, in addition to having *knowledge,* they have *experience*, and *wisdom,* the combination of which is highly valued.

For Corporate Learning, an additional level of certification is available at the "201" level: achieving ISO 44001 Standards (see: ISO 44001 Collaborative Business Relationship Management.) It's worthy to note that ISO (International Standards Institute) is open to specialized derivatives of these standards. A standard could be designed for "Collaborative Engineering" – probably a joint effort with the National Academy of Engineering and a handful of Engineering Schools.

Few organizations (or people) ever produce more than 50% of their potential.

This is because most organizations are "complexified" with muddled leadership, misaligned functions, wasted time and energy, useless non-value added work, misconceptions about human behavior, conflict, turmoil, strife, and misguided understanding about how value is really created.

Utilizing Alumni

For University-based programs, Collaborative Systems Excellence for Engineering Professionals represents a superb opportunity to connect with alumni in two ways:

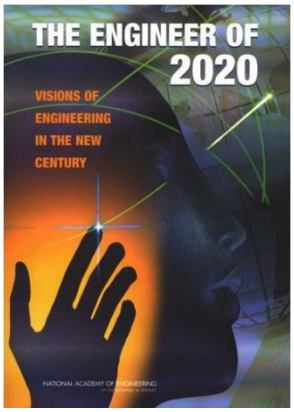
- Provide Adult Learning (either at the University or in major urban areas where there are large concentrations of alumni)
- Recruit Pracademics who are alumni who wish to teach later in their careers.

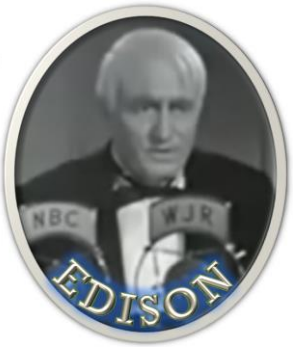
Note: this enables the university to utilize the alumni's wealth of wisdom in a meaningful way, rather than just use alumni as a mechanism for donations.

Capitalizing on STEM

Currently the bloom is on the rose for Engineering as part of the "future ready" high school initiative to focus on Science, Technology, Engineering, & Mathematics (STEM).

This is the ideal time for leading Engineering Schools to accept the National Academy of Engineering's 2020 challenge noted at the beginning of the White Paper, embracing Collaborative Excellence. Then lead the STEM movement by demonstrating that Engineering is not just about Science, Technology, and Mathematics, but also about Socio-Technical Systems – there's a human side that is holistic, systematic, and endearing to people.





Taking this path we also fulfill Edison's vision to put humankind's Dynamos of Technology and Humanity in balance and alignment.

Collaborative Excellence Systems Architecture aligns beliefs, ideas, evidence, and best practices to produce trustworthy interactions resulting in innovation and high performance results: competitive advantage and profitability.

Great Leaders are trusted because they conjoin and fuse knowledge with wisdom.

Today we focus too much on knowledge and have lost our connection with wisdom resulting in a fracture in the soul of human existence.

The Greeks – inventors of the Engineering Profession understood this sacred bond between knowledge and wisdom. Collaborative Systems Excellence rebuilds and reunifies what's been missing, lost, and upended for two thousand years. [45]

[45] See **How the Greeks created the World's First Age of Innovation** by Robert Porter Lynch & Ninon Prozonic

Conclusions

Why the Engineering Profession should be the Vanguard

Of all the professions, the *Engineering Profession is so well best poised to lead the Collaborative Systems Shift.*

Engineering is tasked to be on the cutting edge of things, to be the leaders of new thinking, to create solid, safe structures, and to be bold when needed.

Especially In times of war and emergency, engineering has worked collaboratively across boundaries to create, innovate, act with swiftness, rise to challenges.

Collaborative Systems Excellence is an idea whose time has come. The National Academy of Engineers has outlined the *vision, scope,* and *compelling rationale* to create a *bold new future* for engineering.

Now, the task is for University-based Engineering programs to act as *champions*. There is great leverage in the *first mover's advantage.* Leadership is about seizing the moment, taking the high ground, and setting the standards of excellence for others to follow.

This White Paper takes the National Academy's vision and maps a concrete, realistic, energizing pathway forward that many inside and outside the profession have been yearning.

The Fundamental Question is:

Who in the Engineering Profession has the vison, energy, will, and commitment to lead the Collaborative Systems Shift?

All the Great Problems in the World Today will be Solved on a Foundation of Collaborative Systems Excellence

Appendix 1 – Excerpts from Engineer of the Future

Executive Summary[46]

In the past, changes in the engineering profession and engineering education have followed changes in technology and society. Disciplines were added and curricula were created to meet the critical challenges in society and to provide the workforce required to integrate new developments into our economy. Today's landscape is little different; society continually changes and engineering must adapt to remain relevant. But we must ask if it serves the nation well to permit the engineering profession and engineering education to lag technology and society, especially as technological change occurs at a faster and faster pace. Rather, should the engineering profession anticipate needed advances and prepare for a future where it will provide more benefit to humankind? Likewise, should engineering education evolve to do the same?

Technology has shifted the societal framework by lengthening our life spans, enabling people to communicate in ways unimaginable in the past, and creating wealth and economic growth by bringing the virtues of innovation and enhanced functionality to the economy in ever-shorter product development cycles. Even more remarkable opportunities are fast approaching through new developments in nanotechnology, logistics, biotechnology, and high-performance computing. At the same time, with tightening global linkages, new challenges and opportunities are emerging as a consequence of rapidly improving technological capabilities in such nations as India and China and the threat of terrorism around the world.

This report is the result of an initiative of the National Academy of Engineering that attempts to prepare for the future of engineering by asking the question, "What will or should engineering be like in 2020?" Will it be a reflection of the engineering of today and its past growth patterns or will it be fundamentally different? Most importantly, can the engineering profession play a role in shaping its own future? Can a future be created where engineering has a broadly recognized image that celebrates the exciting roles that engineering and engineers play in addressing societal and technical challenges? How can engineers best be educated to be leaders, able to balance the gains afforded by new technologies with the vulnerabilities created by their byproducts without compromising the well-being of society and humanity? Will engineering be viewed as a foundation that prepares citizens for a broad range of creative career opportunities? Will engineering reflect and celebrate the diversity of all the citizens in our society? Whatever the answers to these questions, without doubt, difficult problems and opportunities lie ahead that will call for engineering solutions and the talents of a creative engineering mind-set.

Because precise predictions of the future are difficult at best, the committee approached its charge using the technique of scenario-based planning. The benefit of the scenario approach was that it eliminated the need to develop a consensus view of a single future and opened thinking to include multiple possibilities. This technique has proven its worth for private and

[46] "Executive Summary." National Academy of Engineering. 2004. The Engineer of 2020: Visions of Engineering in the New Century. Washington, DC: National Academies Press

public entities alike in helping devise flexible strategies that can adapt to changing conditions. Specific scenarios considered in this project were (1) The Next Scientific Revolution, (2) The Biotechnology Revolution in a Societal Context, (3) The Natural World Interrupts the Technology Cycle, and (4) Global Conflict or Globalization? The story form of each scenario is presented in Appendix A. These sometimes colorful versions only partially capture the vigorous discussions and debates that took place, but they serve to illustrate and document the thinking involved in the process. Each in its own way informed the deliberations about possibilities that can shape the role that engineering will play in the future.

The "next scientific revolution" scenario offers an optimistic future where change is principally driven by developments in technology. It is assumed that the future will follow a predictable path where technologies that are on the horizon today are developed to a state where they can be used in commercial applications and their role is optimized to the benefit of society. As in the past, engineers will exploit new science to develop technologies that benefit humankind, and in others they will create new technologies de novo that demand new science to fully understand them. The importance of technology continues to grow in society as new developments are commercialized and implemented.

The "biotechnology revolution" scenario speaks to a specific area of science and engineering that holds great potential but considers a perspective where political and societal implications could intervene in its use. In this version of the future, issues that impact technological change beyond the scope of engineering become significant, as seen in the current debate over the use of transgenic foods. While the role of engineering is still of prime importance, the impact of societal attitudes and politics reminds us that the ultimate use of a new technology and the pace of its adoption are not always a simple matter.

The "natural world" scenario recognizes that events originating beyond man's control, such as natural disasters, can still be a determinate in the future. While in this case the role of future engineers and new technologies will be important to speeding a recovery from a disastrous event, it also can help in improving our ability to predict risk and adapt systems to prepare for the possibilities to minimize impact. For example, there is the likely possibility that computational power will improve such that accurate long-range weather predictions will be possible for relatively small geographic areas. This will allow defensive designs to be developed and customized for local conditions.

The final scenario examines the influence of global changes, as these can impact the future through conflict or, more broadly, through globalization. Engineering is particularly sensitive to such issues because it speaks through an international language of mathematics, science, and technology. Today's environment, with issues related to terrorism and job outsourcing, illustrates why this scenario is useful to consider in planning for the future.

The body of the report begins in Chapter 1 with a review designed to set the stage for likely future technological changes and challenges that will impact the world and the engineering profession. Dramatic expansion of knowledge is expected that will offer exciting opportunities for engineering to develop new technologies to address the problems faced by society. The impact will be seen in medical breakthroughs, new energy devices, materials with characteristics not available today, remarkable light sources, and next-generation computers and tele-communications developments. Engineering has contributed enormously to the quality of life we enjoy today, and the opportunities for the future are likely to be ever greater. The challenges include, among others, deteriorating infrastructure, environmental issues, and providing housing, water, and health care for a rapidly growing population.

Chapter 2 addresses the societal, geopolitical, and professional contexts within which engineering and its new technologies will exist. The coming era will be characterized by rapid population growth, which will contain internal dynamics that affect the types of problems engineers will face as well as world stability. Growth will be concentrated in less developed countries where a "youth bulge" will occur, while in advanced countries the population will age. Issues related to quality of life in some countries will be contrasted with more basic problems like access to water and housing in others. Within countries the demographics will change, particularly in the United States, where the numbers of minorities will grow rapidly while those of the traditional majority will decline in a relative sense. This has major implications for the future of engineering, a profession where minorities and women remain underrepresented.

While certain basics of engineering will not change, the global economy and the way engineers will work will reflect an ongoing evolution that began to gain momentum a decade ago. The economy in which we will work will be strongly influenced by the global marketplace for engineering services, a growing need for interdisciplinary and system-based approaches, demands for customerization, and an increasingly diverse talent pool. The steady integration of technology in our infrastructure and lives calls for more involvement by engineers in the setting of public policy and in participation in the civic arena. The external forces in society, the economy, and the professional environment pose imperatives for change that may exceed those to come from the changes expected in the technology engineers will have at their disposal in 2020. Challenges will abound, but opportunities also will exist if engineering takes the initiative to prepare for the future.

Chapter 3 builds on the context of the earlier chapters with a statement of aspirations for engineering in 2020. Its purpose is to identify those basic themes we can agree are worth striving for if engineering is to be a positive force in the future. The range of possibilities as contrasted with the realities makes this no easy task. As illustrated by the scenarios, they can be constrained by outside forces as well as by our own inaction. The aspirations chosen set the bar high but are believed to be attainable if a course of action is set to reach them. At their core they call for us to educate engineers who are broadly educated, who see themselves as global citizens, who can be leaders in business and public service, and who are ethically grounded.

Chapter 4 takes the aspirations a step further by setting forth the attributes needed for the graduates of 2020. These include such traits as strong analytical skills, creativity, ingenuity, professionalism, and leadership.

This study suggests that if the engineering profession is to take the initiative in defining its own future, it must (1) agree on an exciting vision for its future; (2) transform engineering education to help achieve the vision; (3) build a clear image of the new roles for engineers, including as broad-based technology leaders, in the mind of the public and prospective students who can replenish and improve the talent base of an aging engineering workforce; (4) accommodate innovative developments from non-engineering fields; and (5) find ways to focus the energies of the different disciplines of engineering toward common goals.

If the United States is to maintain its economic leadership and be able to sustain its share of high-technology jobs, it must prepare for a new wave of change. While there is no consensus at this stage, it is agreed that innovation is the key and engineering is essential to this task; but engineering will only contribute to success if it is able to continue to adapt to new trends and educate the next generation of students so as to arm them with the tools needed for the world as it will be, not as it is today.

Professional Context for Engineers in the Future[47]

The Systems Perspective

In the past, steady increases in knowledge have spawned new microdisciplines within engineering (e.g., microelectronics, photonics, biomechanics). However, contemporary challenges—from biomedical devices to complex manufacturing designs to large systems of networked devices—increasingly require a **systems** perspective. Systems engineering is based on the principle that structured methodologies can be used to integrate components and technologies. The systems perspective is one that looks to achieve synergy and harmony among diverse components of a larger theme. Hence, there is a need for greater breadth so that broader requirements can be addressed. Many believe this necessitates new ways of **doing** engineering.

Working in Teams

Because of the increasing complexity and scale of systems-based engineering problems, there is a growing need to pursue collaborations with multidisciplinary teams of experts across multiple fields. Essential attributes for these teams include excellence in communication (with technical and public audiences), an ability to communicate using technology, and an understanding of the complexities associated with a global market and social context. Flexibility, receptiveness to change, and mutual respect are essential as well. For example, it already is found that engineers may come together in teams based on individual areas of expertise and disperse once a challenge has been addressed, only to regroup again differently to respond to a new challenge.

Only recently have strategies for ensuring effectiveness in interdisciplinary engineering teams been discussed among engineering educators (Fruchter, 2002; Smith, 2003). Much of our existing knowledge about teams and how they can best be assembled and managed has been developed through other disciplines (e.g., business, psychology, other social sciences). However, a number of researchers have recognized a need to tailor and adapt this existing knowledge to support engineering teams and organizations (Bordogna, 1997; Shuman et al., 2002; Smerdon, 2003). For engineering this topic, including the challenge of working effectively with multicultural teams, will continue to grow in importance as systems engineering becomes more pervasive.

Complexity

Engineers must know how and when to incorporate social elements into a comprehensive systems analysis of their work. This changing landscape for engineering can be illustrated in a complexity model developed by the committee that indicates that it is not just the nature of a narrow technical challenge but the legal, market, political, etc., landscape and constraints

[47] "Societal, Global, and Professional Contexts of Engineering." National Academy of Engineering. 2004. **The Engineer of 2020: Visions of Engineering in the New Century**. Washington, DC: The National Academies Press

that will characterize the way the challenge is addressed. The model helps categorize how and why engineers approach problems and illustrates the types of challenges engineering will address. A two-dimensional matrix considering "old versus new" methodologies used to tackle "old versus new" challenges defines four different approaches (see Figure 5). The matrix also illustrates the way these problem-solving approaches are influenced by cost sensitivity and confidence in the solution.

Appendix 2 – Notes & Points of View on Systems Thinking

System Elements

A system is comprised of three main elements:

- The ***component parts*** of the system
- The ***interrelationships*** among the parts
- The ***integrity*** of the entire system when the system is operating

The system is functioning at full effectiveness when all elements/parts are in **alignment, integrated & balanced,** which manifests as ***synergy***

  - ***Synergy*** is more likely to ***manifest in collaborative systems***

Basic Ways to Approach a System

- Systematically – the Whole as a function of its components
- Functionally – the Performance Results
- Inputs & Outputs – the Efficiency of the Operations,
- Value Generation – how the system Transforms inputs into outputs
- Components – the Parts & Mechanics
- Interconnects – the Differential Interfaces
- Communications -- the means of directions & Feedback
- Defense – how the system defends against predators, disease, etc.
- Reproduction – the method of Sustainability from generation to generation
- Stress – how the system responds to pressure, pain, torsion, etc.
- Evolution – how the system morphs over time and stress

Basic Dimensions to Analyze a System

- Macro Level (Big Picture)
- Micro Level (Where the problem is evident)
- Root – Cause Level (Where the problem is starting)
- Functional Level (Where functions central)
- Interface Level (where functions meet)
- Component Level (Examining the "parts")
- Systems Redesign Level (where the system needs to be completely reengineered to perform tasks more ably)

Appendix 4 – Comparing Tri-Archetypical Thinking

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

	Adversarial	Transactional	Collaborative
Key Beliefs	Business is a "Psychological War Game;" Winning comes from Power	Trading, Bargaining, & Differential Views on Value Produces Economic Exchange	Extreme Value is Generated when 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 Negoti-ations, 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; Every-thing 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. Solve problems fast and fairly.
View about Risk Man-agement & 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 elimin-ation of Non-Value Added Work. Risk Management, insurance, & risk shedding will limit losses	Synergy is a result of high levels of trust, teamwork, & alignment of goals/values. Use trust archi-tecture to reduce risk. Emerging risks & opportunities require adaption & innovation
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, and Innovation. Little chance of Litigation.
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. Fair allocation of Risks/Rewards
Competitive Advantage	Gained from Size & Money	Gained from Proprietary Information & Bargaining	Gained from Value Co-Creation, Sharing, Speed & Innovation
Information Sharing	Horde Information – It is Power	Contractor responsible for interpretation of information	Share Information to create more new ideas. Take action proactively.
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

Muddled Thinking

The Tri-Archetypical Basic Forms of Thinking have a high impact on Interrelationships

These three modes of thinking are manifested in Culture, Leadership, Economics, and Operational Functioning.

These three forms are embedded into human DNA – Culture, directed by Leadership, brings out one of the three forms, or a muddled agglomeration of all three (which is the typical manifestation the larger the organization gets.)

What a Muddled Culture Looks Like

Cobbling Models Together without Systems Design Architecture

A **MODEL** does not have to be *INTEGRATED with anything – it stands alone. The resulting separation creates FRAGMENTATION.*

One great difficulty in implementing Collaborative Systems Excellence is the massive "installed base" of muddled thinking, fragmented models, and fractured component expertise thrown at decision-makers every day by business schools and subject matter experts. Typically they smatter the brain's pattern recognition system with ideas that have

not been integrated into a system, or are actually contrary to collaborative excellence. When ambiguity and uncertainty lies ahead, leaders all-too-often turn to their “palace guard” (i.e. lawyers and accountants) who, in the name of safety and protection, impose strictures and constraints that inadvertently trigger the corporate auto-immune system against itself.

When fractured subject matter experts create their own proprietary models, they actually increase the chasms between concepts and best practices, producing monstrosities of design that look like Figure 15.

The Mating of a Turkey, Frog, Worm, Shark, & Butterfly doth not make an Eagle.

Figure 17: Result of Cobbling a Muddled Models together created by subject matter experts

Appendix 3 – The Nature of Architecture

Levels:

There are essentially four "levels" to examine any system, from the high level to the down-to-earth:

Architecture is a series of design frameworks, principles, methodologies, and interconnectivities uniting a system's components into a functional, synergistic whole.

1. Architecture: A Systems Design that provides a conceptual pattern or framework, alignments of subsystems, balance of forces & needs, integration of functions, and capacity for reconfiguration as needs change.
2. Model: a part of a System that gives working insights into how something might function.
3. Process: A series or string of practices that will produce an intended result. It might be devoid of context – Why Lean Management normally fails
4. Practice: An action that as a high likelihood of producing a positive result, especially when used within the right/complementary architectures, models, and processes.

What is Systems Design Architecture?

- Holistic/Comprehensive addressing complex interconnects.
    - Requires Alignment, Balance, and Integration of the components
      Requires people and methods to Align, Balance, and Integrate
- Architecture means a design framework and methodology that *Connects Disparate Functions into a Synergistic Whole.* The energies and internal forces of the component parts must function better in a system than independently.
    - Synergy is difficult to manifest in adversarial and transactional systems, but more likely to flourish in collaborative systems -- that's why culture is so important.
    - The energies and internal forces of the component parts must function better in a system than independently.
    - Good design architecture is replicable, diagnosable, measurable, remediable, and alignable, replicable, adaptable, scaleable, duplicatable, leverageable, and integrated
- Good Architecture embraces:
    - Functional Performance
    - Inter-functional Integrations, including human interfaces
    - Governance (control) & Structure
    - Stress & Load Factors
    - Risk Management
    - Design & Beauty

- Specifications & Requirements

Great architecture should be:

- simple at the surface, and
  then progressively inwardly intricate.
- logically rational,
- ethically solid,
- emotionally satisfying,
- replicable and scaleable,
- contains key factors and preconditions for success
- diagnoseable when something is awry,
- predictive and prescriptive,
- standards of excellence with clear breakdown & stress criteria
- can be integrated with other similar architectures
- lowers risk and increases returns/rewards,
- definitively distinguishable and different
- actionable with clear processes & practices
- produce better results than lesser alternatives,
- open for improvement , dynamic adaptation, and innovation over time.

Collaborative Architecture enables a team to design, integrate, and maximize synergy, making things fluid and seamless.

- Enables large numbers of people to shift from *Tactical, Transactional, Hierarchical* thinking to *Collaborative, Trust-based thinking and behaviors*.

Why is a New Order of Proficiency Needed?

- Value Networks are emerging in the Eco-System as the natural evolution of needing solutions to complexity required beyond bilateral (1+1) alliances
- Value Networks embrace a ***quantum jump in complexity*** with multiple partners and complex integrations to adapt to change, engage in massive leaps in innovation and create sustainable improvements in competitive advantage.
- This, in turn, demands an *exponential increase* in Collaboration to succeed.
  - Requiring Proficiency in Collaborative Systems Excellence
- The nature of Complexity requires far more than the Best Practices that underpinned prior versions of alliances (Generations 1.0-3.0)
- Being successful at Collaborative Systems embraces, but requires more than Alliance Best Practices and major changes in understanding risk. While Alliances can be *managed* with Best Practices, Value Networks must be *led* with *Collaborative Systems Architectures*.

Has this been field tested?

- The EcoSystem Architecture is actually not that new.
  - Deployed at Chrysler from 1992-98 with massive success – it was called the Collaborative Enterprise.
  - Supply Systems at Toyota and Honda have used it for years with massive competitive advantage
  - Mayo Clinic has used it for over 100 years with 25% better results than Transactional Health Care
  - It's been tested in High Tech & Pharma internationally.
  - Used to rebuild the Santa Monica Expressway

Appendix 4 -- Standards of Collaborative Systems Architecture

TWELVE STANDARDS for Assessing COLLABORATIVE SYSTEMS ARCHITECTURE

During our assessment of Best Processes and Best Practices, we apply stringent standards to ensure the quality of the outcome.

1) **Applicable:** *Is there a clear "flow" of the practices in an orderly or rational sequence? Does the principle or practice have applicability to nearly all situations, regardless of industry or culture?*
2) **Actionable:** *Will the principle truly work in practice, or is it just nice theory? Are the Actions clear, concise, and linked to the practice, principle, or process?*
3) **Understandable:** *Can this principle or process be simply communicated to those involved?*
4) **Verifiable:** *Can we clearly observe the changes when the principle or practice is put into place?*
5) **Measurable:** *Is there a method of measuring this principle's/process' effectiveness in action?*
6) **Controllable:** *Will the principle enable more effective control of direction, intensity, speed, etc of the collaboration?*
7) **Diagnosable:** *Is it clear what "not to do?" When there is a problem, can we see the problem clearly, do we have a way to recognize the misapplication of the principle/process?*
8) **Prescribable:** *If an element is missing, can the principle/process be injected into the system to cause a cure?*
9) **Replicable:** *Can we recreate a positive result, time and again?*
10) **Trainable:** *Can operational managers successfully acquire the skills and knowledge required for implementation?*
11) **Valuable:** *Is the principle/process really essential, or merely a superfluous nicety?*
12) **Predictable:** *Can we foresee, in advance, the positive or negative results? Are there 'preconditions' for success needed in advance of a program launch?"*

Appendix 5 – Complexity & Connectivity

To understand the non-linear phenomenon, see (see Figures Figure 17,Figure 18, &Figure 19)

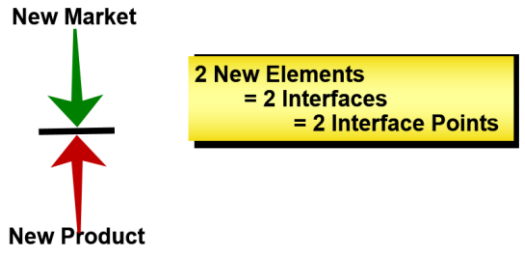


Figure 19: Example of Single Interface with 2 New Elements coming together

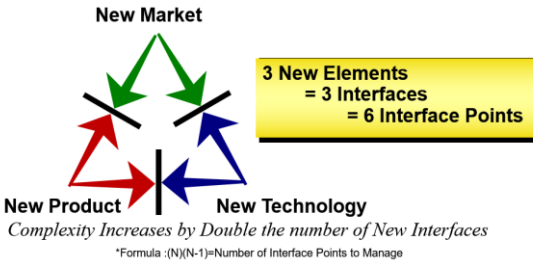


Figure 18: Example of Triple Interface by adding a single new element

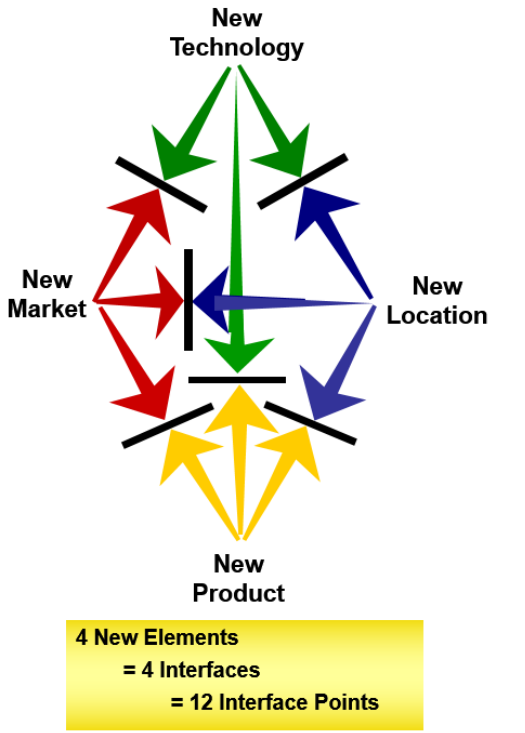


Figure 20: Example of Four Elements with 12 Interface Points to Manage

Think of a sports analogy – the knee is an interface between to major bones; it's the place were breakdowns are the most common. Managing interfaces is critical to the Networked Enterprise, especially because there are so many of them. Every time another interface is added, the number of interface points increases dramatically, increasing the chances of a breakdown if the dynamics of the interface are poorly managed.

This can happen when there are personality clashes across the interface, or intensely different cultures, incompatible technologies, divergent strategies, onerous contracts, mismatched accounting/reporting systems, or even when a person at the interface is replaced by someone unfamiliar or unqualified. These are common problems in any interconnected organizational system.

As illustrated in Figure 18, with four elements (such as four different companies in the Network) there are 12 different Interface points to integrate, manage, and synchronize. Each one presents a point of a potential breakdown, which can trigger more breakdowns. This is why major projects or "Big Bang" rollouts are so difficult to produce flawlessly, especially if the players have never worked together before.

Further, the condition of the Interface is critical to its performance. Interwoven into each of these interfaces lies a set of different

belief systems and supporting methods that either align the networks or, the worst case, cause fragmentation and misalignment.

The three fundamentally different modes of interface interaction produce very different results:

- *Collaborative* interfaces are interactive, neural, trustworthy, and foster innovation.
- *Transactional* interfaces[48] are serial, useful for exchange, and require quid-pro-quo
- *Adversarial* interfaces are dysfunctional, distrustful, divisive, and destroy value for at least one entity.

Figure 21: Modes of Interface Interaction

Each of these three interface modes (Figure 19) has a massive impact on the functioning of a complex network on factors such as:

1. **Speed of Delivery**
2. **Coordination of Effort**
3. **Human Energy/Enthusiasm**
4. **Alignment of Goals**
5. **Collaborative Innovation**
6. **Litigation & Adjudication**
7. **Integration & Planning**
8. **Redundancy & Duplication**
9. **Productivity & Learning**
10. **Joint Problem Solving**
11. **Teamwork & Synchronicity**
12. **Proactive Initiation or Reactive Repetition**

Law of Compounding Interfaces/Risks

- ***The Greater the Multitude of Interfaces,***
- ***The Greater the Levels of Uncertainties & Complexities,***
- ***The Greater the Risks of Multiple Failures & Non-Value Added Work***
- ***Most of the Breakdowns will occur at Non-Collaborative (adversarial & transactional) Interfaces.***

A case in point: our team conducted a detailed study of over 90 major construction projects to determine the impact on of collaborative cultures on very complex "mega projects"--typically seven years long and seven billion in expenses. (see Figure 20: Example of Complex Interconnected Mega Project)

The Return on Investment (ROI) requirements demand on time/on budget project delivery, because the "all-in costs" (expenses plus revenue lost) for an overrun are about $1 million/hour (yes, you read that right!)

[48] Transactional interfaces are still valuable in situations that don't require innovation, problem-solving, rapid change, synergy, and alignment of complex organizational interaction.

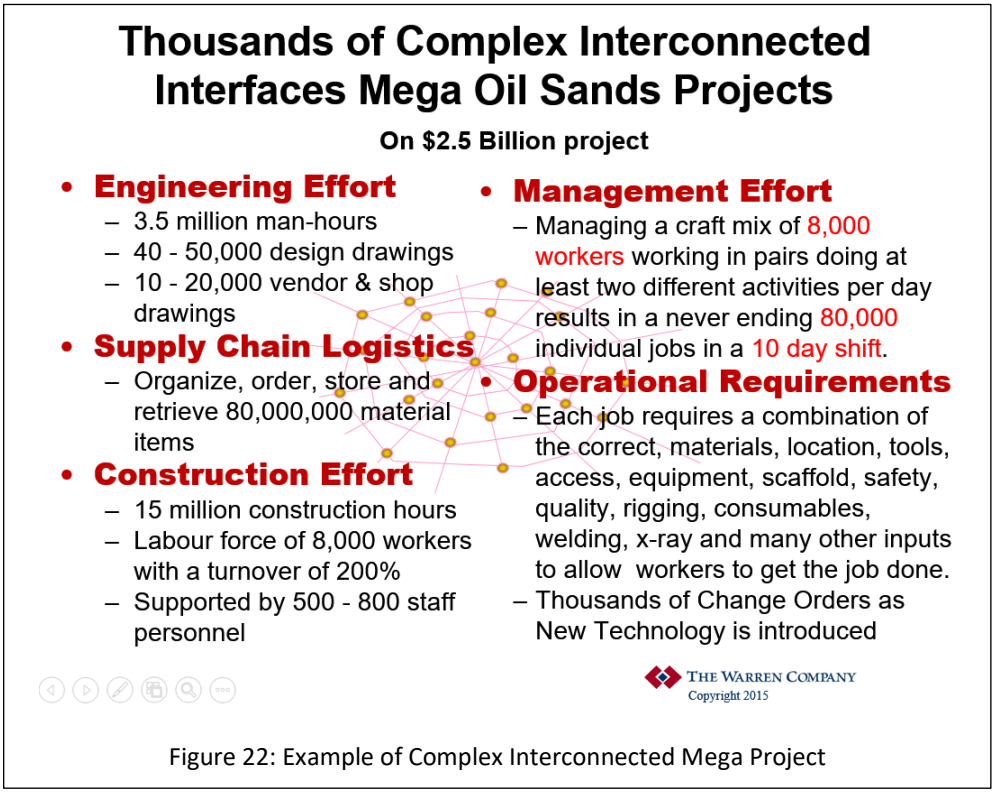


Figure 22: Example of Complex Interconnected Mega Project

Companies that were truly committed to a "partnering" relationship had a profound competitive advantage far exceeding 25%.

Commitment to Integrity & Fair Play

Gaining competitive advantage through collaborative relationships must start with senior leadership making a powerful commitment to building trust. One of the Mega Project leaders, Steve Bass of Devon Energy, stated his perspective on collaboration:

> *Our philosophy is a "value delivery model" – it looks at total value with suppliers working together as a team, not just low cost. Productive supplier relationships are essential for value delivery to work.*
>
> *Our Corporate Values are central to our supply chain; this means having integrity, being open, forthright and honest with our suppliers, and being committed to our mission and purpose – to have passion in improving our business and building trust with our suppliers.*

Appendix 6 – How Culture Determines Human Behavior

General Motors & the Union from Hell

After twenty frustrating years, in 1982, General Motors threw in the towel on its plant in Fremont, California. After GM, Ford, Chrysler lost $5.5 billion to overseas competitors in 1980-81, a new sense of reality hit senior executives. The Japanese, led by Toyota and Honda, were making better cars at lower prices. GM was convinced that the plant that loomed like a big battleship of three million square feet had become simply a battleground for labor and management to tussle and squabble daily.

GM saw the union as the problem, 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 that often 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. Distrust ran so high that the labor contract was crammed with over 400 pages of legal doublespeak and 5000 union grievances were backlogged. Thousands of Fremont workers received pink slips.

Toyota approached GM in 1984 with an offer to establish a Joint Venture in the United States (New United Motor Manufacturing Inc. – NUMMI) to reopen and manage the Freemont 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 this as an opportunity to learn the Toyota Lean Management System and accepted the offer.

Toyota hired back 85% of the Fremont hourly union workforce, giving them a strong voice in plant operations. A no layoff policy was instituted. Toyota spent $3 million to send 450 new group and team leaders to Toyota City for training in Toyota's production system.

Collaborative innovation was the focal point, as employees began participating in decisions regarding their work. Team members were trained in joint problem solving and quality practices to become experts in their respective operations. Employee roles expanded, the additional responsibility was for continuous improvement. Team members quickly implemented ideas for improvement, with successful solutions becoming standardized. All employees were empowered to stop the line at any time to fix a problem by pulling a cord running around the entire facility. Cooperation and confidence replaced coercion and conflict.

By the time the facility was fully operational, quality defects dropped to only one per vehicle. Cars were assembled in just half the time. Absenteeism dropped to 3%. Worker satisfaction and engagement soared. Operational innovation was on the rise, with over 90%

of employees participating in the innovation program with nearly 10,000 ideas implemented. These were the same people, the same union, and the same equipment. But the outcome was radically different. All in under two years."[49]

After two years in operation, the once antagonistic NUMMI workers had built more than 200,000 cars and were winning national recognition. The U.S. 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.

However, even though the GM managers trained at NUMMI learned Toyota's Management 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 collaborative culture, which GM management was unable to replicate because its management culture was unsupportive.[50]

The NUMMI example shows how culture is the Number One determinant of Human Behavior, and
Collaborative Leadership is the primary generator of culture. Great teamwork and collaborative innovation is based on human energy flowing in a single, unified, aligned, and integrated direction. This is the leader's most important task --- building trust, generating innovation, and achieving high performance.

[49] May, Matthew; Elegant Solution , Toyota's Formula for Mastering Innovation; Free Press, 2007, p 61-65 16 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 occupy the facility.

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Appendix 7: Immersive Learning Experience

Because of the "installed base" of legacy thinking and muddled modeling imbedded in the minds of so many leaders, an intense re-framing learning journey is essential. A "smattering of this and a tweak of that" is simply unproductive.

Learning Collaborative Excellence requires, at least for Leadership Teams, an Immersive Learning Experience. The re-learning journey has three fundamental components: the "Three A's" (see Figure 7)

1. *Awareness* explains WHY something is so important
2. *Architecture* provides a logical framework of WHAT the system looks like
3. *Action* tells us HOW to produce great results.

This is the way the mind learns.

Each and every module in the Workshop Program is designed with this Triple A Learning Loop

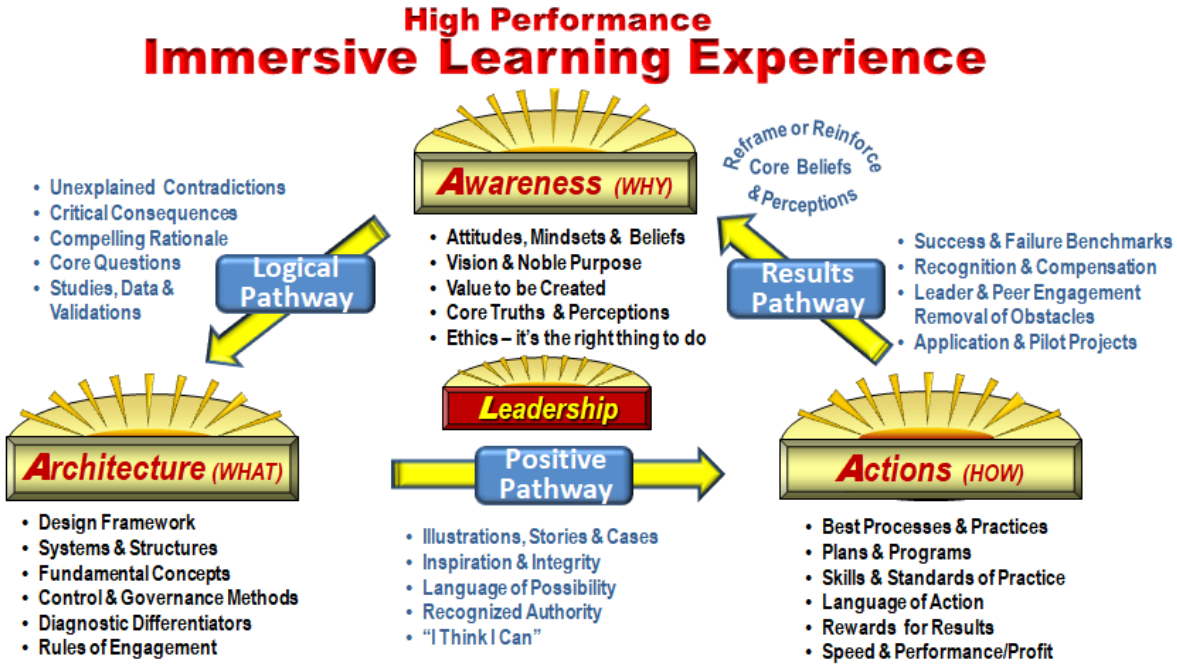

Figure 23: Triple A Immersive Learning Experience

What's Unique from Other Programs?

What's makes this program different from all the others I've attended?

First, most likely all the programs you've attended in the past were fragmented – you received advice and models from one authority that did not integrate their model with another authority. Thus you had to create a patchwork of frameworks, methods, and mindsets that may not really have created synergistic impact with the other models.

> We have ensured that our models and frameworks all fit together seamlessly, so that one framework elegantly dovetails into the next.

We believe this to be the first fully integrated collaborative systems excellence program ever delivered.

Second, all too many management and business schools amalgamate a pastiche of strategies and methods, some of which are *adversarial*, some *transactional*, and others *collaborative*.

> We have fastidiously ensured that all our approaches capitalize on creating a collaborative system – all the way from the neuro-chemistry of the brain to large-scale organizational transformation.

Third, our workshops integrates scientific studies with the wisdom of the ages, along with best practices, tested operational strategies and universal fundamentals of human behavior a holistic, integrated, easy-to-use architecture that will culminate in a revelation that will show you:

- What really causes humans to act the way they do
- The best leadership methods that will produce highest performance
- What causes people to distrust, fight, and destroy each other
- How trust is actually hard-wired into the brain's DNA and how to access it quickly
- How to build a world of trust and avoid the traps of guile and manipulation
- How to align teams on a common goal
- How to create synergy and unleash innovation

How to spot the untrustworthy and limit any damage they might do.

Because our approach begins at the universal level of human behavioral trust-building, it helps transcend and transform cultural differences.

> What you learn can be (and has been) used in a wide variety of cultures across the globe.

Joint initiative between

International Collaborative Leadership Institute

WARREN COMPANY™

The Engineering Profession is positioned to be one of the "lead arrows" aiming at a bold new future by harnessing the Power of Collaborative Excellence.

It has a large, futuristic vision, a broad scope, and has a lot to gain by taking a Leadership Position in the Collaborative Shift.

But does the Engineering Profession have what it takes to lead?
-- the fortitude, the commitment and the willingness to break from the

past?

For more information:

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