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NEW YORK INSTITUTE OF TECHNOLOGY

School of Architecture & Design

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Vision

Modular 2.0

In the near future, a multifamily housing professional will move tenants into an apartment building that took four months to push from idea to reality. Here is how.

In the project's first hours, the professional's software will inform the design with the seamless benefits of a highly organized marketplace. The site will be geo-located and legally defined. Automations will help select building layouts. Site-specific conditions will be studied (weather, zoning, procession, etc.). The building will be configured as a collection of predefined modular and panelized building components. Then, invitations to tender engage the supply chain. Packaged mechanical units, modular kitchens, and modular bathrooms will be swapped, depending on inventory and price. All the data needed to make quick decisions will be in one database. From the professional's perspective, the database of configurable parts ***simply work together***.

In those first days, interested professionals will log in to complete the logistical details of the project. The tendered invitations will invite site specialists to plan site interfaces (foundations, utilities, and staging areas), independent of suppliers. The same invitations will invite modular and panel manufacturers to meet at building interfaces (confirming the proper use of their product lines and confirming the use of standardized interfaces between product lines). From the producers' perspective, the pre-organized design and well-defined scope de-risk speedy commitment. The project and stakeholders will profit from ***simply working in parallel.***

In the first weeks, large parts of the building will be produced across a variety of locations. On site, the most bespoke elements will be placed: foundations interfacing with the earth, utilities stubbing into predefined locations, and the building environment curated (drainage, parking, lighting). In nearby factories, product platforms will spring to life, churning out instances of pre-designed product lines, and stacking products for delivery. The top of the foundation will act as the staging area for all these products to meet on scheduled shipping dates. Speedily, the packaged mechanical units, structure, floors, walls, kitchens, and bathrooms will be stacked in pre-determine order. From an onlooker's perspective, the building will ***simply come together***.

Everyone will feel more empowered and productive. Designers will enjoy how the means of production richly informs every level of design, fabrication, and assembly. Means and methods will not be an obstacle, but a feature of the design. Builders will feel the administrative complexities melt away. They'll simply be more productive. Financiers will enjoy the reduced risk of funding products with warranties and predictable schedules. Developers will enjoy the velocity they need to address the housing crisis. This future is in our grasp. It only takes a few key steps to ***simply bring it together***.

This is Modular 2.0. It is the future of US construction.

Note 1: This narrative stems from the logical interpretation of the Center's ***Core Values***, and ***Mission***, detailed on its website: nyit.edu/architecture/offsite.

Note 2: The necessary technology to make this ***Vision*** an effective, everyday practice is listed in the Roadmap, detailed below.

Preface

Infrastructure to build Modular 2.0

Technology is systems of organization. Industry's fundamental function is to use technology to turn nature into a resource for efficient use. Modern technology, then, lets us isolate nature and treat it as a "standing reserve" — that is, a resource to be stored for later utility.

The sophistication of a technology is correlated with how many systems-of-organization it effectively blends. New technological wonders, like smartphones, are instruments that reflect a tall stack of complex sub-technologies (***cell communications transmitting on FCC radio frequency allocations, lithium-ion batteries powering efficient processors, LED screens, operating systems, HTML protocols, document-object models… all combine to support the web application on a smartphone***). In contrast, contemporary framing hammers are instruments supported by a shorter stack of technologies ***(lumber harvest supplying standardized milling, fasteners distributed to hardware stores, and span tables calibrated to structural engineers' training)***.

Myriad technologies already support today's US offsite industry (Modular 1.0). Some are common to the full AEC industry ***(like the Eisenhower Highway System with flat-bed trucks, Building Information Modeling (BIM) with Level of Development specs (LOD), and the AIA Contract Documents with PDF-based file exchange)***. Other technologies are unique to Modular 1.0 ***(like special-purpose modular lifting cradles to interface with existing hoist machines, and special-purpose manufacturing project management software to aid productized construction)***.

This Roadmap offers unprecedented organization. It represents the key technologies needed to unlock unimaginable efficiencies in US Construction.

Contributors to the Roadmap (listed on page 27) span wide-ranging interest categories including manufacturers and builders, but also standards users, designers, consumers, public interests, and regulators. Each contributor brings expertise and represents their field's interests in organizing the Roadmap.

Each technology listed stands atop the technologies we use today. They are not separate, but integral to the way we do business, and change the built environment.

The difference is in scale. Each new technology empowers tech deeper in the stack. These technologies allow all actors to do more, with less. To design more, with less paperwork. To build more, with less administrative hassle. To enjoy more craft, and less preparation. To finance more homes, at lower price points.

What's at stake

The following technologies organize the Modular 2.0 marketplace. When integrated, all stakeholders will unlock immeasurable efficiency, sustainability, and value. An early-mover advantage grants outsized profits to those who craft these infrastructures, for others' use.

History

		Traditional	Modular 1.0	Modular 2.0
SUMMARY	Phrasing Where frequently cited	Projects, with designers and builders Leon Batista Alberti De re aedificatoria Mid 15th Century	Products not Projects McKinsey & Company report "Modular construction: From projects to products" June 2019	Product Lines, not Products Construction Innovation Hub, "The Product Platform Rulebook" March 2023
LEGAL	Legal Framework Focus	Common Law (Service Contracts) Includes offer, price, nature of work, quantity, and performance.	Common Law (Service Contracts Includes offer, price, nature of work, quantity, and performance.	**Uniform Commercial Code (UCC)** Contractual transactions with goods and tangible objects
	Primary Agreement	Service Contracts (AIA B100, etc)	Service Contracts (AIA B100, etc)	**Bill of Sale**
	Instruments of Service	Architectural Drawings (Owner to GC) Shop Drawings (Sub to GC)	Product Drawings (Modular to Owner) Shop Drawings (Sub to GC)	**Catalog** **Feature list on website**
	Instrument of Use	As-built drawings	Shop drawings	**Owner's manual**
	Instrument of Transfer	Deed Titles transfer ownership	n/a	**Title for product** (like car title) Enable a secondary market and circular economy
	Instruments of Change	Revisions to Statement of Work (pre-agreement), Change Orders (post-agreement)	Revisions to Statement of Work (pre-agreement), Change Orders (post-agreement)	**Refund**
	Inspection	Onsite Municipal Inspection Interpretation of Zoning and Code	In-factory Municipal Inspection	**UL-Listed** **CE Listing**
Guiding Principle		**Building as a Service** Competitive bids and adversarial relationships	**Productization as a Service** Competitive bids...	**Products in a circular economy** Channel partners and cooperative agreements
MARKET	Unit of Engagement	Clients and Service Contracts	Purchasers & Manufacturing Agreements	**Customers representing Market Segments**
	Solicitation	Requests for Proposals (RFPs)	RFPs Invitation to Bid (ITB)	**Tendering** **Advertisements & Catalogs**
	Product-level assembly	Trade-based interfaces	Mirroring job site services, managing trade-based interfaces	**Interfaces (between platforms)** **Standards (within platform)**
	Aggregation of demand	Component level, through suppliers to trades	Mirroring traditional methods, inside	Module level, amassing trades to builder
	Marketplaces	B2B & B2C GCs focus on building type	B2B Focus (almost exclusively) on institutional customers	B2B & B2C Product lines diversify to serve building types
	Pace of Innovation	Rapid: per project	Rapid: per project	Variable: within platform
Guiding Principle		Competitive Bids	Competitive Bids	**Product Interoperability**
Selection Process		Bid Leveling	Bid Leveling	**Price Transparency**
Individual Motive		Secure contract, then change orders Accidental adversarial relationships	Letter of Intent (LOI) Lock scope & price before investing engineering and design coordination unique to project	**Product Differentiation** Secure larger market share

		Traditional	Modular 1.0	Modular 2.0
RISK	Risk Management	RFPs, RFIs, (before contract) Contract exclusions & clarifications (at signing) Bonds (during performance)	RFPs, RFIs, (before contract) Contract exclusions & clarifications (at signing) Bonds (during performance)	**Guarantees** **Warranties**
	Remedies	Change Orders Law Suits Liens	Change Orders Law Suits	**Money back (guarantees),** **Repair or replacement (warranties).**
	Coverage	GC performance Subcontractor performance	GC performance Manufacturer performance	**Product, service, people, and consumer satisfaction**
Guiding Principle		Per specialization - gaps between boundaries Onus on interpretation of service contracts	(mixed)	**Per product** - interfaces cover boundaries Clear boundaries between product and installer

TIME	Management / Coordination	Critical Path Method (CPM)	Critical Path support	Delivery Schedules
	Payment Rhythm	AIA Schedule of Value	**Production deposit, tied to delivery, and installation**	Deposit, Delivery, and Installation
	Unit of Time	Day Manhour	(mixed)	**Takt Time** (in production, i.e. MRP II or JIT) **Lift Schedule** (on site)
Guiding Principle		Efficient site management	**Parallelism**	Uninterrupted Supply Chain (JIT)

LABOR	Concept of Operation	On-site construction	"Indoor Construction"	**Manufacturing**
	Enterprise resource planning	Design / Bid / Build Design-Build	Design to	**Manufacturing Resources Planning (MRP II)** **Just in Time (JIT)**
	Organization	Subcontractors shopping at trade stores (tier 3)	Supply Chain	**Tier 1, 2, and 3 Supply Chain**
Guiding Principle		**Hierarchy** Owner, designer, builder silos (for risk management)	**Parallel** Offsite as subcontractor to Design / Bid / Build	**Holacratic** Decentralized management per product

		Traditional	Modular 1.0	Modular 2.0
CASH FLOW	Concept of Payment	Per bid project scope Services dependent on client viability		Customer-based **Products interchangeable between customers**
	Cash flow	Schedule of Value Dependant on other subcontractor's performance		**Purchase-based** (not service-based) **Deposit and Delivery** (and Installation)
	Disruption	Brittle failures Supply chain variability between bid and service		**Managed externally through product interoperability** **Managed internally through production runs and backlot**
Guiding Principle				
DESIGN INFRASTRUCTURE	Software	Drafting / Computer Aided Drafting (CAD)	Building Information Modeling (BIM)	**Inventor / Solidworks**
	Coordination	Coordination Meeting (Vellum overlays)	Clash Detection	**Interface check**
	Unit of Data	Line	System Family (on-site assemblies) Family (catalog-ordered product)	**Family Table (Formula)**
	Composition	Construction Documents	Federated model (Clashed BIM)	**Bill of Material (BOM)**
	Designer Focus	All scales	Focus at course scale, Modular for finer-scale	Dedicated designers, per scale, working intimately at the manufacturing facility, applying learnings per product run.
	Decision making	All scales Fragmented	Room scale Ex post facto	**Scaled to Product**
	Representation	Releasing drawings at all scales	Focus at course scale, Modular shop drawing for finer-scale	**Product models**
Guiding Principle		**Level of Development (LOD)**	**Level of Development (LOD)**	**Catalog of assemblies**
MANUFACTURING INFRASTRUCTURE	Paradigm	Construction	Fabrication and Assembly	**Fabrication, Assembly, and Installation**
	Software	Paper	Web 2.0 Document Herding (Procore, NetSuite, BIM 360)	Merlin AI
	Unit of Data	Commodity	Element	**Part / Assembly**
	Composition	Shop Drawings	Shop Drawings	**Bill of Material (BOM)**
	Primary Value Stream		Steel, Timber, Passivhaus	CLT, Refurbish existing homes
	Secondary/Waste Value Stream	Material Reclamation Centers Architectural Salvage Stores	Material Reclamation Centers Architectural Salvage Stores	Reuse of steel, timber, insulation, repurpose shipping containers, Hemp-based materials
	Cradle to Cradle	Reduce materials, Use recycled materials	Reduce materials, Use recycled materials	**Healthy Secondary Markets (from Interoperability)**
Guiding Principle			**Parallelism**	**Interoperability (for stockpile)**

Roadmap

Design Infrastructure

[A] Product Interfaces (Industry standard)

Definition: The manner in which products interact with other products (i.e. the USB interface between a smartphone and host computer).

Problem: The threshold of combining trades. Larger products (like pods) combine trades, and modular interfaces must gang several trades' connections. Modular 2.0 interfaces will be instantly recognizable, in that they exist in a shared space, spanning various trades, companies, and construction methodologies. But agreement has not yet been worked out between these entities.

Traditional: interfaces are governed by trade (PEX connections for plumbing, outlets for electrical, etc.). They operate exclusively within a trade's building contributions.

Modular 1.0: almost no new interfaces have been standardized at the industry level. Interfaces that are defined survive inside large vertically-organized volumetric builders that treat these as Standard Operating Procedures (SOPs) and Intellectual Property (IP).

Modular 2.0: Interfaces abound between panelizers, structure, pods, etc. (i.e. standardized products, sold separately, that act as the connection between a bathroom pod and a volumetric module, or the interface between a module and a floor cartridge.)

Rapid arrival of a durable tier 2 marketplace, with firms adopting Confiure to Order [CTO] and Select Varient [STO] delivery methods (see product platforms, below) to offer product lines of large building components.

Rapid organization of Builders as CTO and STO product delivery methods.

Results: Interoperability in design – ability to swap alternate components based on scope, function, or price. Interoperability in supply chain – ability to pivot suppliers during building assembly. Rapid assembly of buildings onsite – ability to restrict on-site connections and hyper-organize trade contributions. Reduction of Labor – fewer connections on site. Increased Project Velocity – reduction of supply chain issues, and speeding of assembly.

The USB Standard (est. 1996, designed in collaboration by Compaq, IBM, Intel, Microsoft, etc.) created explosive growth in the computer peripherals market.

The (developing) medical headwall standard allows for configurable medical gas, electric, and communication service assemblies in a modular/panelized setting.

[B] Product Simulation file type

Definition: A product file format for Modular 2.0 must communicate product data (shape, material, standards), meta-data (model, manufacturer, carbon footprint), and interface data (orientation, clearances, delivery)

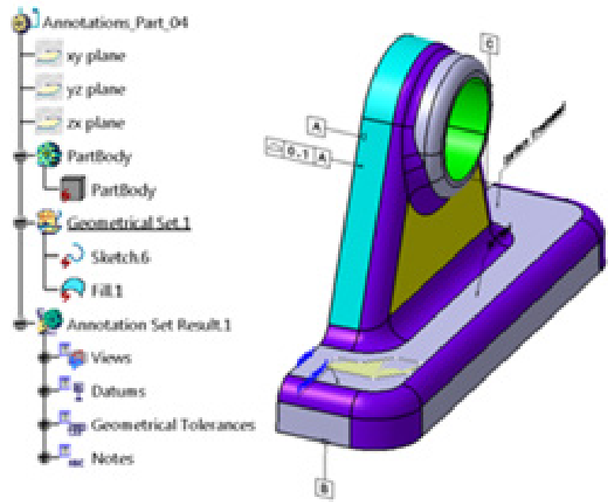
Problem: In current manufacturing practice, these data are spread across several file types. Predominantly, contemporary manufacturing has developed ISO 10303-21, which specifies, “an exchange format, often known as a STEP-file, that allows product data conforming to a schema in the EXPRESS data modeling language (ISO 10303-11) to be transferred among computer systems.” STEP files are seamlessly importable to manufacturing softwares like AutoDesk Inventor, and Solidworks, etc. In contrast, building product interface data is traditionally communicated in BIM family files (i.e. Revit RFA files, or Bently OpenBIM).

Traditional: Product information was spread across data sheets, installation manuals, and vendor experience.

Modular 1.0: Product information is digitized in a variety of 3d representations - RFAs, STPs, and PDFs for most metadata.

Modular 2.0: Single product files traded openly between professionals. Self-organizing product files that “know” how to orient to interfaces. Speedy layout and evaluation of design options.

Results: Interoperability in design phases – preformatted data for ease of evaluation. Reliable design algorithms – standardized interface with product data across sources. Apples-to-apples price leveling – standardized data structures uniform reporting. Faster price leveling – few hours spent qualifying cost data.



STEP-file (pictured) is a widely used data exchange form to represent 3D objects in computer-aided design (CAD) and related information. Due to its ASCII structure, a STEP-file is easy to read, with typically one instance per line. The format of a STEP-file is defined in ISO 10303-21 ***Clear Text Encoding of the Exchange Structure***.

[C] Project evaluation automations

Definition: software to rapidly iterate technically rich design solutions for professional evaluation and selection.

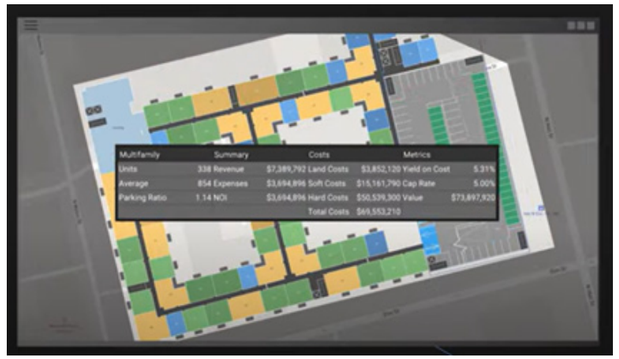
Problem: Integration of existing software into computational platforms. Adoption of product simulation file types (above). Note: VC funding of US ConTech firms has sped work in this space. Publicly-funded data-aggregation projects (“big data”) have digitized most site-specific data.

Traditional: Architecture and engineering firms, who’s services of diagnostics, evaluation, and calculation performed these roles.

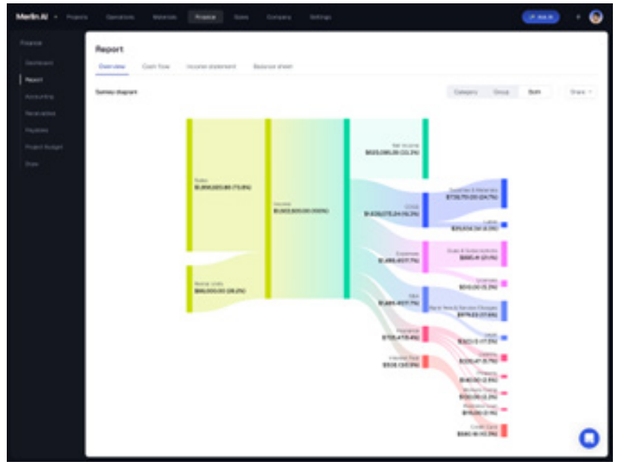
Modular 1.0: The rapid arrival of design simulation software (BIM, renderers, etc.) and SaaS platforms (). Both rely on real estate data (boundaries, jurisdictions, etc.) that has long been publicly-accessible. Automations like TestFit, Zenerate, etc. allow for a real estate feasibility platform to make it easy to do site planning. All platforms are beginning to offer real-time AI configurators to allow for rapid concept iterations.

Modular 2.0: The parcel is also the unit of transaction with municipal oversight. Projects like the National Zoning Atlas make site restrictions data-accessible. Other products, like ArchiStar, evaluate building permit submissions based on the city’s codes and regulations, instantly providing ‘pass’ or ‘fail’ results. This enables submitters to quickly review, modify, and resubmit their applications.

Results: Real-time legal conformance – automated code checks for layout and assemblies. Immediate climate analysis – automated accounting for carbon, lifecycle energy, etc. Expedited permitting – automated pre-check, and one-click submissions. Automated financial evaluations – instant cost summaries, including discounts for government rebates, tax breaks, etc. Designer velocity – faster layouts, immediate feedback, less rework.



TestFit (pictured) and Zenerate are a real estate feasibility platforms that generates rapid design iterations with “real-time insights into design, cost, and constructability to reduce risk and increase potential.”



MerlinAI (pictured) simulates business operations by integrating traditional methods with AI. The platform “enhances every aspect of <business> operations, including project planning, financial management, inventory control, and sales enablement…”

Manufacturing Infrastructure

[D] Product Platforms (for industry position)

Definition: Product Platforms function as the operating system for a building component manufacture. They predestine how the work is chunked, what tools are used, and the delivery methods to complete the work.

Problem: Organizing the producer-side of the marketplace to [1] research market demand into segments they can service without customization, and to [2] adhere to the associated project delivery method (MTO, CTO, STO) without extra-category customization.

Traditional: Early 21st century textbooks teach building materials (masonry, steel, and stud) as a type of product platform (i.e. platform framing). The vast majority of buildings are delivered with ETO, while product platform success is highly correlated to smaller product sizes (windows, doors, etc.)

Modular 1.0: Product platform success, at the scale of rooms, or small buildings – but largely with ETO interfaces, and ETO project completion. (Successes include the manufactured housing industry, Bensonwood's Unity Homes product line, etc.)

Modular 2.0: Clearer path-to-market, improved customer definitions, precise design guidelines, enhanced product-market fit, and a refined end-user experience.

Results: Stronger path-to-market – new firms can quickly evaluate customer potential. Reliable project differentiation – ability for developers to describe project delivery as a function of cost. Clear product differentiation – ability for producers to define clearer advantages to their unique output. Production efficiency – motivation to refuse customization requests and ability to focus on product-related improvements. Iterative process – continuous refinement and improvement with new insights and enhanced performance. Lower costs – less rework, better market fit. Increased sustainable building practices – far more efficient marriage of production to product.

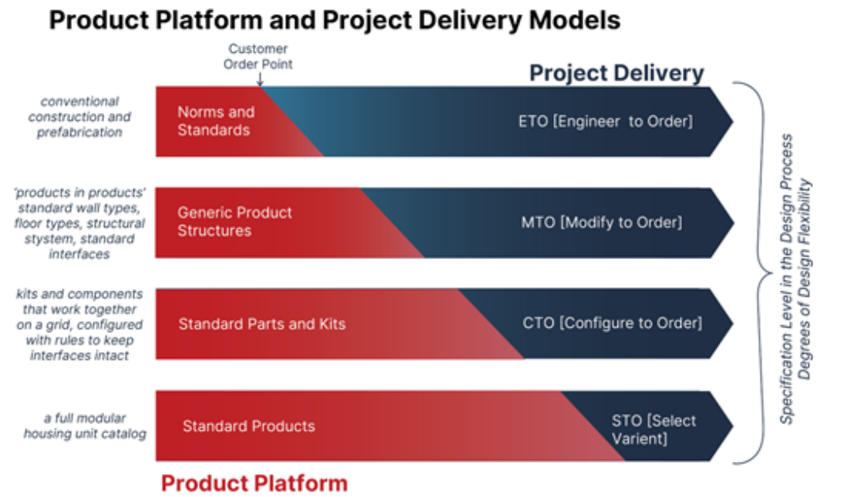


Diagram of relationship between product platform and project delivery from Volumetric Building Companies, and Helena Johnnson (Ludlow) Production strategies for pre-engineering in house - building: exploring product development platforms, Construction Management and Economics, 2013. Vol. 31, No. 9, 941–958.

[E] Product families & variants* (for market segments)

Definition: A product family (UK) is "***a group of related products that share common features, parts, and systems, yet deliver variety.***" These are sometimes called product lines in the US. Key features include that the product line occur [i] completely within the domain of a company, [ii] are a parametrically-driven collection of similar products, and [iii] all offered from the same product platform.

Problem: Organizing the client-side of the marketplace to accept the associated project delivery method (MTO, CTO, STO). Ensuring the products still cater to a wide enough base of customer needs and preferences.

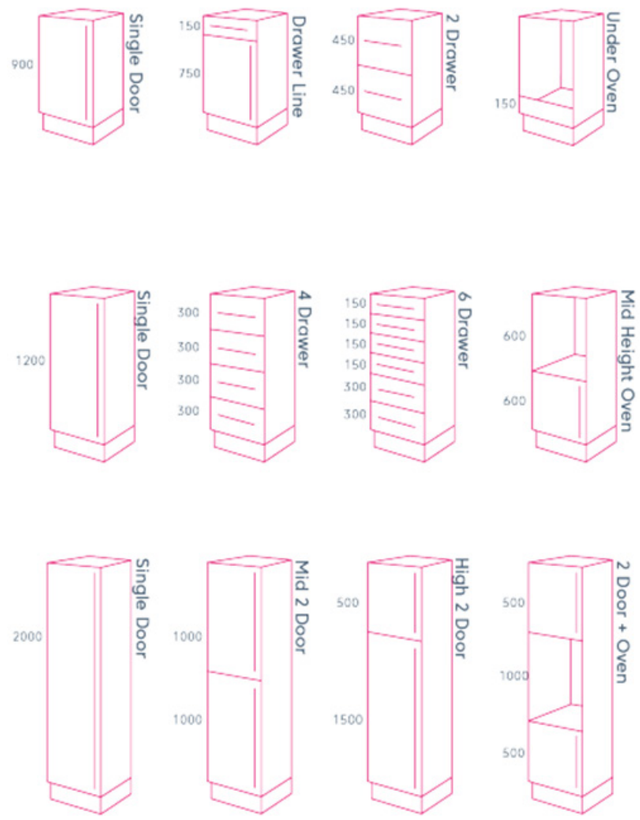
Traditional: The vast majority of product families were offered at the commodity level, relying on the customization of ETO to cater to customer-specific needs (studs to wall products, or windows installed with trim and headers).

Modular 1.0: Pod firms offering bathroom products in a design-to-suit format, under an ETO platform. No standardized interfaces (product-to-product connections).

Modular 2.0: *One-size-fits-many product catalogs. Product differentiation tailored to market segments. Myriad catalogs featuring a Manufacturer's Suggested Retail Price (MSRP).*

Results: Price transparency – reliable MSRPs, reducing variability to transport and installation costs.

**See "The Product Platform Rulebook" Construction Innovation Hub, 2023.*



Product variants illustration from "The Product Platform Rulebook" Construction Innovation Hub, 2023

[F] Tier 1, Tier 2, and Tier 3 suppliers.

Definition: In a B2B marketplace, Tier 1 companies act as final assemblers, directly delivering the final (line) product to market. Tier 2 companies provide pre-finished sub components to tier 1 companies. Tier 3 companies that provide smaller products or materials to higher-tier companies.

Problem: Reliable, standardized interfaces between products at different tiers. (From above) An interface is a connection between two products. Interfaces allow Modular 2.0 pod manufacturers to supply volumetric modular builders with pre-finished solutions that allow for assembly into their product minutes before shipment.

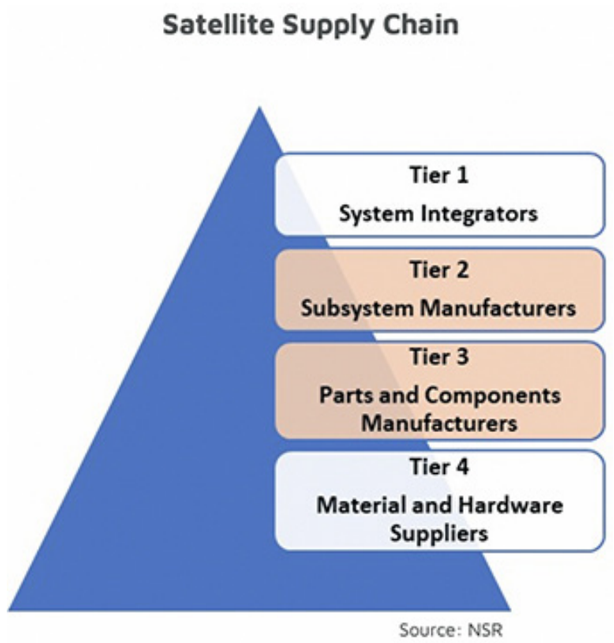
In analogous industries we see laptops offered with interoperable (Tier 2) sub components at price-points related to sub component quality. For example, buying a laptop with i3, i7, or i9 processor, where processor defects correlate to the final product's computational speed. Or buying a higher-end model of the same car with swapped dash and seating features.

Traditional: ETO models dominant. Vast majority of construction-related sales are commodities or small products, sold directly to tier 1. This involved a lumber yard, plumbing supply store, electrical supply store, hardware store, or DIY big-box retailer selling to contractors.

Modular 1.0: Arrested progress. Successful tier 1 panelizers or volumetric builders still purchase commodities directly from tier 3. (Tier 2) Pod manufacturers started to serve hospitality and healthcare, but were still operating under ETO contracts.

Modular 2.0: A robust B2B marketplace. Tier 2 panelizers and pod manufacturers selling from well-stocked backlots, not planning product runs. Tier 1 manufacturers reliably switch tier 2 suppliers mid-project.

Results: Durable and persistent divisions of work. Price transparency. Differentiation of product by interchange of suppliers. No more ad hoc teams of subcontractors, per project.



Legal Infrastructure

[G] Reintegration of “means and methods.”

Definition: Means and methods refers to the techniques and tactics a contractor employs to complete construction of a permanent project.

Problem: The division of design and production restricts the critical feedback loop that experience provides. Manufacturing companies strive to minimize this division with Just-in-Time tools allowing any worker to stop production, to immediately confer designers, managers, and other workers.

Traditional: US designers have spent centuries increasing shielding from legal risk involved with means and methods. This has carried increasing disadvantages to the project, since the ***means of production*** increasingly informs the ***building’s cost***.

Modular 1.0: Increasingly, Modular 1.0 features architects bringing suppliers to the table during early schematic phases to inform means of production in a non-committal, detached fashion.

Modular 2.0: Modular 2.0 demands far more intimacy between the designer and producer, in the same way that the best manufacturing teams feature industrial designers regularly discussing production at the factory floor.

Result: Better made modules. Designers in residence at manufacturing facilities with side-by side feedback. Better designer quality, customized to scale of production. Better design quality informed by more consistent production runs.

[H] Transition from Common Law to Uniform Commercial Code (UCC).

Definition: Common Law governs ETO product delivery, guiding service contracts as drivers of offer, price, nature of work, quantity, and performance. In contrast, the Uniform Commercial Code (UCC) governs CTO and STO project delivery, standardizing transactions with goods and tangible objects.

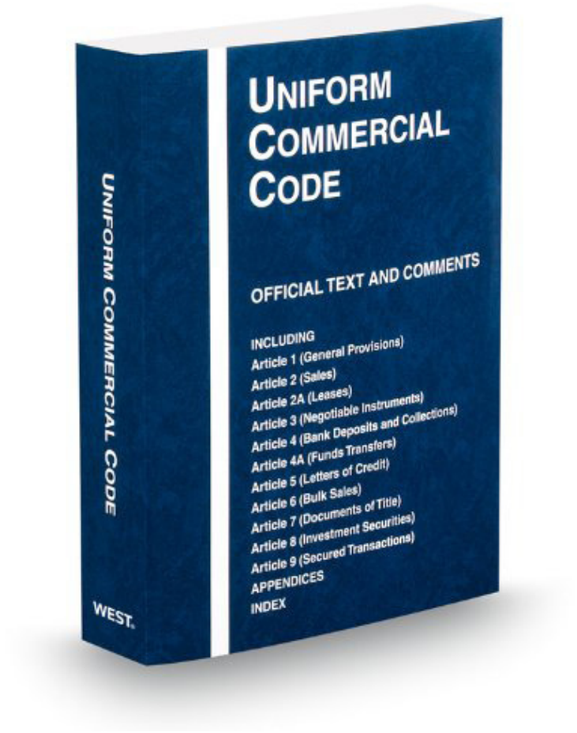
Problem: When selling products, the customer (not "client") has reasonable protections like the right to return a product. This right is incompatible at the scale of building components (in its current form). Further, if a contract is for both the sale of goods ***and*** services, a court will use the "predominant purpose test" to determine which law applies.

Traditional: Common law governs the AIA Contract Document suite. 97% of US homes are delivered with RFQs, RFPs, bids, contracts (bound to drawings and specs), change orders. Bids are answered with ad hoc teams of subcontractors, bound by individual agreement to a general contractor.

Modular 1.0: No change.

Modular 2.0: Larger portions of buildings sold as goods. Shift of risk-management from producers, to products. Warranties and guarantees manage product performance, not surety bonds managing principals and obligees.

Result: Price transparency. Reliable budgets. Smaller contingencies. Less risk. Less paperwork. Fewer exceptions.



[I] Product data chunked to the needs of oversight

Definition: all the information and attributes that relate to a specific product, including its physical characteristics and other details. In this case, at the scale of the pod, mod, or building.

Problem: Vastly larger amounts of data will soon be required for building projects (for example, scope 3 reporting of carbon accounting is legislated in California starting in 2026, and the Buy America Build America Act required documentation of product providence for Federal funded projects, nationwide. They create a new, larger, administrative load on builders.

Traditional: Product cut sheets carried enough data to report overall building quality to LEED, government, or similar oversight.

Modular 1.0: No change.

Modular 2.0: Product data sheets will describe vastly larger portions of the building project. Fewer data sheets are needed per project. The administrative reporting responsibilities are shared equally among Tiers 1, 2, & 3.

Result: Better reporting. Easier reporting. Clearer accounting. Easier data leveling (apples-to-apples comparisons).

Finance Infrastructure

[J] A *Schedule of Value* that matches new production

Definition: a document that shows when contractors should complete a specific amount of work, as well as the monetary value of that work.

Problem: results-oriented metrics conveniently minimize the trust needed for contractor performance, though bonds provide increased entity-based assurance.

Traditional: the decades-old AIA Schedule of Value to incrementally release funds in accordance with work completed on site. This is logical: construction loans take the real estate parcel as collateral, and measurable improvements to that collateral then release more funds.

Modular 1.0: Lenders find offsite methods untested, and so offsite construction projects need extraordinary up-front capital.

Modular 2.0: financing will feather into existing manufacturing agreements previously set up by the producer. Financial instruments can focus on repeats of existing production runs. They will reference the manufacturers' previous descriptions in three categories: [1] Product Specifications, [2] Manufacturing Process, [3] volume and capacity. Because financers are simply funding a new lot size of a previously executed production run, they represent dramatically reduced risk.

Result: Easier to finance building projects. Shorter construction loans. More liquidity. Fewer bonds. Less lost to General Conditions. Smaller contingencies. Fewer change orders.

AIA Document G703® – 1992

Continuation Sheet

AIA Document G702®, Application and Certification for Payment, or G732™, Application and Certificate for Payment, Construction Manager as Adviser Edition, containing Contractor's signed certification is attached.
Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO: 003/0
APPLICATION DATE: 02/01/2024
PERIOD TO: 03/15/2024
ARCHITECT'S PROJECT NO: /

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED FROM PREVIOUS APPLICATION (D + E)	WORK COMPLETED THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D + E + F)	% (G ÷ C)	BALANCE TO FINISH (C - G)	RETAINAGE
001	Rock Fountain	40,000.00	25,000.00	4,200.00	0.00	29,200.00	73.00%	10,800.00	1,460.00
002	Sprinkler Heads	35,000.00	8,500.00	2,300.00	0.00	10,800.00	30.86%	24,200.00	540.00
003	Sprinkler Pipes	25,000.00	12,800.00	1,850.00	0.00	14,650.00	58.60%	10,350.00	732.50
004	CO #1 - Additional Sprinklers	2,500.00	0.00	2,500.00	0.00	2,500.00	100.00%	0.00	125.00
	GRAND TOTAL	**$102,500.00**	**$46,300.00**	**$10,850.00**	**$0.00**	**$57,150.00**	**55.76%**	**$45,350.00**	**$2,857.50**

[K] Incentive bundles that learn from fast-food industry

Definition: Product bundling is a sales strategy that involves selling multiple products together as a single unit for a lower price. Product bundles are most familiar as fast-food value meals.

Problem: In the US, billions of dollars of rebates and tax credits go unclaimed, every year. These incentives are crafted to address community issues, like the affordable housing crisis or greener building practices. Yet, the administrative burden to claim these incentives is steep. Simply demonstrating value alignment between ***a building project*** and ***a corresponding incentive*** can feel like a risky task requiring onerous paperwork.

Traditional: government incentives are promoted through media, websites, trade shows, and conferences. Aggressive developers send a request for information (RFIs) when communicating about a community's request for proposal (RFP) – as a strategy to both encourage competition and earn the best incentives.

Modular 1.0: aggregator services, like IncentiFind, help developers, property owners, and tenants find money for their real-estate and home improvement projects. Such services will help building entities find Incentives, verify the entity's eligibility, then apply, and even track the status of each application.

Modular 2.0: transitions away from the individual- or client-based incentive access, and brings access to the customers' point of sale. Manufacturers are armed with all the project information they need from a tendered project, to initiate a follow-up call in under ten minutes of an inquiry. Discussions can immediately marry specific products to qualifying incentives in the project area. Naturally, incentives at each supply chain tier can be compounded as the project's supply chain is crafted to capture the best value.

In a competitive industrialized construction marketplace, the first manufacturing entity to speak to a prospective customer will be the most likely to close an incentive-rich sale. Decisions about a project's incentive package are resolved within hours — instead of weeks or months.

Result: Lower overall project costs. More projects pencil out. Higher rates of incentive capture. Lower administrative burdens.

A note about software

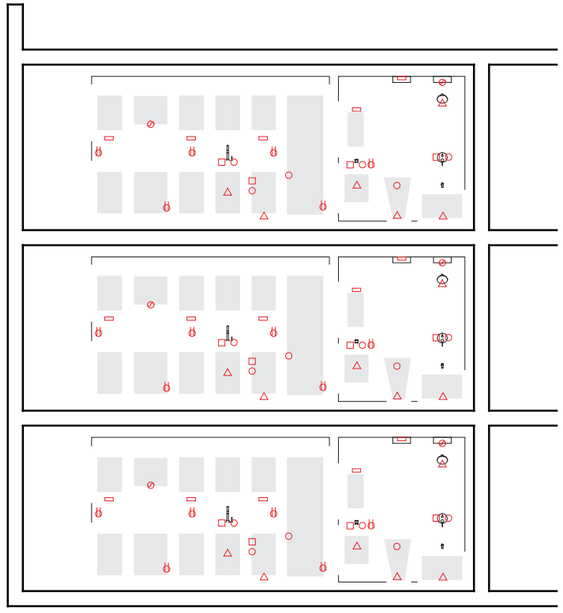
Software automates relationships. The infrastructure above is required to first make the relationships that future software can accelerate. Software development is a latter step of market evolution. Modular 2.0 relationships do not exist yet: we cannot write the apps today.

The danger with developing software in the Traditional, or Modular 1.0 framework is the risk of optimizing ***within the bounds of a decidedly un-optimized system***. Older frameworks are held back by unevolved practice, and unable to address any of the meta-level issues.

A note about the past

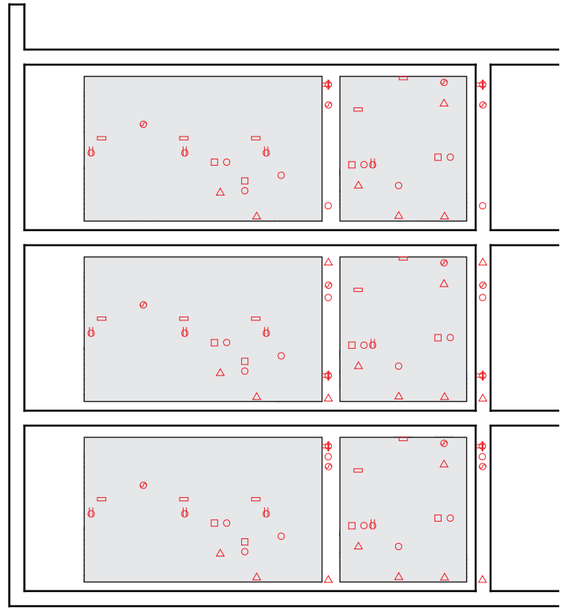
"All the parts will be made in a factory and the work at the site will consist only of assemblage, requiring extremely few man-hours. This will greatly reduce building costs. Then the new architecture will come into its own." Ludwig Mies van der Rohe in "The Industrialization of Building Methods" (1924)

Diagrams



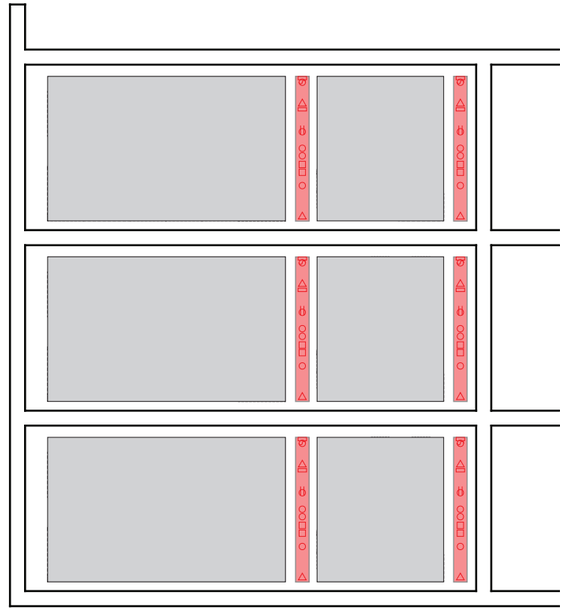
Traditional Building

Onsite Connections commodity-to-product, or commodity-to-commodity, all customized by trades	tens of thousands . . .
Onsite Connections product-to-product, standardized	hundreds . .
Offsite Connections	zero



Modular 1.0

Onsite Connections commodity-to-product, or commodity-to-commodity, all customized by trades	thousands . . .
Onsite Connections product-to-product, standardized	hundreds . .
Offsite Connections	thousands



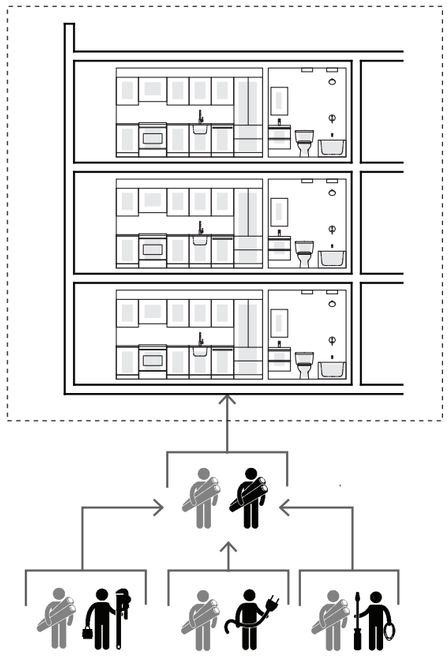
Modular 2.0

Onsite Connections commodity-to-product, or commodity-to-commodity, all customized by trades	few . . .
Onsite Connections product-to-product, standardized	dozens . .
Offsite Connections	tens of thousands

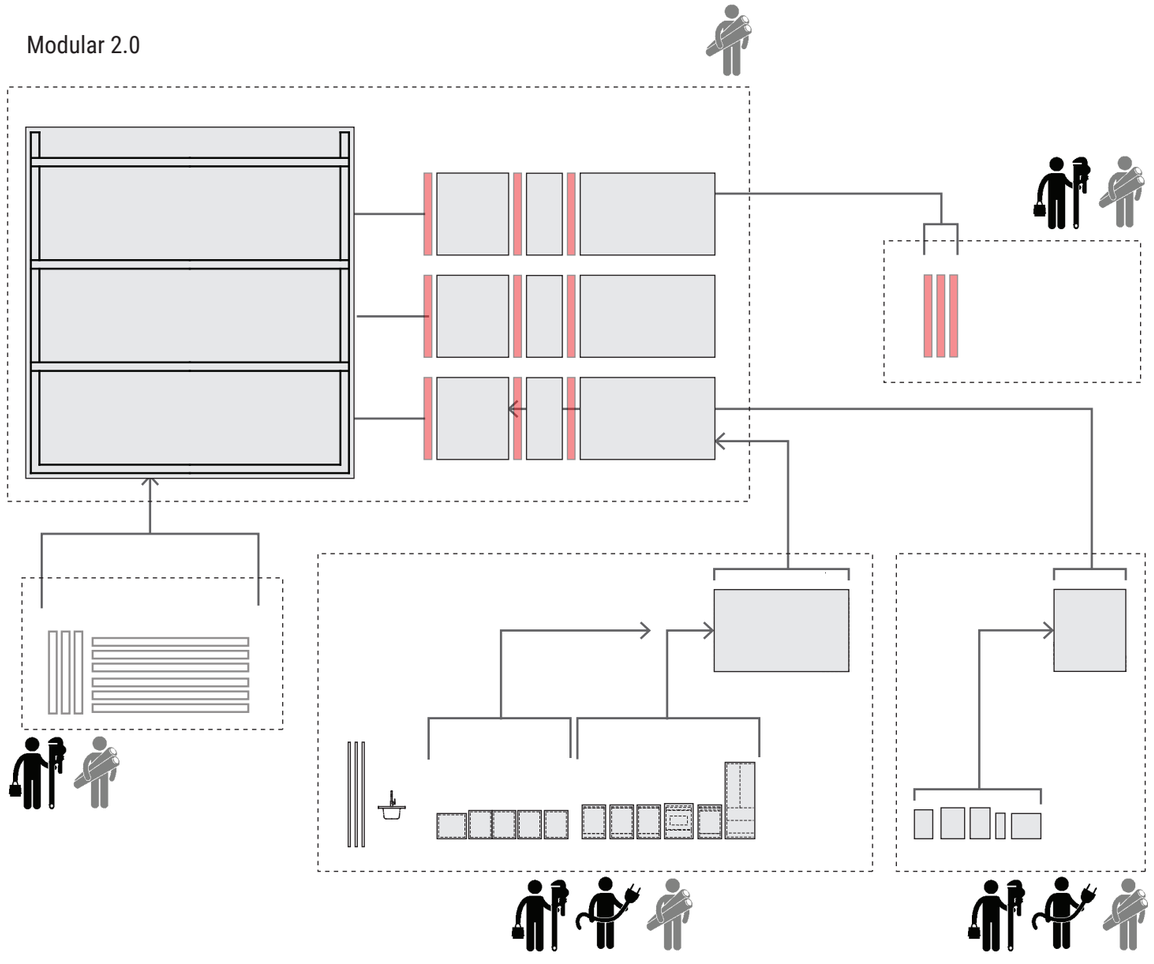
Key:

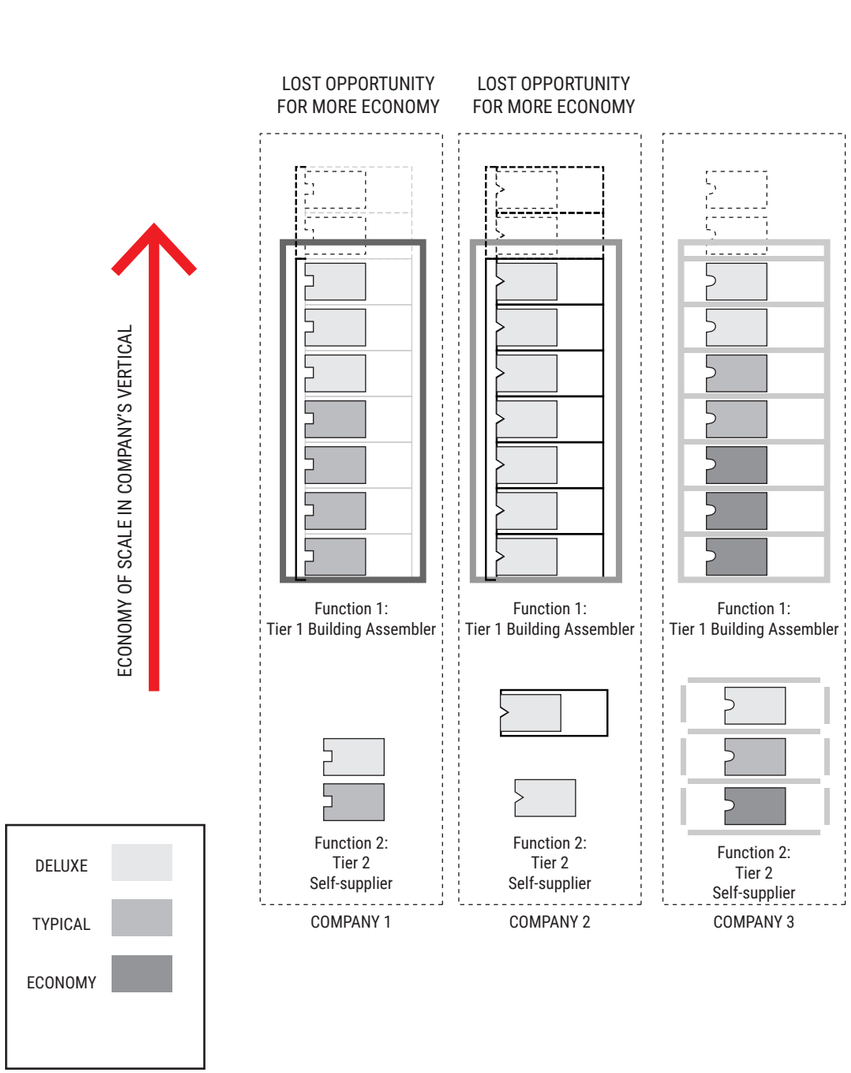
Products, inspected offsite	Products, industry standardize	Require onsite inspection

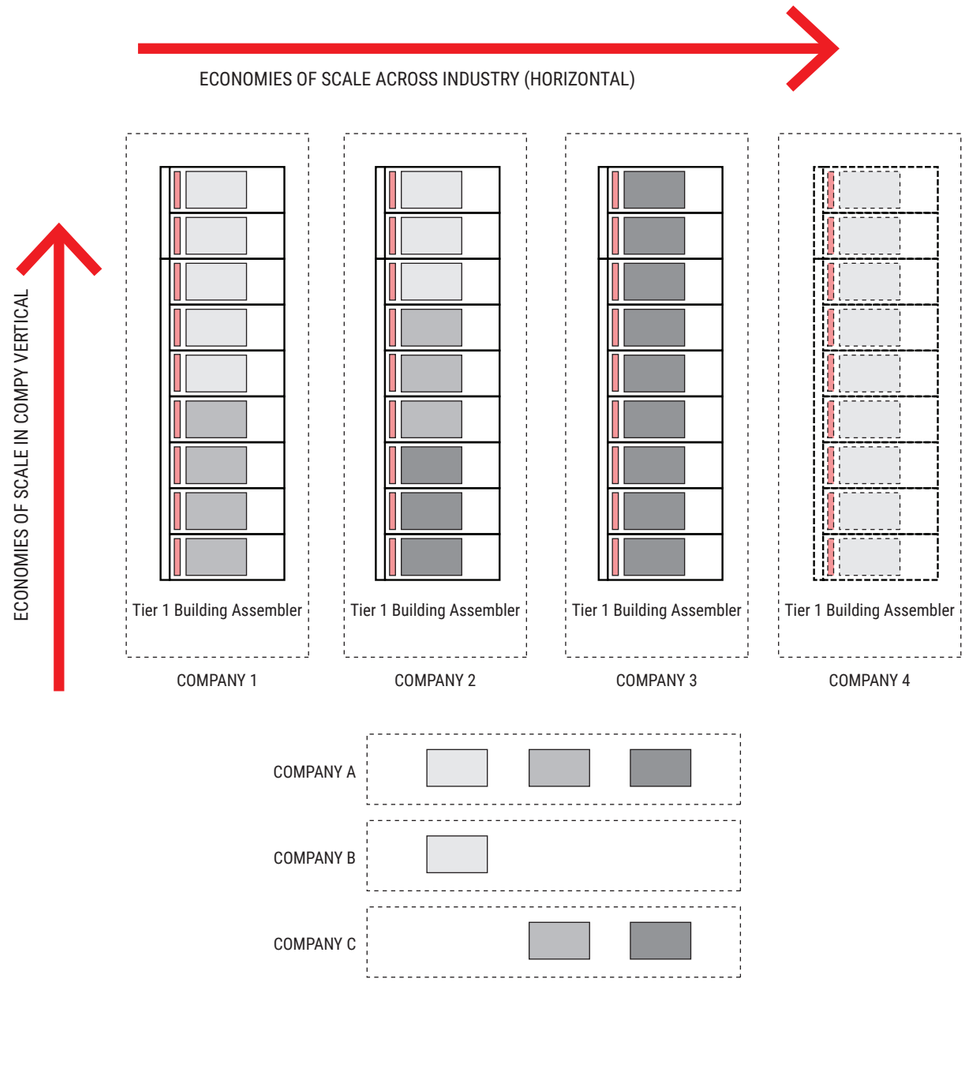
Traditional Building



Modular 2.0




LOST OPPORTUNITY
FOR MORE ECONOMY
LOST OPPORTUNITY
FOR MORE ECONOMY
ECONOMY OF SCALE IN COMPANY'S VERTICAL
Function 1:
Tier 1 Building Assembler
Function 1:
Tier 1 Building Assembler
Function 1:
Tier 1 Building Assembler
Function 2:
Tier 2
Self-supplier
Function 2:
Tier 2
Self-supplier
Function 2:
Tier 2
Self-supplier
COMPANY 1
COMPANY 2
COMPANY 3
DELUXE
TYPICAL
ECONOMY


ECONOMIES OF SCALE ACROSS INDUSTRY (HORIZONTAL)
ECONOMIES OF SCALE IN COMPY VERTICAL
Tier 1 Building Assembler
Tier 1 Building Assembler
Tier 1 Building Assembler
Tier 1 Building Assembler
COMPANY 1
COMPANY 2
COMPANY 3
COMPANY 4
COMPANY A
COMPANY B
COMPANY C

Glossary

Assembly A combination of components.

Block, grand A grand block is a completed segment of a ship that can range in weight from 150 to 1,000 tons. A grand block includes all of the systems in a given segment of a ship, from its structure and outside hull to its inner hulls and all its machinery for heating, ventilating, air conditioning, plumbing, fire protection, electrical power and voice and data systems. It also includes all its program compartments and finishes, including painting inside and out. It is generally only as small as it needs to be in order to be built entirely inside a building, then moved out to the dry dock, lifted into position and welded to its companion grand blocks.

Block, mini Miniblocks are nested, like Russian dolls, within grand blocks. The shipbuilding industry has a double sense of the modularity concept. On the one hand, the grand block is an outer shell, a very large factory-built module unto itself. Nested within grand blocks, on the other hand, are smaller modules. Like grand blocks, these miniblocks are also factory-built, but they are small enough that they can be built anywhere and shipped to the assembly site for final installation within grand blocks.

Building Envelope The physical separator between the conditioned and unconditioned environment of a building, including the resistance to air, water, heat, light, and noise transfer.

Building Information Modeling (BIM) A process involving the generation and management of digital representations of the physical and functional characteristics of buildings and other physical assets.

Cartridges, smart Panels used as floors, walls, and ceilings pre-fabricated and with integrated all of the house's systems integrated, to distribute radiant heating, hot and cold water, waste water, ventilation, and electricity throughout the house.

Categories of MMC A definitional framework for categorizing the many outputs of MMC in the residential sector. It was developed by the UK Government's Ministry of Housing, Communities and Local Government's Joint Industry Working Group on MMC for improving communication and understanding in the mortgage finance, insurance and valuation communities. It is proving useful in other sectors too.

Component A constituent part of a building (or other built asset) which is manufactured as an independent unit that can be joined or blended with other components to form a more complex item. Generally, components are 'self-contained' and sourced from a single supplier, typically the complete unit provided by that supplier rather than its constituent parts.

Component library A store of ready-made digital representations of physical modules, assemblies or components encoding relevant information that can be used in a BIM process. The information typically consists of both geometric representations and associated data tables at different levels of detail for use at different project stages. Their value is in the fact that they can be reused to speed up design. Some component libraries are developed in-house by design teams for particular projects or clients. Others are generic, produced and maintained by product manufacturers or CAD software developers.

Construction industrialisation The process of adopting more manufacturing practices, including specialized tooling, mechanization and automation, to make the construction industry more efficient and productive, with better quality assurance for better-value, more reliable and more sustainable long-term outcomes. See also MMC.

Continuous improvement process (CIP) A formal system for improving the quality of products, processes and/or services continuously over time. CIP initiatives, particularly in manufacturing and lean construction processes, include: Quality First Attitude; Plan Do Check Act Cycle; 7 Tools of Quality; Audits and Inspections; and Poka-yoke (a Japanese term for mistake-proofing assembly operations). Manufacturers generally aspire to achieve 'Six Sigma' levels of performance to obtain high production yields of products with many components.

Demand The use of product platforms requires aggregation of demand across a range of assets – typically where there are high volumes of similar features – and an ability to rationalize design requirements. This is done away from the project environment and is critical to establishing requirements and providing confidence to the supply chain that the solutions they develop will have a market.

Deploy The development of product platforms happens away from the project environment and hence is not undertaken in relation to the requirements of one specific asset. The deployment of product platforms on projects therefore relies on how well the requirements collected during the development stage reflect the specific needs of that project (and the flexibility of the product platform). Once a product platform is developed, a significant proportion of design is replaced by 'configuration' of these standardized components and assemblies, although an element of bespoke design is always likely to be required. A Product Platform Deployment Manual will be produced for each particular product platform using the Product Platform Rulebook. (As referenced within the Product Platform Development Framework)

Design for Assembly (DfA) A process by which products are designed with ease of assembly in mind. If a product contains fewer parts it will take costs.

Design for maintenance A formal process for ensuring that maintenance and intended service life is factored into the design process to reduce whole-life costs. It can include the use of smart components, i.e. ones that are equipped with sensors and are linked to the Internet of Things in a way that allows them to be monitored and controlled.

Design for Manufacture (DfM) The general engineering practice of designing products in such a way that they are easy to manufacture.

Design for manufacture and assembly (DfMA) DfMA is a formal design approach that focuses on designing for ease and efficiency of manufacture and assembly. It is a prerequisite for considering modern methods of construction, especially offsite solutions. It extends the business-as-usual focus of building design to resolve designs in terms of how efficiently they can be manufactured and assembled on site.

Design for Manufacture and Assembly (DfMA) Is an engineering methodology that focuses on reducing time-to-market and total production costs by prioritizing both the ease of manufacture for the product's parts and the simplified assembly of those parts into the final product – all during the early design phases of the product life cycle.

Design for Deconstruction (DfD) Looks at how decisions made at the design stage can increase the quality and quantity of materials that can be re-used at the end of a building's life. This focus can be used in conjunction with DfMA in order to optimize construction products and product platforms for dis-assembly, maintenance and deconstruction. This enables re-circulation of materials, components and assemblies in the sector.

Design for Standardization Focuses on the functional, interface, dimensional and geometric design of components and assemblies to, for

example, rationalize the number of variants and drive commonality to achieve economies of scale, this is in line with a Product Platform approach. The AIMCH project highlights the benefits of adopting this design philosophy for an industrialized housing sector.

Develop It is expected that there will be multiple product platforms serving different market segments and client requirements (and hence deliver different performance and value). The process through which product platforms are developed is not widely understood or consistent in construction. The product platform rulebook will set out this process, ensuring different product platforms use the same language, share the same data, and thus allow for comparison, ease of configuration, and levels of interoperability/interchange. As part of the develop stage, all product platforms will produce a Product Platform Specification and Deployment Manual in line with the Product Platform Rulebook. (As referenced within the Product Platform Development Framework)

Engineering Bill of Materials (EBOM) An engineering bill of materials (EBOM) is developed during the product design process. It's generally created automatically from engineering and design software, such as CAD tools, and it lists the parts and subassemblies necessary to build the product. It also usually includes more detailed engineering information, such as manufacturing tolerances, related engineering standards, and product specifications.

Field factory A temporary factory facility set up near to the construction site to manufacture modules or pre-assembled flat pack components before assembly on site. The work carried out in them counts as offsite construction. They can also help with transportation logistics.

Flat Packed A piece of furniture, equipment, or other construction supplied in pieces packed into a flat box for assembly by the buyer.

Flat pack A term to describe prefabricated assemblies that are transported to site as flat, 2D elements as opposed to volumetric 3D units. They trade speed of on-site assembly for transport efficiency.

Flying factory See Field factory.

Harmonize, Digitize and Rationalize The Construction Playbook states that "Contracting authorities should seek opportunities to collaborate in order to develop and adopt shared requirements and common standards. This should be done to enable standardized and interoperable components from a variety of suppliers to be used across a range of public works. This will create a more resilient pipeline and drive efficiencies, innovation and productivity in the sector.

Hybrid construction system Any construction system that combines two or more categories of MMC.

Indoor Construction (pejorative) [1] The use of 19th-century construction technologies in a 21st-century offsite construction workflow. [2] Constructing modules with the same steps and trades (in a factory setting), instead of re-arranging production into an EBOM, by also blending trades in a fabrication and assembly hierarchy.

Industrialized Construction A building methodology that aims to optimize the construction process by integrating automation and mechanization in a factory production environment. It involves the use of precision technology and lean production methodologies to fabricate building components with high accuracy and quality. Industrialized construction (IC) is a building methodology that aims to optimize the construction process by integrating automation and mechanization in a factory production environment. It involves the use of precision technology and lean production methodologies to fabricate building components with high accuracy and quality.

Interface The point at which two or more components, sub-assemblies or systems connect or interact. Interface characteristics may be physical or performance-related, and provide the necessary functions of the interface. Interfaces are the focus of standardization to allow interoperability, thus opening the market up to competition from different manufacturers.

Interoperability A characteristic of a product, component, assembly or system, whose interfaces are completely understood, which allows it to work with other products, components, assemblies or systems, at present or in the future, in either implementation or access, without any restrictions.

Just-in-time logistics Planning to ensure that deliveries arrive on site only when they are needed, thus avoiding the overheads and added risks involved in on-site storage, improving overall build efficiency.

Kit of Parts A collection of repeatable, standardized building components that are pre engineered and designed to create a variety of assemblies which define part or all of a finished building.

Kit of parts A system of separate proprietary parts manufactured off site, conceived to be efficiently assembled on site. The rationale for keeping the parts separate is to allow more efficient, safer handling and transportation, and to allow flexibility (within certain constraints) in their final configuration.

Lean An adjective used in industry to describe processes where waste (of materials, time, cost, handling, intellectual property and so on) has been eliminated or minimized, improving efficiency and productivity.

Manufactured housing The practice of building housing with 3D offsite manufactured building products. Specifically, by fabricating and assembling all discipline's contributions into one product, and installing the product as a complete home solution.Single-wide and Double-wide Mobile Homes are the most common form of Manufactured Housing.

Manufactured Homes Manufactured homes are built in the controlled environment of a manufacturing plant and are transported in one or more sections on a permanent chassis. Manufactured homes are constructed according to a code administered by the U.S. Department of Housing and Urban Development (HUD Code).

Mass customisation A process that allows manufacturers to customize products by varying production processes without affecting their ability to charge low mass-production prices.

Mass Production The production or manufacture of goods in large quantities, especially by machinery.

Material handling design The detailed planning of the packaging of components and assemblies manufactured off site and the logistics of getting them to their final destination on site, with the objective of making the process as efficient as possible. It can result in incorporating physical features on the components, assemblies or their packaging, including lifting points or positioning aids to facilitate handling or assembly.

MMC adviser An individual or organization

with the necessary knowledge of the MMC systems and the manufacturing industry to assist the client and the design team in assessing which construction method or system best suits the desired outcomes for the project and to provide guidance in the procurement process.

Modern methods of construction (MMC) Building methods designed to improve productivity and safety or reduce the need for labor, or both. They have the specific objective of improving efficiency compared to business-as-usual techniques. Whereas the term is most commonly associated with volumetric offsite construction, it actually includes many other outputs, including on-site process innovations.

Mods (see: Modules)

Modular construction A process that allows manufactured components to be configured in multiple ways by exploiting standardized interfaces.

Modular Housing The practice of building housing with 3D off-site building products. Specifically, by fabricating and assembling large parts of repeating elements (i.e. kitchens, bathroom, etc.) in a manufacturing facility to speed building assembly on site.

Modular Wiring (Electric) Modular Wiring is a simple electrical component system that allows for the pre-wiring of electrical building systems. This system greatly reduces the amount of time required to install a modular office system on-site with a large portion of the wiring done in our modular construction facilities.

Module A separable component, frequently one that is interchangeable with others, for assembly into units of differing size, complexity, or function.

Near-site factories See Field factory.

Off-Site Production (OSP) Largely interchangeable terms referring to the part of the construction process that is carried out away from the building site. This can be in a factory or sometimes in specially created temporary production facilities close to the construction site (or field factories).

Off-Site Construction (OSC) A specific project-delivery process used to realize a building project using large, offsite-manufactured products.

Off-Site Manufacturing (OSM) A process of delivering a singular product for multiple off-site construction projects and realizing that product with late-20th century manufacturing principles. Critically, these products combine more than one construction discipline (framers, plumbers, electricians, etc), and the products are realized with principles from Design for Manufacturability (DfM) and Design for Assembly (DfA).

Offsite construction A collective term for construction processes that are carried out away from the building site in a way that adds value compared to business-as-usual construction. Offsite construction can happen in a factory or in a specially created temporary production facility close to the construction site (see Field factory).

Packaged Plant A generic term describing one or more items of mechanical and/or electrical plant that are combined (packaged) in the factory to form a transportable unit, such as an electrical substation complete with cladding or an air-handling unit.

Pallet A small, low, portable platform on which goods are placed for storage or moving, as in a warehouse or vehicle.

Panelized Construction The practice of building housing with two-dimensional off-site manufactured building products.

Panelized Composed of prefabricated sections of walls, floors, or roofs that can be assembled at the building site:

Platform A term that is widely used but with consistent elements including: a set of low variety core assets (i.e. components, processes, knowledge, people and relationships); a complementary set of peripheral components that exhibit high variety; stable interfaces that act as a bridge between the stable core and variable peripherals; and a set of rules or standards governing how components can be integrated.

Platform construction system A suite of quality-assured, interoperable engineered components (products or sub-assemblies), governed by a rulebook specific to that system, that can be designed to integrate in predefined ways to create functional buildings for specific purposes (e.g. schools, hospitals, accommodation and so on).

Platform Programme Overarching tag for all Hub programme work relating to platforms.

Platform-based design for manufacture and assembly (P-DfMA) The process by which designers develop and make use of platform construction systems to create new bespoke built assets.

Platform frame A wooden building frame composed of closely spaced members nominally 2 inches (51 mm) thick in which the wall members do not run past the floor framing members.

Pods A prefabricated volumetric element, fully factory finished and internally complete with building services. Types of pod include bathrooms, shower rooms, office washrooms, plant rooms and kitchens. Pods use volumetric construction principles, but are smaller in size than modular units and are typically installed into traditional structural frames.

Pre-engineered Constructed of or employing prefabricated modules

Pre-manufactured value (PMV) A proxy measure of project efficiency calculated as the project's gross capital cost less the cost of prelims (site overheads) and site labor, divided by the gross capital cost, expressed as a percentage. The business-as-usual benchmark is 40%; anything higher has more of its operations conducted off site.

Prefabrication To fabricate the parts of at a factory so that construction consists mainly of assembling and uniting standardized parts.

Principles Within the Product Platform Rulebook, the Principles are requirements which should be applied in conjunction with the Rules. Compliance with the Rules determines whether something can be considered a product platform or not. Performance against the Principles determines how advanced a product platform is.

Process control and monitoring A formal system of statistical controls and standardized procedures to ensure that the journey from design to construction is consistent and repeatable, thereby assuring quality and reliability. Production is monitored and variations plotted between control limits which, if exceeded, trigger corrective actions before critical limits are reached.

Product a thing produced by or resulting from a process; result:

Product Family The product family is a group of related products that share common features, parts and systems, yet deliver variety.

Product Line a group of products of the same manufacturer having similar or related characteristics and intended for similar or related markets.

Product Platform (PP) A kit of parts, associated production processes, and the knowledge, people and relationships required to deliver all or part of construction projects using a platform approach. A product platform provides a stable core which is configured and combined with complementary components (via defined interfaces) to suit a particular project. A product platform also includes the processes tools and equipment required for assembly.

Product Platform Definition Rules which define the boundaries of a particular product platform, developed using the Product Platform Rulebook and defining key drivers, objectives, requirements and architecture.

Product Platform Deployment Manual The manual for deploying a specific product platform in a project setting, including configuration, ordering, supply chain management, assembly and how complementary components interface to form all or part of a finished building.

Product Platform Development Framework A common framework to support the development of product platforms. The framework sets out a series of activities across three stages (Demand, Develop, Deploy) covering the identification of market demand through the development of a product platform to its eventual deployment on multiple projects. The Product Platform Development Framework is governed by the Product Platform Rulebook.

Product Platform Roadmap A detailed breakdown of activities to inform planning and investment decisions, that sets out the order in which the product platform provider needs to develop product families and constituent parts.

Product Platform Rulebook (The Rulebook) Rules, requirements and a guide to the development of all product platforms in construction.

Product Platform Specification The component, interface and production specifications for a particular product platform, developed using the Product Platform Rulebook and based on the rules set out in the Product Platform Definition.

Product Variants Working within the framework of the platform, individual products can be variants or derivatives.

Productizing Building Elements The process of unlocking value in construction, by re-organizing traditional building assemblies into stand-alone offsite manufacturing products, and in doing so, add new types of value.

Rationalize (as in a surface or facade) To remove unreasonable elements from. To make rational or conformable to reason. *Chiefly British* To reorganize and integrate (an industry).

Rules Within the Product Platform Rulebook, the Rules comprise general statements and definitions for which there is no alternative; as well as requirements for which no alternative is permitted unless specifically stated. Compliance with the Rules determines whether something can be considered a product platform or not.

Scaffold A temporary structure for holding workers and materials during the construction, repair, or decoration of a building. Any framework or system of such frameworks for supporting other materials.

Skids A low mobile platform on which goods are placed for ease in handling, moving, etc.

Standardization In the context of DfMA, standardization involves quality-assured systems and processes that govern design, manufacturing and assembly inputs with the objective of improving the reliability, speed, consistency and efficiency of digital and physical outputs, making it possible to achieve economies of scale. With CIP, the extent of the benefits is refined over time.

Stick system A metal curtain wall system that is largely assembled in place.

Structurally Insulated Panels (SIPs) A panel consisting of two face sheets of wood panel bonded together by plastic foam core.

Sub-assemblies Major building elements that are manufactured off site, potentially comprising a combination of components. Examples include walls, floors, roofs, balconies, balustrading assemblies, façade cassette panels and pre-assembled M&E elements.

Supply chain A generic term describing the contractually linked people and companies who supply the services, materials, parts, components and equipment that are used to make larger components, assemblies and whole buildings for a head client.

Supply chain integration (SCI) A process for improving the efficiency and effectiveness of the supply chain's performance by setting the conditions for cooperation and collaboration. When successful, supply chains run projects safely, quickly and without rework, and deliver the client's requirements for quality and reliability on time and on budget.

Tilt-up construction A method of constructing concrete walls in which panels are cast and cured flat on a floor slab, then tilted up into their final positions.

Virtual Design & Construction (VDC) Is the management of integrated multi-disciplinary performance models of design–construction projects, including the product (facilities), work processes, and organization of the design – construction – operation team to support explicit and public business objectives.

Volumetric An adjective describing large-scale assemblies constructed offsite in such a way that they enclose a three-dimensional volume of space. In the context of MMC, the term tends to be restricted to assemblies that incorporate primary structural elements, i.e. that fall into Category 1 of the Categories of MMC.

Volumetric modular unit A volumetric modular unit is a self-contained, three-dimensional building module that can be used to create various structures, ranging from residential homes to commercial buildings. These units are manufactured off-site and delivered to the project location in their entirety, complete with finishes, fixtures, and fittings. Each module is built with the intention of seamlessly integrating with other modules to form the final building.

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