



The problem of collaboration: Knot theory, self interest & situational judgment

By Ken Bishop

*You got to know when to hold 'em, know when to fold 'em.
Know when to walk away, and know when to run.
You never count your money, when you're sittin' at the table.
There'll be time enough for countin', when the dealin's done.*

Lyrics from The Gambler, Don Schlitz



It is well known that a jostled string tends to become knotted; yet the factors governing the “spontaneous” formation of various knots are unclear. We performed experiments in which a string was tumbled inside a box and found that complex knots often form within seconds.

Dorian M. Raymer and Douglas E. Smith, *Spontaneous Knotting of an Agitated String*, 2007, <http://www.pnas.org/content/104/42/16432.abstract>

That is knot theory. Wherein examined is the tangling of strings induced by tumbling motion. Sounds like nice work, if you can get it (not). However, there is a useful analogy for us in the construction process. Strings are like all of those distinct forces at work in construction, they entangle in different ways for each project depending upon the specific circumstances of that project. Projects get knotted up and schedule pressure is the catalyst, the tumbler.

The snarl often seems impossible to understand, never mind unravel and manage – the classic Gordian knot maybe. However, just as Alexander the Great's solution to the Gordian knot was simple (the sword) so too is the answer to unraveling knots created by schedule pressure in our projects.



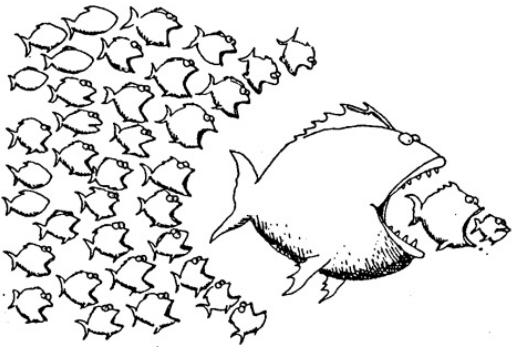
Collaboration unknots tangled project environments. That is why most folks want it. It navigates everyone through the binds created by process quagmires and competing interests - knots. Life is made easier. But collaboration is a craft. It requires hard work, practice and dexterity to master.

The construction environment is a complex organism of interrelated people and processes. Each project has a short life span, so it is temporary in nature; we don't have years to optimize our production line and hone relationships. The cast of characters is large and motivations vary. Generally speaking however, everyone wants a successful project because a successful project usually gets everyone what they need. Self interest is in play for every project constituent, individual and company alike. Let's explore some fundamentals of collaboration under the project entanglements caused by schedule pressure.

The mechanics of collaboration

The fact is most of these guys out here have no clue why they do what they do. From signing a transmittal to signing an agreement people just make shit up, pretending to know about the law and business, and trying to sound smart. But, they get uncomfortable because shedding sunlight on an issue requires a common goal. A common goal makes it much harder to bullshit your way into creating a perception of adding value. Of course the common goal for those enlightened few is to finish the building—share information and move forward.

Craig Malaer

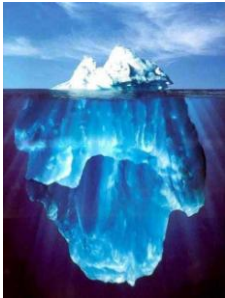


One current formula for collaboration invokes Henry Ford to unravel the knot of *how* to collaborate. It promotes the refocus of projects as production chains, like assembly lines. It seeks to mitigate variability in every aspect of the process and closely manage the remaining variability, reducing the design and construction process to the most efficient production *algorithm*. While another recent vogue collaboration system theorizes a path wherein designer originality is preserved by leading an effort of consensus driven collaboration early on in the design process that includes the builder. Technical and costing expertise of the builder is a tool exploited as an essential part of the collaboration in order to validate the consensus. It seeks to prosecute an early intense trial and error *heuristic* investigation, a method by which the best possible choice is made only after a list of promising choices is generated and tested. Process tension may be created between the two styles when design idea choices introduce variability into the production algorithm. Heuristic decision making quickly becomes at odds with the assembly line algorithm that intrinsically seeks to limit variability in favor of hyper-efficiency.

Can good behavior be legislated through contractual language? The short answer is no. If a contract could guarantee collaboration then why hasn't it been invented in all of the thousands of years people have been doing business? Why are we still searching for it in the design and construction industry today? Contracts are a deterrent to bad behavior more than they are a guarantor of good behavior. However, overreliance on written contracts to ensure that project constituents cooperate with each other daily is a fool's errand. Let's give it a name. Let's call it contractualism; the mistaken or misguided view that ordering collaboration from on high through contractual hegemony actually produces the intended results - real collaboration. Real collaboration is more communal and tribal than it is dictatorial, less of a science and more of a craft. Like all craft, it has to be cultivated through practice to become expert.



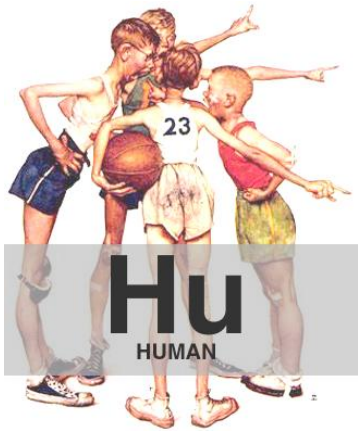
Why do we think collaboration is a top down mandate rather than a bottom up reality? People at the coalface volunteer to collaborate (or not) *regardless* of contractual obligation. They do it, or do it not, for either self interest or altruism, two mindsets that bracket many shades of gray in human behavior. If your job is made easier later by taking it in the shorts on the present construction problem, then self interest usually wins out. Accepting a nasty looking roof overflow drain pipe poking awkwardly out of a precast panel in some innocuous location on the building now, will buy you some extra consideration from the plumber for concealing the same problem in a very prominent location later. Otherwise put, helping me out of jamb right now buys you the promise of being helped out of a future jam. That is peer-to-peer social contracting in a nutshell – the give and take, the quid pro quo that builds reliability and trust between project constituents. It is earned through deeds. Make no mistake; over the long haul of a project's lifespan, trust is not given freely, it is *always* earned.



The real **mechanics of collaboration reside deep underneath contracts in the details of *process***, where the devil is found. Process efficiency is captured (or lost) at this level. People acting as implementers, peer to peer, enable process reliability through social contracts among project constituents and they have been doing this successfully, for a very long time. Implementers regularly chafe when benchwarmers mandate collaboration and dictate its terms as if they knew firsthand what it means to collaborate under schedule pressure – really collaborate. Implementers prevail regardless of aforementioned attempts to legislate good behavior through contract language or avant-garde protocol formulas or business models. They keenly know the difference between theory and practice. They understand what it means to be integrated without a booklet explaining it to them. While collaboration *theory* is sweetly seductive, collaboration mechanics is raw and austere, requiring acuity and practice to successfully cultivate it as a craft.

Leadership and collaboration

Leadership and collaboration are linked. Leadership sponsors collaboration by creating a following. Anyone can be a leader because leadership is influence and influence is also earned. It cannot be awarded, mandated or assigned. In the practical world, leadership is more verb than noun. Demonstrated reliability by example produces influence. Build trust not by talking about it, but by achieving results, with integrity and in a manner that shows real regard for others. Build respect and credibility ahead of personal agendas, by making sound decisions, admitting mistakes, and putting what's best for followers and the work. Leaders create beneficial momentum that others follow. Like collaboration, it is also a craft.



Why can't collaboration be conscripted through contractualism? Because **implementers will follow leaders before they follow contracts** and other artificial constructs. Leadership trumps contractual hegemony in the collaboration game every time because human beings are moved by humanity, not by abstractions. Contractualism fails to recognize what one TV advertisement (ironically by Dow) calls the human element – Hu. We are emotional critters first, before anything else. Effective leaders know that you first have to reach the heart before you request collaboration. You can't move people to action unless you first move them with emotion. Where the heart goes, the head will follow. People don't follow worthy causes at first, they follow worthy leaders. If true, that means relationships are critical to real collaboration.

It becomes the leader's job to initiate and maintain connection with project constituents. The process of building relationships through connecting with individuals, establishing trust by *earning* respect and credibility is how actual commitment networks form and prevail. That is the inertia of peer-to-peer social contracting that a leader looks to tap. Early in the construction process when strangers are put together to build the project, the first thing people do is investigate which people are trust-*worthy*. A leader's goal is to shorten this investigation for as many project constituents as possible in order to establish a high degree of forward momentum as early as possible; as we are all trying to beat our common foe, schedule pressure.

Never underestimate the power of building relationships with people before asking them to follow you. The stronger the relationship and connection between individuals, the more likely the follower will want to help the leader. You develop credibility with people when you connect with them and show that you genuinely will help and be reliable. Predictable and reliable workflow through collaboration follows.

A leader has to quickly read the situation and know instinctively what play to call. Leaders see everything with a leadership bias, and as a result, they instinctively, know what needs to be done. This informed intuition causes leadership issues to jump out of a given problem set. The best way to describe this bias is an ability to get a handle on intangible factors, understand them, and work with them to accomplish forward momentum. The more leadership ability a person develops, the more quickly he recognizes leadership, or the lack of it, in others. Great leadership intuition is nothing more than the intelligent development and use of *situational judgment*.

The problem of collaboration

Do we owe each other moral consideration when performing our work or is it every man for himself? To deny either self interest or mutual interest; or to methodically deny one in favor of the other, is to ignore reality. The sharp edge of this perhaps self-evident observation lies in practical execution; the judgment of which one to choose, at which moment, and on which problem is what makes collaboration challenging. Neither self interest nor mutual interest is always bad, or always good for that matter. Sometimes they are simpatico, sometimes they are not. One person's agreement can be another person's disaster in the construction environment.



Perhaps the answer to how and when to collaborate cannot be usefully decided apart from context. It is *situational*, requiring superior *situational judgment* skills. The problem of collaboration is not well understood when separated from the actual act of collaboration. In other words, you have to be in it to really know it. The intimate realities of collaboration are known only through close proximity to the action, rather than by objectifying it as an abstract and distant notion, or theoretical study. You learn what it really means by actually doing it, rather than talking about doing it. Nowhere is this truer than in construction.

When the framer is fouled because ducts overhead have already been installed who is at fault? Who has/has not collaborated? When the ducts cannot be installed because the as-built framing did not provide an opening for the duct to pass, who has/has not collaborated? Does the first trade in get to build it the way they see fit while the subsequent trade is left to adapt, often through the change order process?

When multiple deficient RFI questions have been submitted and the next one is sent back to the author for rework who has/has not collaborated? When multiple deficient RFI responses have been submitted and the next one is abruptly returned for rework who has/has not collaborated? When an obvious and discoverable drawing error has been made and it is not discovered by the *builder* until the issue has become schedule critical (1), who has/has not collaborated? When an obvious and discoverable drawing error has been made and it is not discovered by the *designer* until the issue has become schedule critical (2), who has/has not collaborated? When an *accumulation* of discoverable drawing errors have been made and they are *chronically* not discovered until schedule criticality is breached, who has/has not collaborated?



The modes of collaboration are fundamentally threefold: face to face (the meeting), telephone or written (e-mail or the like). All are viable tools, each to be used appropriately. E-mail and other written forms is a method that allows for judicious use of time in a busy environment that demands multi-tasking in short bursts. Documentation of the proceedings is inherent. But written collaboration carries with it the temptation to easily pass the buck, hurling the problem over the fence to someone else unfairly or prematurely. It can be too interpretive, ambiguous or elusive especially to those of us less skilled in written communication. Telephone communication (including video) carries with it the ability to provide nuanced verbal collaboration over a distance with a human touch. However, phone conversations do not document significant decisions, the content of which often fades with memory. Meetings small or large are time intensive, especially when the parties are unprepared or remotely located. They can be very wasteful of expensive billable time, especially large groups. Documentation of the proceedings is still required to avoid unreliable and convenient memory problems. There is no perfect collaboration medium. Respect for people's time under schedule pressure constraints is a key to choosing the right combinations of collaboration mediums appropriate to the circumstances and context. Regardless of mode, performing your job in a way that makes the next person's task downstream from you easier remains the best rule for collaboration.



We rely heavily on a salience threshold (3) in our collaborations. Schedule pressure seldom allows us to make decisions by collecting all of the desired information with which to act. Often, we simply do not have the time required to create absolute certainty in the decision making process. Rather, we have to make a robust or best guess when enough value adding information is collected in order to act on a particular issue or problem. More simply, we need to achieve the minimum amount of *significant* information with which to act – a salience threshold. We must intuitively sense when the salience threshold is reached. This is a skill that requires experience, sensitivity and discrimination. Situational judgment is again our best tool. Courage is required to make decisions with incomplete information. A few markers in our pocket from fellow collaborators also help immensely.



The **problem of collaboration is one of self-interest weighed against self-sacrifice**. Sacrifice of some advantageous position, however small or large. We lower a ceiling height to facilitate above ceiling MEP coordination in one room in order to gain moral high ground in the fight for maintaining a soffit height in the main lobby.

But is this really self-sacrifice? Is it truly altruism, where an advantageous position is freely given up for no expectation of quid pro quo later, or maybe it is just a modest self sacrifice on the present issue in order to gain special consideration from others in some other future deal. Is this just simple pragmatic Darwinism at work? At decision points on every issue, sitting at your desk in the quiet of your own thoughts, will self interest or mutual interest prevail - decision of necessity or of convenience? In small ways and large, we face this test thousands of times on a project. It is the internal assessment that comes at the moment of truth. This problem of collaboration is hammered out every day on every project.

We need to understand that knots will form on a project driven by the unforgiving task master of schedule pressure. This requires us to make use of all of the collaboration tools at our disposal, establish appropriate salience thresholds in order to act and exploit influence that leadership provides to help us call the plays. In the collaboration game, a well honed talent for situational judgment is a craft that weighs the correct balance of self-interest to self-sacrifice, one issue at a time. This is **collaboration that unknots tangled project environments** and gets projects built. It is not new and it requires hard work to succeed.

Ken Bishop is an architect specializing in construction administration for over 25 years. He has worked in Boston and the San Francisco on a wide variety of project types. Mr. Bishop currently works in the bay area where he is involved in large, complex health-care projects within California. He is a graduate of California Polytechnic State University, San Luis Obispo and attended graduate school at Cornell University. In addition to mentoring young architects with whom he works, he has written on the subject of construction administration. He plays golf regularly, but poorly.

- Endnotes:
1. Spearin Doctrine aside.
 2. Standard of Care aside.
 3. Salience is the state or condition of being prominent or of notable significance; standing out conspicuously; most noticeable or important; prominent; projecting beyond a line, surface, or level. The salience threshold is discussed in the decision making context by *Roger Martin and Hilary Austen in The Art of Integrative Thinking*.