

# Real Estate Disruptions

REAL 375/875 – Classroom: Huntsman 340.

2021/2022 Fall, Q1 – Tuesdays 3.30 – 6.30

## Instructors:

Professor Gilles Duranton

452 Vance Hall

Email: [duranton@wharton.upenn.edu](mailto:duranton@wharton.upenn.edu)

Office hours: Fridays 9-11 and by appointment

Mr. Richard Mack

Email: [rmack@mackregroup.com](mailto:rmack@mackregroup.com)

Office hours: by appointment

Teaching assistants:

Laura Gong ([lgong43@wharton.upenn.edu](mailto:lgong43@wharton.upenn.edu)).

Andrew Bekkevold ([abekk@wharton.upenn.edu](mailto:abekk@wharton.upenn.edu))

Canvas (to deliver assignments, receive grades, etc):

<https://canvas.upenn.edu/courses/1545196> XXX

Piazza (for communication with us, among students, announcements, etc):

<https://piazza.com/upenn/fall2021/real375875> XXX

Please use Piazza in the first instance for anything that is not a personal communication.

## Key dates:

Regular classes: August 31<sup>st</sup>, September 7<sup>th</sup>, September 14<sup>th</sup>, September 21<sup>st</sup>, September 28<sup>th</sup>, and October 5<sup>th</sup>

Special undergrad session: September 2, 5-7pm on Zoom.

primer on firm creation and the real estate ecosystem. Thursday.

Assignments: September 10<sup>th</sup>, September 21<sup>st</sup>, October 10<sup>th</sup>

## Course rationale:

Before the covid pandemic, real estate was already changing dramatically for the first time in perhaps one hundred years. Covid has accelerated some of these changes and modified others. This class will examine how technology is changing in many facets (all) of the industry. Among the many questions we will consider:

- How is the covid pandemic accelerating existing trends, curbing others, and creating new demands?
- Can you crowd fund development? Can every building in the world now be publicly listed as a stock? Will it happen?
- Will the advent of AI dramatically reduce space needs? Will the office business become a part of hospitality? In what type of spaces will workers want to live and work? Do people need their own apartments or will renting an adult dorm room be enough?
- Can we build new buildings like we assemble legos? What are smart buildings? What is the future of emerging building management giants?
- How will autonomous vehicles affect the demand for space? How will that affect property values? Is multistory distribution the future of last mile, will it be last inch delivery in people's residential buildings or will self-driving/ flying delivery solve the problem of moving goods in an e-commerce world?
- What is the future of new data analytics services? Will they remain small independent niches? Or will they be taken over by incumbent players? Will they become the new core of the industry?
- More generally, what will all the emerging changes that are occurring today amount to?

How will technology fundamentally redefine the real estate industry?

This course will address how technology has already changed the demand for real estate, how it will likely change in the future the way real estate is used, designed, developed, constructed, managed, leased, maintained, and financed.

### **Course objectives:**

This course aims to:

- Provide an overview of the emerging trends and help students form reasonable conjectures about where these trends will lead us.
- Get the students to think critically for themselves about what the next great opportunities are in real estate / real estate technology and foster students' skills at detecting, analyzing, and handling change and disruption.
- Foster the ability of students to articulate their analysis orally and in written form.
- Make students better decision-makers and real-estate industry leaders.

### **Course structure:**

This course will bring together a recognized industry leader (Richard Mack), Wharton faculty (Gilles Duranton), and a broad set of guest lecturers (Start-up entrepreneurs, incumbents, VCs, non-RE technology specialists, etc). We believe there is no one single approach to gain insight about disruptions and change under uncertainty so we will propose a mix of approaches including, in-depth case-studies, interactions with guest lecturers who handle

those issues daily, learning from economic history and other industries, and drawing from core economic concepts.

**Grading/evaluation:**

- 2 memos: 25% and 10% (for the second one)
- 1 business plan for a disruptive RE tech start-up due at the end of the class: 40% (with equal weight to the presentation and the paper)
- Class participation/attendance: 25%

The first memo should provide an analysis of the business model of a proptech start-up. Think about it as a memo for your investment committee, **not as some infomercial for the startup** you are looking at. It should cover:

- Its value proposition: Which previously unmet demand does it serve, how valuable is it, and how does it capture this value? (What would happen if this company did not exist – what is the customers' next best alternative to meet their needs?)
- **Basic unit economic analysis:** what is the addressable market? What is the cost structure? Are there economies of scale? (While no pro-forma financial analysis is needed for this memo, we insist on a serious basic unit economic analysis. We know the numbers are hard to find. We are happy with reasonable guesses and daring extrapolations provided you provide some justification.)
- Its market and competition: What are the main competitors and how sustainable is the startup's competitive advantage?
- Risks and challenges: What are the key threats? (Regulatory, technological feasibility, future changes in technology, etc.)
- Do you think this business is likely to prosper in the medium-term?

This memo should be completed and submitted individually via Canvas on September 10 (deadline at 23.59 pm). It should be less than 1,200 words.

The second memo should provide an outline for possible RE start-up idea. This should not be a fully developed business plan. The assignment should outline the basics of the idea, how you discovered it, and what your next steps would be to assess the idea further. The memo should nonetheless make the case for both the economic rationale of your project (where is the value coming from and how it will be appropriated) and its technological feasibility (i.e., your idea should rely on available technologies or incremental improvements of available technologies). Again, we need to see some serious thoughts given to the unit economic analysis (How will your idea make money).

Like the first memo, the second memo should be completed and submitted individually via Canvas.

The deadline is on September 21<sup>st</sup> (deadline at 3.15 pm) before the start of session 4. Again, it should be less than 1,200 words. This memo will be pass/fail. We will select the best 10 or so which will get an extra bonus. These 10 best ideas will form the basis of the business plans for the final assignment.

For both memos, you are welcome to discuss ideas together but your submission should be yours and yours only. You may share the same starting point but the execution should differ. In this case, please also disclose the name of the classmate with whom you had an idea in common on your written submission. Failure to disclose this information and submit substantively different assignments will result in a large penalty.

The business plan should develop an idea for a start-up in any area of RE tech. It should cover:

- Its value proposition.
- Its unit economic analysis.
- Its market and competition.
- Risks and challenges, including regulatory challenges, and how you are planning to address them.
- Financial prospects, including a pro-forma financial plan, statement of likely sources of financial capital, and a division of equity if relevant.
- Research, including talking to potential suppliers or customers or engaging in any relevant effort that would help you understand how your plan will work in the real world. We are aware that these business plans need to produce over a short period with a reasonable time investment. Some aspects of, say, the unit economic analysis are likely to be speculative but they need to be there. You can look at different scenarios. At the same time, do not make assumptions that are obviously unrealistic and try your best to justify your choices.

For this business plan, you will work in teams of 5 or 6 (depending on class enrollment). Each team will make a 10 minute pitch during the last session. A written document of less than 4,000 words is also due before midnight on Friday October 10<sup>th</sup> after the last class (one team member should submit via Canvas).

Regarding teamwork, it is your responsibility to make sure your entire team prepares its business plan independently. Violations by any team member will result in the entire team getting a zero on the assignment. Teams may also decide to expel free-riders (or notify us about them).

No late assignments will be accepted.

While attendance and participation matter, we also emphasize the importance of the writing component of this course. Neatness, organization, clarity, grammar, punctuation, spelling, and conciseness matter and will impact your grade. Remember that poor writing is the main complaint of employers of business graduates (including Wharton's).

**Class preparation:**

Case material (cases in particular) will be shared before each session. Please be prepared. Cases are meant to be read and pondered upon. You should think about every question at the end of each case. At any time, we will make cold calls to facilitate student commenting during class. We will strive to get everyone to participate. If you feel we have ignored you, please let us know. We will also ask you to provide questions for our guests ahead of time via Piazza (and this is part of your participation). This will help us steer our guests and manage the Q&A.

**Class participation:**

In evaluating class participation, we will consider the following:

- Is the participant a good listener?
- Are the points that are made relevant to the discussion? Are they linked to comments of others?
- Do the comments show evidence of having completed assigned readings?
- Do they move the discussion forward by introducing new aspects or issues to consider, or do they restate points that have already been made?
- Do they demonstrate willingness to take risks and test new ideas, or are they “safe”?
- Do they participate constructively on Piazza?

Please keep in mind the following:

- Well-posed questions are not only a legitimate way to interact but should be an important part of our discussions.
- In most of the issues we will discuss, there will be some controversy in the industry and even within firms about the best course of action. Your two instructors and the guest speakers do not have all the answers (and they often will not agree with each other). Enlightened debate can add significantly to the understanding of the issues.
- Because of the varied backgrounds in the class, many of you will have important contributions to make based on your personal and professional experience. We will try to learn about your backgrounds over the course of the term, but you are encouraged to bring these experiences to bear in the discussion.

**Other policies:**

- Prerequisites. Students are responsible for knowing the material covered in Real Estate Investments (REAL/FNCE 209 AND 721). The class will be taught assuming you have

mastered these topics. This pre-requisite is STRICTLY enforced unless the class is undersubscribed.

- Material provided in this course is for your personal, noncommercial use and may not be copied and distributed to others without the prior permission of the copyright owner.

### **Getting help:**

- Contact us. Do not think that a question is too “basic”. We are happy to help students understand any material they are having difficulty with. Please try on your own first. We hold regular office hours, schedule appointments, and can answer questions through Piazza (about course issues) or by email (about more personal circumstances).

### **Course schedule**

(This schedule might be subject to minor changes as our guests may change following cancellations at short notice.)

#### **1. Introduction to the class, the covid acceleration, and business plans (August 31)**

GD/RM: welcome, introductions, ground rules, etc

GD: Prop tech opportunities

RM: the covid acceleration in RE

Guest speaker: Zach Aarons (Founder, Metaprop)

- VCs in the post covid era
- What do VCs expect to see in business plans?

#### **Special session for undergrads (Sept 2, 5-7 pm on Zoom)**

PLEASE NOTE THE DAY AND TIME (OUTSIDE THE REGULAR SCHEDULE)

Guest speaker: Jorey Ramer (Super)

- Primer on firm creation

RM: The real estate ecosystem.

## **2. Finance and data analytics (September 7)**

Discuss last week's speaker presentation

GD: Do's and don'ts for your assignments

RM: Computing and past financial innovations, what current changes mean for RE

Guest speaker: Brew Johnson (Peerstreet)

Case study: How will blockchain transform real estate?

GD: Data and analytics challenges in RE

Guest speakers: Michael Schoen (A Retail Space)

## **3. Changes in Demand (September 14)**

Discuss last week's speakers

GD: Work from home and changes in the geography of cities

RM: Trends in the demand for 'products': residential, retail, parking, office and distribution.

Lease intermediaries as outsourced facility managers, future of brokers

Guest speaker: Richard Baker (Hudson Bay)

Guest speaker: Shegun Holder (Founder WrkANYWahr)

Group discussion: Do previous property type distinctions apply to a technology-enabled society? (Time allowing)

## **4. Brokerage and intermediation (September 21)**

Discuss last week's speakers

GD: Brokerage: a broken industry? + The economics of platforms

RM: TBD

Case: Can Residential Brokerage be Fully Automated?

Guest speaker: Someone from Opendoor (TBC)

Guest speaker: Pamela Liebman (Corcoran) (TBC) / Someone from Compass (TBC)

## **5. Infrastructure, the environment, and efficiencies in operation and construction (September 28)**

Discuss last week's speakers

Case: Investing in micromobility

Case: Climate tech for real estate

Guest speaker Donnel Baird (Blocpower) (TBC) Brad Klatt (Canoe Brook - Asynchronous)

Case: New technologies in construction

Guest speaker: Tyler Christiansen (Funnel Leasing)

## **6. Integrative session: the promises of RE tech (October 5)**

Student presentations/pitches: 10 minutes per team

Integration panel: Ron Kravit (Tracker Capital Mangement) and Alec Ellison (OurCrowd)

## Reading list

Forewords about the readings. Because we will be dealing with changes that, for many of them, are still in the making and concern a specific industry, standard texts and articles are scarce. Luckily, we have a main text, *PropTech 101*. While we will not discuss it explicitly in class, it will be relevant for most of our sessions. It also provides numerous insights and has the great merit of being (mostly) current. The rest of the readings are divided into roughly two groups. Traditional chapters and research articles are providing context. However, for most of them they were written without a real estate focus. Shorter pieces and press articles are more directly focused on the real estate industry but will often remain superficial or lack a broader perspective.

### Main text.

- Block, Aaron, and Zach Aarons. 2019. *PropTech 101*. Charleston (SC): Advantage. (It may not be available in the bookstore but can be ordered on Amazon easily).

In particular

- Read chapter 1 for the first session.
- Chapter 2 is most relevant to sessions 2.
- Chapters 3 and 4 are most relevant to sessions 4 and 5.
- Chapters 5 and 6 (to a lesser extent) must be read to prepare for your final assignment.
- Chapter 7 will be really helpful for the first and second assignments.

We also advise you to read:

- Poleg, Dror. 2020. *Rethinking Real Estate: A Roadmap to Technology's Impact on the World's Largest Asset Class*. Brooklyn (NY): Palgrave Macmillan.

(This is a good book but its organization – asset class by asset class – does not fit well with ours.)

### 1. Introduction

- Clayton, Jim, Frank J. Fabozzi, S. Michael Gilibert, Jacques N. Gordon, Youguo Liang, Greg MacKinnon, and Asieh Mansour. 2019. The world's oldest asset class enters the 21<sup>st</sup> century: How technology is transforming real estate investment. *Journal of Portfolio Management*, 45(7): 14-23.

- Botelho, Tristan L., Daniel Fehder, and Yael Hochberg. 2021. Innovation-driven entrepreneurship. National Bureau of Economic Research Working paper 28990.
- Sahlman, William A. 1997. How to Write a Great Business Plan. *Harvard Business Review* (July-August), 98-108.

#### *Shorter readings*

- Bloom Nicholas, Paul Mizen, Shivani Taneja. 2021. Returning to the office will be hard. VoxEu CEPR. <https://voxeu.org/article/returning-office-will-be-hard>

## **2. Finance, analytics and data**

#### *Background on fintech*

- Gai, Keke, Meikang Qiu, and Xiaotong Sun. 2018. A survey on FinTech. *Journal of Network and Computer Applications* 103: 262-273.
- Philippon, Thomas. 2019. The Fintech opportunity. Mimeographed, NYU.
- Azevedo, Eduardo M. and E. Glen Weyl. 2016. Matching markets in the digital age. *Science*, 352(6289), 1056-1057.
- Conway Viriato, Jennifer. 2019. AI and machine learning in real estate investment. *Journal of Portfolio Management*, 45(7): 43-54.

#### *Shorter readings*

- Rizzi, Nicholas. 2019. Leaving tracks. *Commercial Observer* (June25 – July 2). - *The Economist*. The world's most valuable resource is no longer oil, but data. June 20, 2019.
- Kuflinski, Yoroslav. 2020. 6 Ways Artificial Intelligence Is Reshaping Real Estate. Inflexion. <https://www.iflexion.com/blog/artificial-intelligence-real-estate>
- Chaillou, Stanislas. 2019. Urban tech on the rise: Big data disrupts the real estate industry. *Medium*.

#### *Case*

- How blockchain will transform real estate?

## **3. Changes in demand**

#### *Changing geography across cities*

- Autor David H. 2020. The Faltering Escalator of Urban Opportunity. In: *Securing Our Economic Future*, Melissa S Kearney and Amy Ganz (eds.), 108–36, Aspen Institute. <https://economics.mit.edu/files/21077>

### *Changes within cities*

- Ramani, Arjun and Nicholas Bloom. 2021. The Donut Effect of Covid-19 on Cities. Mimeo, Stanford. [https://wfhresearch.com/wp-content/uploads/2021/05/DONUT\\_MAY21.pdf](https://wfhresearch.com/wp-content/uploads/2021/05/DONUT_MAY21.pdf)
- Hwang, Jackelyn, and Jeffrey Lin. 2016. What Have We Learned About the Causes of Recent Gentrification? *Cityscape: A Journal of Policy Development and Research* 18(3) 9-26.

### *Shorter readings*

- Badger, Emily. 2019. Why Technology Hasn't Fixed the Housing Crisis. *New York Times* (January 29).
- Salviati Chris. 2021. Remote Work Revolution Gives Rise to a New "Untethered Class". Blog post. <https://www.apartmentlist.com/research/remote-work-untethered-class>
- Andrews, Edmund L. 2021. The Pandemic Blew Up the American Office — For Better and Worse. *Insights by Stanford Business*. <https://www.gsb.stanford.edu/insights/pandemic-blew-american-office-better-worse>

## **4. Brokerage and disintermediation**

- Barwick, Panle Jia and Maisy Wong. 2019. Competition in the Real Estate Brokerage Industry: A Critical Review. The Brookings Institution Publication. <https://www.brookings.edu/wp-content/uploads/2019/12/ES-12.12.19-Barwick-Wong.pdf>

### *Platforms.*

- Evans, David S. and Richard Schmalensee. 2016. Chapters 1, 2, 3, and 4. *Matchmakers: The New Economics of Multisided Platforms*. Harvard Business Review Press.
- Tirole, Jean. 2017. Chapter 14: How digitalization is changing everything. *Economics for the common good*. Princeton (NJ): Princeton University Press

### *Case*

- Can Residential Brokerage be Fully Automated?

## **5. Infrastructure, the environment, and efficiencies in operation and construction**

### *Shorter readings*

- Intel. 2015. Increasing property owner profitability with the internet of things. Solution brief, smart buildings.
- Green Street Advisors. 2019. Automating the cube. Industrial Insights.

### *Cases*

- Investing in Micromobility
- The Collision of Real Estate & Climate Tech. The Greatest Disruption in Real Estate History

- New Technologies in Construction