CRTKL

# MICROGRANTS RESEARCH JOURNAL

*HIGHLIGHTS*

**VOL 01**
JUNE 2021

## INTRODUCTION

This study was produced as part of the CRTKL Research Microgrant Program, which fosters knowledge generation across the firm by supporting small, focused research ideas and projects. The program is also intended to identify new ideas, insights or pivot points that enable us to inform how we think and approach our work. The format is intended to be a safe space in which evolving thought leaders may ideate, fail safely and directly implement findings into our projects, business or culture. The grants represent one of several firmwide research programs that promote, support and inspire research-related endeavors.

The 2020 cohort represents the first set of grantees, which were selected from a pool of 34 total applicants by a diverse jury of design, innovation and architectural thought leaders. These individuals and teams investigated a wide range of topics with support from internal mentors firm-wide, CRTKL Research Fellows and the program jurors.

The Microgrant program was made possible by the Microgrant committee comprised of Sarah Wicker, Sam Coats, James Poppell, and Camila Simas.

Editing of the journal was provided by David Lehrer, a specialist in building science and design research.

**Without research, architects and planners cannot address climate change, advancements in the built environment, social and economic inequities, and other pressing issues facing our industry today. At CRTKL, we enable creative thinkers to investigate topics through programs like the Research MicroGrant Program, which offers seed funding to develop solutions, apply them to our projects and advance our profession.**

**KIM HEARTWELL**
PRESIDENT & CEO

# TABLE OF CONTENTS


Bias in the Building Code

Mass Timber in Seattle

The Future of Office Work

Thermal Comfort in Dubai's New Retail Environments

Residential Adaptive Reuse of Decommissioned Cruise Ships

Improving Access to Community-based Telemedicine

New Models of Production

Corporations on the Move

# THE FUTURE OF OFFICE WORK

## The Covid-19 Pandemic Aftermath in London and Beyond

**EKATERINA DZIADKOVSKAIA**
LONDON

**GUSTAVO SBARDELETTO**
LONDON

## ABSTRACT

The Covid-19 pandemic has driven many changes to office workplaces as these activities have become remote. While it may have initially seemed that remote work would be a temporary solution, as we get through the pandemic, it is becoming clear that companies and employees have had to adapt and demonstrate resilience. This study explores the changes now underway, and whether these will lead to permanent new modes of office work. We also investigate the impact on persistent changes in commercial property occupancy in cities around the globe, including central London, a district hugely dependent on office businesses, and how London needs to adapt and diversify uses and provide more attractiveness at different times of the day.

The paper also includes results from an online survey of approximately 250 London office workers. This survey revealed work trends and preferences from before and after the pandemic, and suggests specific programs that can increase the attractiveness of traditional workspaces so that companies can maintain and improve the innovative and collaborative benefits of office workspaces.

## WHAT DROVE US

We hypothesized that remote work, which began as an incremental innovation and then became universal for many workers during the pandemic, is here to stay. We expect the long-term result will be a hybrid model with work being done both at the office and at home.

## APPROACH

This work investigated how office work will change, and where it will be taking place after the pandemic. This research was carried out in four phases: (1) question reframing, (2) secondary data collection, (3) primary data collection, and (4) analyzing secondary and primary data. We also developed an online survey to investigate the experience and expectations of London office workers.

> *Cities are resilient by nature. Considering that we learned several lessons from working from home, which will not simply go away when this virus is gone, we wanted to research what is going to stay for good and* ***reshape the way those who have office jobs work.”***

## WHAT WE LEARNED

### Productivity at home may be similar to office environments.

Previously, a lack of trust among employers that workers could consistently be productive at home contributed to the slow adoption of widespread remote work. The recent period of intensive remote work has built up trust between employers and their employees, largely because they have not seen productivity fall.

### New work modes have been tested and are likely to persist.

Our survey found that most people had never worked from home before the pandemic, but 55% of respondents would like to work in a hybrid scenario going forward. We are finding new ways of interacting, communicating and socializing with our colleagues. We expect that a fluid work mode — allowing people to work from other locations, and perhaps with flexible working hours — is here to stay.

### Post-pandemic London needs to reinvent itself.

For a district hugely dependent on office businesses, the City of London needs to adapt, diversify uses and offer more at different times of the day. Small businesses and those in the arts sector may help this financial capital recover from the economic damage of the Covid-19 pandemic. These findings can be applied to many cities having similar characteristics, such as those with large volumes of people who commute to an area of high office density.

# MASS TIMBER IN SEATTLE

Potential Carbon Emission Reductions through Large-Scale Adoption of Mass Timber Structures

**AMIR LOTFI**
SEATTLE

Mentor:
Joey-Michelle Hutchison
Advisor:
Janelle Leafblad

## ABSTRACT

This study explored the potential carbon reduction impacts if midrise residential developers were to adopt mass timber structural systems for projects throughout the city of Seattle. While research exists on carbon emission reductions from single mass timber projects, few are available that consider comprehensive carbon reductions that could be achieved with large-scale adoption of this emerging building system. Data were collected from more than 150 midrise residential projects (buildings with 6 to 18 floors) in the city of Seattle, and the amount of avoided greenhouse gas emissions (GHG) and carbon sequestered was calculated if these projects were to be made of mass timber, using the WoodWorks Carbon estimator.

The research demonstrates that the potential carbon benefits are substantial, and that such findings may increase awareness of the importance of choosing low-carbon and locally-sourced building materials. Also, these findings may create momentum for better policies and incentives for more sustainable mass timber projects at a city-wide scale.

## WHAT DROVE US

Considering the amount of new construction that is projected to take place between now and 2050, it is projected that embodied carbon will be responsible for almost 50% of the total resulting emissions. In order to rapidly reach ambitious climate goals, we must better understand and adopt low-embodied carbon structures.

## APPROACH

We investigated the potential carbon reduction if mass timber were to be used in over 150 midrise residential buildings in Seattle, Washington. The city was chosen as a case study because of its unique location in the heart of Pacific Northwest with excellent proximity to forests and wood industry resources.

> *This research can help CRTKL establish itself as one of the pioneers in the emerging building technologies. It also strengthens our* ***commitment to the environment and sustainable design*** *and could pave the way for future potential mass timber projects."*

## WHAT WE LEARNED

### Mass timber adoption at scale holds potential for rapid climate change mitigation.

Based on the data collected from more than 150 projects, we conclude that large-scale adoption of mass timber for residential midrise projects in Seattle offers carbon reduction benefits equivalent to taking over 60 thousand cars off the road for a year, and equal to 8% all residential carbon emissions in the city.

### Emerging building codes and policies are critical for adoption of low-carbon structures.

The adoption of new mass timber codes, and the impacts of community enhancement programs like Seattle's Mandatory Housing Affordability, will make it easier for taller mass timber residential midrise projects to be realized.

### This approach may be expanded with additional methods, building types and locations.

This method could be applied to additional building types throughout the city of Seattle and beyond. In addition, adding comprehensive life cycle assessment to future studies may help validate this work, and increase the accuracy of carbon benefit estimates.

# THERMAL COMFORT IN DUBAI'S NEW RETAIL ENVIRONMENTS

A Look at the Design of Outdoor Urban Environments in the Context of the Local Climate

**KHALID AL-TAMIMI**
DUBAI

Research Advisors:
Sarah Wicker
Sam Coats
Jake Vacek

## ABSTRACT

The goal of this study is to formulate climatically responsive design approaches for open-air retail developments in Dubai, a rapidly evolving city with a particularly challenging hot and humid climate. This research begins with an overview of human thermal comfort and a literature review of studies offering strategies for providing comfort in outdoor public spaces in hot climates. The study then provides an in-depth look at Dubai's climate and compares it against three other cities with hot climates: Hong Kong, Phoenix and Singapore.

The paper describes qualities the public realm of such destinations should possess to respond to harsh climates. The paper also investigates case studies of outdoor retail malls in the three comparison cities to find relevant design architypes, and these comparisons reveal a lack of adequate climate design interventions in Dubai's open-air destinations. Finally, the authors suggest that design professionals should look further into new design ideas and processes in order to mitigate Dubai's harsh summer weather, and to help these urban spaces to be actively used all year round.

## WHAT DROVE US

Known for its world-class malls, Dubai is home to many new retail centers including open-air malls. The growth of these destinations came from a desire to bring new concepts to the city that would allow people to escape indoor malls and enjoy the outdoors more. Surprisingly, a critical factor that seems to have been overlooked in this process was dealing effectively with the city's challenging climate.

## APPROACH

We applied thermal comfort considerations to a comparison of climate conditions for Dubai retail developments, and three comparison design architypes. We created graphical visualizations of the climate characteristics of all four cities. Based on the information presented, we offer guidance for improving the design processes for future work.

> *Coming up with design strategies or new materials that ensure thermal comfort all year long, with minimal or no need for electricity and major cooling equipment would help us reduce the carbon footprint of such spaces,* ***while still ensuring good quality design*** *and successful urban environments."*

## WHAT WE LEARNED

### These spaces were not designed with sufficient consideration of thermal comfort and the climate of the city.

The case study of Dubai's City Walk development shows the result of favoring a pre-determined aesthetic over functionality and human experience, as it lacks design elements that could help mitigate some of the climate issues the city faces.

### Successful desert developments require a focused effort to understand the local design context.

By comparing case studies and their climates across four cities, we see clear differences that will impact the summer comfort of visitors, and perhaps affecting seasonal use and the general success of these developments.

### Creating human-centric spaces that are responsive to the environment and urban context should be part of a design firm's core design principles.

Designers could consider traditional climate-responsive approaches to designing publics spaces. Including climate and comfort simulations within the scope of services would also help to present compelling design proposals and to validate design decisions.

# BIAS IN THE BUILDING CODE

A Study of the 2015 International Building Code to Investigate Biases in the Text and in the Code-Making Process

**CAT HEARD**
SEATTLE

## ABSTRACT

This study investigated whether biases exist in the 2015 International Building Code (IBC), and their potential effect on the building industry. The study looked in detail at the IBC Chapter 12, which describes the requirements for indoor environments. The review included the code itself, code commentary, guidelines for submitting code amendments, and other supporting documentation regarding building the code development process. Each sentence of Chapter 12 of the 2015 IBC was examined for "metrics," which we define as any parameter which can be described as conforming or non-conforming during a code review. These metrics were then traced to their root sources to discover the driving forces behind them. The analysis showed that negative forms of bias do exist within the code. This study represents a focused snapshot of one code section, and offers a new method to investigate biases in the building code that could be applied to wider sections of the code.

## WHAT DROVE US

Some building industry codes have been shown to be subject to implicit bias, especially zoning and land use codes that encourage higher socio-economic developments and gentrification of neighborhoods. If biases exist in planning and zoning codes, it is reasonable to think biases may also exist in the IBC which governs the design of buildings.

## APPROACH

This study reviewed numerous sources of data related to code development, such as guidelines for submitting code amendments, and bylaws for the code development organizations. Key documents were reviewed for metrics that could have come from implicit biases, and these were cataloged and traced to their root sources to determine reasons behind each.

> *We can do our best to create these spaces, but if the building code doesn't allow it, we're at a stalemate. We need to look at the rulebook for design and ensure that the* ***foundation on which we build is as level as possible."***

## WHAT WE LEARNED

### Approximately 30% of the IBC Chapter 12 cannot be traced to a definitive source.

Rules that cannot be traced back to a scientific or peer-reviewed source offer a possibility that these portions may be negatively biased, or based around personal opinion. Opportunities for bias may lead to codes that affect the experience of building users.

### Bias is an uncomfortable topic for many people, as it carries a strong negative connotation.

However, bias in and of itself is not inherently bad. The building code should be biased toward life safety and public welfare, which we may consider to be positive type of bias.

### These findings imply that designers in many situations must go beyond the minimum requirements of the building code.

Portions of the building code have intentionally been left vague to allow designers to make their own interpretations to fit clients' needs. By being aware of these sections, we can use them to our advantage and work to create more just and equal environments.

# IMPROVING ACCESS TO COMMUNITY-BASED TELEMEDICINE

Using Telehealth Technology in Medically Underserved Areas to Improve Healthcare Access and Outcomes

**JULIE MENDOZA**
DALLAS

**MARIO SANCHEZ**
LOS ANGELES

Researchers:
Michael St. Clair
Velma Jackman

## ABSTRACT

This study investigated the feasibility of applying telehealth technology in medically underserved areas to improve access to specialized care, evaluating novel approaches such as freestanding telemedicine stations in areas where many residents lack internet connections in their homes. We investigated the current state-of-the-art for connected health monitoring devices and commercially available telemedicine stations now in use by health systems and universities. We conducted data collection and observations in Pleasant Grove, an underserved community within Dallas County, Texas.

Through quantitative and qualitative research and analysis, we identified gas station convenience stores to be an important and abundant element within the community infrastructure. While additional interventions would be needed to provide consistent health access to the entire population, our findings indicate that gas station convenience stores offer a viable and overlooked opportunity for telemedicine integration within the community.

## WHAT DROVE US

Before the Covid-19 pandemic, only around 10% of Americans had used telemedicine services, but the onset of the pandemic increased telemedicine visits by 159%. During this time, it became important to leverage telemedicine to reduce the spread of the virus, to preserve scarce supplies of personal protective equipment, and to lower risks to caregivers and patients. However, telemedicine access is not equally accessible throughout the country, as rural and underserved communities within the U.S. lack adequate physical and technological infrastructure.

## APPROACH

This study investigated the needs and challenges faced in accessing telemedicine in a community with low levels of health infrastructure, personal mobility, economic resources, and access to the internet. Our approach included analysis of the area regarding access to healthcare, and we explored the idea of providing telemedicine stations at gas station convenience stores to improve access to specialized care, including qualitative observations at gas stations within the community.

## WHAT WE LEARNED

**Telemedicine technology and stations are viable ways to address some, but not all, of the leading causes of death in communities such as Pleasant Grove.**

We found that available technology could support some functions for treating heart disease, and for monitoring diabetes and hypertension. However, we determined that telemedicine technologies are not yet sufficient for diagnosing or treating cancer.

**Connected handheld devices offer a shift in care from episodic monitoring to continuous health awareness.**

Through these technologies, using phone apps and websites, patients can become more engaged and proactive in their health.

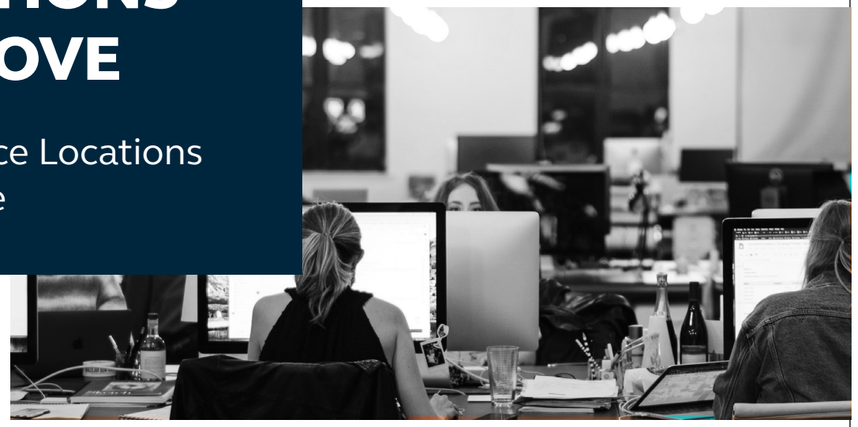
**Gas station convenience stores are closely tied into the community and accessed by a diverse set of residents.**

While telemedicine stations at these stores may provide improved access for many residents, additional interventions will be needed to provide more comprehensive access to virtual care.

> *As designers, researchers and innovators, we have the responsibility to shape environments to* ***promote healthy communities.*** *Through this research, we have an opportunity to facilitate better care, improve population wellness and promote health equity."*

# CORPORATIONS ON THE MOVE

## The Impact of Office Locations on Climate Change




**TESS HURRY**
DALLAS

**APRIL COOVER**
DALLAS

**HARRY VICCI**
DALLAS

Mentor: Pablo LaRoche



## ABSTRACT

The Dallas Fort Worth (DFW) metroplex has recently seen many corporations with thousands of employees establishing new offices or relocating to the area. It is not apparent whether these companies generally consider carbon emissions that result from employee commutes in the selection of office locations. The goal of this study is to provide information about impacts that corporate office moves have on the environment and the surrounding community, and to better inform decisions about office locations and policies.

Using CRTKL's Dallas office as a cast study, we conducted a survey of the office staff to understand commuting habits, and then applied standard factors to calculate a commuting carbon baseline. Using this baseline, we analyzed three scenarios to understand how company decisions may impact greenhouse gas (GHG) emissions, both positively and negatively. These scenarios included a flexible work-from-home model, a transit option, and an office move from downtown to a suburban location. Results show that flexible work and transit scenarios yield similar impacts in carbon emissions, with reductions of 59% and 60% respectively. Conversely, an office move to the edge of a metroplex will have an enormous impact on carbon emissions and commuting time, in this example as much as eight-fold when compared to an urban location. Finally, we applied these results to a set of large companies in the DFW area to understand how adopting these ideas at scale may have broader impacts.


## WHAT DROVE US

An inventory of greenhouse gas emissions in Dallas shows that 35% of the total come from transportation, and that 72% of Dallas drivers are in single-occupant vehicles. In 2019, the area also saw the highest growth in population of any other county in the U.S., with over 130,000 new residents. In addition to this growth, corporate office moves have significant impacts on energy, carbon emissions and commuting hours.

## APPROACH

We surveyed our fellow coworkers at CRTKL's Dallas office about their commutes and then calculated the carbon impact as a baseline. We then analyzed three scenarios: a flexible work-from-home model, a transit option, and an office move from downtown to a suburban location.

> *As part of the workplace practice, we get the opportunity to work with many companies to help shape their space strategies. In a city, **growth is largely based on the very idea of the movement of corporations**, so we wanted to study the impacts."*

## WHAT WE LEARNED

**During the Covid-19 pandemic, commuting miles were drastically reduced in 2020, which started conversations about maintaining flexible or hybrid work modes into the future.**

If employees reduce their commute to the office only two days per week, working from home three days, we estimate that commute-based carbon emissions would be reduced by 59%, equivalent to a carbon offset of planning approximately 15,000 trees.

**The baseline study revealed that few people in the Dallas office are taking advantage of public transit, and we factored this into our average carbon footprint calculation.**

While the Dallas light rail system is electric, it still results in GHG emissions. However, if CRTKL employees took public transit to work, we could potentially reduce our carbon emissions by 60%, a reduction very similar in impact to the flexible work model.

**Corporate moves to outlying suburbs pose an enormous GHG impact and risk to worsening climate change.**

For a scenario with a hypothetical office move to 33 miles north of downtown, with employees commuting by car, carbon emissions would increase by 868%, producing over seven million pounds of carbon a year, and requiring over 241,000 trees as an offset.

# RESIDENTIAL ADAPTIVE REUSE OF DECOMMISSIONED CRUISE SHIPS

Taking Advantage of the Oversupply of Decommissioned Ships as a Primary Housing Structure

**IBRAHIM DESOOKY**
MIAMI

Mentor:
Yasamin Miller

## ABSTRACT

The rapid increase in cruise ship decommissioning during 2020 has created a unique opportunity to recycle or repurpose large ships using innovative strategies. This report examines the potential for the conversion of decommissioned cruise ships for housing, with a focus on the Miami-Dade County area. The goal was to investigate an alternative mode of coastal living, taking advantage of the oversupply of decommissioned ships as a primary housing structure, using semi-permanent docking in available port spaces. We identified case studies of residential cruise ships to serve as relevant precedents. We then investigated the engineering feasibility of a docked residential cruise ship in Miami, conducting interviews with engineering practitioners having marine terminal expertise.

Finally, we conducted an on-line survey with adults in Miami-Dade County, to investigate perceptions from potential residents of this new living concept. We found that residential cruise ships could be moored in developed areas, such as the Port of Miami, but that infrastructure costs would be considerable and the need for hurricane evacuation an issue for prospective residents. Our survey results strongly supported the concept, with respondents expressing interest in living on a repurposed cruise ship. Those expressing the greatest interest are 41-50 years of age, earning at least $100,000 per year, who are single or have children, and willing to pay rent of $2,000 or more per month.



## WHAT DROVE US

In 2020, a record number of cruise ships were sold, decommissioned and/or sent to the scrap yard in 2020, for a multitude of reasons. The Covid-19 pandemic led to a sudden freeze in the cruise industry worldwide, leading to financial losses for major cruise corporations. Our goal was to investigate this as an opportunity to take advantage of decommissioned ships, to potentially create affordable housing.

## APPROACH

We identified case studies of residential cruise ships as relevant precedents, and investigated the engineering feasibility through interviews with engineering practitioners. We also examined economic trends, such income and rent stress among of Miami-Dade County residents, and conducted an on-line survey to investigate perceptions of this new concept among potential residents.

> *There is a possibility for the shipbreaking industry to redefine itself from just a decomposition and supply business model to a renovation and deployment business model — **enhancing the lives of workers** and the laborious process of recycling these massive ships."*

## WHAT WE LEARNED

### For the concept of cruise ship to residential conversions, this study found that less is more.

We found that small cruise ships are more suitable for permanent docking as they require less space and dredging, they are less intrusive on the urban planning of the city, and also less likely to block views from land to sea.

### The focus group study with engineering experts revealed alternative concepts for recommissioned cruise ships.

Rather than using permanent ports, periodically moving locations may reduce the high cost of new pier construction. This idea leverages the increase of remote work seen since 2020, and may attract residents who are not tied to a particular location, such as retirees or students, or those interested in short term leases.

### These findings are relevant to the cruise industry and warrant further study in other coastal cities.

To further pursue the idea of cruise ship repurposing, we must next study costs for interior renovation, federal and city planning approvals, and the engineering and construction costs for building new pier infrastructures specifically for this use.

# NEW MODELS OF PRODUCTION

## Reintegration of Industry into Cities and Mixed-Use Development

**NIKITA MALVIYA**
NEW YORK

Mentors:
Renee Schoonbeek
Camila Simas

## ABSTRACT

Many cities have evolved with manufacturing activities physically integrated with the everyday activities of city dwellers. In the recent past, manufacturing in central cities has declined due to their negative impacts and these businesses have become clustered in industrial zones, generally out-of-sight and disconnected from the activities of the center cities. However, a new so-called Fourth Industrial Revolution is emerging, enabled by a range of modern technologies. Many industrial processes are evolving, from polluting and noisy practices to cleaner and more sustainable processes. These innovations are driving shifts in the manufacturing sector and enabling social and entrepreneurial revolution. This research investigates the new spectrum of production and how it can be integrated it with commercial, residential, and other uses in mixed-use buildings.

The findings illustrate new production models for multiple sectors, including food, digital, entrepreneurship, medical, energy and retail, and suggest a need to broaden our definition of industrial production. Such a revised definition would consider the trend towards downscaling many manufacturing spaces, and their integration with other urban activities. The study concludes with a set of planning and policy goals to enable expanding and scaling these new models of industrial production.



## WHAT DROVE US

Historically, cities became manufacturing engines due to access to the workforce, customers and transportation for goods. For many decades, manufacturing in central cities has been declining, based on the negative impacts (noise, pollution, traffic) it has on other uses. However, recent innovations in manufacturing and industry are now allowing for the ability to live and work in closer proximity, and supporting small businesses with better access to skilled workers, suppliers, customers, and institutions that support them.

## APPROACH

This investigation involves learning from the past, understanding current trends, and identifying policies that will enable production spaces to again be integrated into diverse urban environments.
The study describes new production typologies, and how these may best fit within a city. We document successful examples of mixed-use buildings with industrial/manufacturing uses, and finally, we suggest policy strategies to integrate manufacturing into cities.

## WHAT WE LEARNED

**Historical precedents include vertical factories and industrial mixed-use buildings situated within the city with workers living nearby.**

Although these buildings faced challenges associated with workplace safety and health, they represent a rich history of people working and living in close proximity, and they shaped the identities for many cities that were associated with their industries.

**New urban models include mixed-use buildings with production spaces that can create a network, connecting places to live and work.**

These findings illustrate new production models for multiple sectors, including food, digital, entrepreneurship, medical, energy and retail. They also suggest a need to broaden our definition of industrial production.

**Many new typologies should be considered as blended uses, physically and functionally integrated with residential, commercial and other uses.**

The integration within the urban fabric should be a multi-layered approach involving policy, zoning, land use, building use and design. Design professionals can provide leadership on this topic, and inform the design of mixed-use buildings, districts, workplaces and retail spaces.

> *To harness creativity and innovation, there is a need for i**ndustrial activity in all its modern forms to be integrated** with places to live. We need spaces for local producers to grow their businesses, urban hubs for entrepreneurs, and uses that attract young talent within the city neighborhoods."*

# THE JURY

Our great thanks and acknowledgements to the MicroGrant global jury — experts in their field who helped judge ideas for consideration.

**JESSICA BURNHAM**

Director of Design and Innovation Programs

Southern Methodist University

*Dallas, Texas*

**ANDREW MCCARTHY**

Founding Academic Director Master in Customer Experience & Innovation

IE School of Human Science and Technology

*Madrid, Spain*

**JOON-HO CHOI PH.D., LEED AP, ASSOC. AIA**

Associate Dean for Research in the USC School of Architecture

School of Architecture University of Southern California

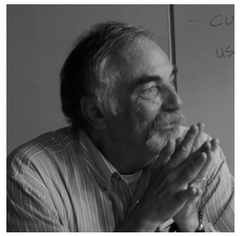
*Los Angeles, California*

**AKSHAR PATEL**

Director of Corporate Innovation

Kaplan Institute for Innovation and Tech Entrepreneurship at Illinois Tech

*Chicago, Illinois*



**BRUCE HAGLUND**

Fellow of the American Solar Energy Society
Distinguished Professor of Architecture

University of Idaho

*Moscow, Idaho*

**ALEXANDRE SALLES**

Owner of Estudio Tarimba
Coordinator of Undergraduate/ Graduate Program for Interior Design/Furniture Design

European Institute of Design – IED Sao Paulo

*Sao Paulo, Brazil*

**JAMIE N. JONES, PH.D.**

Executive Director of Fuqua's Center for Entrepreneurship & Innovation
Associate Professor of the Practice of Management

Duke University

*Durham, North Carolina*

**JACK SANDERS**

Founder

Design Build Adventure

*Austin, Texas*

**RESEARCH MICROGRANT PROGRAM**

CRTKL

CRTKL.COM