



NAC Executive Insights

White Space Opportunities

Key Points

- The Executive Insight provides a framework for opportunity assessment.
- White space opportunities can be identified as one of three broad classes: core business, adjacent, and white space.
- White space opportunities are further segregated into internal, external, and transformative categories.
- A capital facility value chain is outlined to guide a search for potential white space opportunities.
- A more granular description is provided for the capital expenditures (CAPEX) phase.
- Value chain driving forces are described and detailed.
- An initial listing of potential white space project opportunities segregated by internal, external, and transformative characterizations is presented.
- A similar listing is developed from a business-of-the-business perspective.

Introduction

For the purposes of this Executive Insight, we will define the following three broad classes of white space opportunities:

1. Core business opportunities
2. Adjacent opportunities
3. White space opportunities

Core business opportunities are those that arise as a result of continuous process improvement, which benefits an organization (as well as a large complex project) yet often does not receive the management focus it deserves. In many ways, continuous improvement is a key driver for performance in the moment.

Adjacent opportunities are those compatible with a company's existing business model or, on a large complex project, those compatible with the general execution approach and strategy being applied.

White space opportunities require a company or a large complex project to function in a significantly different manner.

White Space Opportunities

White space opportunities exist outside the core business and its immediate adjacencies. They represent new clients or existing clients who are served in fundamentally different ways. In a project context, the execution and delivery paradigm is fundamentally altered. In a corporate as well as a project context, typical organization structures and operating regimes likely will be noticeably modified.

When one's white space opportunity represents another's core business, strong competitive barriers and resistance may have to be overcome. In either instance, white space opportunities induce significant transformation in an organization. Other effects may take place as well, along with the resulting outcomes and risks.

Corporate and project organizations that have strong continuous process improvement commitment and practices will tend to better exhibit the agility required to embrace white space opportunities.

White Space Opportunity Classification

White space opportunities may be further classified as addressing:

- Internal white spaces
- External white spaces
- White spaces arising from transformative events

Internal white space opportunities. Internal white space opportunities are about satisfying unfilled needs of current clients or addressing unfilled needs related to execution on a large complex project. These are distinguished from continuous process improvement of existing business processes or logical extensions of them into adjacent areas that do not require a change either in business or execution models.

Internal white space opportunities often reflect a foreseeable shift in either the basis of competition or execution. The industry shift towards increased modularization is one example of white space opportunity. Modularization increases were initially addressed by a handful of "first movers" for competitive advantage. Later, modularization became a norm within the broader industry.

Cost advantage is a typical end-state goal of internal white space optimization, but increased reliability of delivery or execution is often a first realization. The improved schedule reliability modularization provides was even more valuable in the early stages of this industry shift. The field erection involved with modularization efforts began to benefit from manufacturing techniques and mindsets that were complimentary to modularization. All of these have become part of the new core business model.

Incorporation of white space opportunities into a company business model or project execution approach will necessitate further changes to each over time as the opportunity matures and becomes a core part of a new norm.

External white space opportunities. External white space opportunities represent the creation of new markets in contrast to what we see with serving adjacent markets. External opportunities are associated with finding new methods, usually through new business models, to serve new clients. The new business models often are driven by significant price reductions, which make solutions available to clients previously unable to take advantage of a capability or solution. The client base is expanded, transforming non-clients into new clients.

In a large project setting we may see external white space opportunities created through a range of supply chain activities, thus changing relationships between various suppliers, improving supply chain transparency and efficiency, and consolidating and redistributing purchasing power. Some current artificial intelligence (AI) enabled supply chain networks are opening up buying power to middle-size players who previously could not participate.

White spaces arising from transformative events. White spaces arising from transformative events are rare. They arise from broad, sometimes historic paradigm-shifting events. When such events occur, they typically affect multiple markets at multiple points along the value chain. Examples of such transformative events include:

- End of the Cold War
- Commercialization of the World Wide Web
- 9/11 attacks
- 2008 financial crisis
- COVID-19 pandemic

These major transformations may be categorized as encompassing three types:

1. Market demand shift (Cold War)
2. Major new technology (WWW; iTunes®; The Cloud; AI)
3. Government policy (airport security; social distancing)

Each transformative event drives a need for:

- A new business model—this is the essential ingredient. If change is not required, the opportunity is most likely an adjacency.
- A change in profit models.
- A change in key business processes and resource types and mix.
- A change in rules, norms, and metrics.

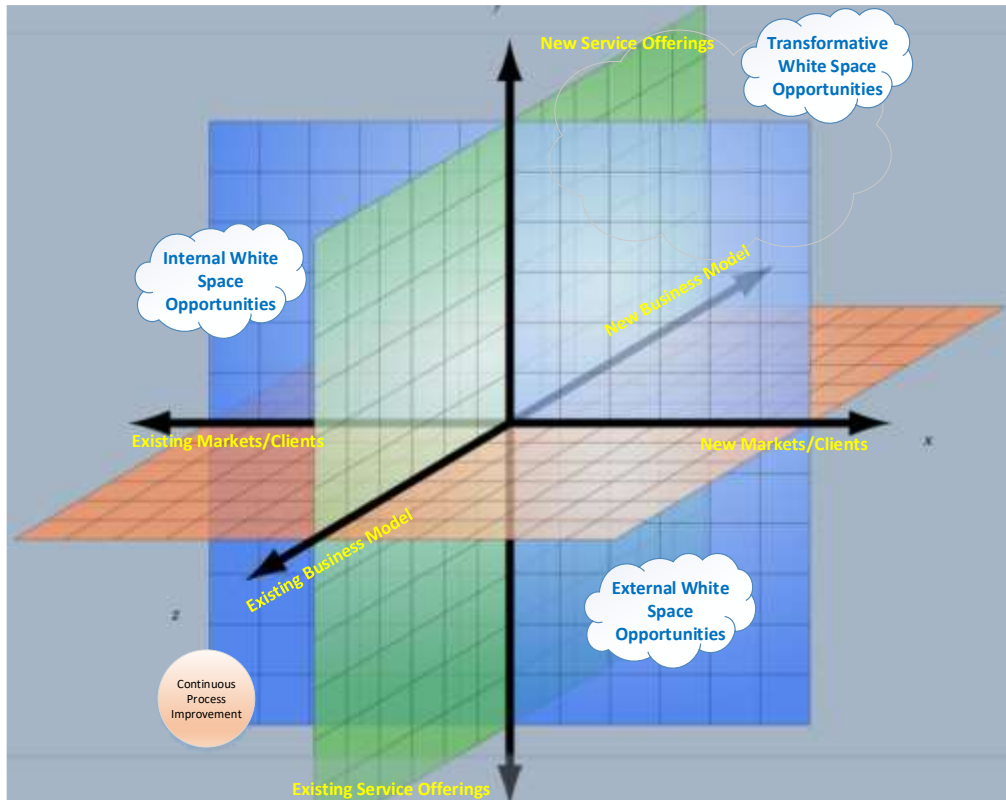


Figure 1. White space opportunities in business, markets, and service areas.

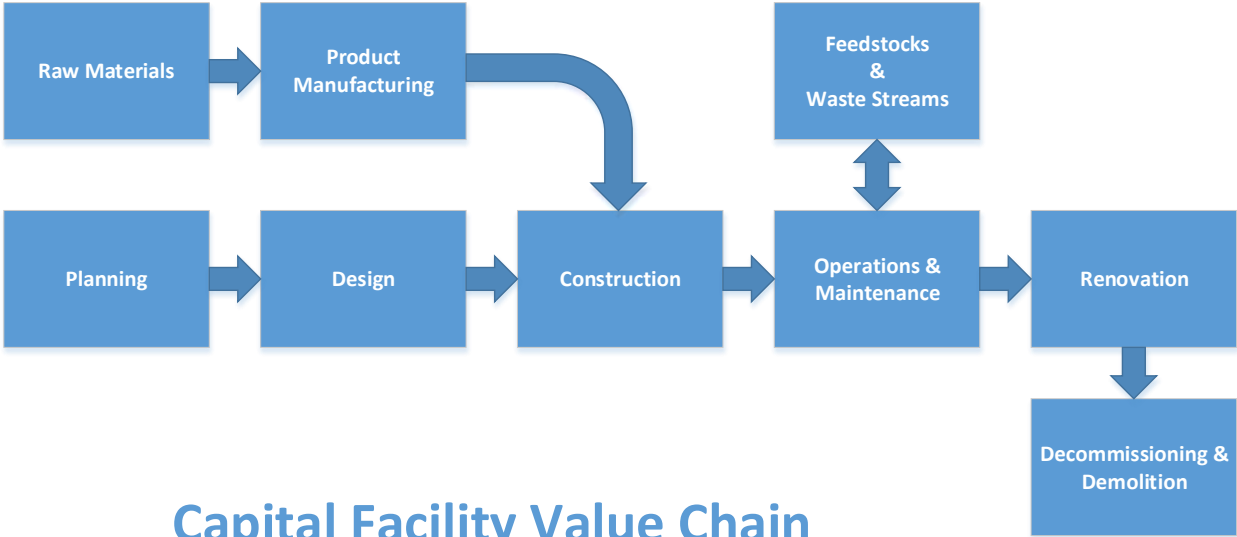
Search for White Space Opportunities

The search for transformative white space opportunities (see Figure 1) requires a systematic examination of the broader ecosystem that lies along a company or project's value chain we identify from each of the three different perspectives. White space opportunities may be a hybrid from different elements of the value chain or a combinations of aspects from other industries. Often these opportunities are created by shifting markets driven by:

- Demographics
- Technology
- Values shifts
- Behavioral changes (social distancing)
- Cultural shifts
- Psychographics

Internally, we identify how well existing structures, systems, and processes can respond to opportunities and threats. Externally, we focus on factors from outside the enterprise, seeking opportunities to exploit weaknesses in existing networks or latent capabilities upon which we can capitalize. Future focus applies foresight principles to examine medium-term trajectories in trends and capabilities that we then can accelerate for advantage.

By their very nature, white space opportunities are both organization dependent and transitory. Figure 2 describes the capital facility value chain. Engineering and construction operate and influence the entirety of this value chain in significant ways. It provides a good framework for considering potential white space opportunities.



Capital Facility Value Chain

Figure 2. Capital facility value chain

As we search for potential white space opportunities, it is useful to consider two types of driving forces acting on this value chain (see Table 1). The first type comprises a set of megatrends, which act not only directly on the industry, but also indirectly, influencing policy, demand, and preferences. The second type consists of driving forces—a combination of innovations, influencers, and drivers. The latter may be more local in nature. Megatrends have a longer time horizon/forcing function, while the driving forces may be more bounded in time and space and yet more transitory in nature.

Table 1 Value Chain Driving Forces	
Megatrends	Driving Forces
Climate change	Innovations
Demographic changes	
Technology revolution	Influencers
- Digital	- Energy prices
- Other	- Resource availability
Economic crisis	- Infrastructure availability
- Social Polarization	

Energy supply	Drivers
- Decentralization	- Consumer demand/preferences
- Decarbonization	- Regulatory signals
Globalization/localization	- Manufacturing choices
Resource/Energy depletion	
Urban redevelopment	
Migration	

A more granular look into the engineering and construction white space begins with the capital expenditures (CAPEX) process, a key part of the overall value chain. The following figures describe the engineering and construction portion of the CAPEX phase.

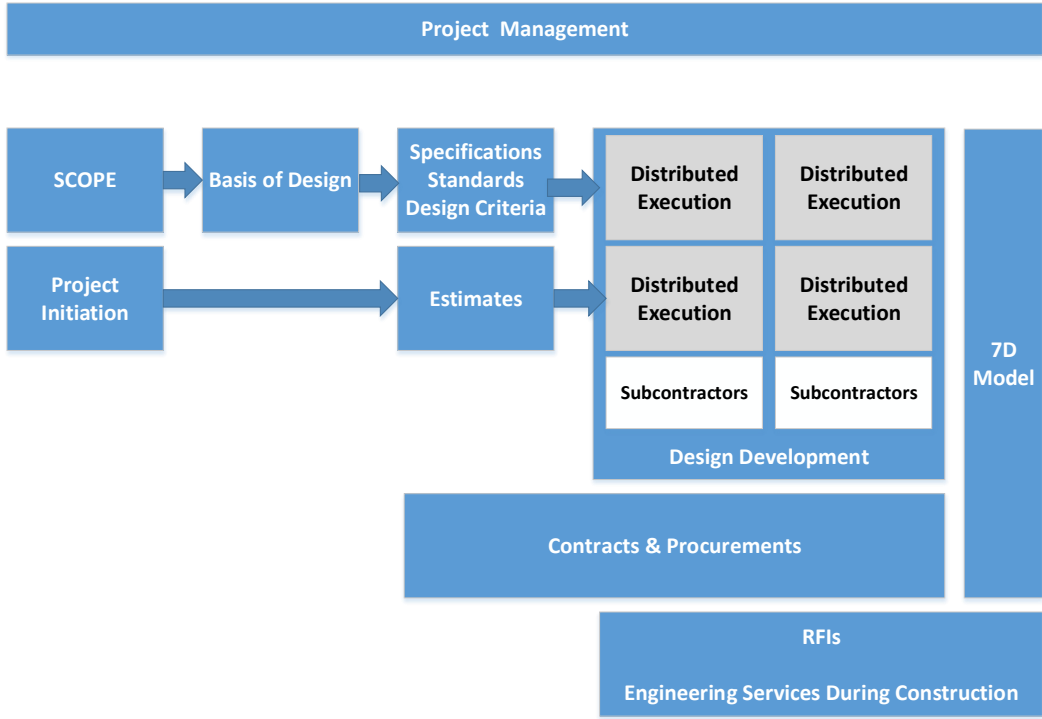


Figure 3. CAPEX phase: engineering.

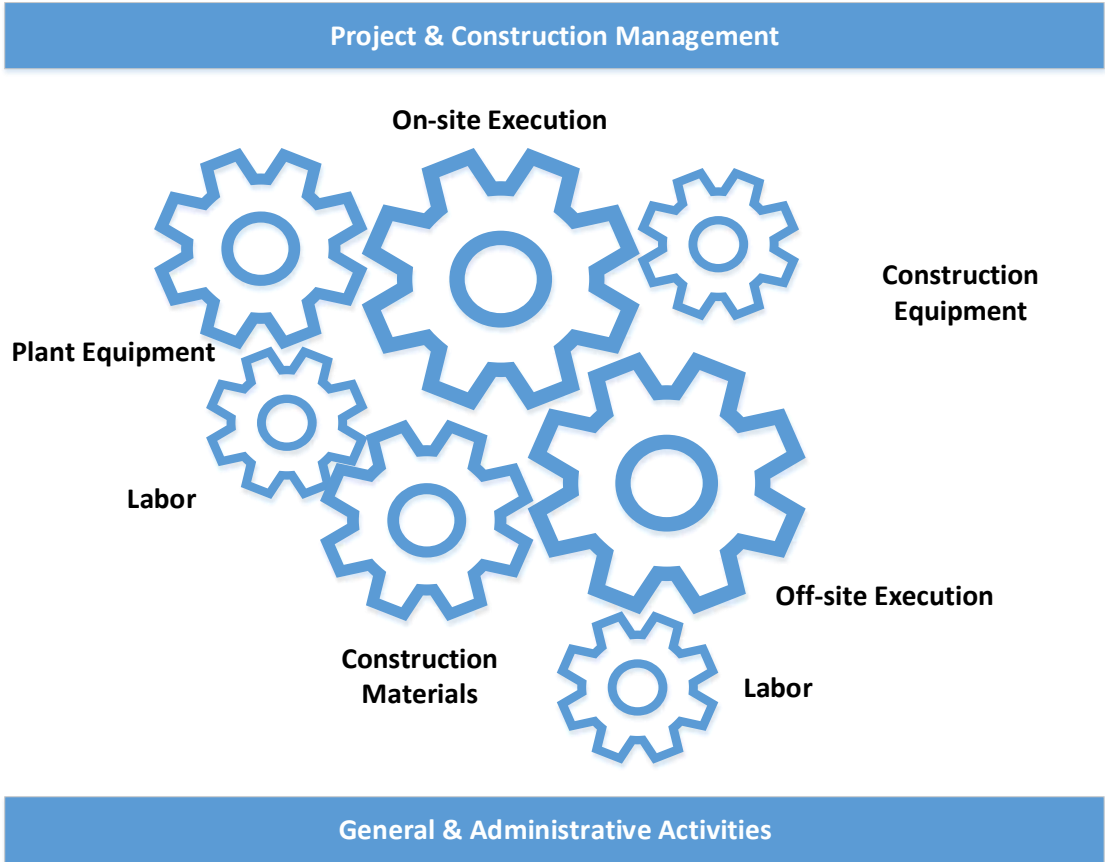


Figure 4. CAPEX phase: construction.

Tables 2 and 3 suggest some potential white space opportunity areas for the engineering and construction industry, considering each of the dimensions described to this point. Table 2 presents project-level white space opportunities. Table 3 looks at these opportunities from a business-of-the-business standpoint. The balance of the life cycle and other capital efficiency levers are not addressed in this Executive Insight.

Table 2
CAPEX White Space Project Opportunities

	Internal	External	Transformative
Planning			Predictive AI applied to societal behaviors and patterns to focus stakeholder engagement
			Real time visualization of planned project alternatives utilizing virtual simulations
		Targeted, personalized social media messaging	
	Massive scenario optimization and sensitivity testing using AI		
		Holodeck based solution marketing	New revenue streams from Holodeck based designs and experiences
	Utility relocation package generation using integration of project/construction schedule, preliminary design and AI enabled application and package generation		Fixed price utility relocation offering
		AI based resilience testing of plans	Resilience insurance founded on AI enabled resistance testing
	Project planning utilizes an efficient “frontier model”		
Design	AI enabled scope development and testing tool	Scope risk assessment using AI to consider market, technology, and client factors	Scope warranty
	AI enabled basis of design incorporating construction and O&M basis of design elements	Basis of design industry data base improves CAPEX and OPEX process	
	Specification checking linked to realized risk database	Performance based specifications reducing design risk	Independent checking of performance-based designs using AI as a business
		Performance based standards normed driving innovation	
	Design criteria optimization on a triple bottom line life cycle basis	Green scoring as a differentiator	Green warranties
	Project initiation acceleration utilizing an AI enabled rules-based approach	Project initiation as a service for owners and contractors	Project backbone as a service
	Estimate completeness checking reflecting prior project actuals, automated quantity takeoffs, identification of potentially missing estimate elements, market factors, uncertainties and recommended contingencies	Enhanced estimates incorporating integrated supply chain partners	AI enabled supply chain platform serving the engineering and construction industry
			Project cost warranties
	Schedule confidence reflecting prior project actuals, execution logic, nature and level of precedence, real time assessment of productivity and other factors, complexity, uncertainties and recommended contingencies	Robust schedules incorporating integrated supply chain partners shop loads, fabrication times and logistics factors	Increased use of schedule-based project incentives
			Project completion warranties

**Table 2
CAPEX White Space Project Opportunities**

	Internal	External	Transformative
	Improved risk modeling utilizing a multiplicity of AI enabled risk modeling techniques and fat tail distributions on larger more complex projects	Real time informed external risk factors and comparison of emerging risk patterns to prior industry experience	Various enhanced risk informed insurance products
	Knowledge assemblies to increase design productivity	Industry scanning of developed solutions to enhance company knowledge base	Industry knowledge cooperative
	Knowledge assemblies include BIM library design elements/modules		
	AI enabled design optimization	Industry scanning of developed solutions to enhance design optimization	Validation and verification of AI generated designs as a service
	Package development and demarcation to support construction schedule and execution methodology	Work-package database incorporating broader industry results	AI enabled work package development service for contractors reflecting bespoke conditions
	AI enabled dynamic design package management in support of extreme distributed execution including maximum remote working	Dynamic design package management reflecting real time subcontractor capabilities and capacities	AI enabled dynamic design management service incorporating interface management, specification and basis of design checking, contract requirements and identification of areas warranting special attention
	Real time design to cost assessment	Assessment of evolving cost threats and opportunities	
	Cost and schedule impact assessment of changes in scope based on current project condition and execution strategy and risks going forward	Automated generation of claims notices and supporting packages	Scope warranty services
	Migration of 3D models towards 7D models (TBL, life cycle, incorporating risk and uncertainty)	Construction execution simulation services	
		O&M simulation services	Capital efficiency-based enterprise asset management service.
			Virtual asset management business
	Deep optimization of design solutions	Modified procurement strategies to reflect outcome-based procurement on key operating assets (power used by capital asset vs power capability and capacity on balance sheet)	Asset as service offerings (Rolls Royce aircraft engine concept more broadly employed).
	Self-diagnosing; self-healing; self-repairing technologies incorporated as a capital efficiency differentiator		
	Optimization of module battery limits and incorporated elements	Module optimization considering broad industry demands and capacities	Standard modules of various types sold "as is"
	AI enabled procurement specification generation including associated contract terms	AI enabled bid review for conformance with RFP requirements including	Supply chain platform with standard contract content and terms

**Table 2
CAPEX White Space Project Opportunities**

	Internal	External	Transformative
		procurement specifications	
	Standardization/optimization of connections, repetitive elements		
	AI enabled performance specification generation to meet contract requirements and design intent	AI enabled evaluation of proposed solutions to performance-based procurements and specifications	
		Sub-assemblies become the procurement point of supply - not equipment	
	AI enabled prime contract management	AI enabled contract management and notifications	
		AI enabled supply chain management	
	AI enabled design completeness reviews to minimize risks	AI preliminary response generation in response for RFIs	
Construction	AI enabled construction execution risk assessment and workflow optimization scenario analysis	Dynamic analysis of external and emerging risks	
	AI enabled work package development and resourcing plans	AI enabled resource procurement and mobilization in support of designated work packages	
	Development of contingent work packages and decision strategies	Predictive analytics forecast cost and time to complete based on current performance and emerging risks and trends	Real time project forensic analysis and turnaround service
		Allocation of work packages to module yards and their sequencing based on mod yard and on-site execution performance and productivity	
		AI enabled supply chain (plant equipment) vendor performance against plan and on other in shop projects	
		AI analysis of vendor performance and quality data to predict emerging issues	
	Construction schedule linked to attribute files identifies prerequisites of construction on real time basis (Labor, materials, equipment, permits, safety training)		
	Predictive analytics to support predictive inventory management of construction materials	Just in time construction materials platform and services agreements	
	Dynamic labor forecasting by work package and trade including required conditions precedent (training, equipment)	Assessment of available labor force on dynamic basis and continuous engagement through tailored social media	
	Real time safety through advanced visual AI	Safety as a service in support of site based sub-contractors	
	Construction fleet optimization using AI technologies	New construction equipment business models (pay for service)	
Construction	Increased integration of robotics	Specialty construction tech	Manufactured plants (more than

**Table 2
CAPEX White Space Project Opportunities**

	Internal	External	Transformative
technology/processes		solutions firm	just modules)
			Construction technology one stop shop (Home Depot of construction technology)
	Work package development and optimization tool (last planner on steroids)	Integrated work package tool with direct supplier and subcontractor participation	Management of construction robots and manufacturing of modules driven by work package system
		Advanced construction materials consortium	
	Integration of large-scale additive manufacturing as a core capability (print a structure)		
	Real time AI safety system integrating real time site conditions (dynamic and planned operations) with employee data (training; utilized PPE) and workforce plans		
	Greater utilization/first mover advantage on new construction materials Meso Coat – nanometer cladding to prevent corrosion Gaia – concrete additive that replace micro silica Pureti – photo catalyst to keep surface organic free Solar roof shingles (vs white roof) Super Therm: Ceramic Paint Insulation		
		Self-erecting/ pop up structures - the origami building	
Construction waste	Embedded carbon calculator coupled with AI design tool		
	AI enabled temporary works minimization		
		Shipping and packaging materials evaluator and optimizer with key supply chain partners	
			CO2 concrete for net zero construction
Project/Construction Management	Real time project status - Actual design, procurement, and construction status known continuously		Project control subscription/by the drink service platform
	AI enabled predictive project analytics	Predictive analytics applied across supply chain and sub-contractors	AI project data commons and analytics platform
	Work flow planning linked to actual resource distribution and availability (economic dispatch model)		

Table 2 CAPEX White Space Project Opportunities			
	Internal	External	Transformative
			Own the complexity metric and tool (score for a fee)
	Real time contingency planning reflecting changing project condition and externalities	Share real time contingency planning with supply chain	Real time contingency planning tool/service
	Risk management on steroids (white space risk; complexity scoring and trending; assumption tracking)		

Table 3 Engineering/Construction Business White Space Opportunities			
	Internal	External	Transformative
Corporate processes and systems	Utilizing capacities created by transitions (technology; skilled/unskilled resources)		New business models selling unused capacity of existing networks (digital and other)
			Non-core operations set up to serve broader industry as a profit center
			Competition of supply chains
			Risk aggregation and transfer solutions (warranties/insurance)
Workplace efficiencies	Changed labor model (individual contractors vs employees) for broad segment of labor force		
	Service derived from assets owned by others to become asset lite	Service provider to asset lite industry participants	Outcomes based asset models
	Automation and application of AI at every step of design process	Low cost automated design service provided broadly in market including traditional competitors	Service business that translates preliminary designs and specifications into final designs and construction work packages utilizing latest technology
	Rapid prototyping and deployment of productivity enhancing apps		Engineering and construction app business. Examples: - "Punch List" - \$6.99 - TBL Life cycle capital asset analysis tool - \$25,000 (Benchmarking subscription - \$15,000 annually)
			Integration of BIM, video game technology, avatars and AI for construction planning and workforce simulation
	Put fixed assets to work 24x7 (volunteer second shift labor; contract labor)		
New market intersections			Agri-engineering
			Capital efficiency services for clients including participation in underlying industry asset ownership
			Materials business focused on rapid

Table 3 Engineering/Construction Business White Space Opportunities			
	Internal	External	Transformative
			scaling of new differentiating materials
			Decarbonization warranties and insurance
		White space WIFI networks to deliver health and education in developing countries	
		Supply Chain Resilience Assessment and Management	
			Engineering/construction network integrator (capture network premium/advantage)
			PPP all government services on either demand, availability, or level of service basis (transportation; public buildings; water/wastewater; engineering and facility mgmt services; multi-agency program and project management)
		innovation platforms to accelerate innovation	

Summary

White space opportunities exist outside the core business and its immediate adjacencies. They represent new clients or existing clients served in fundamentally different ways. In a project context, the execution and delivery paradigm is fundamentally altered. In both a corporate as well as a project context, typical organization structures and operating regimes likely will be noticeably modified.

The full range of white space opportunities has not been addressed in this Executive Insight, but the included tables should stimulate one’s own thinking process. Please feel free to share potential additions to these tables.

About the Author

Bob Prieto was elected to the National Academy of Construction in 2011. He is a senior executive who is effective in shaping and executing business strategy and a recognized leader within the infrastructure, engineering, and construction industries.

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