

A Case for Change: The New AEC
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ACKNOWLEDGEMENT

The ideas in this paper are not new. Anyone within ear-shot could have heard them in parts and pieces from GA's founder, Joseph P. Giattina, Jr. FAIA, an extraordinary talent and a dedicated generalist who maintains that architecture, practiced well, is a noble profession worthy of a life's work. For him, good architecture is the product of a comprehensive, integrated and clear thought process that results in a beautiful answer which is sometimes a building. By strength of idea and force of personality, he has successfully advanced these principals in the company he founded against the grain of an industry promoting compartmentalized specialization. The logical extension of this philosophy further into the AEC industry has been a primary driver for this paper.

Our thought process has been strongly influenced by numerous writings consumed over decades, specifically: B.H. Liddell Hart's dissection of strategy; Taiichi Ohno's situational awareness and Zen like ability to reduce to enormous, fragmented, complexity, into an integrated comprehensive system; and Edward R. Tufte who reminds us the power and necessity of clarity, in everything.

And finally, we recognize the staff of GA, past and present, young and old, who sacrificed countless nights, weekends, friends, and families, to provide the formidable mental and physical force necessary to give substance to raw ideas.

THE AEC CONDITION

The Architecture, Engineering and Construction (AEC) industry constitutes 5% of the United State's GDP and includes architects, engineers, general contractors, trade contractors, and manufactures, who together provide the goods and services necessary to add physical structures to real property. The AEC is an industry that affects every person in the US and every sector of its economy. It has an enormous potential to provide value to its consumers.

Ideally, the AEC industry should efficiently capture a project's potential value for the consumer. Harvesting this potential consistently requires a very smart, multidisciplinary, and continuously trained workforce. It helps if that workforce is motivated, aligned and compensated based on the value it delivers the consumer.

The conditions present during the last half of the 20th century, as the modern AEC industry was established, presented a more immediate problem than achieving an abstract potential. Specifically, the US GDP was expanding rapidly and the need for new buildings "fast" trumped other needs. Because this condition persisted for three generations, expectations of annual growth were institutionalized.

Accordingly, the modern AEC strategy was developed to respond to the need for rapid supply expansion. First, the industry recalibrated project potential to three of the four variables required to financially underwrite a building: square footage, first cost, and schedule (the fourth variable, income, was a market condition that existed outside the AEC). Second, to deal with the increasing complexity of building systems, the industry advanced specialization; Third, to simplify a linear process and to compartmentalize

risk, specialties were organized into silos. Together, these three strategies constitute the AEC strategy in effect now. Though this strategy cannot deliver project potential, until the 2007 global economic recession, it had been highly effective at supplying acceptable product to meet demand.

Since 2007, there has been no systemic change to the industry strategy. Change that has occurred has been localized at the level of the individual company and largely consists of (significant) reductions in labor and overhead costs, territory expansion, and increased marketing efforts.

Unfortunately, without an increase in demand, a decrease in supply, or a combination of both, cost reducing tactics are insufficient tools to stabilize the industry. Economic projections by McGraw Hill, FMI, and the Associated Builders and Contractors all show minimal gains in non-residential construction through 2012. Pre-2007 demand highs are unlikely before 2016, consequently, competition for remaining work will continue to intensify.

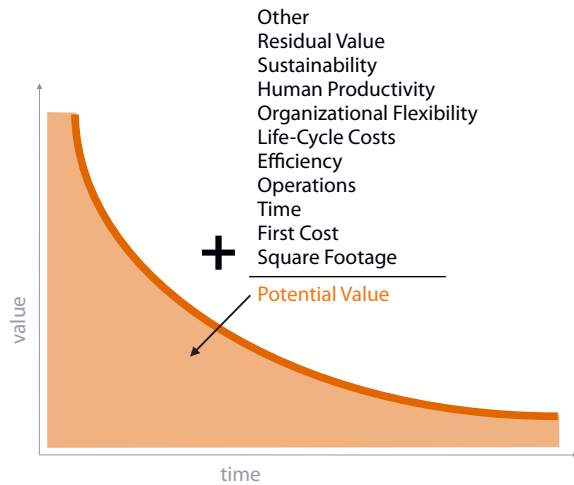
Meaningful short-term reduction in supply is unlikely for two reasons: First, overall contraction of the US economy leaves no place to absorb displaced workers; Second, former employees, many highly skilled and educated, have no choice but to create start-ups that compete directly against former employers. This new class of architects and contractors, technologically linked with minimal overhead, exacerbates an already over-supplied market and forces margins lower.

Lower margins increase anxiety and risk, and leave less to invest in process refinement and R&D; overtime, companies will have a harder time attracting and retaining the talent necessary to capture project potential.

The industry's strategy, focused on variable reduction, specialization silos and risk compartmentalization, proved effective in rapidly increasing supply. However, it fails to account for the fundamentally different conditions faced today. Without responsive adjustment, the continued decline of the AEC industry is certain. Implausibly, Warren Zevon captured our predicament perfectly: "The shit that used to work – well, It won't work now".

The focus of this paper is to create an alternative strategy capable of delivering project potential in a highly competitive market using readily available resources and technology.

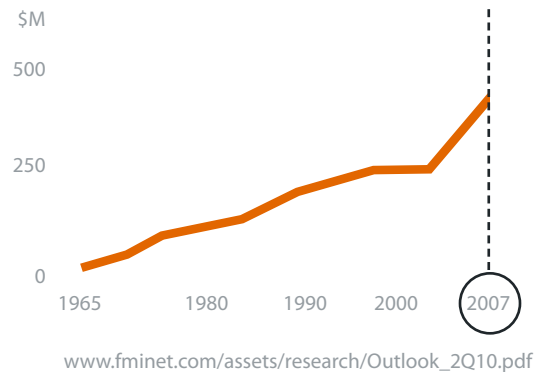
Potential Value
Diagram 1



Demand for AEC Services - 2007

Diagram 2

Put in Place Non-Residential Buildings



Industry Assessment: 1960 to 2007

In the AEC industry, a project's potential is greatest in the early stages of a project, when the maximum variables are unfixed and can be optimized at minimum costs. Project Potential diminishes on a downward curve as the project advances toward completion and variables become fixed (*diagram 1*). The area under this curve is the Project Potential: the product of available and relevant variables optimized. Thus, Project Potential = Square Footage + First Cost + Schedule + First Quality + Operating Efficiency + Life-Cycle Cost + Productivity + Risk Management + Flexibility + Functionality + Residual Value + Other Variables. Absolute Project Potential remains theoretical, but the *realized* Project Potential increases proportionately with the number of relevant variables it optimizes and incorporates into the solution - more variables mastered equals more value created.

Culture Built On Supply Trailing Demand

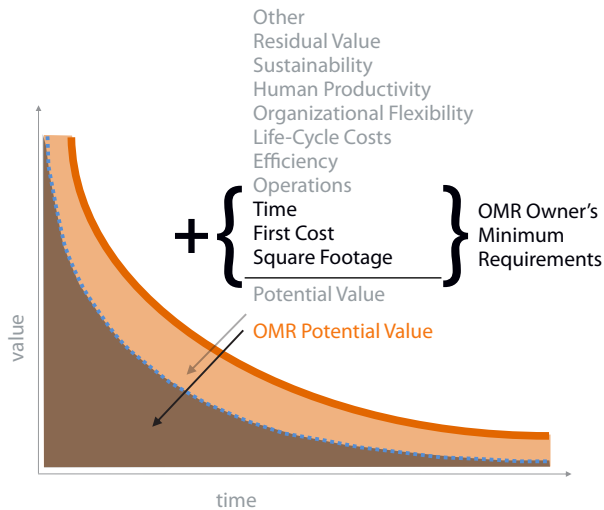
For nearly 50 years, the AEC industry experienced a demand for their goods and services that outpaced supply (*diagram 2*). The sustained trajectory of this supply-demand curve created three conditions: 1) Growth was a given; companies competed for talent to grow capacity more so than they competed for work; 2) Minimizing the variables required

to meet demand made rapidly increasing capacity more manageable; 3) To deal with the increasing complexity of buildings, materials and systems, the industry encouraged specialization. Other than for isolated cyclical market blips, these conditions have existed for multiple generations and became an institutionalized industry strategy.

Owner's Minimum Requirement (OMR)

An AEC industry fixed on increasing Project Potential would command a deep pool of varied resources sufficient across a spectrum of disciplines - design, production, logistic, aesthetic, operational, life-cycle quality, financial, and others - to maximize this potential. However, the AEC industry moved in the opposite direction, and reduced the variables it was concerned with to four: first-cost, schedule, square footage, and minimal acceptable quality. This strategy, designed to meet an owner's minimum requirements, is the industry baseline that directs a half-trillion dollar industry. For convenience, I refer to this as the industry's **OMR** (Owner's Minimum Requirements) Strategy: a straightforward process that is easy to manage, easy to measure and easy to communicate. Expansion of the four OMR variables is suppressed by the industry on the basis that the expansion is an unnecessary process complication that dilutes industry focus and slows growth (*diagram 3*).

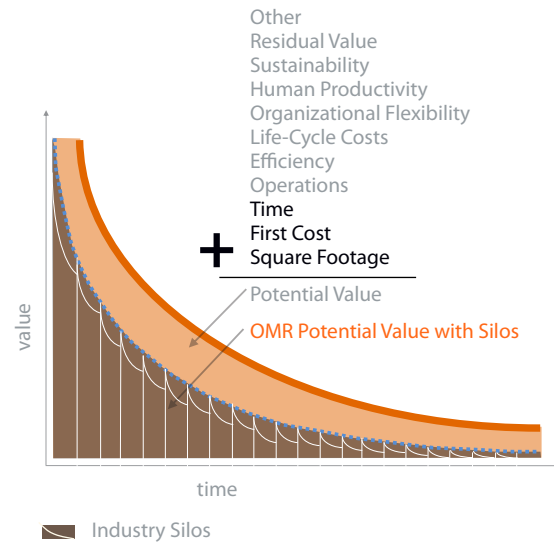
Owner's Minimum Requirements (OMR)
Diagram 3



The OMR Strategy is the logical outcome to the situation the AEC industry faced coming out of World War II when the demand for services exceeded its ability to supply them. Notwithstanding periodic market slumps, demand for AEC services in the US exceeded supply from post WWII until 2007. During this period, maximizing Project Potential required complications that the industry could neither justify nor accomplish. Rather than make its offerings more complicated, the industry saw an urgent need to simplify them so that it could more easily and quickly train the expanded workforce required to meet market demands. The OMR Strategy accomplished the objective perfectly: it reduced the variables it managed to only those necessary to financially underwrite a project - size, cost, time, and first quality. All that remained was for the banker to add revenue calculations for the project to become financeable.

The projects produced with the OMR strategy are designed to maximize size, cost and time, toward a minimum first quality at the exclusion of other factors affecting Project Potential. By focusing on OMR, the industry has been able to rapidly expand to meet the US economy's near trillion dollar peak demand for its goods and services and every year, hundreds of billions of dollars in construction are successfully delivered utilizing an OMR strategy.

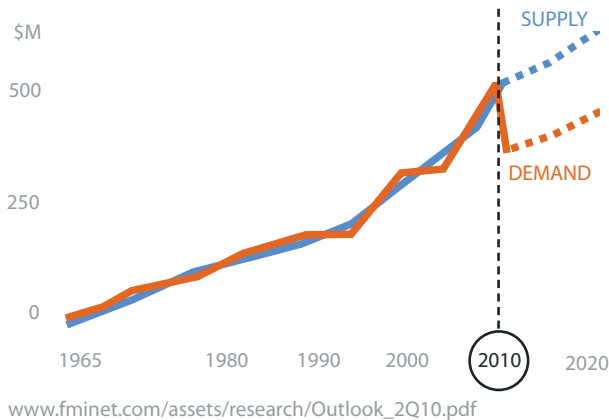
Decreased OMR due to Industry Specialization
Diagram 4



Specialization

To improve OMR delivery, the industry has progressively focused on discipline specialization. Specialization is a logical response to increasingly complex buildings and systems; there is too much complexity for any single person to have expert knowledge of all components and systems of a modern building. Consequently, the industry breaks down the complexity into disciplines separated into discrete silos, appropriately scaled to allow mastery. To master the discipline, the specialist focuses on a rational subset of issues extracted from the overall process. Basic specialties like Architect, Engineer, General Contractor, Subcontractor and Manufacturer have expanded to include discrete specialized entities focused exclusively on: Planning, Landscape, Interiors, Equipment, Traffic, Signage, Information Technology, Waterproofing, Energy, Project Management, Program Management, Construction Management, Commissioning, Cost Analysis, Schedule, etc. Work flows linearly from start to finish, from one specialization to the next. Each specialty works within its discipline to optimize their silo (diagram 4).

Demand for AEC Services - 2010
Diagram 5
Put in Place Non-Residential Buildings



Risk Management

This specialization has helped define the industry's risk management policies by legally codifying the artificial boundaries so that commensurate roles, responsibilities and risks could be efficiently assigned, contracted, insured and held to account. Professional and trade organizations have worked to clearly define their boundaries, market their benefits and regulate their application.

AEC Assessment 1960-2007

As measured by its pro-rata GDP growth, the AEC industry health, implementing an OMR strategy and utilizing specialization silos, was strong. Incremental improvements in the industry were constant. Overall, nothing in the data suggested the need, - nor was there desire - for radical change.

AEC Condition 2007-Present

Enjoying sustained double digit growth and healthy margins, the AEC industry was hitting its stride when in 2007 the bottom fell out; the favorable Demand/Supply curve the AEC industry was built on inverted (*diagram 5*). Today, AEC supply exceeds market demand by nearly half. What is

left of the demand for the AEC industry comes from market sectors facing significantly increased national and global competition for their products. These markets, now more than ever, need to maximize leverage on resources.

The Demand/Supply inversion, if persistent, represents a structural shift that will have a lasting impact on the AEC industry. For the industry to return to a normalized state, either demand must double, or supply must half (or some combination); neither scenario is likely to occur quickly enough to help many. Consequently, margins for most AEC suppliers will drop precipitously as owners seize their advantage. Over time, market forces will balance the Demand/Supply curve, but until then, it will be painful for many companies.

Overall, AEC companies nationwide have seen lower margins and significantly increased competition for remaining work. To survive, many have slashed personnel expenses and expanded their traditional market territories; these actions, while necessary, are insufficient to correct the problems facing the AEC industry. Because the Demand/Supply imbalance is a national condition, territory expansion helps one while hurting another (no net growth - only redistribution of smaller pie). An insufficient demand relative to available supply maintains a persistent downward pressure on fees for goods and services. Consequently, the increased competition allows Owners their pick of any number of qualified companies capable of delivering OMR. And, because OMR is OMR, the buyers are left to differentiate on two concerns: 1. Low price; 2. Their relationship with the low-price company. Long-term, this condition is unsustainable.

THE NEXT STEP: Beyond OMR

An alternate to trading on OMR is to trade on Project Potential. An owner, made demonstratively more competitive because their project surpassed OMR and achieved a Project Potential, may well consider paying for goods and services on a value added basis. There are three primary barriers keeping the AEC industry from accomplishing this:

1. Long-term reliance on an OMR strategy
2. Specialization silos
3. Current risk-management practices

First Barrier: Reliance on an OMR Strategy

The industry's long-term reliance on an OMR strategy presents a problem for the AEC industry, because OMR structurally limits the possible variables considered for Project Potential $OMR = \text{Square Footage} + \text{Cost} + \text{Schedule} + \text{First Quality}$. Consequently, the industry and its supporting universities, trade schools and union halls are trained to focus on a limited subset of factors – its members are not educated, trained or equipped to recognize, let alone optimize, the additional factors capable of increasing Project Potential (refer to diagram 3).

So, while OMR may have been a sufficient strategy to deal with the rapid growth of the last decades, it is an insufficient strategy to deal with the current public and private need to extract optimal value from every human, physical and economic resource. This continued industry failure to deliver its Project Potential hobbles the owners it serves by reducing their ability to compete; owners in turn, logically, look at the AEC industry as commodity providers with marginal relevance. Given the increased demands of the early 21st century, the AEC industry's OMR strategy has become the primary barrier between the industry and its ability to realize a higher Project Potential. Because the AEC industry is not designed to deliver Project Potential, it is vulnerable to losing market share to an alternative industry that does.

Second Barrier: Industry Fragmentation

The second barrier keeping the AEC industry from maximizing Project Potential is the industry's increasing reliance on specialization silos. What started out as a logical response to manage complexity devolved into territorial fiefdoms, each naturally inclined toward isolation - a "hey! keep on your side of the line and I'll stay on mine" attitude that occurs at all levels throughout the design and construction process. The unintended consequence of specialization is industry fragmentation.

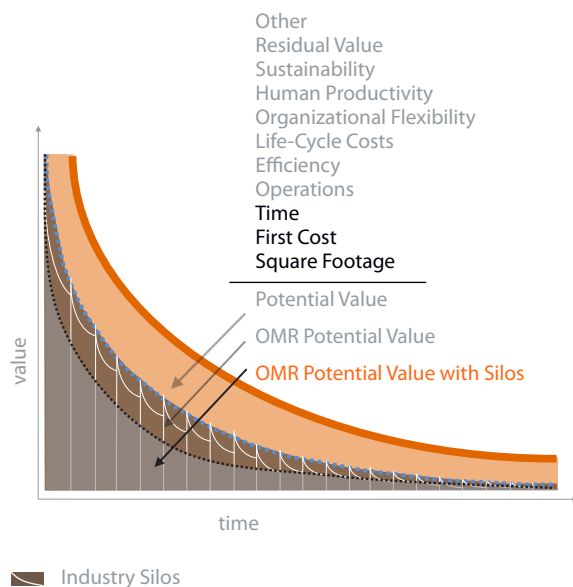
The institutionalization of this attitude in the industry has framed the prevailing methodology of design and construction as a series of specialized disciplines linked by a linear process incentivized to communicate only as necessary for contract compliance. This non-iterative process necessitates fixing variables in each silo prior to advancing to the next silo. Potential discovered at the end of the linear

process requiring adjustment at the beginning of the process has arrived too late - any change requires more time, money and cost. The process inherently resists any change, even one that could significantly increase Project Potential. This is optimization failure, and it continues to have a profound negative impact on the industry. The cause of this failure is not specialization, rather it is the industry fragmentation from the fraternity-like culture seeking to protect or advance a discrete agenda at the expense of a better building. A siloed OMR strategy achieves less value than the same strategy without silos (diagram 6). An integrated industry will achieve more than a fragmented industry. The less value the industry offers the organizations, the further it marginalizes its relevance to the larger economy. Industry fragmentation is the second barrier between the industry and its potential.

Third Barrier: Risk Management Policies

Meaningful change to the OMR strategy and to specialization silos must address the industry's well-established risk-management practices which continue to play a significant role in defining and regulating the AEC industry. A strong risk-management practice is critical to the success of the industry and its consumers. Current procedures were established over the course of decades and are adequate tools for delivering projects under an OMR strategy with specialization silos. These tools make it relatively easy to control delivery of an OMR project by assigning appropriate tasks, risks and compensation. To these constituents, current risk-management procedures present only minor issues. However, to industry constituents interested in increasing potential value through innovation - technological, procedural, organizational, etc. – the inertia of fifty years of US case law defining risk management resists them. The Project Potential that robust innovation could bring to the industry is staggering. However, current risk-management procedures reinforce silos, stifle innovation and limit advanced project-delivery methods, thus forming the third barrier between the industry and its potential.

Decreased OMR due to Industry Specialization
Diagram 6



CONCLUSION

Until now, the negative effect of the AEC industry's OMR strategy and the specialization which led to industry fragmentation, has been concealed by rapid industry growth – we were too busy growing to notice how unwieldy we had become. Today's sustained global economic recession has reduced industry demand by half; twice the supply of demand has yielded a buyer's market. Margins have dropped while competition has escalated. 2.4 M white and blue collar jobs have been lost; because the larger economy is also contracting, these workers have nowhere to go. Necessarily, they will remain in the industry, not as employees of major firms, but as a technologic confederation of new non-traditional competitors offering expert services and minimal overhead. A plant closing represents an immediate cessa-

tion of overhead for an industry while also improving the ratio of supply to demand (a laid off worker does not have the capital to build a competing factory). An AEC industry layoff represents a reduction in a company's overhead and the creation of a potential new competitor.

AEC supply will not be reduced by layoffs and GDP growth is not forecasted to recover prior to 2020; the AEC industry faces sustained downward pressure on fees and increased competition for the remaining share of work. Without healthy margins, innovation and talent will leave the industry and the quality of the built environment will decrease.

Many in the industry see the current condition as the tough part of a normal economic cycle that, with some time, will correct itself. They have the capital necessary to ride the storm and will emerge on the other side stronger, not because they are different, but because there are fewer of them. For these people, this is a hard time, but not one that necessitates any structural changes. This sentiment is good news for the strategic entrepreneur capable of delivering Project Potential: as the existing AEC industry rides the market down from \$700 B to \$350 B with tightened belts and no innovation, the new strategy entrepreneur will be in a growth industry worth \$350 B. She will have the competitive advantage afforded by offering a superior quality product at a lower cost with higher value.

The new strategy could be designed to optimize the industry's potential by building an organization capable of optimizing more issues that affect value. It could be orchestrated by a new methodology of concurrent design, manufacture and production practices that rely on existing experience, emerging technologies, restructured risk-management procedures, and a new culture philosophically geared to get much better, faster.

The timing for this undertaking is perfect; until the current industry crisis, there was no cause for industry leaders to change. Because prospects for many are grim, some minds previously closed to change are receptive and a unique window opens that allows serious consideration for creating an alternative project delivery model that works better.

Though the industry may contract by half, there is no guarantee that the players who excel going forward will be the other half of the current players. It could be that a new kind of player will move the industry.

END PART I