10.20.20

BUILD USA

PRESENTS

WHITE PAPER THREE

THE THIRD OF A WHITEPAPER SERIES

OPTIMIZED BUILDING

SYNTECGROUP

Contents

Introduction

The traditional on-site building process is **notoriously inefficient**. Typically, it involves the coordination of multiple, disjointed teams, each inhabiting their own walled-off silos of knowledge and jealously guarding their professional turf. Even in the pre-construction phase, before the real building gets going, this situation often results in a series of miscommunications, conflicts, and costly errors. The actual construction itself is no more efficient. Bad weather, unreliable material deliveries, difficulty organizing and managing large numbers of personnel and complex pieces of equipment—these are just some of the factors that can lead to interminable scheduling delays and chronic cost overruns. As projects become more complex and larger in scope, and environmental and safety standards become more exacting, the inefficiencies of traditional construction become more intolerable to all involved.

This state of affairs is not sustainable. Although about 80% of all construction work is still done on-site, forward-thinking owners, project developers, and contractors are exploring off-site construction alternatives that allow for a more streamlined approach to the building process. Among the various off-site or prefabrication methods, modular construction has emerged as a potential industry game-changer that helps deliver projects faster, safer, and cheaper.

Modularization is a construction method in which an entire unit of a building is produced off-site in a factory setting and then shipped to a construction site for assembly. Today's off-site factory may produce flat-pack components (such as walls or beams), volumetric modules (bathroom pods or bedrooms), or even entire buildings. The basic elements of a modular project—walls, doors, windows, columns, etc.—arrive as individually packaged items that are ready for assembly. Like a series of Russian dolls, modular assembly follows the logic of a nested hierarchy, proceeding stepwise from the smallest unit to the largest unit: a wall; four walls together; a single room; a suite of rooms; an entire building. Modular units require the least amount of on-site construction time, as all plumbing, electrical, and design finishes have typically already been installed in the facility.

Historically speaking, modular construction is not a new concept. **The longer history of modularization** goes back to ancient Greek architecture and its creation of three classic column types: the Doric, Ionic and Corinthian Orders. Ancient Roman armies built their forts from prefabricated sections which they carried as they marched. In **the modern era**, Sears, Roebuck and Co. first popularized modular housing in America when they began selling "kit homes" whose components could be shipped and assembled upon delivery. From 1908-1948, Sears sold approximately 75,000 homes via catalog. The modern use of modular peaked during the post-WWII building booms in the US and Europe, when there was an urgent need for speedy reconstruction due to widespread housing shortages.

Despite intermittent periods of popularity, modular construction has generally remained a niche approach. Today, however, this is changing. Modular is attracting unprecedented interest and investment, and being adopted for projects as varied as hospitals, ambulatory medical centers, high-end condos, apartment complexes, and hotels. Over the last five years, the modular construction business has doubled in size to become an **$8 billion industry**. Among general contractors already using modular methods, **nearly 70% expect modular use to increase over the next three years**. Factors contributing to the rise of modular include:

- *Digital Technology.* The rise of digital technology has helped modular construction by facilitating the design of modules, increasing precision and productivity in manufacturing, and optimizing delivery logistics. Thanks to digital tools such as BIM it is becoming easier to create more sophisticated systems of modular components and to integrate them into conventional buildings.
- *Consumer Perception.* Consumer perceptions of modular housing are beginning to change as new, more diverse material choices enhance the aesthetic appeal of buildings, and builders start to focus on sustainability and customization.
- *Leadership Mindset.* New entrants and first movers, dissatisfied with the industry's lack of innovation and poor productivity, are starting to disrupt the market and change the mindset of incumbents. Industry leaders are beginning to realize it may be time to reposition themselves.

- *Economic Demands.* Modular is more appealing in the current environment of accelerating skilled labor shortages and increasing cost and schedule pressures.

The market for modular construction will continue to grow as owners and developers become aware of the advantages of modular and become accustomed to new project delivery methods. Under modest assumptions of penetration, the market value for modular in new real estate construction alone could reach **$130 billion in Europe and the United States by 2030**. The growth of modular could help give the industry a much needed **productivity boost**, solve housing issues in many markets, and significantly revise established building practices.

Benefits

By transferring a large portion of the building process from an unpredictable on-site environment to a controlled factory setting, modular construction mitigates the waste, delay, and inefficiency associated with traditional construction. The main benefits of modular include the following:

- *Accelerated Schedule.* Construction of modular buildings occurs simultaneously with the site and foundation work, and any delays experienced on-site do not impact the production process. This enables modular projects to be completed **30%-50% sooner** than traditional projects. In turn, the occupancy and revenue-generating stage of a project can begin much sooner.
- *Reduced Risk.* Modular construction is far less subject to the legal and financial risks inherent in complex collaborations with subcontractors. Plus, the indoor construction environment reduces the risk of dangerous accidents and related liabilities for workers, resulting in improved safety and security.
- *Higher Quality.* Modular buildings are designed to meet or exceed the same building codes and architectural specifications as traditional buildings. Thanks to standardization, a controlled environment, and factory quality checks, the modular process permits superior quality management. For best-in-class producers, **the defect-free rate on new buildings is now above 95%**.
- *Lower Costs.* The controlled, weatherproof workplace increases the productivity of individual employees, while also allowing economies of scale, optimized logistics, and lean manufacturing. Minimizing the inefficiencies, delays, and wasted materials associated with the traditional building process can **reduce overall costs by up to 20%**.
- *Less Waste/Environmental Impact.* Traditional construction produces significant waste and environmental impact. When the building process takes place in a factory setting, waste is reduced by controlling inventory and recycling materials. Pollutants are prevented from entering the surrounding environment. Production efficiencies, **emissions can be cut in half**.
- *More Reuse.* Modular buildings can be disassembled, and the modules repurposed for new uses, reducing the demand for raw materials and conserving expenditure.
- *Limitless Design Opportunities.* Modular buildings are very versatile and can be designed to serve almost any function. Modular units can integrate seamlessly with

the aesthetic features of existing buildings. Once assembled, they are virtually indistinguishable from their site-built counterparts.

Modular construction, combined with new methods of data sharing and decision-making, is the industry's best bet for improving the overall quality and efficiency of the traditional building process.

Challenges

Despite the numerous advantages of modular construction, many North American owner organizations remain reluctant to fully embrace off-site project delivery methods. According to recent research, only **38% of owner organizations have a high rate of acceptance of off-site projects, and nearly 50% still opt for the traditional design-bid-build approach**. Obstacles to the widespread acceptance of modular include the following:

- *Image Problem.* Modular has a poor image due to traditional misconceptions about quality, price, and the potential for customization. Modular is often associated with low-quality, uniform, aesthetically unappealing housing.
- *Lack of awareness.* **More than 70% of general contractors** say their primary reasons for not choosing modular construction are: 1) clients aren't requesting modular projects and 2) architects aren't developing designs for modular projects. Due to the irregular nature of demand, off-site factory space is underutilized.
- *Risk Aversion.* The building industry is risk averse. Both builders and clients are overly cautious when it comes to adopting new processes and technologies. Contractors, in particular, are wary of investing significant funds in off-site factories. Further, there is increased risk involved in committing to particular off-site suppliers due to the underdeveloped state of the market.
- *Regulation.* Traditional construction is typically subject to strict labor rules regulating the activities of on-site personnel or specifying the minimum number of workers for a particular task. Such rules are incompatible with the off-site labor model, which is based on small teams of broadly trained workers. Other rules, often local, including health and safety regulations, planning codes, and mortgage or insurance requirements, have also hindered the development of off-site construction.
- *Costs.* Upfront costs can be considerable and securing loans can be difficult. For example, modular projects often require a significant upfront deposit for building materials that may account for **25% of the total construction cost**. In addition, the cost of transportation can be high, especially in cases of long distance between the factory

and the site. In general, prices are elevated due to the lack of scale and competition in the current market.

To confront these challenges, and accelerate the industry uptake of modular, individual companies along the value chain can adopt strategies such as:

- Work jointly with the material procurement chain to further develop modular construction systems. Develop products in conjunction with manufacturers and their regional distributors.
- Tailor on-site construction processes to the use of modular components and systems.
- Work to establish industry-wide standards for modular components and processes.
- Educate the general public and industry professionals on the benefits of modularization and best practices for executing modular projects.
- Develop specific products that prove out the concept.

The Near Future

Four building delivery processes will emerge in the near future of the building industry:

1. ***Boutique*** projects that offer high-end, custom building solutions based on the unique preferences of an owner or client.
2. ***Iconic*** projects that develop large-scale structures that push the boundaries of current building technologies and techniques.
3. ***"Optimized"*** (modular) projects that focus on buildings used throughout the built environment and do not require one-off customization for optimal performance.
4. ***Hybrid*** projects that combine features of #1, #2, and #3.

Of all these processes, "Optimized building is poised to have the most significant impact on the building industry. The ability to consistently deliver high quality, high- performing buildings in shorter time and at lower cost will enable "Optimized" building to achieve prominence.

The automotive industry offers a useful analogy for “Optimized” building. Like cars, “Optimized” buildings will be developed on standardized chassis, with a sufficient variety of modular components to satisfy the customer’s operational needs and aesthetic preferences. And, like options on cars, these modular components will offer the customer a menu of custom choices for each building (including a preset project schedule with definitive deadlines). In addition, the development of optimized modular buildings can create corresponding changes in AECM business relationships. In the same way that an auto dealer sells different automobile models and supports specific warranties, the AECM can sell different building models directly into the surrounding community. Finally, like automotive production, modular production occurs in a controlled environment with consistent standards and workflows. Thus, modular can enjoy the primary benefit of producing at scale: higher quality at lower cost.

Conclusion

“Optimized” building and modular construction represent a significant portion of the future of building development. After decades of relatively slow growth, the rapid rise of modular looks likely to disrupt the building industry. Innovative owner organizations that are aggressively adopting off-site construction are already achieving significant results through enhanced efficiency and more transparent delivery mechanisms. Moreover, ongoing advances in digital production methods such as robotics and 3-D printing, and collaborative platforms such as BIM and digital twin technology, will only complement and support the growth of “Optimized” building...

These transformative developments will affect companies all along the value chain. Industry players should evaluate the considerable upside potential of “Optimized” building and assess their strategic choices to ensure they don’t get left behind. The initial investment doesn’t have to be all or nothing—most of today’s offsite-active companies started off with a small side project and gradually increased their involvement over time. However, the time to invest is now.

About BuildUSA

CEO / Founder – Steve Salzman, Steve holds a Bachelor of Architectural Science from the University of Illinois. His career has encompassed the areas of architecture, design, construction management, and real estate development. Building and running multiple companies has afforded him the opportunity to develop an intimate understanding of all phases of the building process. These professional activities coupled with a personal interest has led to extensive research on how to develop and deploy new technology, new building materials and new building prototypes. As a recognized in leader in the rapidly changing building industry, Steve applies his industry-specific experience to provide executive leadership to The Syntec Group in the areas of client and project development and collaboration, market penetration, technology and strategic planning.

About BuildUSA

Evolving market realities have begun to significantly impact the historical cottage industry nature of Building. Firms of all sizes will increasingly develop collaborative organizations that pool the required shared digital workflows, standards, and resources. Collaboratively Integrated Partner Organizations (CIPO's) will strive to maintain their unique identity/culture while remaining agile and strong enough to both accommodate and drive market shifts. BuildUSA-Chicago (BUSA-C), will be the first CIPO group and will focus on the Midwest region, providing a branded building process that will offer:

"High Quality", "High Performing" buildings to the market in "Shorter Periods of Time" and at "Lower Costs"

About The Syntec Group

Syntec Group is comprised of leading building industry solution providers expert in in each specialty required to address all your building and facility needs. The Syntec Group's business protocols and management tools result in seamless projects, well informed owner's and positive outcomes.

We strive to provide our clients:
Real world experience, creatively applied, using cutting edge business & technology solutions.

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