Technology, Housing and Investment

Macro-trends in the post-covid real estate market

Dr. Andrea Chegut
DIRECTOR, MIT REAL ESTATE INNOVATION LAB

Colombian Construction Congress 2021,
Housing as a Source of Well-being
August 18,2021

COVID-19

Shift in our Live, Work and Play

- **There will be an undeniable change to the way we live, work and play in cities.**

There are pre-exisiting resilient community models with technology and ethical data science in place that we can use as precedents going forward.

- **Right now we are facing a public health crisis.**

We had a weak response at first with limited organization and plans for a society to go into social distancing, isolation and lockdown.

- **The secondary impacts to the global economy, psychology and culture are already immense.**

The crisis has had ripple effects into every home, company and organization.

- **What will we do to address a public health, economic and a changed community fabric all at once?**

Like in so many crisis before, we as humans will address this with Technological Change and Progress, Innovation and progress in the products, processes, uses and organizational frameworks to meet this challenge.

Progress Society Is Making Already

Innovations deployed for Covid-19

Wearable Health

OURA

OUra With the backdrop of COVID-19, Oura is sponsoring research at University of California, San Francisco (UCSF) to study whether physiological data collected by the Oura ring, combined with responses to daily symptom surveys, can predict illness symptoms. The study aims to build an algorithm to help UCSF identify patterns of onset, progression, and recovery, for COVID-19.

The UCSF TemPredict study will include two groups: front-line healthcare workers and the general population.

To learn more: https://ouraring.com/ucsf-tempredict-study

Robotic Hygiene

AKARA ROBOTICS

Irish scientists have developed a robot that can disinfect hospitals and remove Covid-19 from surfaces in the continuing fight against the deadly virus.

Akara Robotics, a technology start-up attached to Trinity College, developed the robot emitting ultraviolet light to clean healthcare facilities quickly and thoroughly to help deal with the demand on hospitals as the number of Coronavirus cases escalate.

To learn more go to: https://www.akara.ai

Health Passports

IATA TRAVEL PASS

To re-open borders without quarantine and restart aviation governments need to be confident that they are effectively mitigating the risk of importing COVID-19. This means having accurate information on passengers' COVID-19 health status.

Informing passengers on what tests, vaccines and other measures they require prior to travel, details on where they can get tested and giving them the ability to share their tests and vaccination results in a verifiable, safe and privacy-protecting manner is the key to giving governments the confidence to open borders.

To learn more: https://www.iata.org/en/programs/passenger/travel-pass/

Secure Access Service Edge

BUTTERFLY MX

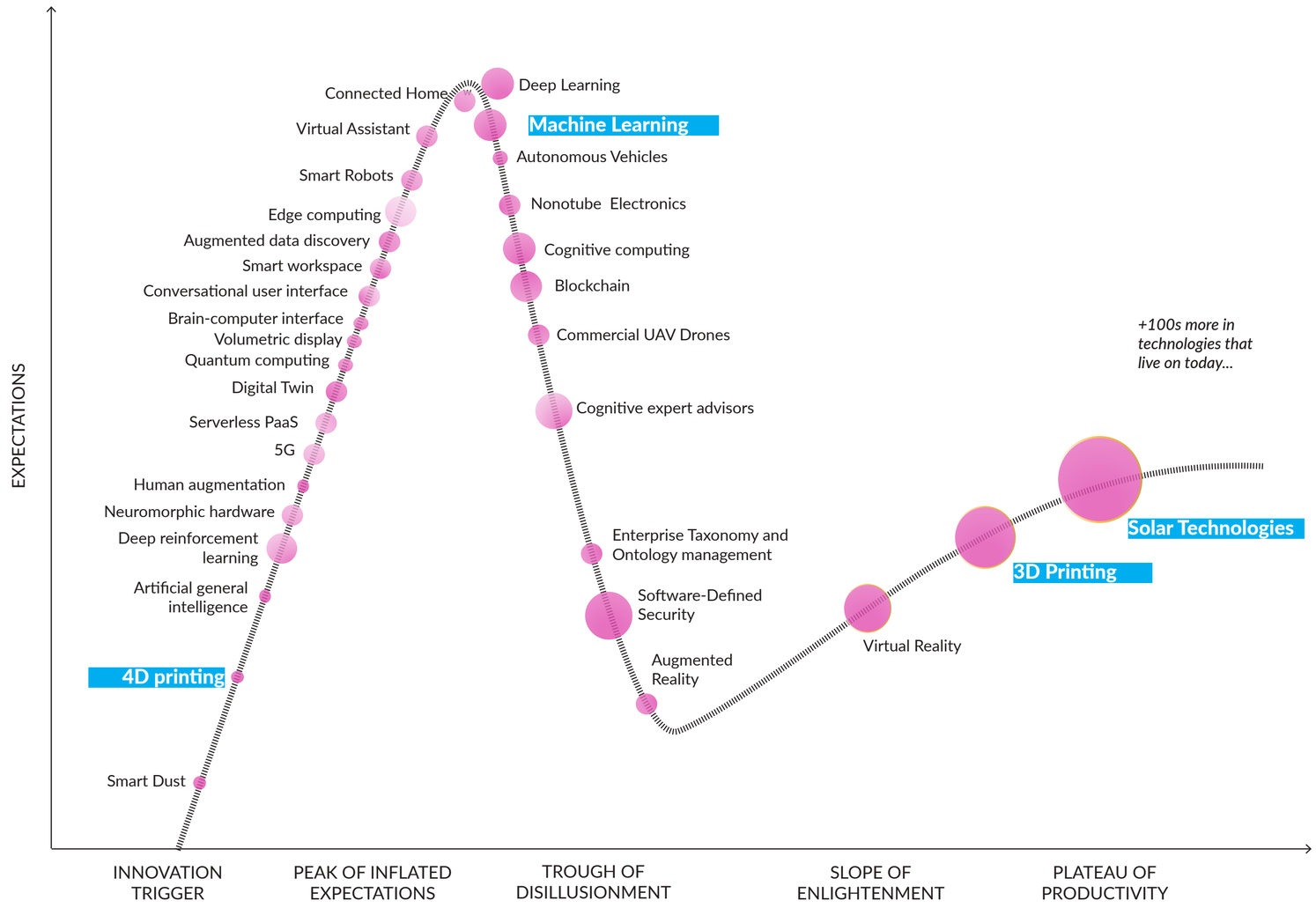
ButterflyMX makes property access simple. Get video & open doors and gates from any smartphone. Never miss a delivery or visitor again. Easy installation & integrations to your access control and property management system.

To learn more:https://butterflymx.com

A Sample of Progress

General Purpose Technologies

GARTNER'S 2017 EMERGING TECHNOLOGY HYPE CYCLE



4D Printing

MIT SELF ASSEMBLY LAB

4D Printing, developed as a collaboration between the Self-Assembly Lab, Stratasys and Autodesk, is a new process for printing customizable smart materials. 4D Printing entails multi-material prints utilizing the Stratasys Connex printer with the added capability of shape-transformation from one state to another, directly off the print-bed. This technique offers full functionality built directly into the materials, including; actuation, sensing and material logic.

Potential applications include; robotics-like behavior without the reliance on complex electro-mechanical devices, as well as adaptive products, garments or mechanisms that respond to user-demands and fluctuating environments. Using only water, heat, light or other simple energy input, this technique offers adaptability and dynamic response for structures and systems of all sizes.

SA+P Founder:
Rana el Kaliouby

Program
MS in Media Arts & Science

House
Media Lab

Founded
2009

Machine Learning

AFFECTIVA

Affectiva, an MIT Media Lab spin-off, is focused in emotion recognition technology, the next frontier of artificial intelligence. Affectiva brings emotional intelligence to the digital world by measuring and analyzing facial expressions of emotion. Its emotion-sensing and analytics software is built on an emotion AI science platform that uses deep learning and the world's largest emotion data repository of nearly 4 million faces analyzed from 75 countries, amounting to more than 50 billion emotion data points. Affectiva is used by more than 1,400 brands to gather insight and analytics in consumer emotional engagement.

SA+P Founder:
Rana el Kaliouby

Program
MS in Media Arts & Science

House
Media Lab

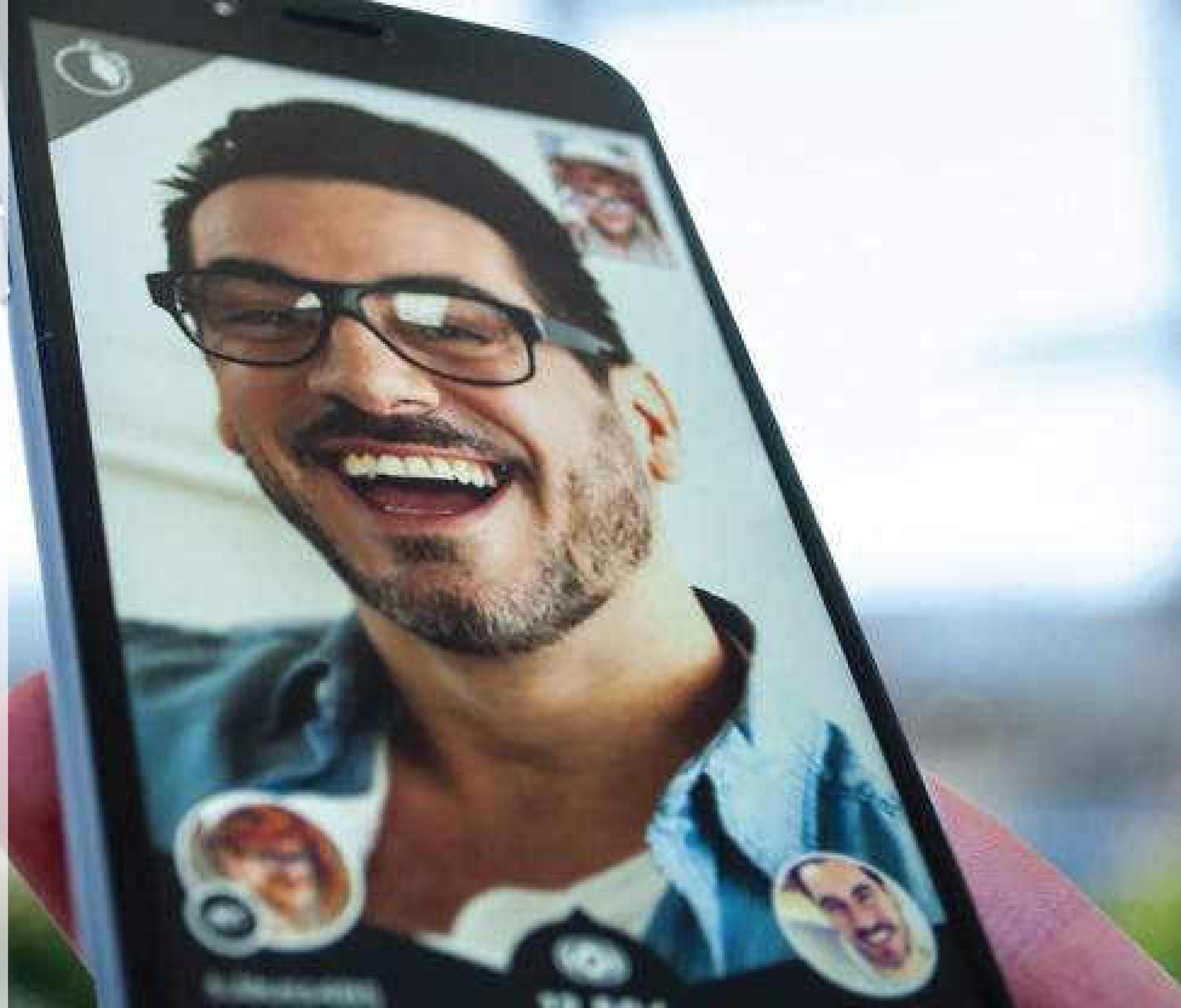
Founded
2009

Theme
Analytics

Location
Boston, MA

Website
www.affectiva.com

Associations
#machineinteraction
#data, #emotion, #sensor



3D Printing

FORM LABS

Formlabs develops innovative and sophisticated fabrication tools for professional artists, designers, and engineers. They are best known for designing and manufacturing consumer-oriented desktop 3D printers.

SA+P Founder:
Natan Linder,David Cranor,Maxim Lobovsky

Program
MS in Media Arts & Science, PhD in Media Arts & Science

House
Media Lab

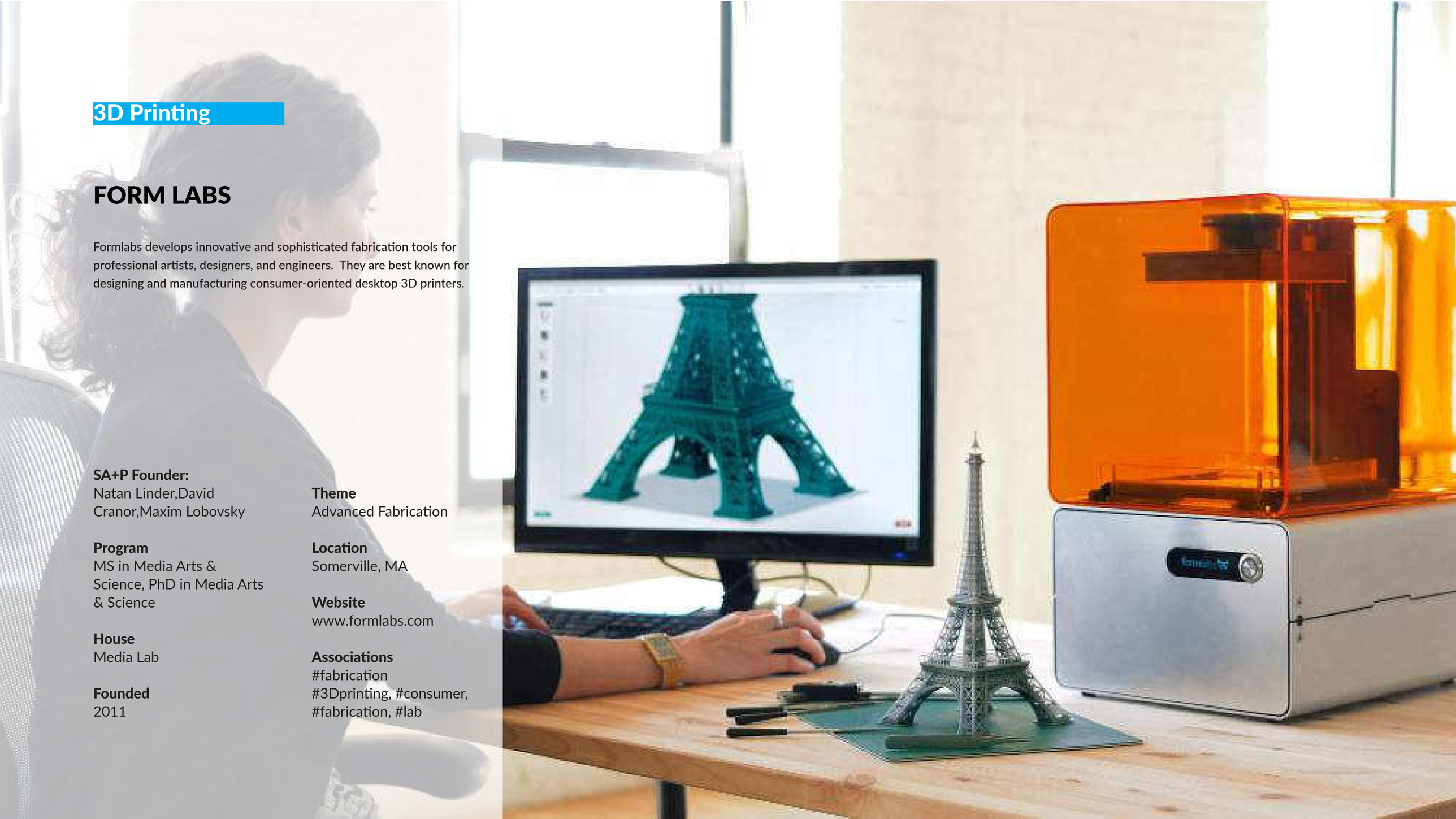
Founded
2011

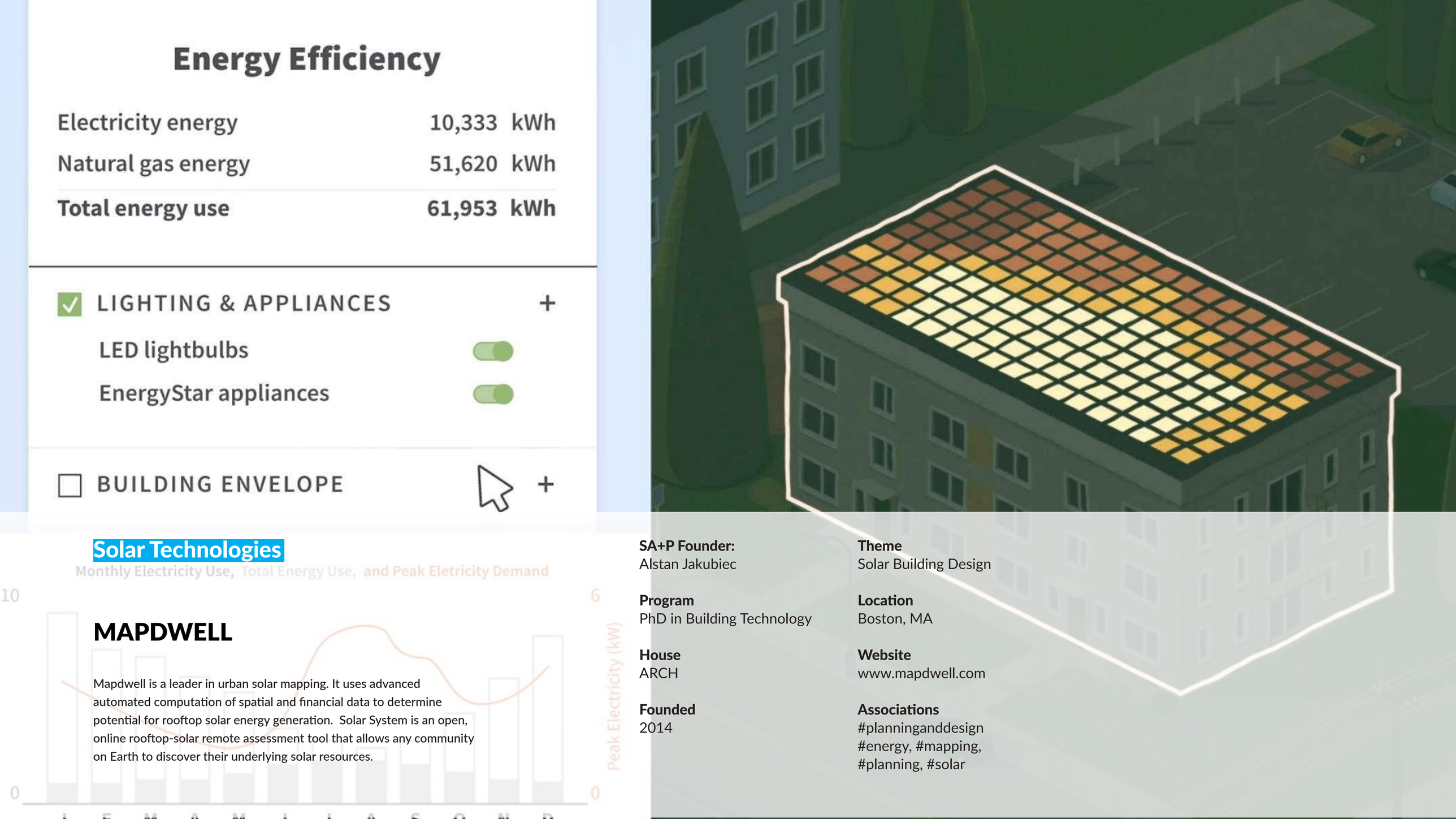
Theme
Advanced Fabrication

Location
Somerville, MA

Website
www.formlabs.com

Associations
#fabrication
#3Dprinting, #consumer, #fabrication, #lab





MAPDWELL

Mapdwell is a leader in urban solar mapping. It uses advanced automated computation of spatial and financial data to determine potential for rooftop solar energy generation. Solar System is an open, online rooftop-solar remote assessment tool that allows any community on Earth to discover their underlying solar resources.

SA+P Founder:
Alstan Jakubiec

Program
PhD in Building Technology

House
ARCH

Founded
2014

Theme
Solar Building Design

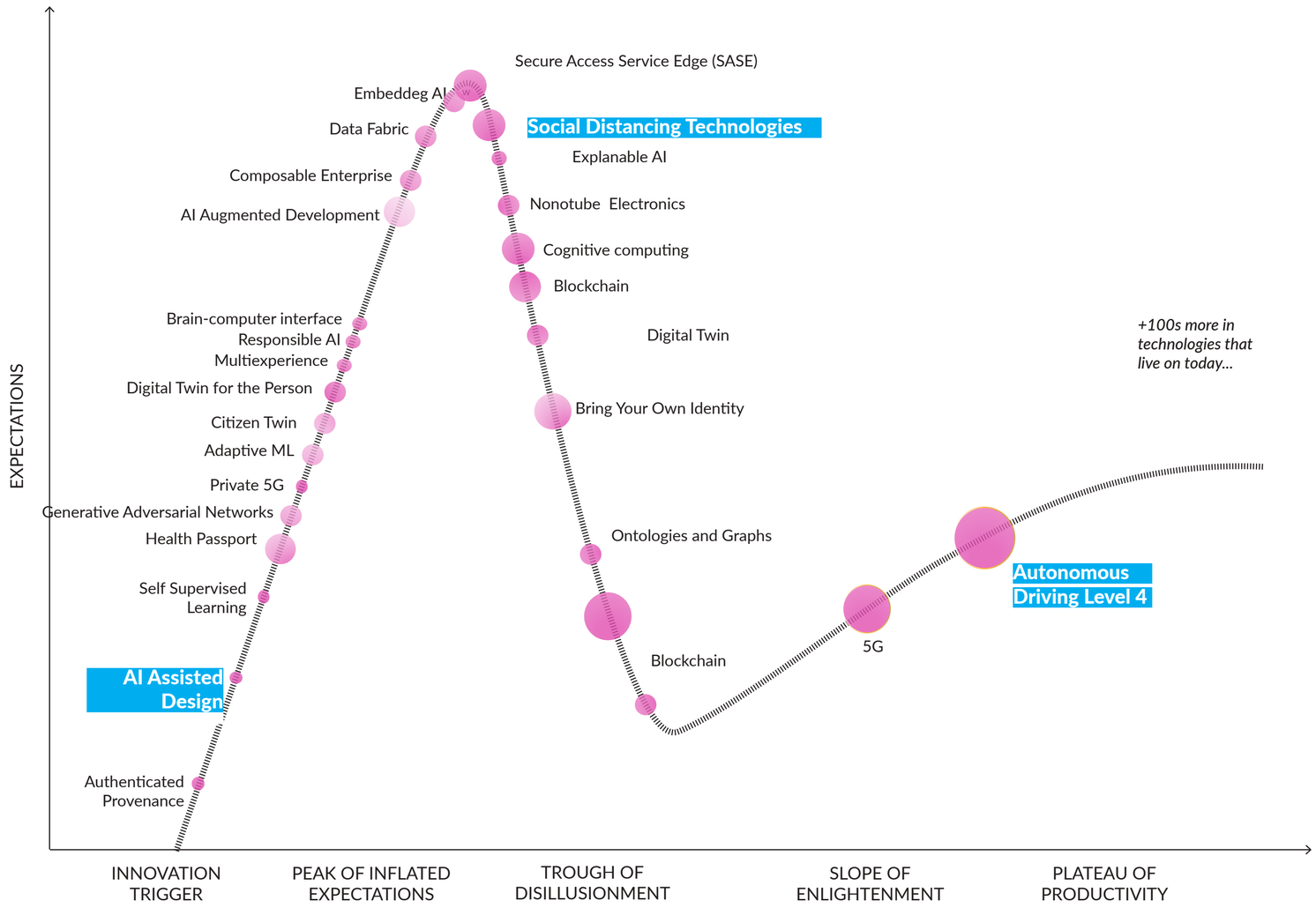
Location
Boston, MA

Website
www.mapdwell.com

Associations
#planninganddesign
#energy, #mapping,
#planning, #solar

General Purpose Technologies

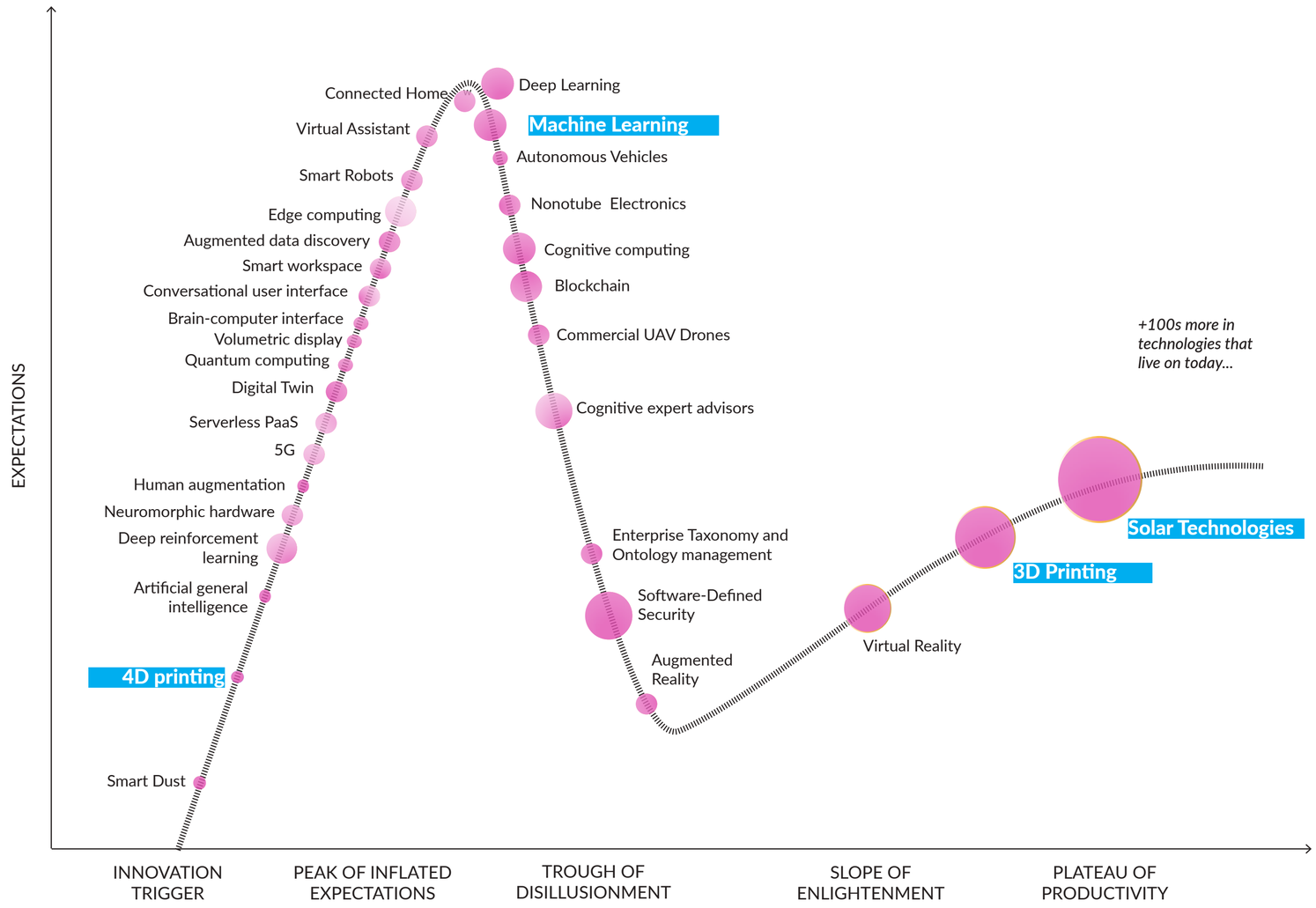
GARTNER'S 2020 EMERGING TECHNOLOGY HYPE CYCLE



An MIT Study on Technology for the Built Environment

General Purpose Technologies

GARTNER'S 2017 EMERGING TECHNOLOGY HYPE CYCLE



CASE STUDY

"Technologies rarely die, but companies often do," is a phrase not often uttered outside of academic circles. Chegut et al. (2018) found for a case study

AUTONOMOUS VEHICLES

It is only anticipated that by 2030 full CAT5 autonomous vehicles will have massive market uptake, but until then CAT3 and CAT4 vehicles will continue to grow for safety in our urban areas.

COMMERCIAL UAV DRONES

Commercial drones are expected to undergo their first massive uptake in the next 10 years, potentially changing delivery, photogametry and potentially travel.

VIRTUAL REALITY

Virtual reality is an old technology, but its commercial applications had no quite met viable computing power and digitally comfortable users as this changes VR will change our interactions with the world.

TECHNOLOGIES

206	9	10-20
NEW TECHNOLOGIES	PIVOTED	NEW PER YEAR

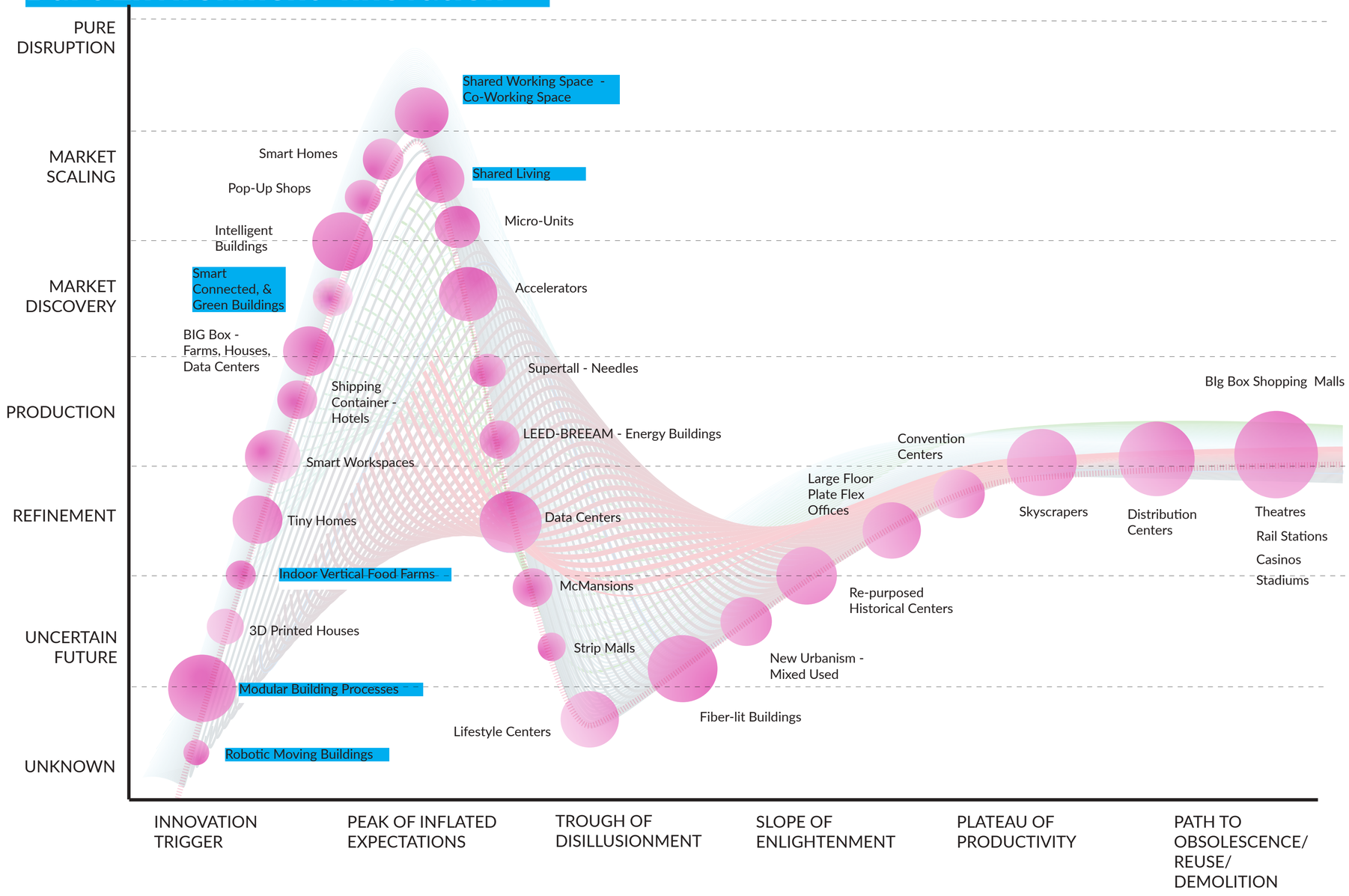
4	20	25	10	20
MIN	MAX	YEAR CYCLE	MIN	MAX

AVERAGE DURATION

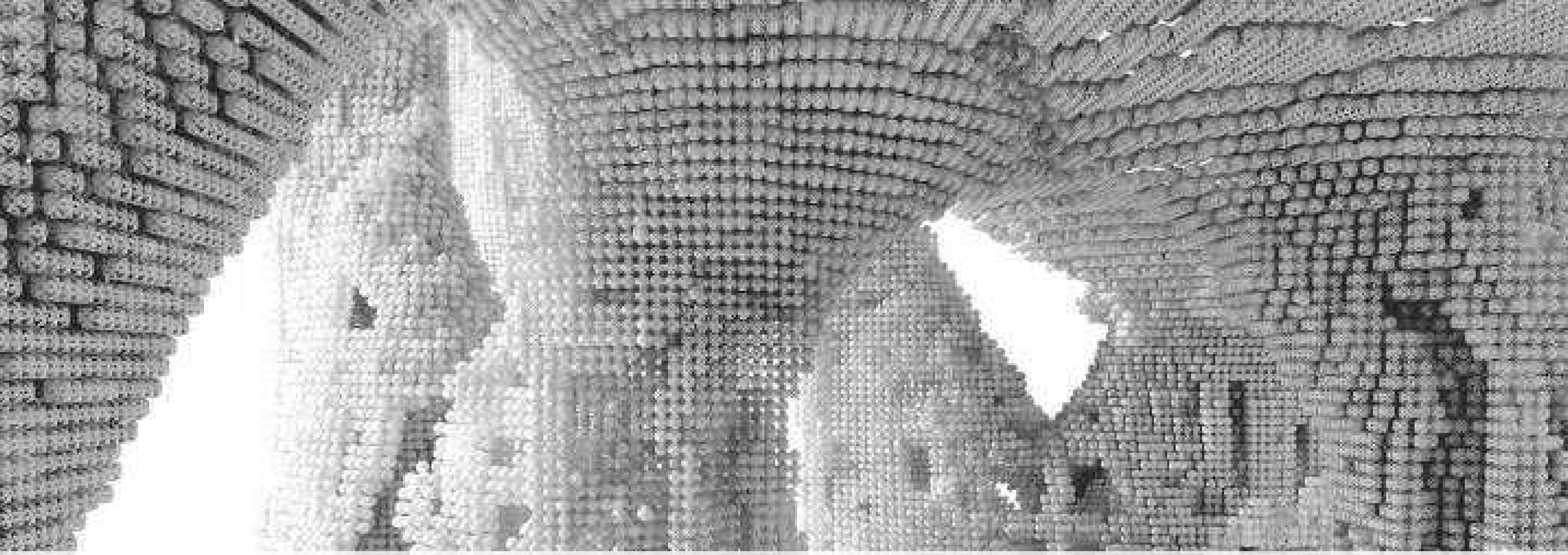
INNOVATION TRIGGER	3 YEARS
PEAK OF INFLATED EXPECTATIONS	2 YEARS
TROUGH OF DISILLUSIONMENT	6 YEARS
SLOPE OF ENGLIGHTMENT	4 YEARS
PLATEAU	10 YEARS

Let’s Dig Deeper into the Built Environment

Built Environment Innovation

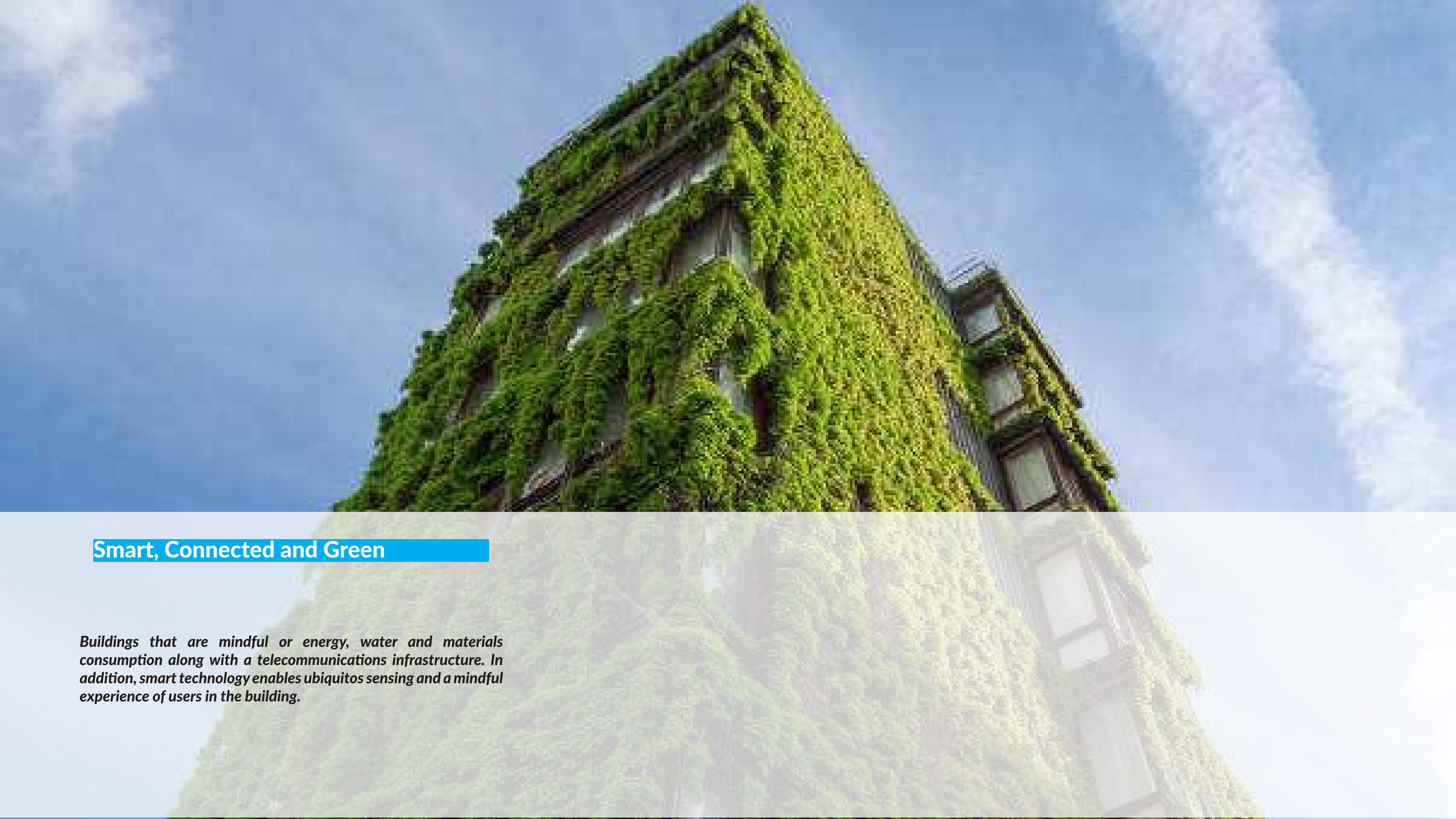


MIT'S 2017 REAL ESTATE PRODUCT LIFECYCLE



Robotic Moving Buildings

Robotic moving construction currently under development in labs is a way to remove the confines of location, the constraints of time and the fundamental design of space.



Smart, Connected and Green

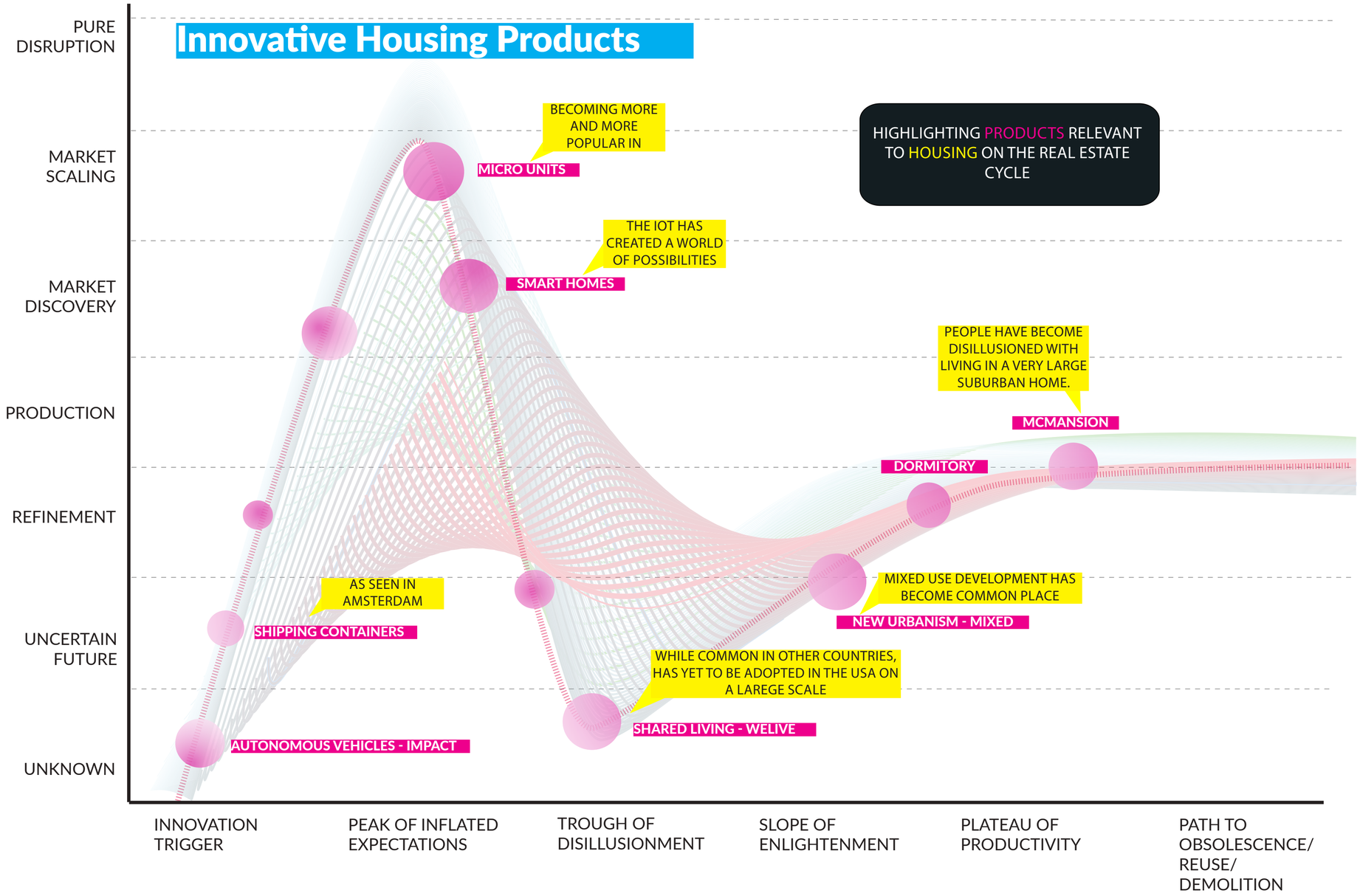
Buildings that are mindful or energy, water and materials consumption along with a telecommunications infrastructure. In addition, smart technology enables ubiquitos sensing and a mindful experience of users in the building.

Indoor Food-farms

Urban (controlled) agriculture is on the rise! Vertical and Container farms are popping up here and there and there is increasing need to make urban agriculture more sustainable. AdaViv is creating an AI-enabled adaptive environment for optimally operating indoor agriculture.

What is on the market for housing today?

Innovative Housing Products



HIGHLIGHTING PRODUCTS RELEVANT TO HOUSING ON THE REAL ESTATE CYCLE

Real Estate innovates just like any other industry, albeit at a slower pace than conusmer product technology.

#development

#design

#construction

#land

CUBE HAUS

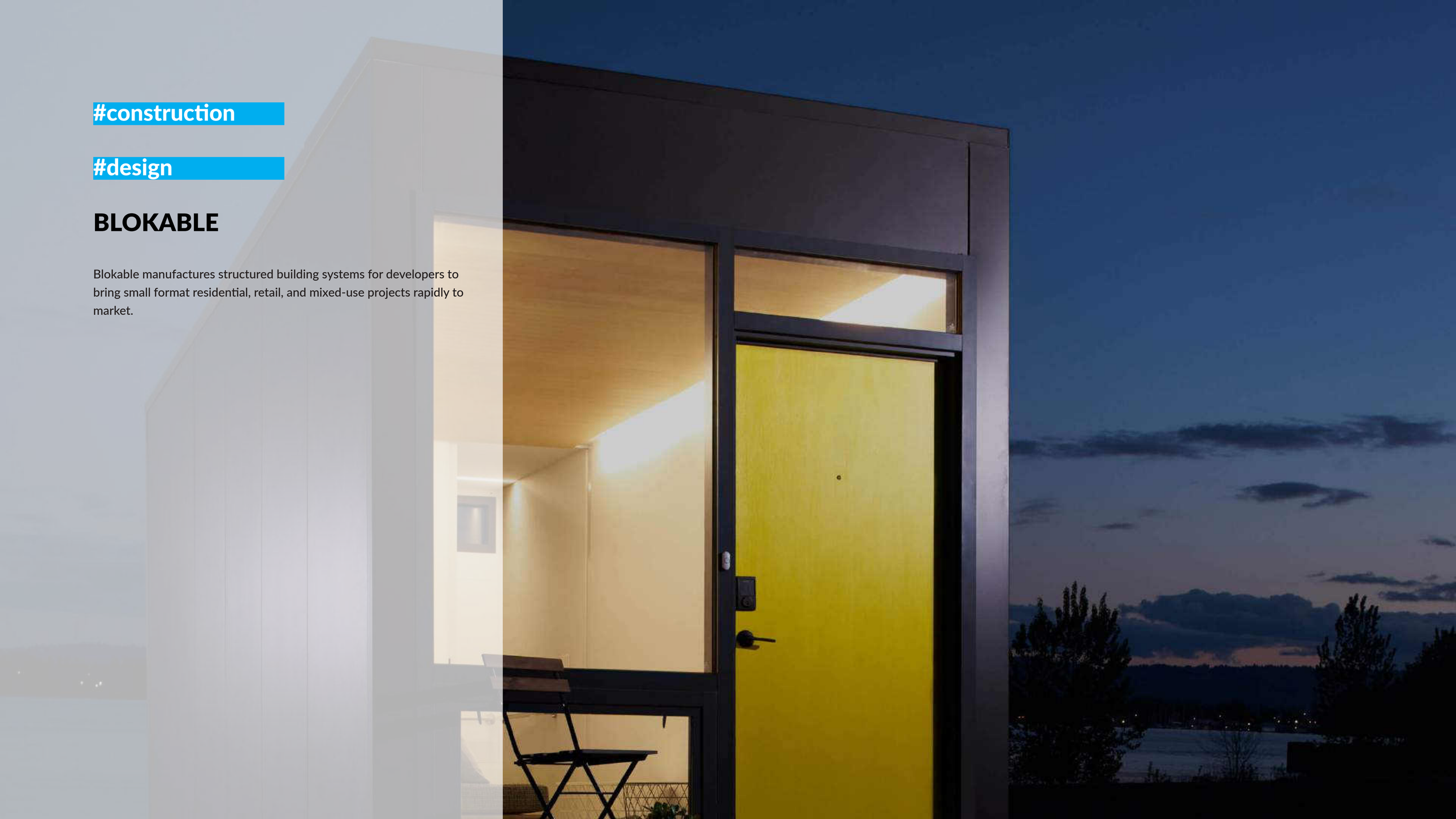
Cube Haus is a property pioneer, disrupting the existing housing market, delivering high-design value, modular homes at reasonable prices that can be configured to fit small and awkward urban sites.
The Cube Haus delivery model creates economies of scale that make innovative architectural design very accessible: people who might never have considered using an architect, let alone a renowned contemporary practice, will be able to do so. The houses will either be commissioned and installed by Cube Haus on sites that the company acquires, or will be available to buy as an ‘off-the-peg’ solution for self- builders.
Modular construction will cut down on both waste and build time and will mean that houses can be quickly and economically configured to fit any shape or size of land plot - back land sites, gap sites and rooftops.
Components will be made off-site in factories located in the UK. The frames of the buildings will be made from cross-laminated timber and will be clad in sustainable materials.

#construction

#design

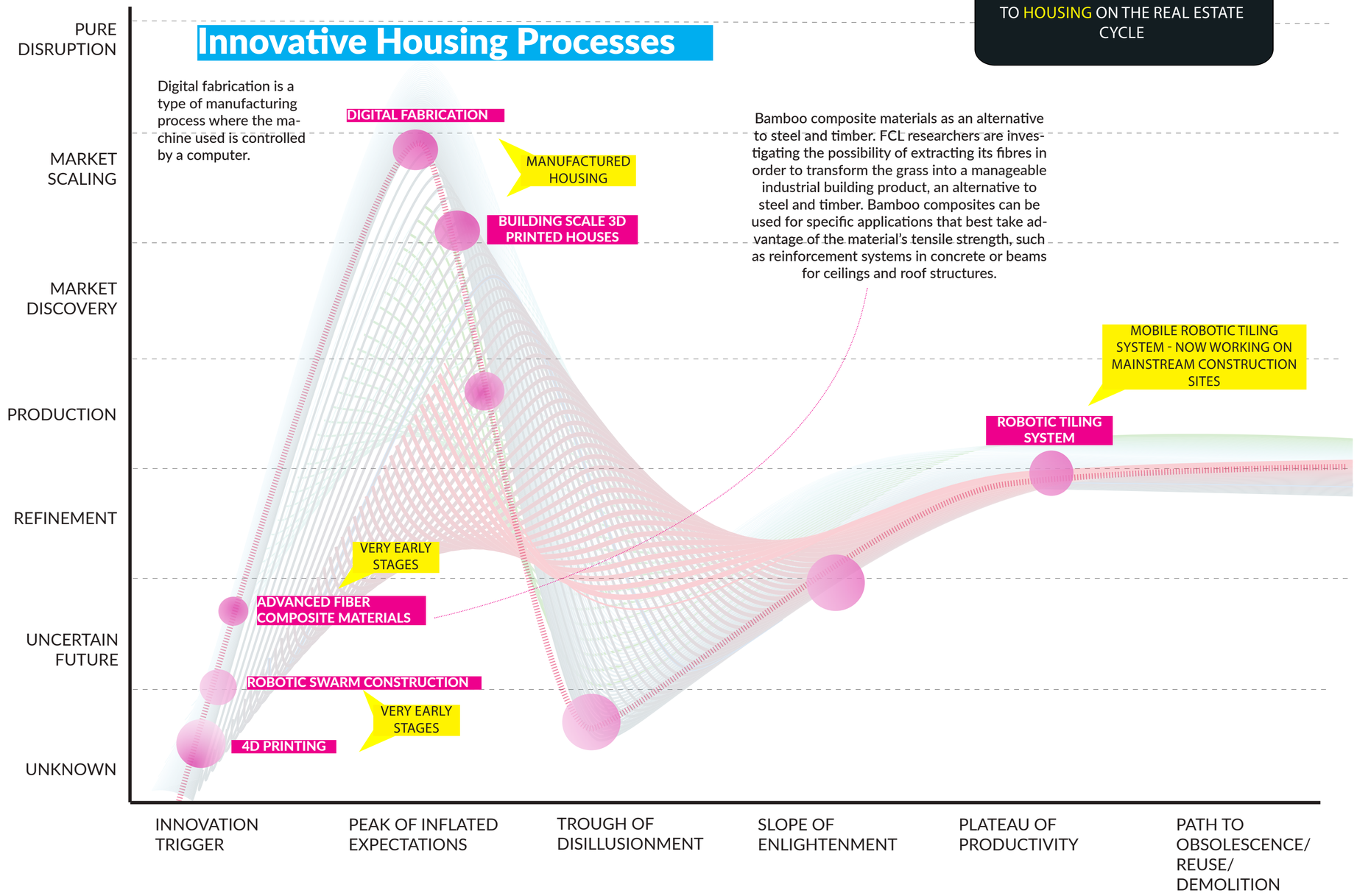
BLOKABLE

Blokable manufactures structured building systems for developers to bring small format residential, retail, and mixed-use projects rapidly to market.



Innovative Housing Processes

HIGHLIGHTING PROCESSES RELEVANT TO HOUSING ON THE REAL ESTATE CYCLE



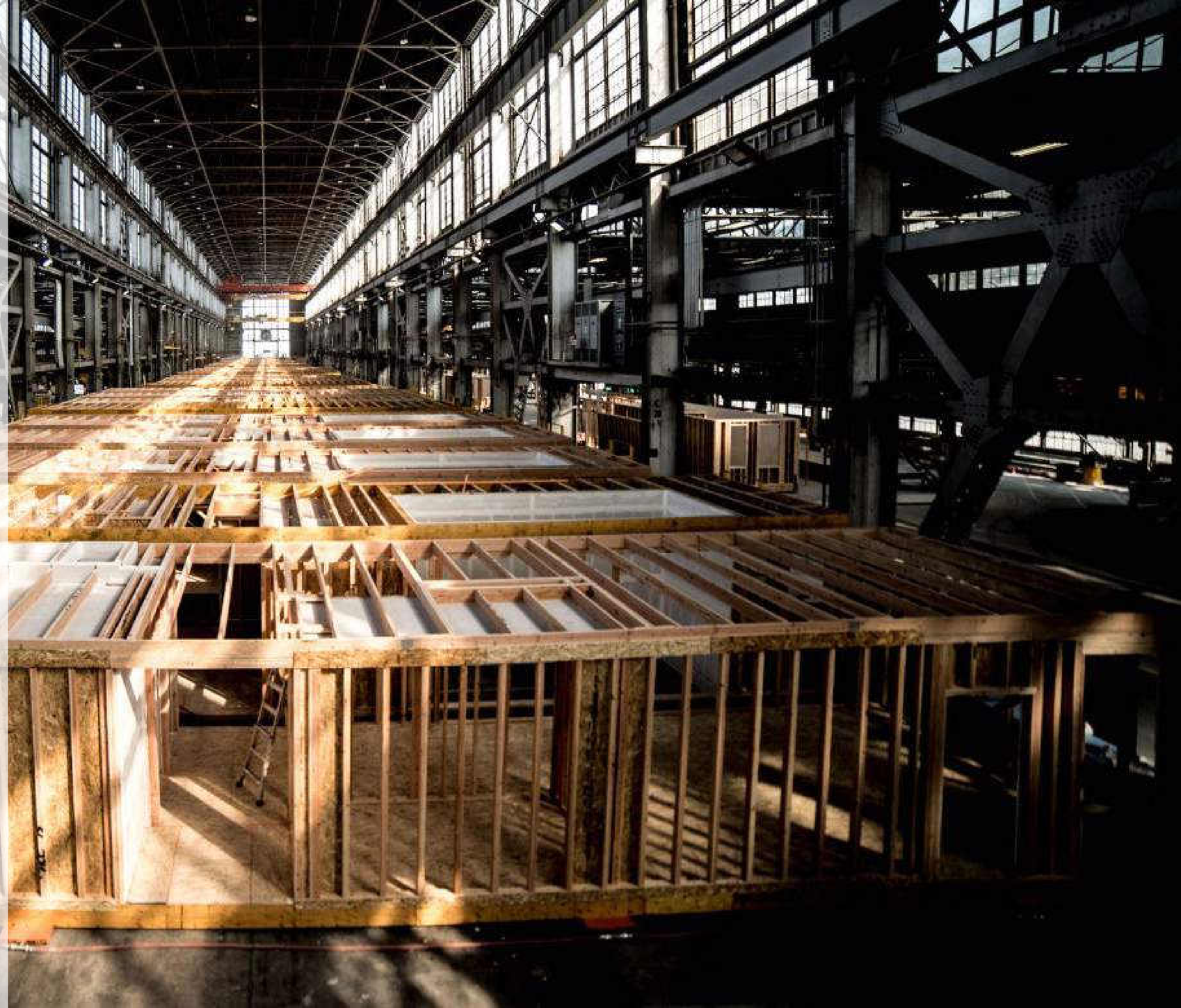
#construction

#design

#materials

FACTORY OS

Factory OS specializes home construction. The company has combined technology with tried-and-true manufacturing methods to build multifamily modular buildings more efficiently and at a lower cost.



#development

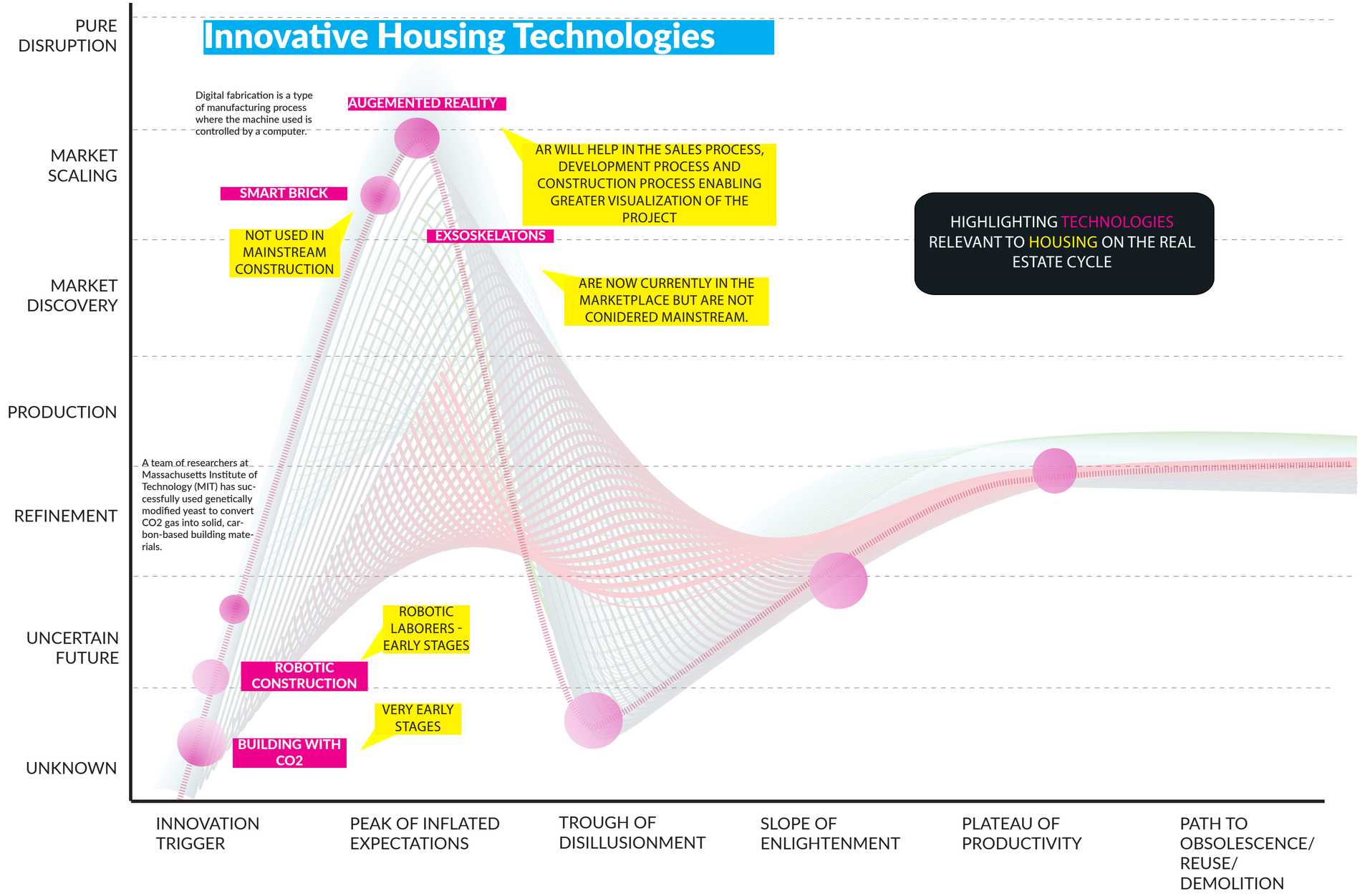
#design

#capital formation

POCKET LIVING

Pocket Living is a new kind of property developer, delivering intermediate affordable housing for London's singles and couples. We build homes for the people who contribute economically, socially and culturally to London but who earn too much for social housing and don't earn enough to buy into the private market. We are known for our compact 38m2 one bedroom Pocket homes. They are well-designed inside and out, to maximise use of space and encourage sustainable communities. They are purchased outright by owners with at least a 20% discount to the open market and have a restrictive covenant, which controls their future affordability. We also develop a small number of Pocket Edition homes, perfectly designed for city living, which are available without restriction to anyone from across London.

Innovative Housing Technologies



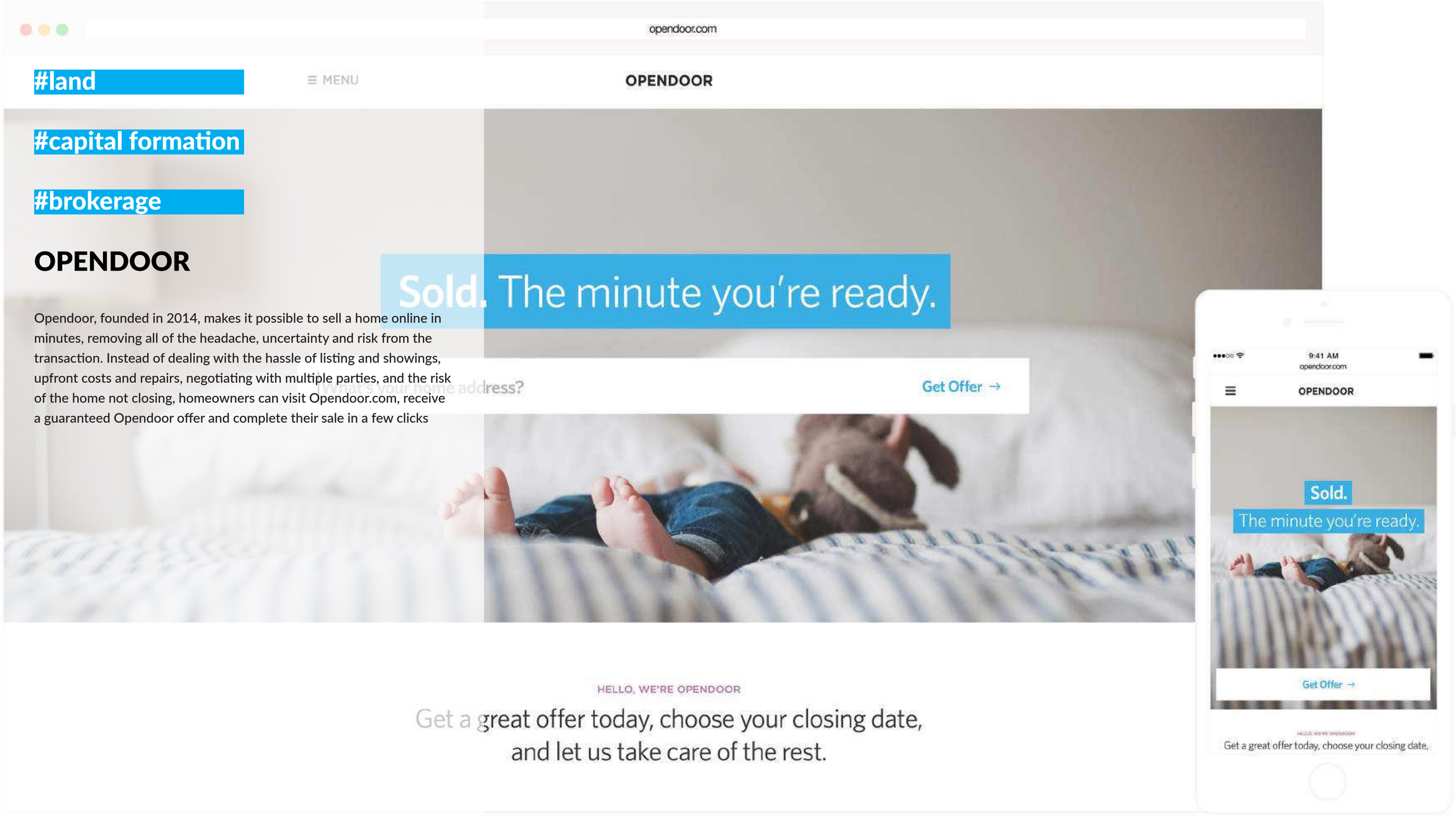
#land

#capital formation

#brokerage

OPENDOOR

Opendoor, founded in 2014, makes it possible to sell a home online in minutes, removing all of the headache, uncertainty and risk from the transaction. Instead of dealing with the hassle of listing and showings, upfront costs and repairs, negotiating with multiple parties, and the risk of the home not closing, homeowners can visit Opendoor.com, receive a guaranteed Opendoor offer and complete their sale in a few clicks



FLYHOMES

Search for homes

How It Works Agents Sellers More

Make a Cash Offer, We've Got the Cash.

Buy with FlyHomes so that you have the best terms at the negotiation table, local expertise, and on-demand service.

Get Started

Non-FlyHomes Buyer

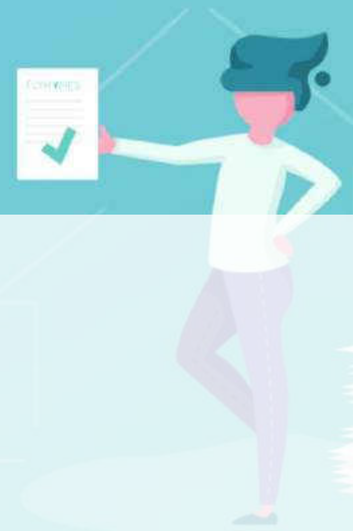
"We've made 4 offers and we still haven't won."

FlyHomes Buyer

"We won our second offer, even though there were 8 other offers!"

Seller / Listing Agent

"We accepted the FlyHomes offer and closed in two days. was awesome!"



#borrowing #capital formation

FLYHOMES

FlyHomes is an end-to-end real estate brokerage and technology company that empowers home buyers, sellers, and agents to win. We are transforming the home buying experience through comprehensive consumer education, segmented expertise, financial innovation, and on-demand technology.

Bloomberg GeekWire Forbes FORTUNE built in chicago The Seattle Times

Create Some Solutions

4 TOPICS:

CONSTRUC-
TION
new materials
& techniques

PROCESS
new regulations
& procedures

TECHNOLOGY
new products
& services

FINANCING
new underwriting
& sources

CONSTRUC-TION
new materials

PROBLEM:

Currently, we have limited ability to reduce the cost of construction for residential buildings.

The choices available for materials, structure, and finishes are limited and tightly integrated with conventional construction techniques, labor skills, supply chains, firm sizes, locations, and regulations.

CHALLENGE:

How could new materials and construction techniques have the potential to be incorporated into the housing construction industry? How could their diffusion be facilitated?

E.g:

- Prefabricated, Cross-Laminated Timber and alternate fire-safety evaluation
- 3D-Printed Concrete
- SIPs (Structural Insulated Panels)
- Passivhaus
- Modular Componentry
- Low-Carbon & Low Embodied-Energy materials

CONSTRUC-
TION
new materials

CROSS-LAMINATED TIMBER

Featured:

Mithun + Katerra,
CLT Student Housing Prototype

CONSTRUC-
TION
new materials

VOLUMETRIC MODULAR

Featured:

Kasita,
Stackable modular housing prototype

CONSTRUC-
TION
new materials

3D-PRINTED HOUSING

Featured:

ICON,
Collaboration with New Story low-cost housing prototype

PROCESS new regula-tions & proce-

PROBLEM:

Currently we have antiquated zoning and built environment regulations that inhibit innovation or market-fit in new housing development.

CHALLENGE:

How can the relationship between communities, regulators, and the housing industry be reformed so that development is more predictable, community-oriented, and sufficient for a growing population?

E.g.:

- Legislation to promote/enable ADUs (Accessory Dwelling Units, Tiny Homes)
- Lowering barriers to co-ownership
- More transparent & accessible permitting
- Zoning for specific innovative product types
- Removing parking minimums
- Rent Control policies
- Reduced minimum unit sizes

PROCESS
new regula-
tions & proce-

ACCESSORY DWELLING UNITS (ADUs)

Featured:

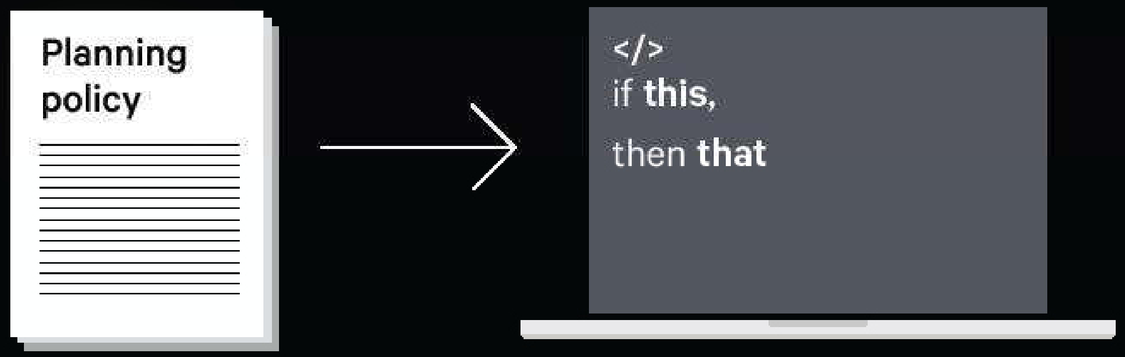
People's Architecture Office,
Plug-in House

PROCESS new regula-tions & proce-

DIGITAL PERMITTING

Featured:

Open Systems Lab,
PlanX, digitized permitting guidance and compliance system



What if we could write planning policy as ... code?

The problem is that the planning system was designed before computers or the internet. It was designed to run on paper, so everything has to be laboriously written, read and checked by humans. But what if planning policies and information could be read automatically: not just by humans, but also machines?

TECHNOLOGY
new products & services

PROBLEM:

Currently, the diffusion of new technologies into the housing industry is slow and fragmentary.

The process for institutional capital to value and invest in housing innovations requires significant market precedent, or governmental assistance and risk-mitigation.

In addition, the impact of infrastructural innovation (like autonomous vehicles) on housing & planning is poorly considered or planned-for.

CHALLENGE:

Which technologies show great promise for the housing industry, and how can their diffusion be facilitated? Which technologies will have significant impact on the housing market, and how can these be leveraged to produce beneficial outcomes?

E.g.:

- Autonomous (Electric) Vehicles
- Automated Parking Structures
- Household Solar (off-the-grid energy)
- Co-living (Mix Use)
- Shipping Container Homes
- 3D-printed homes
- Robotic Furniture

TECHNOLOGY
new products & services

AUTOMATED & ELECTRIC VEHICLES

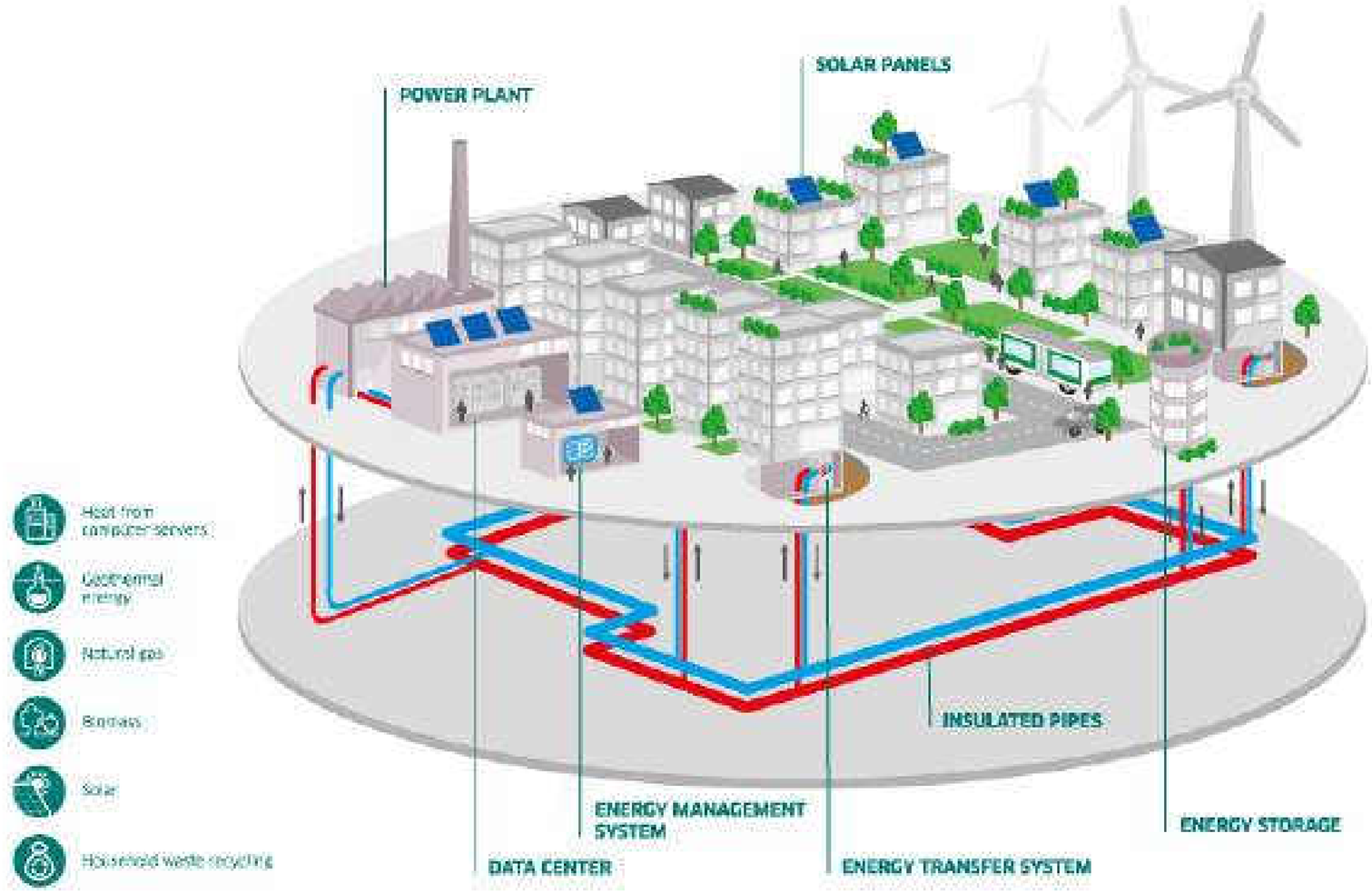
Impact on housing choice, location, and parking

TECHNOLOGY
new products & services

DISTRICT ENERGY

Featured:

ENGIE,
District heating and cooling systems



TECHNOLOGY new products & services

ROBOTIC FURNITURE

Featured:

Ori,
Transformable furniture for high-density urban living

FINANCING new underwrit-ing & sources

PROBLEM:

Currently financial underwriting of housing development is blunt and has little incentive to value innovation.

The fragmentation and dissociation between investors/lenders and eventual occupants means amenity benefits that cannot be immediately captured into the asset price are left out of new development specifications or requirements.

CHALLENGE:

How can a closer financial relationship between housing occupants and asset investors be fostered so that innovations are valued? Which ownership, tenancy, or organizational vehicles could spur the adoption and diffusion of innovations in construction, materials, and products?

E.g.:

- Tenant-led Co-operative ownership (Baugruppen)
- Amenity metrics in tax/price assessment
- Discounts in property taxes for innovation adoption.
- Lowering barriers to co-ownership
- Co- & crowd-funding development

FINANCING new underwriting & sources

CO-OWNERSHIP & CO-OPERATIVE DEVELOPMENT

Featured:

Nightingale Housing 1.0,
20 Apartments in Florence Street, Brunswick

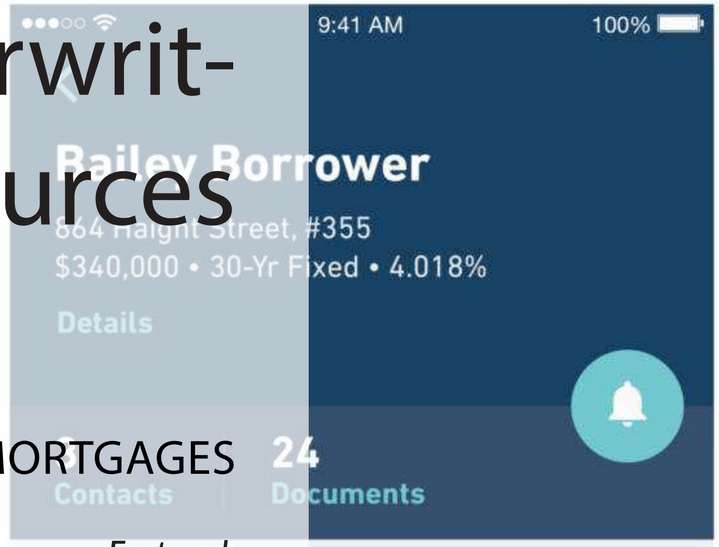
FINANCING new underwrit-ing & sources

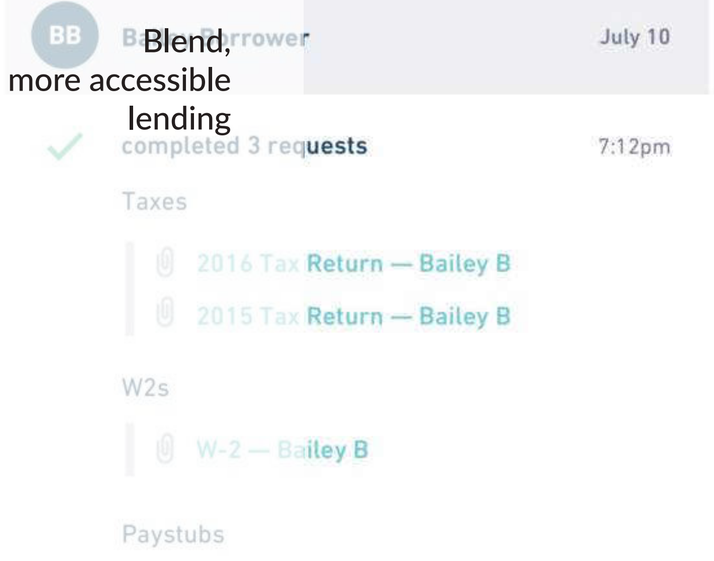
DIGITAL MORTGAGES

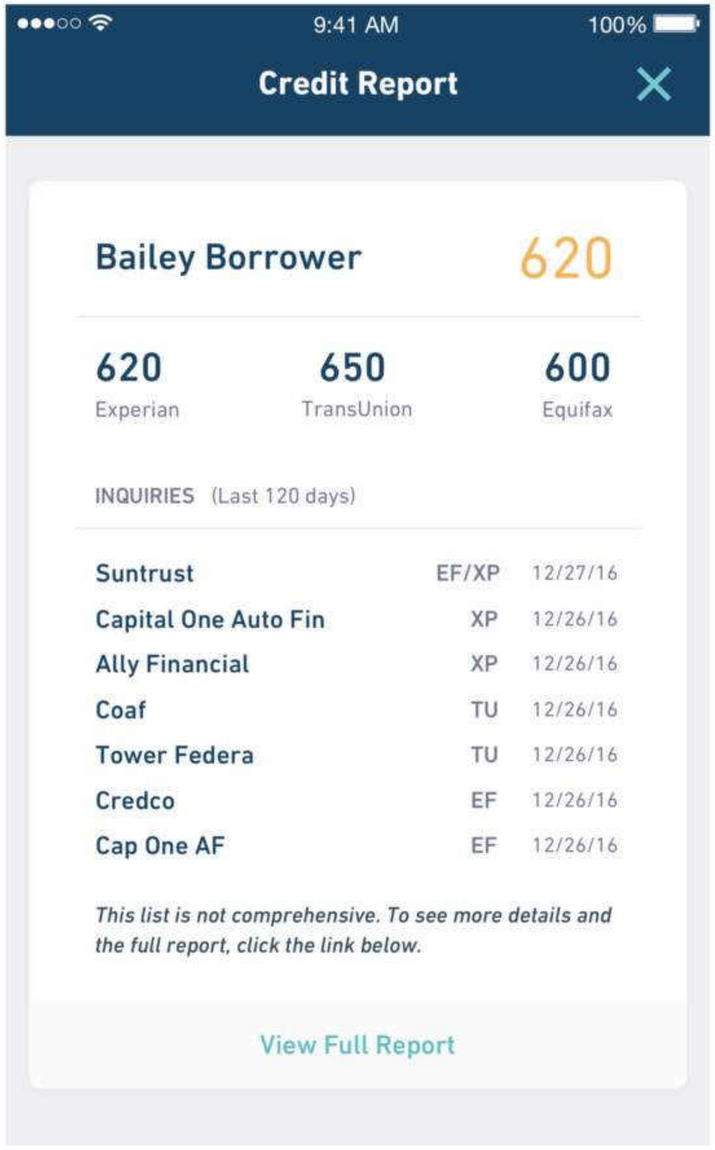
Featured:

Blend,

Frictionless, compliant, and more accessible lending







FINANCING new underwrit-ing & sources

CROWD-FUNDING

Featured:

Fundrise,
Online syndicated real estate investment platform.