Architectural Practice after COVID19: Preparing for Possible Futures

Sam Omans
Autodesk Industry Strategy Manager, Architecture

Phil Bernstein, FAIA
Associate Dean and Professor Adjunct, Yale School of Architecture
We may make statements regarding planned or future development efforts for our existing or new products and services. These statements are not intended to be a promise or guarantee of future availability of products, services or features but merely reflect our current plans based on factors currently known to us. These planned and future development efforts may change without notice. Purchasing decisions should not be made based upon reliance on these statements.

We assume no obligation to update these forward-looking statements to reflect events that occur or circumstances that exist or change after the date on which they were made.
About the speakers

Sam Omans, Autodesk Architecture Industry Strategy Manager
Trained as an architect and historian, Sam has lead business development at multinational firms and startups. He teaches and publishes on architecture and technology.

Phil Bernstein FAIA, Associate Dean and Professor Adjunct, Yale School of Architecture
Phil Bernstein is an architect, technologist and educator, former VP at Autodesk, and former associate principal at Pelli Clarke Pelli Architects.
There is a recession every 58 months on average

Data since 1854, National Bureau of Economic Research
AIA Architectural Billings Index as of October 2020

- .com rise
- housing bubble
- .com bust
- world-wide crisis
- slow recovery
- COVID-19

- 1998
- 2002
- 2007
- 2009
- 2011
- 2017
- 2020

- 4 years
- 7 years
- 11+ years?
“It’s too early to be making nuanced arguments about the future as we face down what is undoubtedly going to be a much more serious situation in the second half of 2020.”

-Phil writing in spring 2020
Identifying driving forces

Adapted from Kees van der Heijden
Cone of plausibility

### Projected Future

<table>
<thead>
<tr>
<th>Constants</th>
<th>?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantities or conditions not expected to change</td>
<td>?</td>
</tr>
<tr>
<td><strong>Trends</strong></td>
<td>?</td>
</tr>
<tr>
<td>Quantities or changes that move incrementally</td>
<td>?</td>
</tr>
<tr>
<td><strong>Plans</strong></td>
<td>?</td>
</tr>
<tr>
<td>Intentions, Actions</td>
<td>?</td>
</tr>
<tr>
<td><strong>Projections</strong></td>
<td>?</td>
</tr>
<tr>
<td>Public forecasts</td>
<td>?</td>
</tr>
</tbody>
</table>

Or, what if the state of business model, legality, technology continues down the same course…?
Cone of plausibility

Projected future
Business forces

Adapted from Kees van der Heijden

Economic, Ecological, Business, Contextual Environment, Transactional Environment, Sustainability, Technology, Design, Build, Operate, Practice Methods, Social, Legal, Risk, Regionalization, Geopolitical, You.
Trends | COVID short term positive impacts
For Infrastructure, Institutional and Single Family Buildings

<table>
<thead>
<tr>
<th>Category</th>
<th>CAGR (2018-23)</th>
<th>Construction Output ($B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil &amp; Gas</td>
<td>0%</td>
<td>280</td>
</tr>
<tr>
<td>Telecomm</td>
<td>6.9%</td>
<td>253</td>
</tr>
<tr>
<td>Water</td>
<td>6.27%</td>
<td>608</td>
</tr>
<tr>
<td>Institutional Buildings</td>
<td>5.64%</td>
<td>800</td>
</tr>
<tr>
<td>Electricity and Power</td>
<td>7.2%</td>
<td>1,036</td>
</tr>
<tr>
<td>Institutional Healthcare</td>
<td>6.65%</td>
<td>1,611</td>
</tr>
<tr>
<td>Commercial Buildings</td>
<td>5.25%</td>
<td>2,101</td>
</tr>
<tr>
<td>Single Family</td>
<td>5.25%</td>
<td>2,855</td>
</tr>
<tr>
<td>Multi Family Residential</td>
<td>5.52%</td>
<td>2,855</td>
</tr>
<tr>
<td>Transportation (Rail, Airport, R&amp;H)</td>
<td>9.2%</td>
<td>2,264</td>
</tr>
</tbody>
</table>

Source: 2020 GlobalData Construction Intelligence Center (CIC) database
Short-term Revenue, COVID-19 Retrofitting Services

Autodesk AEC Return to Workplace Tools (link on the handout)
Rudolph Hall Reopening

Apicella + Bunton Architects
SYSTEMS PLANNING FOR REOPENING

SUMMARY / KEY FINDINGS

1. Building HVAC systems are in good operating order and Yale facilities staff have already performed all necessary physical evaluations of equipment.

2. There is good understanding of systems zoning and the report includes detailed operational parameters for available supply air and outdoor air ventilation.

3. Based on anticipated maximum occupant counts (per Space Planning for Reopening diagrams), available supply air and outdoor air ventilation rates per person can be considered exceptionally high from an indoor air quality point of view. Note however, that there are currently no specific guidelines for supply or ventilation rates per person relative to risks associated with COVID-19.

4. Air distribution systems in the Rudolph Hall are designed to create fully mixed conditions within occupied spaces for uniform temperature/comfort control (typical for majority of HVAC applications).

5. Evaluation of existing air distribution systems has identified five discrete locations in the building that may be problematic for occupancy considering COVID-19 conditions. These include: Hastings Hall Project Room 608A, Ground Floor; 608A, and 610A, 6th Floor; Seminar Room 706 and vicinity of Mach 702B. This is due to existing arrangement of return air paths for the HVAC systems.

6. The report identifies some specific minimum recommendations for adjustments to building systems to meet guidelines. These include:
   - Enable demand control ventilation and set outdoor air dampers to introduce design outdoor air quantities during all occupied hours.
   - Implement pre- and post-occupancy flushing as opem.
   - Ensure MERV 13 or preferably MERV 14 filters are required in all handling units per surgical design intent.
# Studio Schedule and Seating Plans

## Fall Term 2020

### Studio Block Scheduling - Fall 2020

<table>
<thead>
<tr>
<th>Time Block</th>
<th>Start</th>
<th>End</th>
<th>M</th>
<th>T</th>
<th>W</th>
<th>Th</th>
<th>F</th>
<th>Sa</th>
<th>Su</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block A</td>
<td>9:00 AM</td>
<td>1:00 PM</td>
<td>Ash Grp 1</td>
<td>Ash Grp 2</td>
<td>Ash Grp 2</td>
<td>Ash Grp 1</td>
<td>Ash Grp 2</td>
<td>Ash Grp 2</td>
<td>Ash Grp 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Core 1</td>
<td>Core 3</td>
<td>Core 2</td>
<td>Core 1</td>
<td>Core 2</td>
<td>Core 2</td>
<td>Core 1</td>
</tr>
<tr>
<td></td>
<td>1:00 PM</td>
<td>3:00 PM</td>
<td>Studios occupied</td>
<td>Studios occupied</td>
<td>Studios occupied</td>
<td>Studios occupied</td>
<td>Studios occupied</td>
<td>Studios occupied</td>
<td>Studios occupied</td>
</tr>
<tr>
<td>Block B</td>
<td>2:00 PM</td>
<td>7:00 PM</td>
<td>Ash Grp 1</td>
<td>Ash Grp 2</td>
<td>Ash Grp 2</td>
<td>Ash Grp 1</td>
<td>Ash Grp 2</td>
<td>Ash Grp 2</td>
<td>Ash Grp 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Core 1</td>
<td>Core 2</td>
<td>Core 1</td>
<td>Core 2</td>
<td>Core 1</td>
<td>Core 2</td>
<td>Core 2</td>
</tr>
<tr>
<td></td>
<td>7:00 PM</td>
<td>9:00 PM</td>
<td>Studios occupied</td>
<td>Studios occupied</td>
<td>Studios occupied</td>
<td>Studios occupied</td>
<td>Studios occupied</td>
<td>Studios occupied</td>
<td>Studios occupied</td>
</tr>
<tr>
<td>Block C</td>
<td>9:00 AM</td>
<td>1:00 AM</td>
<td>Ash Grp 2</td>
<td>Ash Grp 1</td>
<td>Ash Grp 1</td>
<td>Ash Grp 2</td>
<td>BUILDING STOP</td>
<td>Ash Grp 2</td>
<td>CLOSED</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Core 1</td>
<td>Core 2</td>
<td>Core 1</td>
<td>Core 2</td>
<td>Studios occupied</td>
<td>Core 2</td>
<td>Studios occupied</td>
</tr>
</tbody>
</table>

Building Closed: 1:00 AM - 5:00 AM

**Diagram:**

- **STUDIO CLASS ACCESS FOR 1ST YR CORE STUDY** (M, Th 2-4pm)
- **WORK TIME ACCESS FOR 1ST YR CORE STUDY**
- **STUDIO CLASS ACCESS FOR 2ND YR CORE STUDY** (T, F 3-4pm)
- **WORK TIME ACCESS FOR 2ND YR CORE STUDY**
- **STUDIO CLASS ACCESS FOR ADVANCED STUDIOS GROUP 1** (M, Th 2-4pm)
- **WORK TIME ACCESS FOR ADVANCED STUDIOS GROUP 1**
- **STUDIO CLASS ACCESS FOR ADVANCED STUDIOS GROUP 2** (T, F 11am-4pm)
- **WORK TIME ACCESS FOR ADVANCED STUDIOS GROUP 2**

**MED PhD:**

MED and PhD students may access their work areas whenever the building is open.
Yale School of Architecture
ARCH 2230B: Exploring New Value for Design Practice
(Version 1.1)
Spring Term, 2019

1 - Abstract: Are architects undervalued in the systems of delivery and if so, how do we make design a more profitable practice? Design practice has traditionally positioned building as a commodity in the delivery supply chain, valued by clients like other products and services purchased at lowest first cost. Intense market competition, sole focus on differentiation by design quality, and lack of innovation in project delivery and business models have resulted in a profession that is grossly underpaid and marginally profitable, despite the fact the building sector in its entirety operates in large capital pools where significant value is created and profits taken. Innovation in practice is largely deployed in the service of traditional design objectives rather than value generation opportunities. The profession must explore new techniques for correlating the real value of an architect’s services to clients and thereby break the downward pressure on design compensation.

This course will reimagine and re-design the value proposition of architecture practice, explore strategies used by better compensated adjacent professions and markets, and investigate methods and models by which architects can deliver—and be paid for—the value they bring to the building industry. Using the platform of business plans—where value generation is defined through specific business parameters—we will compare and contrast value generation strategies. Students will form firms and propose new practice paradigms as a final project.

The course is designed to achieve the following outcomes:

a. Understand the relationship of the architect to the economic systems of building.
b. Understand the role of the architect in various models of building delivery.
c. Define value creation challenges inherent in the current architect’s role and speculate on future options.
d. Understand and be able to deploy essential principles of strategic and business planning in defining value propositions and how they are instantiated, including financial analysis and business planning.

e. Understand and be able to manipulate operating models of practice and the relationship of those models to money, risk and value.
f. Create a viable business plan for an alternative value practice.

First Principles
Architect and Associate Dean at the Yale School of Architecture, Phil Bernstein sees a tsunami of change brewing for the architectural profession, conditioned by artificial intelligence, big data, the ubiquitous cloud and robotics. Yet the delivery and procurement of buildings is often inhibited by pre-digital structures of the construction industry. He argues that architects need to rethink their processes from first principles.

In the spring of 2013, a new course was offered at the Yale School of Architecture, one of only two in its professional practice curriculum. Exploring New Veneer Propositions for Design Practice was a small seminar designed to interrogate current business models, examine other models both within and outside of the building industry, and propose new strategies for the practice of architecture. Its first students had notable moments of the recent global financial crisis, and despite the relative isolation caused by studio-based design education they were very much aware of the general 'start-up' spirit among their peers on college campuses elsewhere. Since that first trial run, the course has grown in popularity and size as one of few opportunities for architects in training to experiment beyond the boundaries of building design in the innovation era.

The expanding interest in the course is a product of a general questioning of the efficacy of traditional practice among today's generation of students. Having experienced the worst downturn in modern history, and saddled with the daunting financial obligations of paying for a graduate education in the US, students are more engaged in questions of professional efficacy and economics than their peers of even a decade ago. Traditional design education — and its aesthetic solution — seems hardly up to the challenge of globalization, emergent rationalism, climate change and income inequality. Architects need new approaches and new tools — not just software — and their interest in start-up culture stretches beyond mere economic self-interest.
Triangulation of economy and ecology

Adapted from Kees van der Heijden

Contextual Environment

Economic

Ecological

Business

Sustainability

Transaction Environment

Design, Build, Operate

Practice Methods

Technology

Social

Practice Methods

Risk

Regionalization

Legal

Geopolitical

You
Total Carbon New Buildings → 2050

Total Carbon Emissions of Global New Construction from 2020-2050
Business as Usual Projection

- Embodied Carbon 2020-2030: 74%
- Embodied Carbon 2020-2050: 49%

- Embodied Carbon: 49%
- Operational Carbon: 51%

More information on Beta:

insight.support@autodesk.com
“What if [material] labels didn’t just reveal energy-efficient something is, but how many greenhouse gas emissions it’s responsible for? That’s the idea behind EC3” – Bill Gates
Supply Chain Circular Carbon Economy

CO₂ SEQUESTRERED IN 1 m³ OF DRY TIMBER BY SPECIES

CO₂ SEQUESTRERED IN COMMON GROUND HIGH SCHOOL

Image courtesy of Gray Organschi Architecture
Supply Chain: Enslaved Labor

- **Owner**
- **Arch**
- **Eng**
- **CM**

**Concept**
- Construction documents

**Production**
- Steel erectors
- Steel fabricators
- Steel suppliers

**Buyout**
- Shop drawings

**Procurement**
- Steel fabricator
- Steel supplier
- Iron supplier
- Smelters

**Construction**
- Steel erector
- Tree farm
- Charcoal supply

Supply Chain: Enslaved Labor
Post-Covid Practice Methods

Adapted from Kees van der Heijden

Contextual Environment
- Economic
- Ecological
- Business
- Sustainability
- Design, Build, Operate
- Risk
- Regionalization
- Legal
- Geopolitical
- Social
- Practice Methods

Transactional Environment
- You
The dispersed workforce has arrived
Cloud-based project delivery

CAD ➔ BIM ➔ CONNECTED BIM

20 years ➔ 1 year

AUTOCAD

AEC Collection

AEC Collection

AUTODESK

BIM 360° DESIGN
“over 100 projects to the cloud within days”

BIM 360 Design with the support of Micrographics
New Competition Landscape

Talent Pool, Markets

Competition
Deliver ISO compliant and competitive CDE

Autodesk solves CDE on BIM360 Docs

Owner Team: Capital Projects
Construction spend attributed to offsite construction increases from 5% to 31% by 2035.
Project $n=1$

Product $n=\infty$
Industrialized Construction: a dream of 20th century modernists
Supply Chain: Industrialized Construction

The next normal in construction

How disruption is reshaping the world's largest ecosystem

June 2020

The construction ecosystem of the future...

A more standardized, consolidated, and integrated construction process.

Players to increase control of value chain, either digitally or via vertical integration (e.g., off-site manufacturing, supplier chain, assembly, and operations of final building).

Developers choose entire designs or specific components from a library of options developed in-house or offered externally on the market.

Value chain is more consolidated, both vertically (delayering) and horizontally, with increased degree of internationalization.

Disintermediation takes place through digital marketplaces and direct channels.

Contractors focus on lean, on-site execution and assembly of products.

Data and analytics on customer behavior generated after completion to optimize total cost of ownership and future designs.
**Cone of plausibility**

Alternative futures
## Alternative Futures: differences from the expected future

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trend Breaks</strong></td>
<td>Counter-trends, disruptions</td>
<td>?</td>
</tr>
<tr>
<td><strong>Unfulfilled plans</strong></td>
<td>Key stakeholders doesn’t Complete plan. What instead?</td>
<td>?</td>
</tr>
<tr>
<td><strong>Potential events</strong></td>
<td>Surprises</td>
<td>?</td>
</tr>
<tr>
<td><strong>Unresolved issues</strong></td>
<td>Decisions yet to be made</td>
<td>?</td>
</tr>
<tr>
<td><strong>Novel ideas</strong></td>
<td>Proposals, weak signals</td>
<td>?</td>
</tr>
</tbody>
</table>
Plan for multiple future to be competitive, profitable

FUTURE
- Consider the expected future, alternative futures and identify your chosen future – the preferred future towards which you want to apply most of your time, talent and resources.
- In reality, all three will shape the future

TECHNOLOGY WILL ENABLE YOU
- Select your investments by considering multiple futures
- Training is priority #1 when your pipeline slows
Adapt to Arch – Driving Forces

Instructions and resources (Delete page)

- Access the slide layouts for this template on the Home tab under Slides/Layout.

- AU 2020 Fonts: Artifakt or as a backup please use Arial.

- AU 2020 Colors

  - ADSK blue: R 6 G 150 B 215 (HEX: 0696D7)
  - Gray: R 102 G 102 B 102 (HEX: 666666)
  - White: R 255 G 255 B 255 (HEX: FFFFFF)
  - Dark blue: R 250 G 162 B 27 (HEX: FAA21B)

- AU Resources
  - Branding and editorial guidelines – Autodesk Brand Hub
Main title can extend over one or two lines

Presenter Name
Presenter Title | @socialmedia
About the speaker

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Main Title - Bullets

LOREM IPSUM

LOREM IPSUM

LOREM IPSUM

• First-level bullet: closed circle. Text style: gray, 1.4 spaced, Arial 30pt font.
    ▪ Third-level bullet: closed square. Text style: gray, 1.4 spaced, Arial 30pt font.
Main Title – 2 column bullets

LOREM IPSUM

LOREM IPSUM

LOREM IPSUM

LOREM IPSUM

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  o Second-level bullet: open circle. Text style: gray, 1.4 spaced
    ▪ Third-level bullet: closed square. Text style: gray, 1.4 spaced
Title Goes Here

Title 1


Title 2

Text with image background
Main title – video page

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Facts & Numbers

97
CLIENTS

104
PROJECTS

58
APPS

12
WEBSITES

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Phases/Stages

STAGE A

YOUR TITLE
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Cras lacinia interdum odio, at cursus elit sagittis lobortis.

STAGE B

YOUR TITLE
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STAGE C

YOUR TITLE
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Cras lacinia interdum odio, at cursus elit sagittis lobortis.

STAGE D

YOUR TITLE
Lorem ipsum dolor sit amet, consectetur adipiscing elit.
Cras lacinia interdum odio, at cursus elit sagittis lobortis.
Stats & figures

1. WRITE HERE
   Right click on the chart for an excel spreadsheet to populate your figures and automatically update this chart

2. WRITE HERE
   Right click on the chart for an excel spreadsheet to populate your figures and automatically update this chart

3. WRITE HERE
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Right click on the chart for an excel spreadsheet to populate your figures and automatically update this chart.
Bar graphs

Right click on the chart below for an excel spreadsheet to populate your figures and automatically update this chart.