# The Design Crucible: Implications Of The 2030 Challenge (et al)

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## Abstract

In order to meet the energy targets identified by the 2030 Challenge, or sustainability targets suggested by the Living Building Challenge, or the social plus sustainable targets identified in the Clinton Climate Initiative, the process of design in architecture and related engineering fields must not only continue to evolve, but also to improve. The process of design must adapt to a more complex collection of circumstances. Against this complexity, decisions must become more effective. Within this complexity, the influence of design must expand to align and help to manage more circumstances. In order for the influence of design to expand in the direction of energy performance, a larger number of project stakeholders must be invited to talk about energy, and the language and tools used to tie business support to energy investment must be expanded. This article explores several context questions and suggests that a significant collection of context issues must be considered in order to better leverage the value of design. Also, the challenge to address energy concerns is driving improvements in design process and these improvements can lead to increased value in other areas. Finally, for both energy concerns and other concerns attached to the built environment, there are means available to take the next step with the design process and generate more valuable results.

A significant collection of issues must influence decisions in order to better leverage the value of design.

## Introduction to the Design Crucible

The 2030 Challenge is a concise set of energy performance targets that define a scenario for design and implementation in the construction industry leading to net zero $CO_2$ production in those buildings that meet the targets in the year 2030. The 2030 Challenge is one of several sustainable approaches that are driving improvements in energy design.

Several forces drive the evolution of building design practice. One force stems from a growing number of experiments related to attaining energy effectiveness and sustainability goals. The results of these experiments are good enough to compel repetition. Another force stems from construction-centered management approaches – like those of the Lean Construction Institute – often developed by design/build construction teams. A third force stems from improvements in production technologies like building information management (BIM), which is maturing as a useful tool and beginning to save time and money by eliminating virtual conflicts before they become physical conflicts on the construction site. A fourth force stems from the next generation of architects and engineers who are trained on computing platforms to the extent that their mode of invention, design, and problem resolution resides comfortably within the software available on inexpensive computers.

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Experiments in the area of design process that are focused on energy performance are now common and are supported by many organizations including, the New Building Institute (NBI) via Getting to 50, the Northwest Energy Efficiency Alliance and BetterBricks via training for better Integrated Design Practice, the Department of Energy via a case study data base and best practice papers for energy technologies, the Living Building Institute via the Living Building Challenge, AIA via the 2030 Challenge and their 50 to 50 training, USGBC via LEED certification and AP training, and ASHRAE via their own Integrated Design training.

A powerful common theme is reflected in the 2030 Challenge and its cousins and this theme combines a substantive goal – using much less energy in buildings – with a measurement system – earning points, meeting energy benchmarks, or obtaining quantified utilization goals. The notion that the goals are measured is essential; the extremity of the goal-set drives design change and earns it the label "difficult."

A significant reduction of energy use in buildings is, in fact, a difficult challenge, and critical to our children's future. It could help improve the business performance of the United States by reducing one continuous (and presently non-competitive) cost factor. And meeting this challenge on an international scale may significantly moderate global climate change.

Thus, the design and construction industry has been responsive to the challenge by trying new ideas and by moving an entire industry toward more efficient equipment and better system selection.

Growing from a focus on energy efficiency, the design industry has learned to anticipate the areas where energy performance can be most easily improved. The industry has learned to create synergistic solutions with simple relationships, e.g., providing more insulation and reducing the heating system capacity so the construction cost budget is met and the building has better energy performance. By addressing energy efficiency, the industry has adapted to addressing new goals and traditional goals for individual projects.

Practitioners have a visceral feel for how difficult it will be to create carbon neutral buildings and recognize that the potential for generating value via design is not being fully tapped.

The building industry is not producing a new set of forward-looking, truly energy-effective, productive, healthy, memorable buildings.

Instead, a few leading teams, working for a few leading building owners, help to establish examples of what can be done. Then, other design teams and other owners, seeing that the risk of building a new solution is moderate and the risk of not building an energy-efficient building is growing, follow the leading examples.

This pattern of creating examples and imitating them is fairly effective for easy to understand solutions and for moderate improvements to existing building models, but the pattern breaks down when applied to complex solutions and for radical improvements in energy performance. Also, this pattern of change is very slow. The 2030 Challenge requires radical change, so design teams that have been imitating leading solutions will need to step up and change their working methods in order to move toward the 2030 Challenge targets.

As a participant in the design industry, I must give credit where it is due; the industry, while adapting to changing energy targets during the past decade, has changed the way it works. For example, it is typical for teams I work with to ask about LEED certification prior to starting each new project. Teams are working together better and several "new" energy-effective technologies are now common to new building deign. And nearly every architect and design engineer has attended a design charrette focused on sustainable issues. But, there is a component missing from most design team strategies.

> *The core of the problem is that the design industry does not directly manage the core of the innovation process.*

I will try to expose the missing component by exposing the way leading energy-focused organizations talk about collaboration and integrated design.

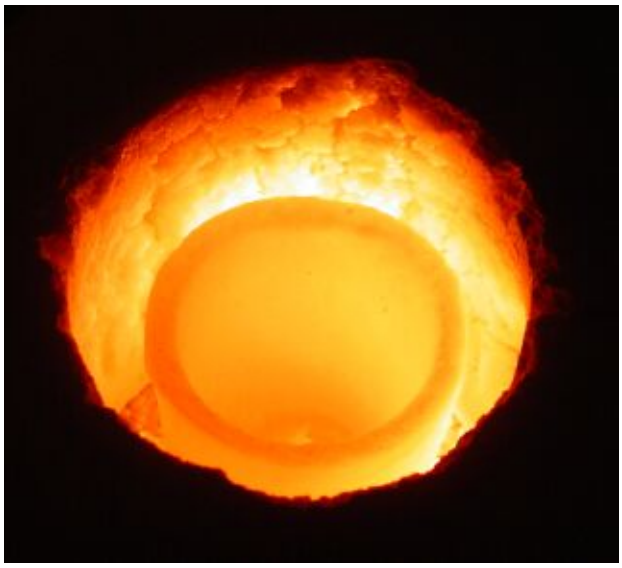
Lisa Rosenow (Putnam Price Group) and I spoke at BUILDEX Seattle in October 2009. Our thesis was, "Design for the 2030 Challenge will be different from traditional design and this new design method is identifiable and manageable." The presentation wrapped a description of effective integrated design inside a collection of examples of synergistic building solutions.

We considered an alternative thesis statement, directed at developers and owners, "you must act to select, enable, and participate with collaborative design teams, to a degree you can barely imagine, in order to include energy efficacy on the list of criteria that inform adequate design. Further, if you want great design – design that anticipates new demands in the marketplace – then you must manage energy use with the same level of attention that you manage any other significant criterion as you define the next generation of America's built environment."

But, even our stronger message – our desire to demand attention and participation from developers and owners – is not strong enough; it does not get to the core of the problem. And this is the best the construction industry does to talk about their own process.

The core of the problem is precisely that the design industry does not directly manage the core of the innovation process. This requires consideration of several essential steps including

research, invention, tuning the invention to best meet the project intent, finishing the swing by finishing the design (including eliminating risk created with the invention step), constructing the invention using orderly means, and commissioning, training, and follow-up equal to the invention.



I am using the term design crucible to label the core of the innovation process.

On the one hand, several aspects of the design crucible are found in design charrettes, several aspects are found in the integrated design process, several aspects are found in formal industrial design processes, and several aspects are found in mature architectural practice. On the other hand, no one set of instructions (or management rules) seems to address the entire process. Each instruction omits one or two important concepts that can lead to less-then-ideal results. And, it seems, none of the innovation processes I have experienced or read about addresses managing the way people interact both inside and outside the design crucible.

The extraordinary challenge in applying the design crucible in the design industry is that the design crucible is not complete in itself. Instead, it is a component of a larger process and it is different from the process it resides within. The invitation to speak, to brainstorm and to help create meaning for a building project, is an event, a moment in time. When brainstorming is not contained, then the building project is apt to fail in at least one respect – the contractor will attempt to build the new solution before the construction process can be defined, making construction difficult to manage – generally wasting time and money.

So, here it is – the design crucible.

In order to manage, share, sustain, and benefit from the wealth of prepared contextual information, and in order to maintain the benefits of traditional design practice, we need to identify a place and time, more intense than usual – not unlike a crucible.

> *The design crucible is a component of a larger process and it is different from that process.*

Corporate collaboration often breaks down. Project managers learn to avoid this by making a checklist of collaborative failure modes and to manage around these failures.

But the design process poses even greater demands. The collaboration we are hoping for must occur in a short time, in a container (a crucible, perhaps), and must be drawn out of the container so the results of the collaboration (synergistic solutions) can be managed through the normalized, risk-controlled, process of technical design.

So a design team manager is managing to two goal sets. First, to gather the professional knowledge base (people) and apply heat to the crucible and, second, to capture ideas best aligned with the project and to carry these ideas into technical design.

The design crucible is, after all, a managed event, concerning experienced design professionals working with stakeholders, assembled for the purpose of creating ideas exposed

through conversation; capturing meaning as it is made, and turning this into actionable design guidance.

A successful design crucible depends on avoiding the hurdles found in organizations and among professionals, performing a rational degree of research about each individual project, establishing why people might want to participate, facilitating a measure of extraordinary conversation, and converting ideas into commitments from team members to make the ideas happen.

## Moving Toward the Design Crucible

An effective collaborative design event relies partly on process, partly on attitude, and partly on research to establish a sufficient understanding of project context. A collaborative design event is fragile and temporary – it belongs to one project. Even so, once a design professional participates in a successful collaborative design event, they are usually interested in a second collaborative experience. If a collaborative effort fails, the results (by definition) return toward traditional design solutions, so the potential downside of attempting a collaborative process is small. The downside includes the loss of investment in design effort and the calendar time necessary to create a design crucible, less than a couple of percent of most project design investments.

No design team manager wants their collaborative team to disassemble, but if the goal is "not to fail" then the collaborative portion of the project is already crippled. Instead, every design team manager must reach out for client support and actually move toward a design crucible. Here is a checklist (for clients also) to help bolster a collaborative team so they provide results different enough to make the collaborative process worthwhile.

- ***Market project intent*** – ensure that every design team member understands the nature of the design problem and its relationship to the organization it serves.
- ***Expand research*** – assign design team members topic areas that align issues in their disciplines with the nature of the design problem and ask them to come prepared to contribute.
- ***Create a safe place*** to talk – ensure that every design team member is invited and feels comfortable to participate in the meetings (in each moment).
- ***Schedule "time" for dialog*** – allow for thoughtful responses to a wide range of possibilities. Make it clear that the initial step is defined to gather ideas, information, connections, etc., and not to make selections. One or more design charrettes may be part of this step. Collect ideas at a grand scale (ignoring detail as much as possible). Then, at a predefined time, make decisions, select options, and document a preferred project description.
- Assign responsibility to ***follow-up with each team member*** – ensure that each discipline is solidly aligned with the preferred project description. Be certain that once systems are defined that they are refined and optimized prior to construction.
- ***Respect resource allocation*** – sustain the design profession as a business. Once the project is described, proceed (respecting traditional methods) to refine system details and make the project constructible.

- ***Reinforce relevance*** – revisit the intent of each early decision as the project is refined and executed. Maintain a constant watch on the balance between purpose and cost. Do not allow cost concerns to "dis-integrate" early project decisions.

I assert that these are tasks and habits that lead to better results when they are practiced inside what is now called an integrated design process. The remainder of this paper is written to support my assertion by suggesting why these tasks and habits lead to better results.

For a detailed description of an integrated design process, see material from the New Building Institute: *Reference Guide: Applying the Benchmark™ to High Performance Building Design, Version 1.0*, New Buildings Institute, Inc., 2005, p. 2-1.

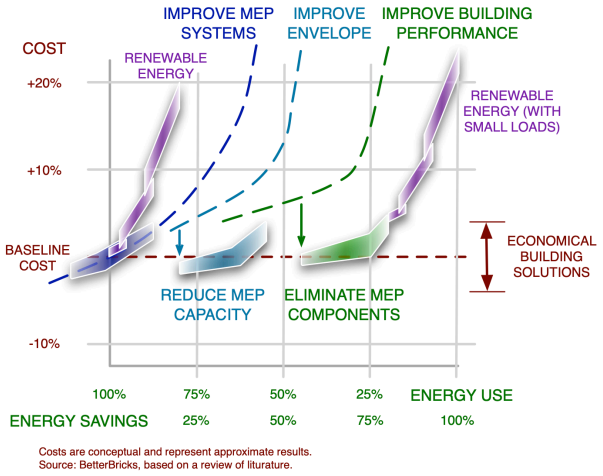



Figure 3: Construction Cost Impacts of Integrated Design. (© 2007 BetterBricks)

## Creativity & Context Shifts

State-of-the-art design practice is not one process; instead, it must be understood as a collection of processes ranging from an individual drafting a sketch in order to locate a building to a collection of hundreds of design professionals and stakeholders assembled to create and construct new cities. Also, design must be understood as being bound by a scope of service ranging from acquiring a permit for a copy of a simple building to defining a whole new building approach (e.g., meeting the 2030 Challenge in the year 2030).

Although state-of-the-art is not one process, the purpose of this white paper is to offer a means to improve design practice. In order to move from state-of-the-art-value in design to greater value creation in design and, I believe, in order to make significant advances toward the end-game of the 2030 Challenge, design professionals must make several shifts in context.

The list of context shifts (or design topics, if you prefer) below is not complete, but is representative of my suggested change in the design industry.

***Building loads balance point*** – balancing a building's energy gathering and rejecting characteristics. This means designing a building that tends to naturally reject heat in hot climates or designing a building (a different building) that tends to gather and retain heat in cold climates.

A well-balanced building (regarding energy flow), with some means for storing thermal energy for a few hours, enables a reduction in heating and cooling equipment capacity. This is one of several means to enable cost balancing described in the search for design synergies in sections above.

***Cost balance*** – trading construction budgets across systems to discover the best combination of building system investments measured against overall energy outcomes.

This topic was discussed in detail in the section Synergies and Cost above. The same idea is often described as "tunneling though the cost barrier" since the goal is to obtain breakthrough energy performance for no additional construction cost. This is a critical and difficult context

shift, because it involves shifting funding away from traditional system investments and into building shell investments.

Cost balancing requires a new way of working together; that is, a new context to frame conversation about whole-building design and design team goals – one area where my introduction of design crucible management can help out.

***Managing energy*** – designing to the end-game where organizations participate in energy management on an ongoing basis.

In order for this to work, design teams must talk to the key individuals who will monitor and adjust each building and augment traditional energy systems design with measurement and control devices that allow enough human intervention to sustain energy performance.

This new energy management system must account for (at least) communications among building systems, occupants (at the center of the diagram in Figure 4), an automated monitoring system that captures the building performance history, and an energy manager that has the responsibility to adjust building components and to communicate with building occupants.

***Design stakeholders*** – including everyone who might make an effective contribution at some point in the design process.

In practice, this is a balancing act – inviting participants to the design process can be costly, in both resources and calendar time, but leaving essential stakeholders out can result in conflicts, bringing projects to a halt.

***Scale*** – using site and energy sources to reduce energy demand.

This context shift stems from the question, "can two adjacent buildings save energy by sharing one or more energy systems across building boundaries?" In practice, this question is not asked very often, but the possibility of sharing energy systems is often a significant opportunity to improve energy performance and reduce cost.

***Capital*** – defining specific timelines for energy investments.

On the one hand, commercial loans for energy investments are seldom available for more than 15 years and simple-payback on energy-saving schemes longer 8 or 10 years are seldom selected for direct investment. On the other hand, some energy-saving components can last 20 to 60 years and if these features are financed within a 30-year building loan package, they will often improve the overall investment performance and save energy.

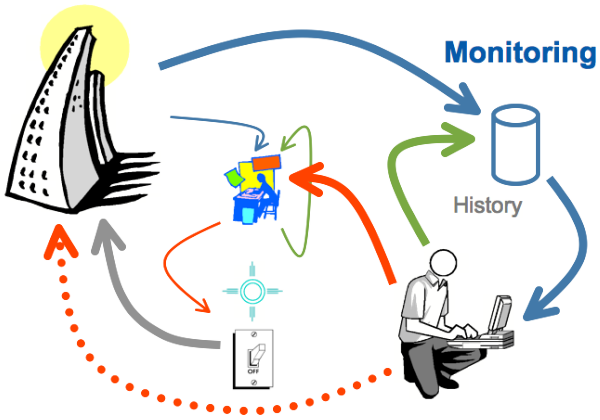


Figure 4: energy management seen as a system.

***Policy*** – leveraging the policy goals of a region, especially via energy conservation programs.

Nearly every power utility in the Northwest offers rebate programs for energy-saving devices and energy-efficient equipment. Using these rebate programs is common for design professionals across the country. But rebates are usually a small part of building construction cost. A larger value might be associated with carbon trading. Presently, the value of carbon trading is small and it is unevenly applied

across North America. Within a few years it looks like this may change and carbon trading could have a significant impact on funding related to energy savings.

***Business risk*** – containing risk, especially vis-à-vis new system ideas designed for an individual building.

An essential component of collaborative design is to manage the process in order to control risk via design decisions, to manage risk through detailed design, and to allocate resources during construction to further limit risk for new elements in the scheme. That is, collaborative design must, along with its other goals, assemble the rope seen in the picture above.

All of these ingredients (context shifts) demand supporting research, validation against the goals set for each project, thoughtful appreciation, their moment in the limelight, and a priority within the project goals. Then, the design team is ready to focus on collaboration; ready for the moment of innovation.

## The Design Crucible – Introduction

As an owner, a developer, a corporate leader, or a design firm leader, it is fair to ask if creating a high performance building is any different from creating a more traditional structure. At first glance, it appears that hiring design and construction teams that practice integrated design and managed construction should do the trick. But, great design stems from expanding the participation of stakeholders and this is different from buying high performance in a box. The point of this white paper is to convince executives and project managers that different modes of inviting participation produce different results, that those differences matter, and that an organization benefits by participating in integrated design.

Collaborative design is a specific type of collaborative process. Collaborative design is characterized by the collection of three distinct viewpoints. First, there is a gathering of people concerned with the building's outcomes, including the owner, the owner's financier, facility planning and maintenance staff, future building occupants, and neighbors in the community. Second, there is a collection of design professionals including the architect and a selection of engineers and experts. Finally, there is an assembly of construction professionals concerned with the predictability, profitability, and safety of construction, including a general contractor and a host of sub-contractors.

Successful collaborative design depends on both the formal means and style of communication between these constituent groups.

A collaborative design process is, usually, a form of team activity where project goals, project constraints, invention of alternatives, selection of alternatives, and cross-discipline integration are all "owned" by the entire team. Further, collaborative design is most effective when several conditions are established for each team member. For example, resources are adequate, the way success will be measured is clear, everyone has been invited to participate, and the process for gathering ideas and selecting from among them is clear.

On one hand, collaborative processes are not self-sustaining and depend on both the individuals involved and on the process definition to enable individual contributions. On the other hand, the act of inviting people to collaborate can be very simple. For example, for many smaller projects, the use of a design charrette has been effective in establishing a collaborative team attitude throughout the remainder of a project.

This white paper explores a short list of conditions required to enhance collaboration in support of integrated design. These conditions reflect the way people operate together in any organization, especially while working in high performance teams to create new solutions for current problems. Industrial design, business improvement, software engineering, marketing, sports team performance; all depend on human action and reflection that, to a surprising degree, parallels the balance of activity and reflection that fuels effective integrated design.

An effective collaborative design process relies on several conditions. Team members must act within a framework that respects these conditions for enhanced success:

- Individuals need a direction to travel; a place to go toward – map ***vision & goals***.
- Every practical idea stems from reality, from information about specific problems – gather ***research***.
- Every conversation we join carries with it a portion of technical content and a portion of negotiation to ask for what we want or to define who we are – respect ***conversation and power relationships***.
- Individuals need a reason to act, especially a reason to act for the benefit of a larger organization – create ***relevance***.
- People must trust one another well enough to work together; they must earn that trust – practice ***dialog***.
- There must be something new, specific to the project, created out of the effort invested – participate in ***sense making***.
- Each project team holds the option to select the shape of its design process; and a responsibility to understand the impact of the process they select – model a ***Stage|Gate*** process.

Each of the topics below is a reminder to organizational and design leaders that common management principles apply to the ad hoc team that is assembled to execute their next building project.

## The Design Crucible – Vision & Goals

Many goals identified for a project stem from the characteristics of an owner, a developer, or a corporation. Consider three points.

First, many construction specific goals should align with a collection of more general organizational goals. For example, energy efficiency reduces operating costs and decreases economic risk from volatile energy prices; these help assure an organization's future.

When an owner's project representative helps to align that set of project goals most relevant to an organization's goals, and helps to articulate priorities for these goals, then a design team hold an opportunity to better support organizational goals.

Second, each construction goal discussed and documented during design is connected to a functional requirement in someone's mind. It is a bad habit of the construction industry to forget the intent behind each goal. Indeed, by the time a set of construction documents is complete, in its extraordinary detail and pragmatic need to be direct and concise, the construction team is often left with a collection of specific instructions without any connecting glue – without intent.

There is significant advantage to keeping intent connected with goals, with solutions, with investment opportunities, etc., throughout a project. Some of the very best architectural project managers do this, recalling at the drop of a hat, the "why" behind each design decision embodied in a set of plans. But, this person is not always in the room, and most people need practice to carry this layer of information with them.

When an owner's project representative helps to carry "intent" into the detailed decisions and keep it in conversations about the project, then fewer synergistic system combinations are "dis-integrated" as the project proceeds.

Third, similar to the way an organization benefits from an appropriate vision (or mission statement) about its own future, a construction project team often strives for higher performance when it is connected to an appropriate vision.

An owner is clearly responsible for articulating an organization's relationship to the future (or for giving the design team access to individuals who carry a vision for the organization); and to moderate between the vision for the organization and a vision for the building project. Without a credible connection between the two visions, members of the design team will come up short when faced with the most difficult questions about the project – and the project will "dis-integrate" under the pressures of schedule and budget. When a clear project vision is available throughout the design and construction processes, then team members continue to ask, "how can we make this better serve the project?"

In this white paper, I have only invested the space to say that vision (especially a shared vision) can drive success. For another description of shared vision, and its pragmatic application in dozens of circumstances, see the writings of Peter Senge. In particular see Chapter 10 in *The Fifth Discipline*.

## The Design Crucible – Research

Research related to design projects is undervalued. This white paper is not about design research so I will not try to defend my statement. But I will say that the basis for an effective conversation, where effectiveness is measured by the degree and success of formative design (new ideas, captured and implemented), stems from research surrounding that design problem.

Research in this context is most effective when it occurs prior to convening a design crucible. It is part of the step where participants are invited to join in the crucible.

## The Design Crucible – Conversation and Power Relationships

This topic is the most likely topic to escape recognition in the design industry because it is not discussed; rather it is practiced. On one hand, it is easy to say out loud. On the other hand, it is difficult to believe that something so simple has an essential part to play in collaboration.

Nearly everything done in design is about communication. Photographs, drawings, models, specifications, reports, letters, and conversations are intended to convey technical content about a project to numerous team members.

And yet, every conversation carries with it the weight of power relationships among the people in that conversation. That is, every conversation carries the combination of technical content and negotiation of human relationships. The relationship between Architect and Owner can be used as a demonstration of this issue.

Implementation guidelines for the 2030 Challenge, published by Architecture 2030, are an architect-focused view of change. The guidelines go so far as to place responsibility on architects to inform clients of a firm-wide intent to meet new energy goals and to attempt to meet these goals on every project.

The guidelines do not address the relative power of an architect in the development cycle. The guidelines also miss several other potential hurdles to success, e.g., information required by, and the desired outcomes of, code review officials (suggesting the need for managing the building permit review process), design/build contracts (suggesting the need to inform contractors about the energy design process when the contractors are a direct stakeholder in construction outcomes), and the general difficulty of change in a (necessarily) standards-based industry (suggesting the need to manage change within each architectural firm).

Every conversation carries with it the weight of power relationships among the people in that conversation.

The guidelines suggest hiring firms (sub-consultants) that have adopted the 2030 Challenge and have a "similar implementation plan within their firm," but they do not indicate what it takes for architects to invite consultants to the table, or note that an attitude change is often required to support new conversations, or insist that the communications channels and design schedule must be tuned in order to provide new outcomes. The industry's ability to generate nearly 40% improvement in energy performance without significant changes to building shape has actually slowed the pace of design process change within the design industry. At the least, architectural designers still need to recapture an understanding of the energy performance of built space and this requires relearning a bit of physics.

Thus, I feel the implementation guidelines do not identify the elephant in the room.

The elephant involves power relationships. The elephant involves the means to make decisions while maintaining the power relationships among the players, to make difficult decisions without breaking the power relationships.

Basic research about the relationship between content and power in conversations is found in *Complexity and Group Process* (Stacy). Chapter 7 is a difficult read, but it reinforces the simple notion that there is a relationship between conversation and power; further suggesting that negotiating of power relationships is integral to all of human interaction so we cannot ignore it.

This points to the need for managing a design crucible – the crucible is forged to be a safe place to share ideas without significantly changing power relationships outside the crucible. In fact, the assurance that power relationships persist outside the crucible is a prerequisite to inviting meaningful content-rich conversation inside the crucible.

Thus, the relationship between Architect and Owner necessarily informs the capacity of the design team (including the Owner) to make effective decisions. Investing time and attention in this aspect of human interaction in collaborative teams provides significant return on investment.

## The Design Crucible – Relevance

A new project is relevant to an organization to the extent that the project supports its central purpose. Easily said. But, all too often this message is unavailable to the individuals executing a project – over generalized descriptions of purpose leave them without the leverage to turn this information into great design solutions or better construction execution.

Thus, I suggest that a clear statement of goals is an essential step toward a high performance building. But this is not sufficient. The statement of goals must also connect to the players and stakeholders participating in the project; including design team members.

Project leaders, must attempt to capture and to describe information about a project's context and the purposes behind a decision to build – and then make numerous connections between that purpose and specific project goals.

Let me try to say this another way; relevance stems from shared vision when the shared vision is specific enough and real enough that participants can connect with elements of the vision and use these to help them make better design decisions.

## The Design Crucible – Dialog

Every design team faces a difficult task – they must turn a collection of goals into a collection of (integrated) solutions, and these solutions must also follow the laws of physics (especially gravity) and comply with a collection of codes, regulations, and financial limitations.

A "collaborative design process" implies that a design team must seek and find solutions that span the scope of individual disciplines. This process depends on several steps. We start by asking team members to "show up." Simply put, they must meet several times in order to have the opportunity to discover each other's thoughts about a particular project.

But, showing up is not enough. If a project is to benefit from new ideas, these ideas must be tested against a series of traditional solutions. If the new ideas fail to promise improvement, then why use them? The implication is that participants in an integrated design project must be working outside the meetings (or charrettes) and in step with the progress of design. When each team member is prepared for these meetings, then the team is much more productive.

In some cases the process (of preparation and meetings) outlined above is adequate. Professionals with several integrated design projects under their belt will meet, assess options and select significantly better solutions than those found in traditional projects. However, we must explore two more hurdles – in part because some design teams will fail by stumbling on them, in part because no matter how well a team has performed on past projects, there is always room for improvement.

The first significant hurdle is found in the way that individual professionals (especially engineers) respond to protect their own systems. They are uncomfortable reducing the capacity of systems based on past experience, or they are unwilling to accept additional risk by executing a new design concept. In all fairness to these professionals, their professional liability insurance carriers have trained them for years to replicate known systems and to

execute quality assurance based on checklists built from experience with past failures. And, we must admit, individuals like to act the expert. Asking engineers to attend to a collection of ideas, offered by people outside their discipline, and to spend their time analyzing these ideas, may feel contrary to treating them like experts.

Further, participation depends on an invitation to share and this depends on the assurance that when an idea is rejected it will not reflect on the individual who offered the idea. Keep in mind that every great building is the result of ten symbiotic ideas selected from one hundred good ideas, i.e., many good ideas are rejected.

The second significant hurdle is found in the way engineering and design firms model the resources required to execute the design process – to get a building designed and built. Design managers often claim that the additional work spent in the initial phases of design will be resource lost to them, increasing the risk that they will experience a financial loss on a project. Their claims are partly true and partly moderated by the integrated design process. We do not know of any firms that can provide multiple meetings, dual daylong charrettes, do the research necessary to select the best design solutions and, at the same time, make up all of that time in later design phases. On the other hand, if the early design process is successful, then it will provide the team with a significant collection of design decisions that will remain solid through the remainder of the design schedule. So, some or most of the initial investment can be recovered by reducing the effort of detailed design.

The reason for identifying these hurdles is to step over them. To respond to the second hurdle, and to meet any reasonable schedule, the overall process must be keyed to two kinds of activities, and these activities must be scheduled separately. During a "moment" of the design schedule participants must be invited to join the team (to collaborate). This means that they leave their disciplines at the door, that they take off their "expert" hat, that they open their minds to multiple possibilities at one time (i.e., they are not being asked to choose, but rather to listen and to collect information), and that they are not judged by each idea they bring to the table (i.e., ideas are accepted freely). Later, for pragmatic reasons, each participant will be asked to decide, to select best ideas, to answer (in an expert fashion) the questions others have about their own discipline's systems. After that collaborative moment, and as design selections are made, tested and reinforced, the design must proceed in a more traditional way – to the extent that professionals must measure progress against the resources they are investing; and must measure proposed solutions against pragmatic engineering standards.

To respond to the first hurdle, an owner's representative or project leader must acknowledge that the design team is composed of individuals. When effective conversations take place in a design charrette, and in the days after, ideas are presented, tested, mixed, shaken, and mostly tossed out. This cannot be about the people in the room. This must be about the project. This cannot be about the power of an individual (the one who chooses). This must be about the good of the project. This cannot be about who is boss and who is not. This must be about the results of research into options, into synergies, into materials and equipment, into making the goals for this project bigger than life. And (as if this were not hard enough already) this process must allow individuals to return to their own firms with credible stories of progress, of value created, of manageable processes within their own discipline.

These two responses to hurdles, outlined above, draw an amazing parallel to the challenge of establishing dialog. By this I mean generative, problem solving, creative conversation

among two or more people who do not share the same goals, worldview, or purpose outside of the project at hand. The owner and design team must build a protected meeting place, where integrated design is held, protected, and nourished. The owner must also allow the rest of the world, the rest of each participant's professional life, to go on. The owner, at the end of the day, is still the owner; but for a moment, the owner is a source of information, of connections, of ideas, and is a participant, not a judge, of the conversation. Dialog, when practiced in difficult situations, demands the same relationship of its participants.

For additional information on dialog and its use as a creative tool, see *dialog and the art of thinking together*. I am suggesting that the entire book could apply to the design and construction experience, even though the book is designed to address issues of greater difficulty than design teams face. If you have limited time to invest, begin with Chapter 3.

## The Design Crucible – Sense Making

This is the second most difficult topic, after conversation and power relationships; but in this case, once recognition occurs, an "aha!" is more likely.

The claim here is that two or more people talking about a topic (including both technical content and negotiation) hold the opportunity to create meaning that would not have occurred without the conversation. Further, when this occurs among a team (a business team or a design team) the experience of creating meaning can be accompanied with shared commitment to move toward a future where the new meaning (or design idea) holds credibility and value.

> Two or more people talking about a topic hold the opportunity to create meaning.

So, sense making is the core of what occurs inside the design crucible. I do not spend much time on this topic, because this is the desired result, not the means. Instead, the means are the focus of this paper.

The notion of sense making is commonly found in business consulting tomes and in writings about organizational research. There are many good examples. For a rigorous description of the modes of sense making see Chapter 6 in *Changing Conversation in Organizations* (Shaw). For an understanding of the extraordinary potential of discovering new meaning during this moment of sense making see the middle chapters of *Presence* (Senge).

Sense making is the core value won from investing time and energy in a design crucible.

## The Design Crucible – The Stage|Gate Process

Create effective options; think about them; make a choice.

An effective collaborative process includes an analysis of a collection of ideas. It is critical that the level of detail and the time allotted for this analysis be commensurate with the scale and value of the ideas considered. In many respects this is not about "design", instead, it is about narrowing the field of design decisions (as a team) prior to proceeding with detailed design. One model for this process is found in the first few steps of a Stage|Gate process common in industrial design.

As a framework for innovation, Stage|Gate is well-established, with its own description, books, articles, body of university research, and numerous consulting firms offering to bring Stage|Gate to manufacturing companies.

The Stage|Gate process is about generating options, holding options open as they are developed, then analyzing options and selecting one of these options to carry forward to the next stage. This process is repeated three to five times in various formal product design process models. I am suggesting a similar process, but limited to the early stages of design, i.e., identifying schematic design with one or two iterations of the Stage|Gate process model.

The reason for this suggestion, and for using a nomenclature from another profession, is to draw attention to the different approach needed to achieve a portion of the building design process. But, whether we use the term, "Stage|Gate" or not, we need to draw the design team (and the owner, users, stakeholders) into that moment of ideas; and hold onto those ideas just long enough that they can be useful in forming pragmatic solutions for one particular project.

## The Design Crucible – Summary

I am using the term design crucible to describe a dramatic moment when design professionals talk about options for several systems along a path toward new meaning. This new meaning is characterized by an assembly of synergistic building technologies that provides better energy performance. The design crucible also provides a means for communicating to a team that the design process is modeled as a moment of invention, followed by more traditional, detailed engineering. In fact, if the ideas discovered inside a design crucible are not further refined against traditional engineering standards, then the result is not likely to be worthwhile.

The design crucible is a management tool to help improve collaborative design process.

This tool has its roots in energy design, but can be applied to other problems. For example, one can remove the word "energy" from this description of the design crucible and replace it with the phrase "evidence based design" in healthcare and have a means for improving health care facility design.

The industry is ready to move collaborative design forward – the design crucible is one tool for that motion. The industry is ready for a return to creating value through design.

***For the betterment of our lives we should, perhaps, all experience a design crucible.***

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BetterBricks

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# About the Author

Doug Bors is president of Sophometrics, Inc. The company name means wisdom in measure. Sophometrics' mission is to demonstrate the *value of design*.

Doug is a force for change in the design profession; leading toward higher reliability, lower energy consumption, and better-integrated technology solutions. He is participating in the design industry's response to changing market demand for energy efficiency by teaching for NEEA's BeterBricks program. Doug is a proponent of integrated design processes. Also, Doug is designing the organizational means to reduce energy utilization via public investment plus private development as team leader of the Snohomish County Energy Development Advisory Workgroup; Energy Supply Team.

Doug graduated from MIT with two Bachelor of Science degrees (in electrical engineering and architectural design) and has been enriching the intellectual space connecting engineering and design ever since.