Building the Future: Combining Technology, Sustainability, and User-Centric Design

Presented by: Derek So

With changing demographics, evolving lifestyles, and rising housing costs, there is a growing demand for housing that is flexible, adaptable, and sustainable. Future housing must be of a responsive nature and capable of adapting to the different needs of today's population and the unknown needs of the future.


InnoCell

Modular Integrated Construction

- Refers to the process of constructing buildings by assembling pre-manufactured modules
- Offers faster and more efficient construction compared to traditional on-site building methods
- Allows for greater precision and quality control in the manufacturing of building components
- Reduces construction waste and improves sustainability by using off-site manufacturing

Next Generation MiC

Open Building System

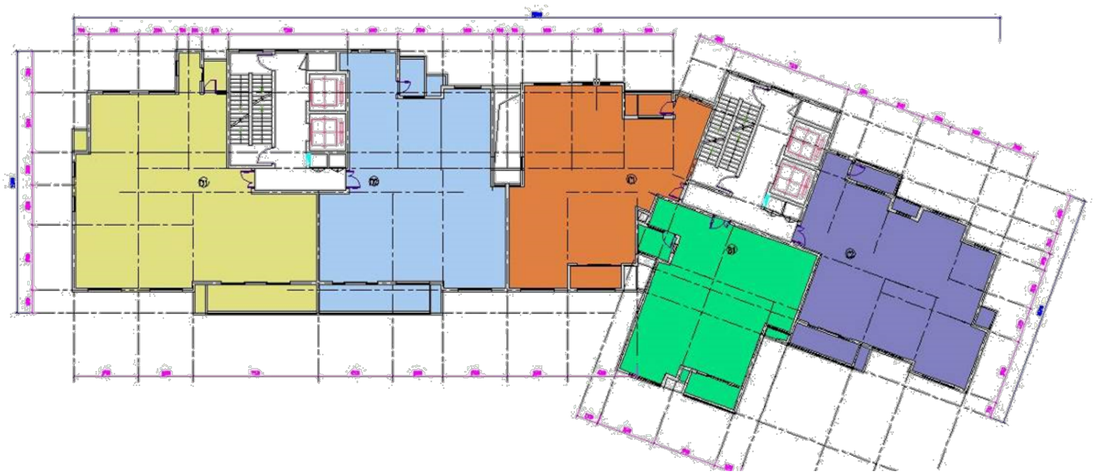
- Modular and flexible approach to building design and construction
- Separates the building into different layers, allowing for easy modification and adaptation to changing needs
- Offers easier renovation and refurbishment, making it useful in multi-generational housing
- Provides adaptability, sustainability, and cost-effectiveness

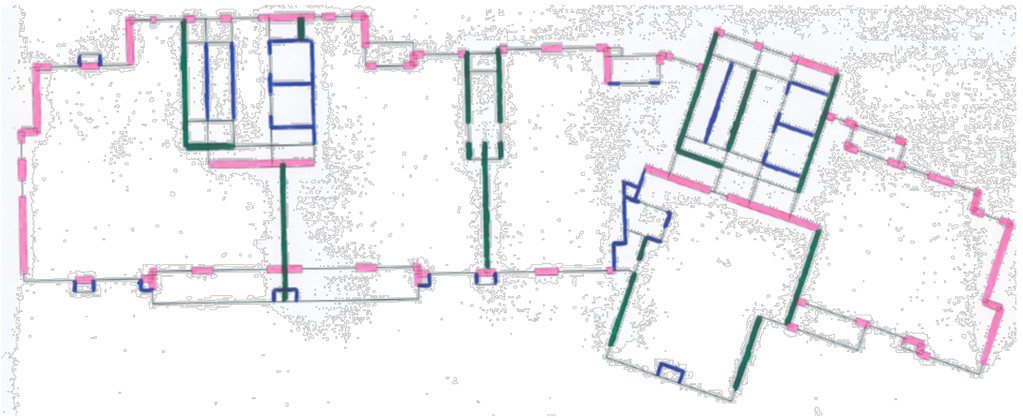
APARTMENT FLEXIBILITY

Publicat el 31 de Desembre de 2017 per evgeniyasukhinskaya

Structural system for an Open Building System

- ‘Clearspan’ structural concept removes the need for interior load-bearing walls, thus allowing maximum flexibility for individually-designed interior layouts.





Mass customisation

- Allows for personalized and bespoke housing solutions that cater to individual needs and preferences
- Uses advanced technology such as computer-aided design and manufacturing
- Provides greater flexibility in design and more efficient use of materials and resources

Future Home

=

Chassis

- Structure + Connection
- Power
- Communication etc

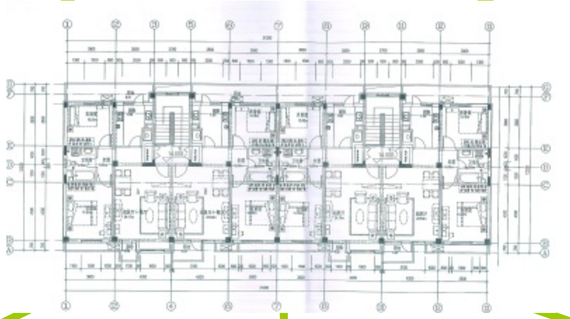
+

Mass Customized Modules

- Exterior facades
- Interior fit-out
- Electronics etc.

FUTURE HOME MUST PROVIDE CHOICES AND TAILORED SOLUTION

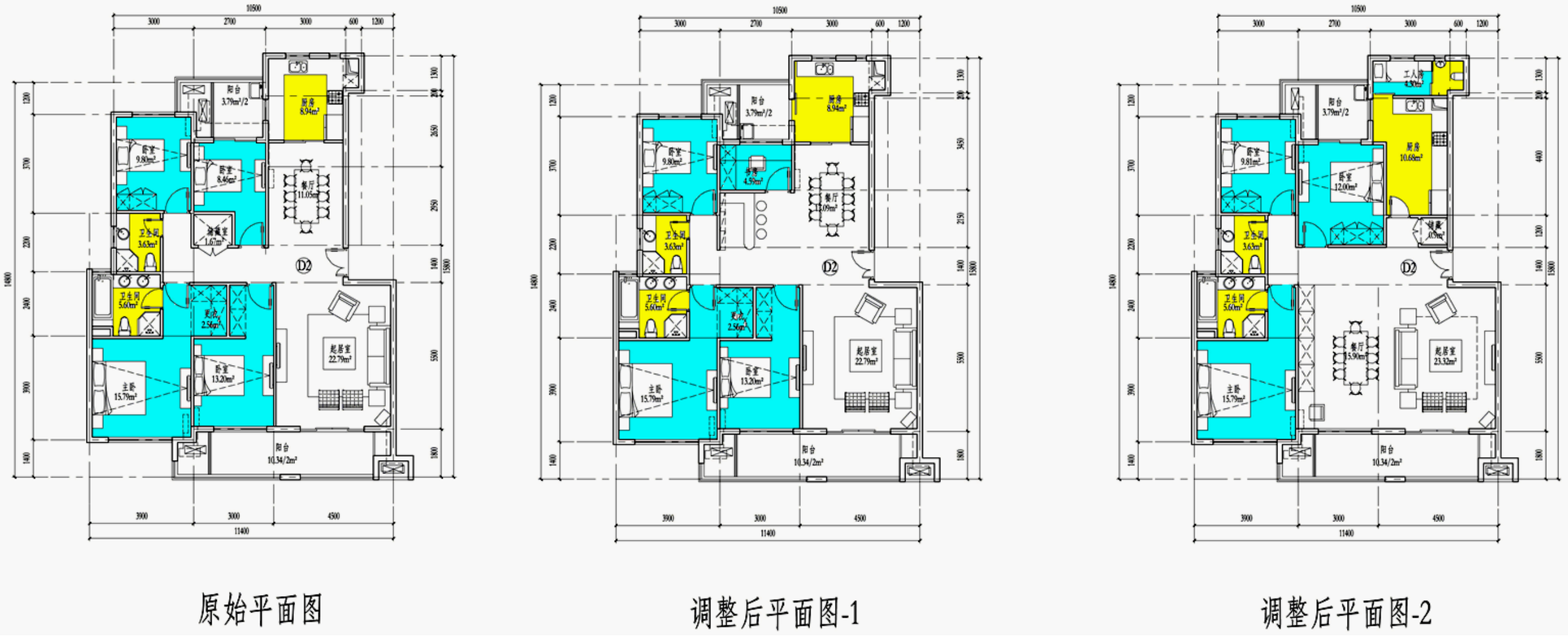
Chassis



Example of Chassis with Mass Customized Modules to Provide Distinctive Design

Demonstration project For mass Customised apartment

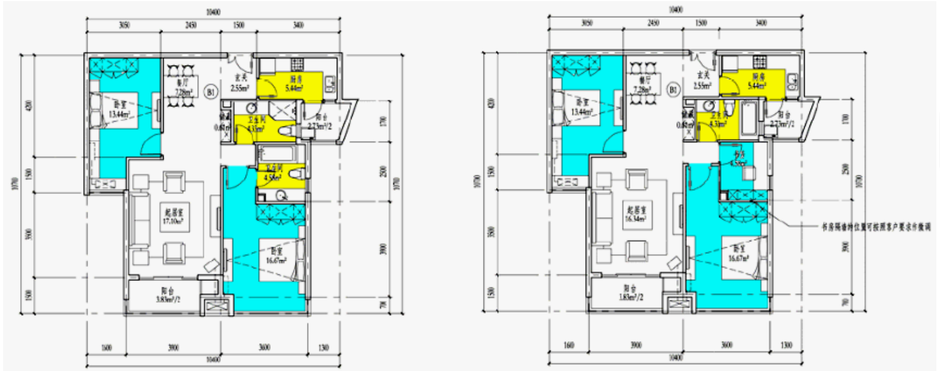
Open Building system for Mass Customized Apartment



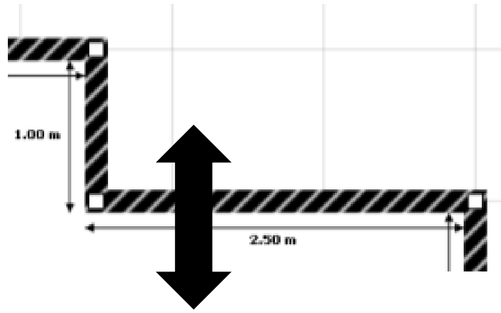
Digital Habitation Concept Formation

Customization Start

Select Layout



Move Partition Walls

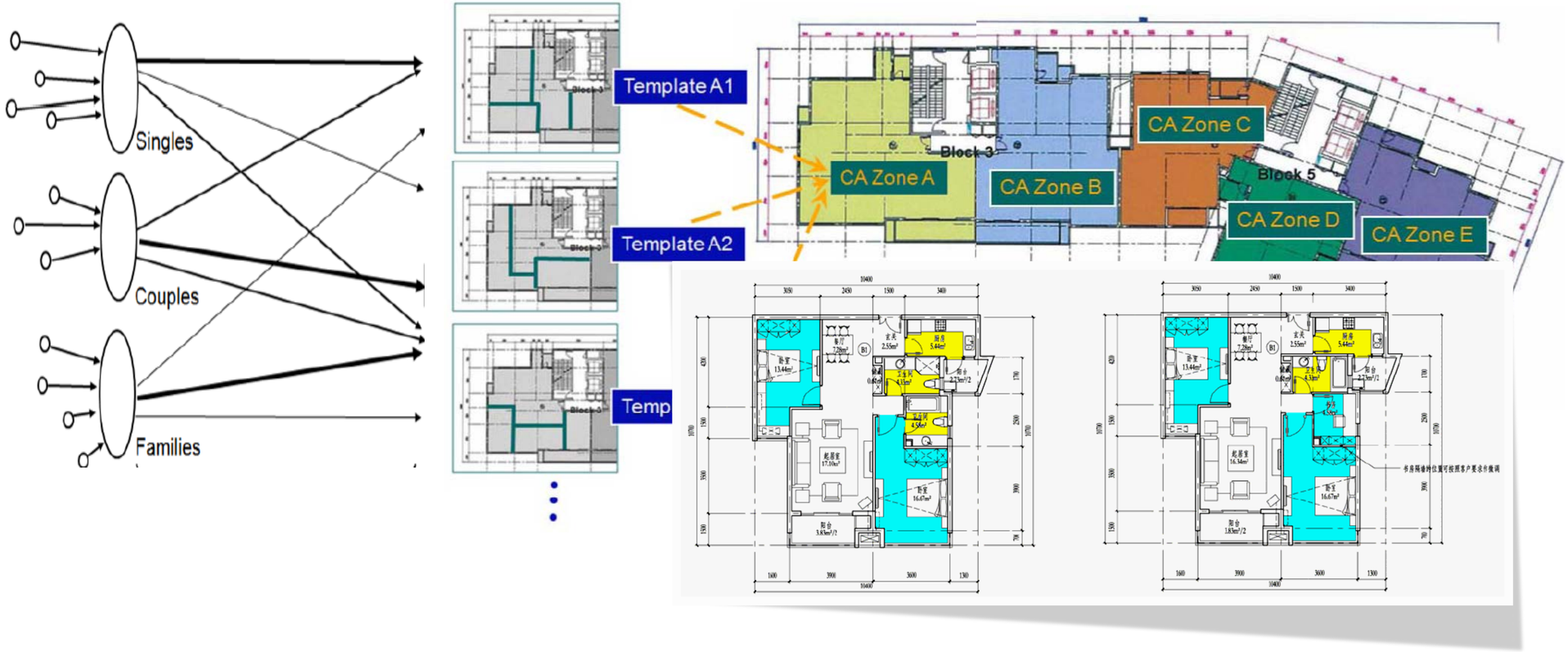


Choose Style Package

Real-Time 3D Web Browser Visualization

Layout Templates

Matching of Buyers ➡ Market Segments ➡ Templates ➡ Zones and Floors



布局房型 | 延缓模型 | 选项套餐

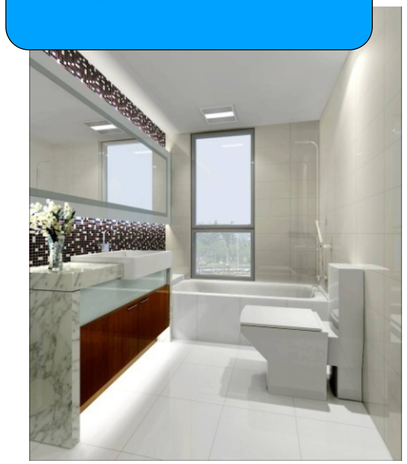
Range of Customization

Selection Packages

Kitchen

Cabinets, Sink, Tiles, Groove, etc

Bathroom

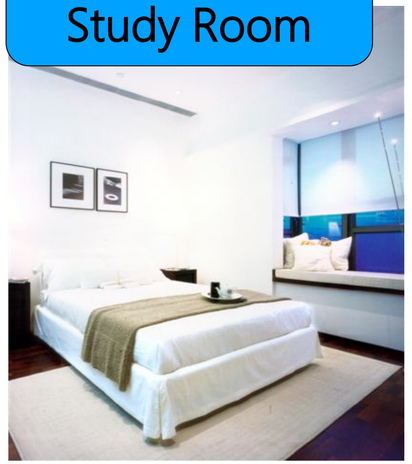


Bathtub, Sink, Toilet, Tiles, etc

Living Room & Dining Room

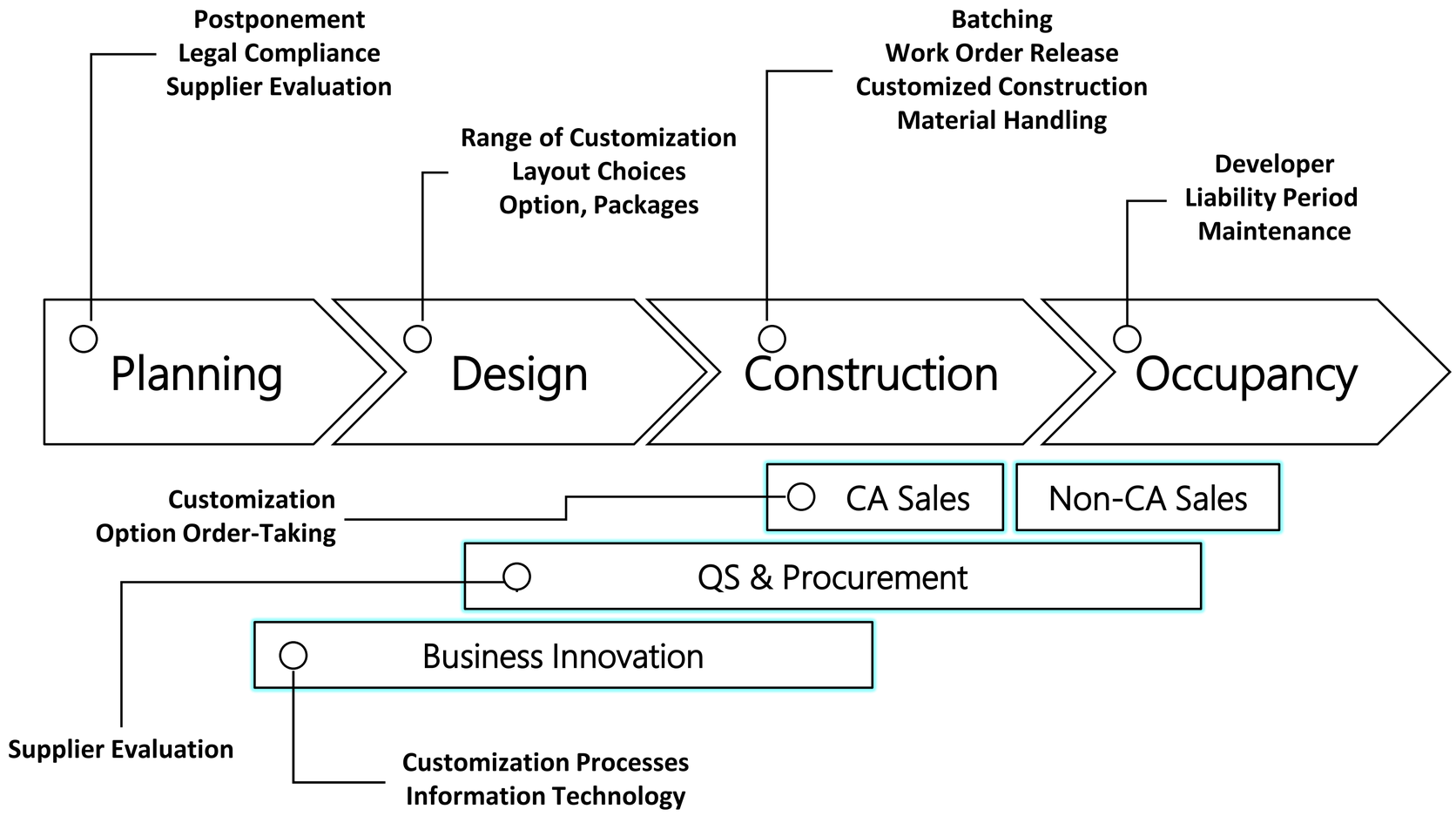
Flooring, Wall Finishes

Bedroom & Study Room



Flooring, Wall Finishes, etc

CA Project Delivery Model



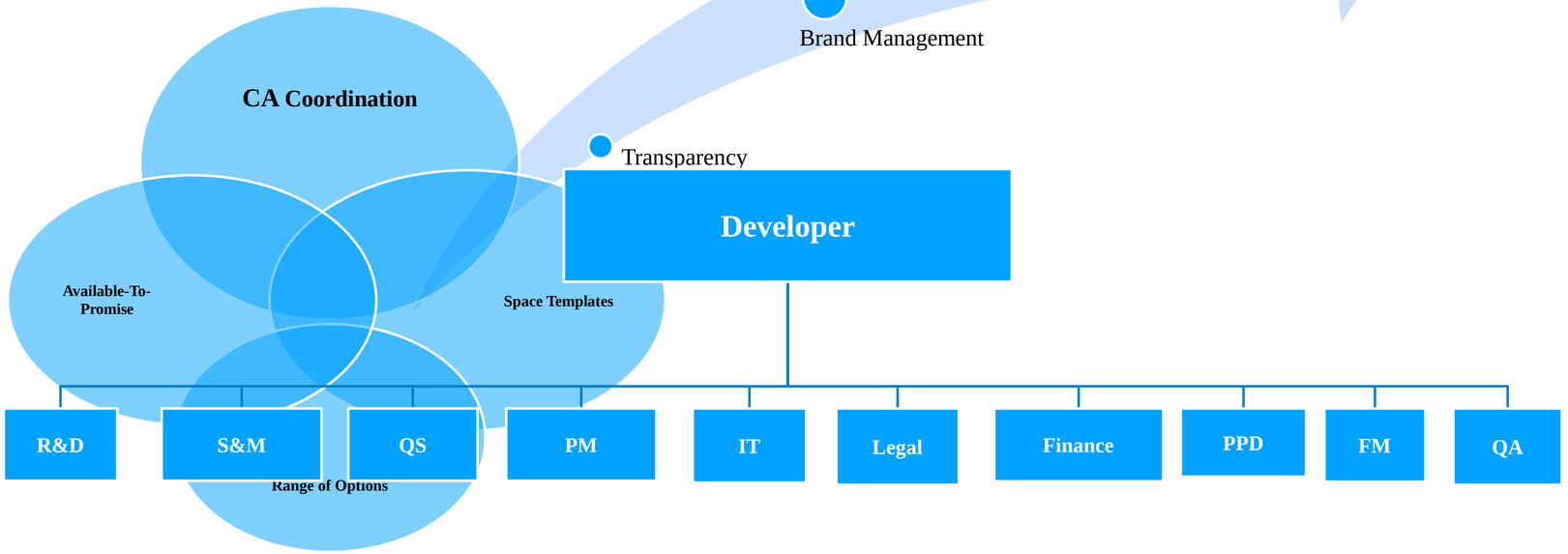
Customization Apartment Business Transformation

Customer Centered Business

Customer Experience Management

Brand Management

Transparency



CA Control

- Order Batching
- Work Batching
- Material Batching

Partition Walls, Flexible Structure	Personalized Sales, Design configuration	Procurement Strategy, Strategic Partnering	Postponement, Contractor Coordination	New IT Systems / System Enhancement	Sales Contract, Permits	Return On Investment	Template Design	Custom Repairs	Custom Quality Control

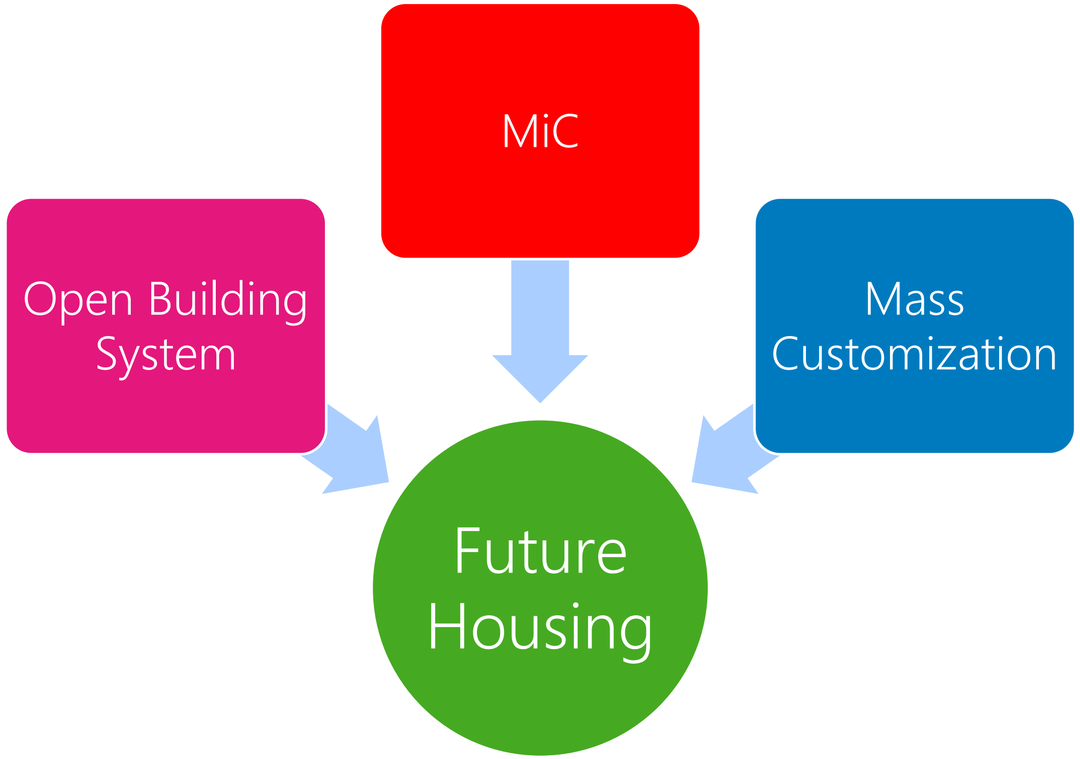
CA Process

- Hybrid Execution

Mass Customized Apartment in Shanghai

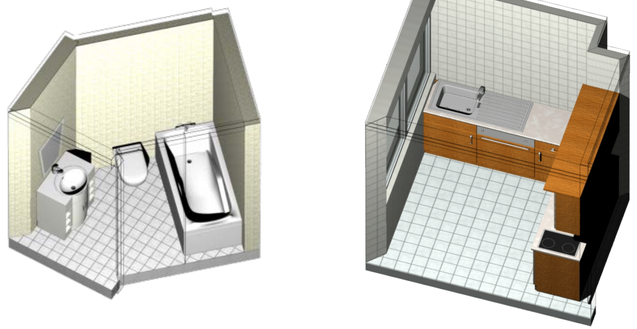
Future Housing

- Combining open building systems, mass customization, and modular integrated construction allows for a more user-centric approach to housing design
- The use of pre-manufactured modules allows for greater customization and flexibility in building design
- Offers easy modification and adaptation to changing user needs and preferences
- Provides cost-effective and sustainable solutions that cater to individual user needs and preferences.



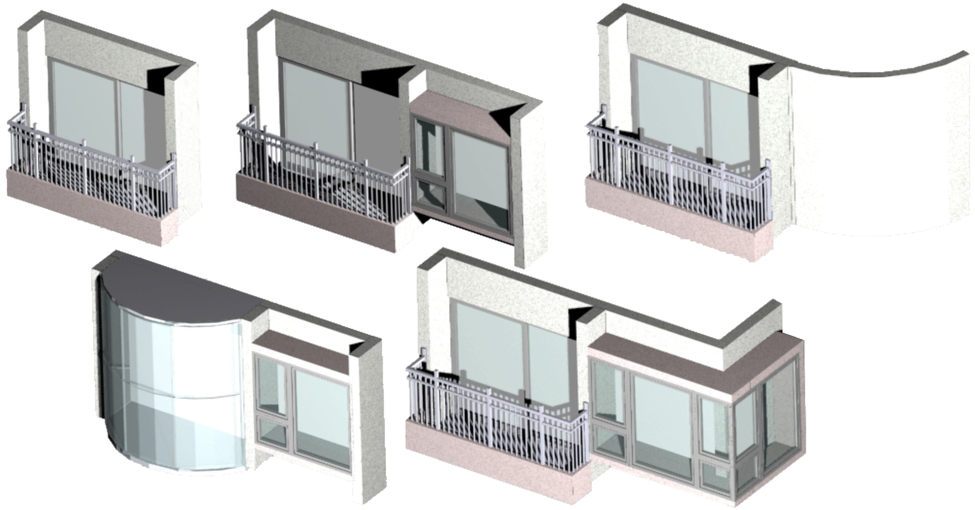
Mass-Customized Modules

Catalogue
OEM(s)



"Make to stock" prefab component
Kitchen Model x-xx

Tailor-made
OEM(s)

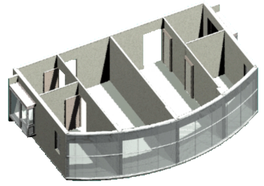


"Make to order" prefab component
bay-window Model xx-xx-xx

Tailor-made
OEM(s)

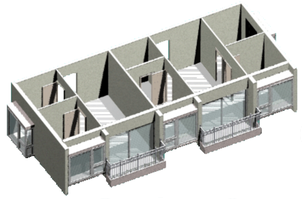
Different Product Platforms

Rule-based Approach to Parametric Design



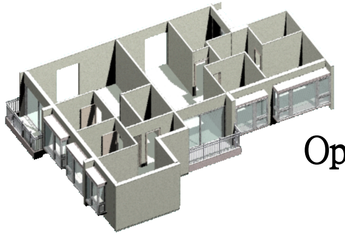
Option 1

Option 1



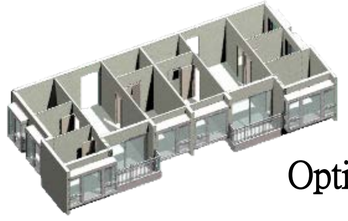
Option 2

Option 2



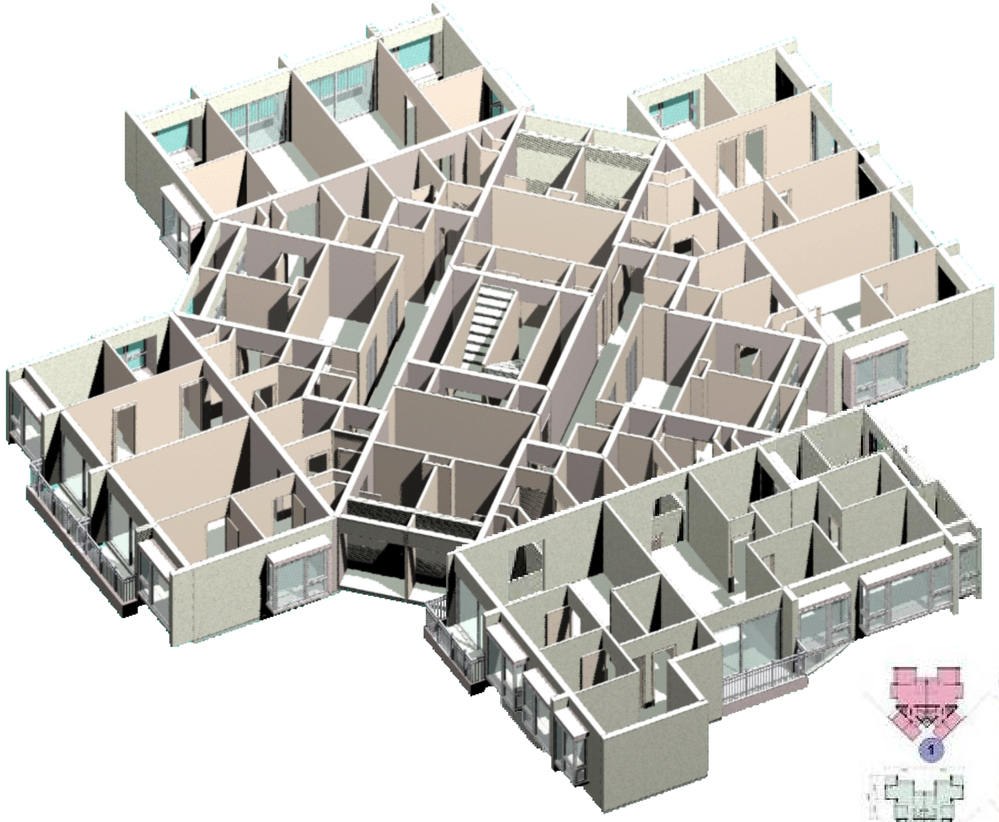
Option 3

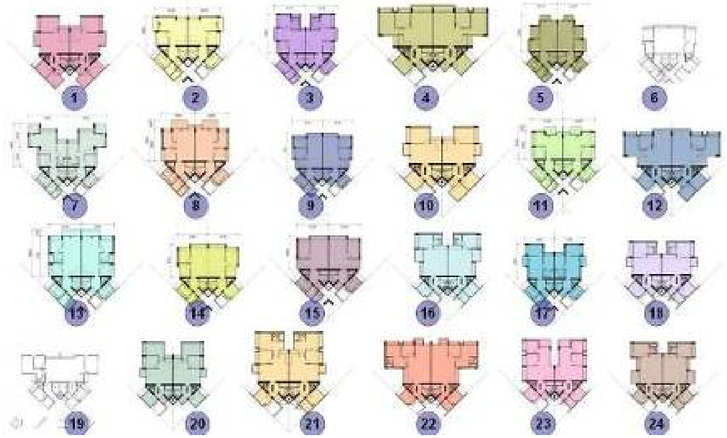
Option 3



Option 4

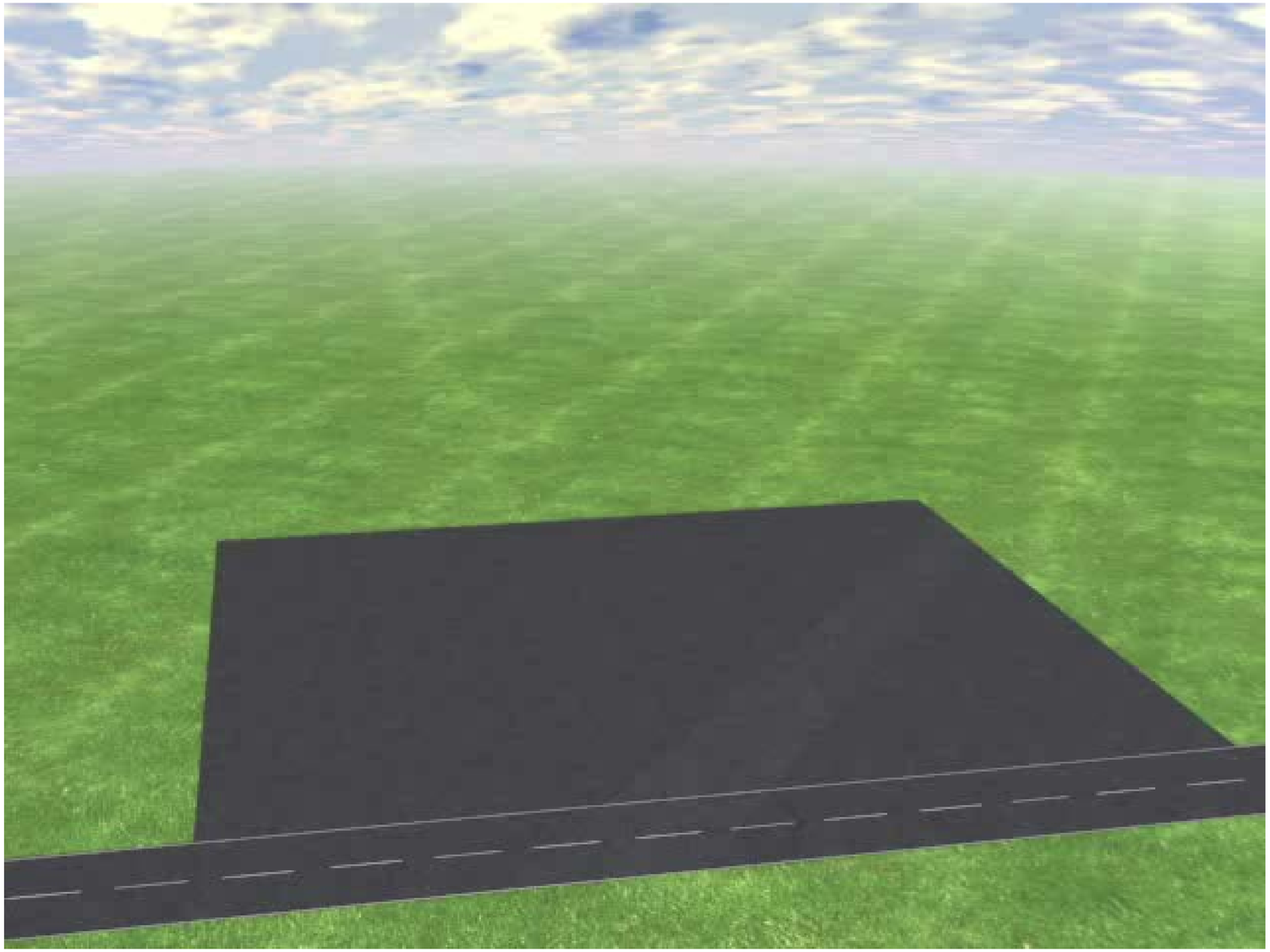
Option 4





High-rise Product Platform

Future High-rise Construction



Innovation in construction materials

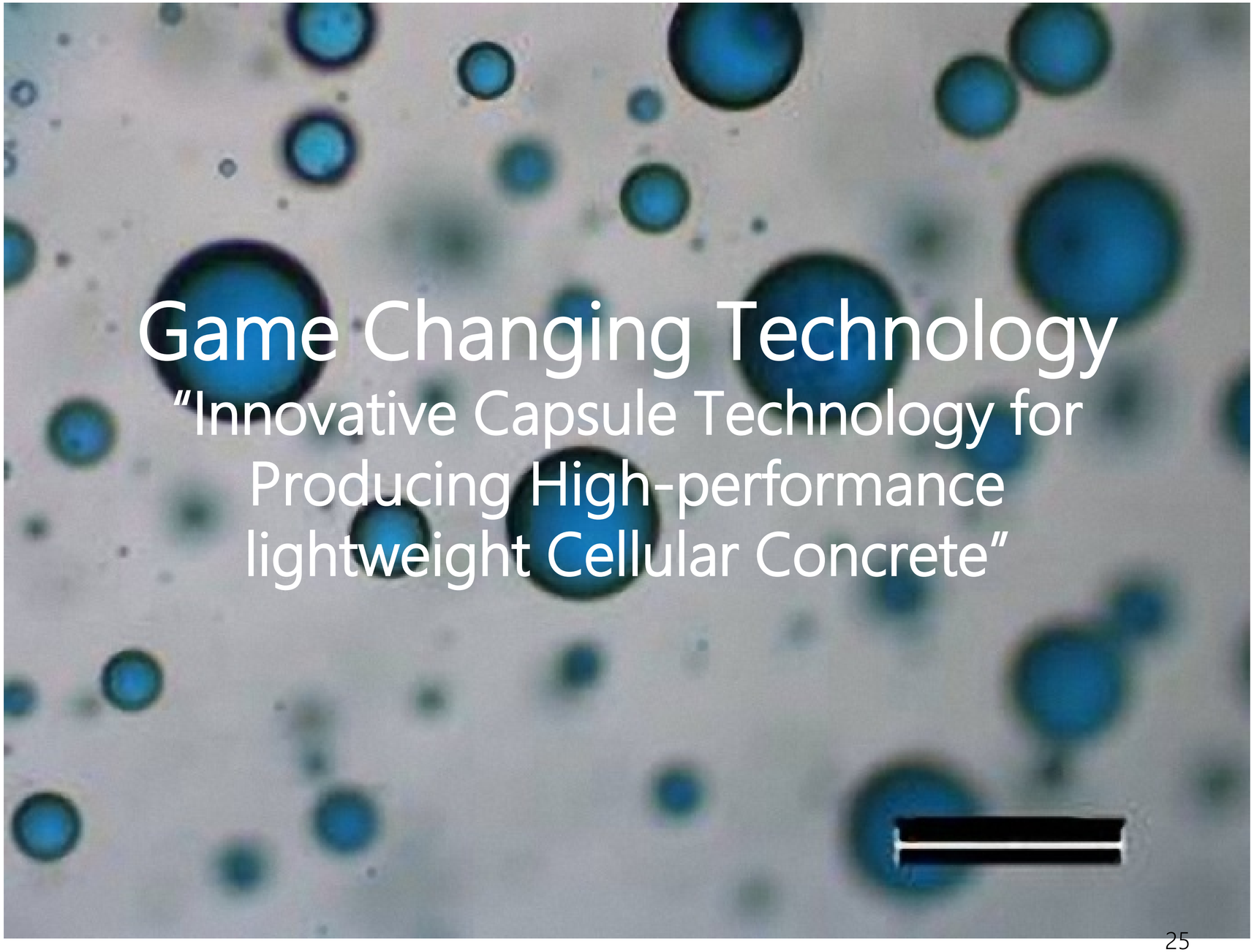
- Innovative construction material is important to housing innovation because it allows for the development of more sustainable and energy-efficient buildings that are also durable and long-lasting

- **Lightweight high-performance concrete:** This type of concrete is made with lightweight aggregates and special additives, which makes it significantly lighter than traditional concrete while also providing high strength and durability. This allows for the construction of taller buildings that are also more energy-efficient due to the reduced weight and associated lower heating and cooling costs.

- **Self-healing concrete:** This type of concrete contains materials that can repair cracks and other damage that may occur over time. This not only reduces maintenance costs but also prolongs the life of the building, which is especially important for multi-generational housing that may need to accommodate multiple generations of occupants.

Need new concrete sustainable solution

- Enhanced durability
- Reduced maintenance

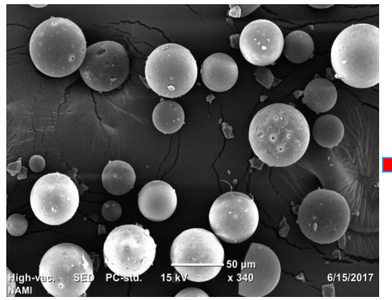


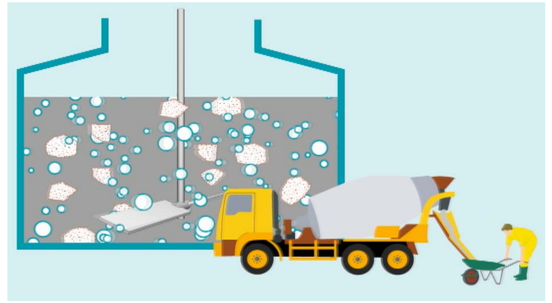
Game Changing Technology

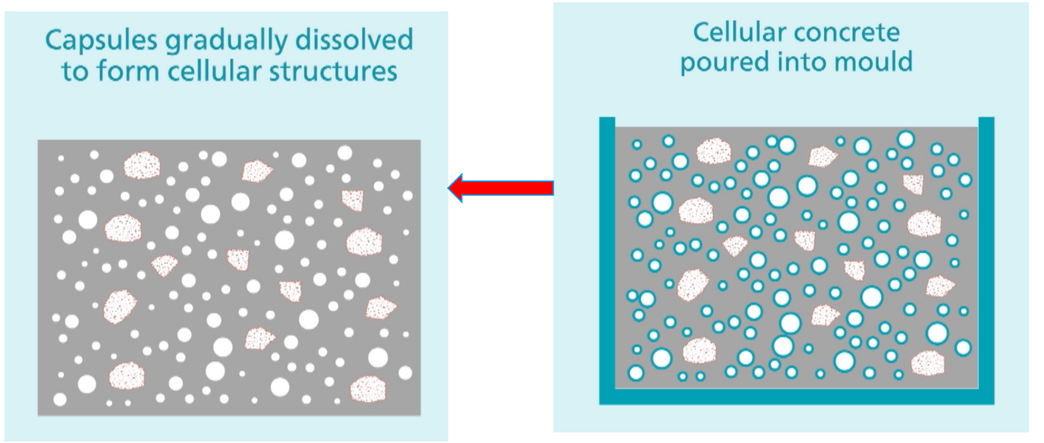
"Innovative Capsule Technology for Producing High-performance lightweight Cellular Concrete"

Next Generation Concrete

- Lighter
- Economic
- More durable
- Possess better environmental & sustainable properties

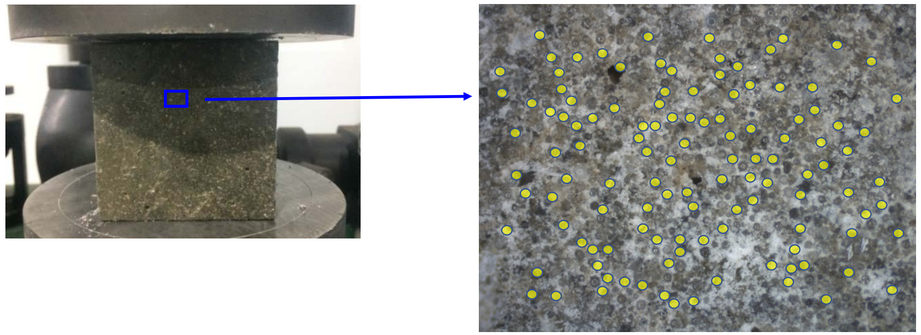






Characteristic

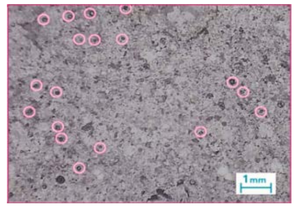
- **Closed cell tiny air void**
- **Evenly dispersed**



Performance & Benefits

	Performance
Density	1500 – 1700 kg/m^3
Strength	25 – 35 MPa
Thermal conductivity	0.5 – 0.7 W/m.K
Modulus	15 – 18 GPa
Sound insulation	> STC45 (for 100mm thick)
Total building weight reduction	15 – 20% (due to weight reduction in slabs and partitions)

- Lightweight – reduce foundation load & seismic load during earthquake
- Capsule lasting time could be tuned – **fit** practical transportation time for in-situ casting
- Mixing aggregate without settlement – enhance mechanical properties for structural application
- Internal curing – produce more robust concrete
- Closed cell & evenly dispersed cellular structure – better thermal and sound insulation



DIPLÔME

inventions Geneva

SALON INTERNATIONAL DES INVENTIONS

GENÈVE

Après examen, le Jury International a décidé

de remettre à: Dr. Jeffery Lam & Ir. Derek KL So

pour l'invention: Technologie d'encapsulage pour la production d'un béton léger super-résistant

MÉDAILLE D'OR
GOLD MEDAL
GOLDMEDAILLE

Genève, le 31 mars 2017

Le Président du Jury: David Taji

Le Président du Salon: Jean-Luc Vincent

Gold Medal
Geneva Invention 2017

Patent No: 201710079925.3

Self-healing Concrete

Treated PET-Fibre Self-Healing Cementitious Composite as Platform Technology

Treated PET-Fibre Self-Healing Cementitious Composite (PETSHCC)

Basement wall, Roof slab, Swimming pool, Water tank, External façade, Tunnels, MiC modules etc….

Short Term

- Develop PETSHCC lost form and Structural form,
- PETSHCC Spray Mix and Render,
- Wider adoption in Infrastructure Projects…

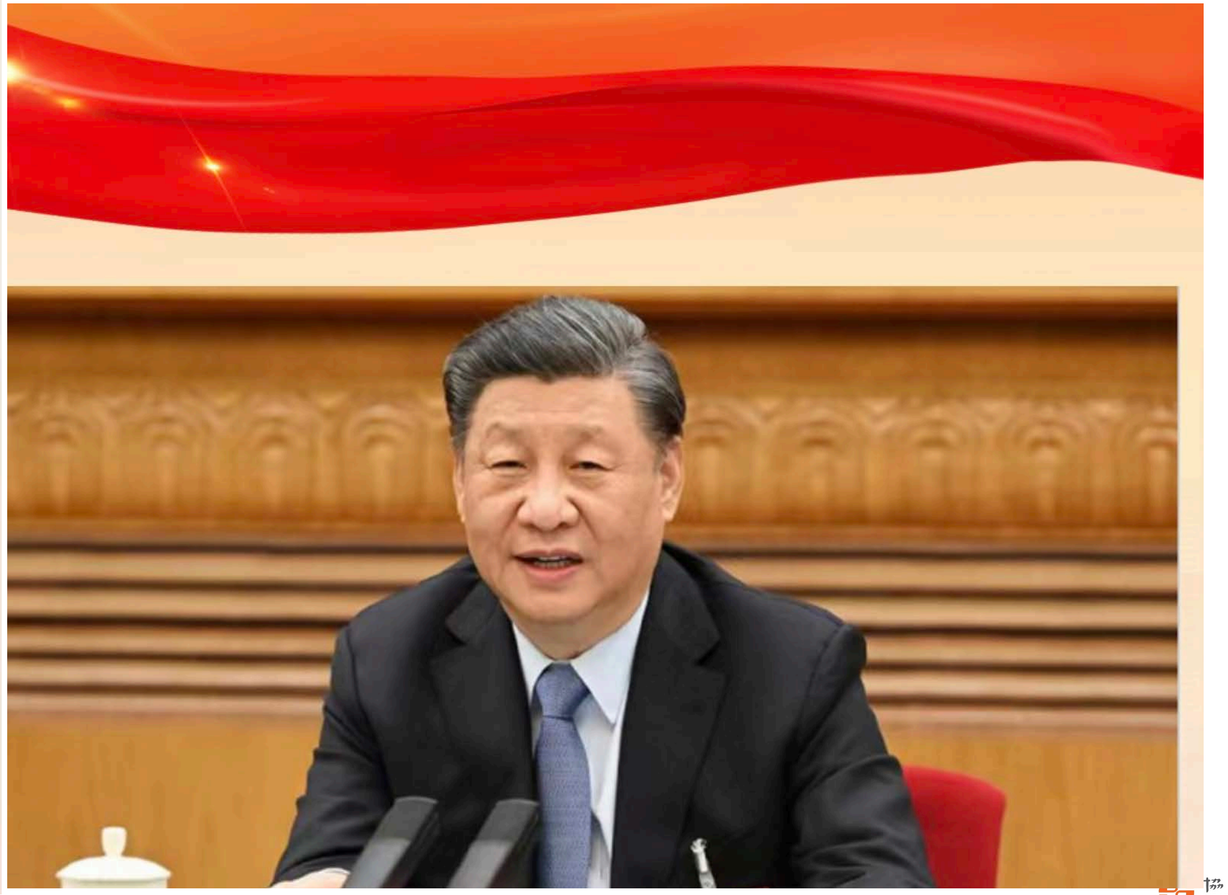
Long Term

Future Housing

- The integration of technology, sustainability, and user-centric design is crucial for the future of housing
- Open building systems and modular construction offer flexibility and adaptability in housing design and construction
- Mass customization allows for personalized and bespoke housing solutions
- New materials like lightweight high-performance concrete and self-healing concrete using nanotechnology offer cost-effective, energy-efficient, and eco-friendly solutions for sustainable housing
- Combining these elements can lead to innovative housing solutions that meet the specific needs and preferences of individual users while promoting sustainability, efficiency, and adaptability
- The potential for further integration of different approaches and technologies presents exciting prospects for the future of innovation in housing.

必须 以满足人民日益增长的美好生活需要为出发点和落脚点，把发展成果不断转化为生活品质，不断增强人民群众的获得感、幸福感、安全感。

Continuously enhancing the sense of gain, happiness, and security of the people



Thank you