The Future of Real Estate

Innovation, technology and the property market

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Research

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Thanks to interviewees, Simon Tucker, Yue Zhang, Dan Madrigal, Roberto Charvel
Timeline

- **PropTech 1.0: 1995 – 2005**
  - CoStar, Trulia, Zillow, Rightmove
  - Consolidation leading to…

- **PropTech 2.0: 2008 -2018**
  - Airbnb, WeWork, Nest, Datscha, REALLA, LendInvest
  - Consolidation leading to…

- **PropTech 3.0: 2020 -2025?**
  - Blockchain, Propcoin
PropTech 2.0
The app

billions of rooms

billions of people
The PropTech taxonomy

PropTech

- Construction Tech
- Smart Buildings
- Shared Economy

FinTech

- Real Estate FinTech

Exogenous tech
7,000 PropTech 2.0 firms

ConTech
- Autodesk
- ConstructConnect
- Holobuilder
- Iron Planet
- Micello
- Kahua
- Plangrid
- ProCore
- Rhumbix
- Textura

Smart Buildings
- Aggreko
- CAME Digital Realty
- Distech
- Equinix
- Honeywell
- Maalka
- Matterport
- Nest
- Siemens
- TaskRabbit
- WiredScore

Shared Economy
- Airbnb
- Appear Here
- Breathr
- Central Working
- Flexioffices
- Grind
- LiquidSpace
- Love Home Swap
- Mayi
- Open Door Co-Living
- PivotDesk
- Regus
- Rentpath
- Roost
- Sharedesk
- Sharemystorage
- Soho 3Q
- Splitable
- Spaces
- Spacious
- Storemates
- The Collective
- The Hub
- Tujia
- Urwork
- Vanke Cloud Space
- We Are Pop Up
- Wework
- Workbar
- Xiaozhu
- Youlianxia

Real Estate FinTech
- 42 floors
- Aerial Look
- Argus
- Better Mortgage
- Brickvest
- Capitalrise
- Comptak
- CoStar
- Cozy
- Credi-Fi
- Credit Sesame
- Datscha
- Envestnet/Yodlee
- Equifax
- ESRI
- EyeOpen
- Fang
- Geopry
- Guaranteed Rate
- Habito
- HouseCanary
- Houzen
- Hubble
- Intabode
- IPSX
- Juwei
- Kensee
- Knock
- Kofax
- LandlordStation
- LendingHome
- LendingTree
- LendInvest
- Levertton
- LoopNet
- Lucre
- Mashvisor
- Megalytics
- Mortgagebot
- Mortgage Harmony
- NoAgent
- OfferPad
- OnTheMarket
- OpenDoor
- Piggyback
- Placester
- Plastiq
- Point
- Property Crowd
- Property Moose
- Property Partner
- Property.Works
- Propstack
- PropTiger
- Propy
- Purple Bricks
- RadPad
- Real Capital Markets
- Real Estate Strategies
- REALLA
- RealMassive
- RealtyShares
- Reoptimizer
- Reposit
- RexMLS
- Rezi
- Rightmove
- Rocket Mortgage/Quicken Loans
- Roomi
- Roostify
- Shoqin
- Sina
- Sindeo
- SquareYard
- Statebook
- SoFi
- Source Central
- StrideUp
- SPD
- Talliance
- TheSquareFoot
- The Unmortgage
- Top Image Systems
- Triple Mint
- Trulia
- Trussle
- VTS/Hightower
- Xcelerint
- Yapstone
- Yardi
- Zeus Mortgage
- Zillow
- ZoomProspector
- Zoopla
- Zumper
### PILabs applications: sizing a $50bn market

<table>
<thead>
<tr>
<th>Category</th>
<th>Real Estate</th>
<th>Fintech</th>
<th>Sharing Economy</th>
<th>Smart Building Tech</th>
<th>Contech</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information</td>
<td>12.9%</td>
<td>0.6%</td>
<td>0.9%</td>
<td>3.1%</td>
<td></td>
</tr>
<tr>
<td>Transactions</td>
<td>38.3%</td>
<td>16.6%</td>
<td>3.4%</td>
<td>3.4%</td>
<td></td>
</tr>
<tr>
<td>Control/management</td>
<td>0.0%</td>
<td>2.5%</td>
<td>15.0%</td>
<td>2.1%</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>51.2%</td>
<td>19.6%</td>
<td>19.3%</td>
<td>8.6%</td>
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</table>
The technologies (exogenous tech)

- Web-delivered and phone-ready apps
- Driverless cars, autonomous vehicles, drones, flying cars
- Artificial intelligence, machine learning, deep learning (big data)
- Robotics and cyborgs
- Virtual reality, augmented reality, CAD
- Blockchain, quantum computing
- Sensors and controls
- GPS, GIS, satellites
Smart buildings/real estate/cities

The internet of things

- By 2020 it is that there will be 50bn connected devices
- The IoT market size forecasts range from 1tn to 7tn
- With infrastructure efficiency being the biggest driver

How can this shape the roles that everyone plays in the real estate world?

Smart houses

More information is being generated about human patterns than ever which, if processed, can yield insights on property improvement

Smart cities

“Known as Bristol is Open, the project will effectively turn Bristol into a giant laboratory and look at how big data can be used to solve problems such as air pollution, traffic congestion and assisted living for the elderly.”

in WIRED
The shared economy

Long term leases on property are becoming more and more difficult to secure for landlords, as company lifecycles shrink and more flexibility in lease terms is demanded.

There has been a rapid growth in co-working with the emergence of 7,800 co-working spaces globally by the end of 2015, initially driven by freelancers, start-ups and entrepreneurs but now becoming more mainstream as small and large companies look to adopt the concept.

The serviced office market grew 16% last year and is set to treble in the UK into meet the demand for flexibility.

Growth in demand for flexible space is now DOUBLE that for leases.

Companies are founded, reach maturity and die/get acquired inside a 10 year lease term.

Key Considerations

1. Long term leases on property are becoming more and more difficult to secure for landlords, as company lifecycles shrink and more flexibility in lease terms is demanded.
2. There has been a rapid growth in co-working with the emergence of 7,800 co-working spaces globally by the end of 2015, initially driven by freelancers, start-ups and entrepreneurs but now becoming more mainstream as small and large companies look to adopt the concept.
3. The serviced office market grew 16% last year and is set to treble in the UK into meet the demand for flexibility.

Source: Phil Kemp, The Grid
“We can expect to see secondary trading platforms that help investors to manage mixed portfolios of listed and unlisted property, particularly at the core end of the market.”

“Blockchain is coming - get ready. If you haven't heard of Blockchain yet, it's likely you will soon. It could drastically change the real estate industry if it takes off as proponents believe. It's a new technology, a way of doing business, and transformational if it plays out.”

- 3,335 firms cannot all be wrong – and some processes are crying out for improvement (conveyancing, GP/LP matching, lease assignment)

- Tech platforms will create a primary and secondary market for units in commercial real estate - but how big can this be?
2025-2030: PropTech 3.0
Residential estate agency

- Sales leads are generated by
  - Estate agency branches (5%)
  - Direct by seller (5%)
  - Portals (90%)
    - Rightmove/Zoopla/OnTheMarket

- Which is the bigger threat?
  - On-line estate agents
  - Portals

<table>
<thead>
<tr>
<th>Online Estate Agent</th>
<th>Properties for Sale</th>
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<tbody>
<tr>
<td>Purplebricks</td>
<td>6,682</td>
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<tr>
<td>aMoor</td>
<td>3,392</td>
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<tr>
<td>HouseSimple</td>
<td>1,280</td>
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<tr>
<td>Tepilo</td>
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<tr>
<td>House Network</td>
<td>897</td>
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<td>easyProperty.com</td>
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<td>Sell Simple</td>
<td>428</td>
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<tr>
<td>hatched.co.uk</td>
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<td>Open House</td>
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<td>YOPA</td>
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<td>SellARhouseOnline</td>
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<td>GetAnOffer</td>
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<td>Excel Estate Agency</td>
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<td>Visum</td>
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<td>Mouse House</td>
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<tr>
<td>I Am The Agent</td>
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<tr>
<td>SellMyHome.co.uk</td>
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<tr>
<td>House4u</td>
<td>75</td>
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<tr>
<td>My Online Estate Agent</td>
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<td>Getrealestate</td>
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<tr>
<td>settled</td>
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<tr>
<td>Tortoise Homes</td>
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<td>Hopprice</td>
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<td>Chimney Pots Estate Agents</td>
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<td>Homeseller</td>
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<td>PropertyEagle.co.uk</td>
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<td>MoveEstates</td>
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<td>Online Agent UK</td>
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<tr>
<td>asaleuk.com</td>
<td>20</td>
</tr>
<tr>
<td>makeumove</td>
<td>19</td>
</tr>
</tbody>
</table>

Data is via Zoopla.co.uk and does not include properties marked ‘Under offer’ or ‘Subject to Contract’. Table accurate on May 5, 2016 © SellingUp.com
Automated valuation models and AVMs

- House Canary
  - [https://www.housecanary.com](https://www.housecanary.com)

- Zoopla, Rightmove

**Zoopla buys housing data firm Hometrack for £120m**

*Zoopla Property Group has announced it is buying Hometrack, a specialist in housing valuation data, established back 1999. This data includes home prices in UK cities, and its automated valuations. The purchase has prompted speculation among agents.*
On line property trading?

- The current process is inefficient and deserves disruption
  - Blockchain could disintermediate conveyancers and brokers…
  - …but the disintermediation process will be long and slow, the product of many small process improvements, with no silver bullet or big bang
- There will be a regulatory and human pushback
  - Consumers needs protection against unauthorised deposit holding, unregulated investment advice, unprofessional governance and inaccurate advertising
- Traditional business formats capturing tech for their own benefit will hit back and compete with purely digital offerings
Research aims – the future of real estate transactions

- To expose the causes of delay in the current real estate transaction process
- To explore the role technology might play in the future of real estate transactions
- To suggest necessary reforms required to facilitate the digitalisation of real estate transactions
The causes for delay have never been documented

- Delays occur where the variance in expected time (and therefore risk) is longest
- Through mapping a hypothetical end to end transaction we identified over 150 separate actions required for an end to end transaction
  - CBRE
  - BCLP
  - Reed Smith
  - HMLR
  - Search Acumen
All causes for delay are data storage or transfer issues

- #1: the vendor may not have maintained accurate or digital records of relevant information
- #2: generating the sales pack may create conflicting data
- #3: performing adequate searches via under-resourced or non-motivated authorities and data providers
- #4: identifying the correct parcel: no single, true plan
- #5: completing standard enquiry forms: caveat emptor
- #6: reviewing and reporting using non-integrated software
- #7: filing for registration: a lack of transparency over requisitions
PropTech is not a silver bullet

- Participants felt that technology is not a panacea
- But an openly accessible, single pool of up to date, standardised property information could solve many of the bottlenecks identified
“The inefficiencies and roadblocks in real estate exist in the walls built by legal and regulatory systems that are now antiquated and out of place among contemporary technology” (Fraser, 2018)

“Contracts, transactions, and the (associated) records … are fundamental for the commercial real estate industry. However, the management of those assets has not kept up with the economy’s digital transformation” (Dijkstra, 2017)


Dijkstra, M. (2017): Blockchain: Towards Disruption in the Real Estate Sector, October 31
Digitalised data is key driver for any future change
Digitalise the bottlenecks to create liquidity

- Blockchain and smart contracts
- Property passports, building information models and internet of things
- Geospatial, satellite and drone technology
- Artificial intelligence and machine learning
  - Lease information extraction
  - Auto valuation models and instant mortgages
  - Virtual reality and augmented reality
  - Chatbots
## Bottlenecks and solutions

<table>
<thead>
<tr>
<th>Bottleneck</th>
<th>Tech Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Blockchain Land Registration</strong></td>
<td>✓</td>
</tr>
<tr>
<td><strong>Blockchain Transactions and Smart Contracts</strong></td>
<td>✓</td>
</tr>
<tr>
<td><strong>Property Passports, IoT, BIM</strong></td>
<td>✓</td>
</tr>
<tr>
<td><strong>Geospatial data, Satellites, Drones</strong></td>
<td>✓</td>
</tr>
<tr>
<td><strong>AVMs, Instant Mortgages</strong></td>
<td>✓</td>
</tr>
<tr>
<td><strong>Lease Information Extraction</strong></td>
<td>✓</td>
</tr>
<tr>
<td><strong>VR/AR</strong></td>
<td>✓</td>
</tr>
<tr>
<td><strong>Chatbots</strong></td>
<td></td>
</tr>
<tr>
<td>#1: the vendor may not have maintained accurate or digital records of relevant information.</td>
<td>✓</td>
</tr>
</tbody>
</table>
A property passport is the biggest enabler being developed

- An openly accessible, single pool of up to date, standardised property information
- A platform able to store all the information relating to an individual property in its own unique digital data file, to be maintained by the owner or tenant and transferred along with the title
  - IoT, BIM, title, searches, utilities, maintenance, user manuals, floor plans, energy and safety certificates
- Regulation is needed to define clear guidelines on the ownership and transference of property lifecycle data
- But … caveat emptor:
  - will the buyer have to go through due diligence to check a property passport is accurate?
Property passport start-ups

- Chimni
- Property Made Liquid
- PropTWIN
We enable property owners to unify fragmented asset lifecycle information into tokenised smart data models, and share access to structured property information.
“The existence of relevant technologies which propose to reduce the time or cost of an average transaction does not mean that they will automatically be implemented.

In order to give a clearer picture as to the future of real estate transactions, the operational, regulatory and social barriers to their adoption must first be understood.”
## Blockchain faces the most barriers to adoption

<table>
<thead>
<tr>
<th>Ease of adoption criteria</th>
<th>Tech Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Blockchain Land Registration</td>
</tr>
<tr>
<td>Operational</td>
<td>Easy software integration</td>
</tr>
<tr>
<td>Standardised data</td>
<td><img src="red" alt="Red" /></td>
</tr>
<tr>
<td>Achieved critical mass</td>
<td><img src="red" alt="Red" /></td>
</tr>
<tr>
<td>Easy measurement</td>
<td><img src="red" alt="Red" /></td>
</tr>
<tr>
<td>Low transition cost</td>
<td><img src="red" alt="Red" /></td>
</tr>
<tr>
<td>Data security</td>
<td><img src="red" alt="Red" /></td>
</tr>
<tr>
<td>Regulatory</td>
<td>Legal framework</td>
</tr>
<tr>
<td>System transparency</td>
<td><img src="red" alt="Red" /></td>
</tr>
<tr>
<td>Social</td>
<td>Maintain/increase revenue</td>
</tr>
<tr>
<td>Job security</td>
<td><img src="red" alt="Red" /></td>
</tr>
<tr>
<td>Interview Findings</td>
<td>Optimal existing process</td>
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<tr>
<td>Trust</td>
<td><img src="red" alt="Red" /></td>
</tr>
<tr>
<td>Available data</td>
<td><img src="red" alt="Red" /></td>
</tr>
</tbody>
</table>

**KEY**

- **Yes**
- **Somewhat**
- **No**

The table assesses the ease of adoption criteria for various technologies, with the table indicating levels of adoption: 'Yes', 'Somewhat', and 'No'.
The nexus of the new technologies

Automated valuation models with access to digitalised due diligence data held within an insured property passport (tied to a geolocation and updated in real time via IoT), coupled with virtual reality inspections and viewings, could take away all risk from buyers, who will need to offer a price close to or at the AVM estimate. Sellers will have no reason to expect a different price and the transfer of title recorded by a digitalised land registry could be rapid, trustworthy and secure.
Can we tolerate a real estate data monopoly?

- Who actually creates this data efficiency (or a property passport)?
  - Top down from government regulation
  - Bottom up from tech businesses tending to monopolies or oligopolies
  - Institutions or business and trade associations
  - Disintermediation through technological advancement … the new data trade union?

- A business process question and real ‘signum temporis’
Conclusions: the future of transactions

- Government - regulate
  - Digitalise all relevant real estate data: HMLR’s general boundaries, local authority records

- Business - innovate
  - Innovate ways to extract and transfer digital data across platforms
  - Develop insurance products to enable risk free transfer of digital property files

- Industry groups - facilitate
  - Develop standards and protocols encouraging common standards for digital data/DLT

- Individuals - participate
  - Take data responsibility
PropTech 3.0: the future of real estate

University of Oxford Research

Partners: Arcadis, BCLP, CBRE, The Crown Estate, EY, Nuveen, UBS, Redevco