

SCIENCE & TECHNOLOGY

A DEEP DIVE INTO TOP RESEARCH INDUSTRY TRENDS

Flexibility | Resiliency | Private Partnerships | Return on Investment | Speed to Market

SMITHGROUP





TEMPE INNOVATION, DISCOVERY, ARTS & EDUCATION CAMPUS

Our Client Advisory Board was created as a forum to ask questions and explore ideas with organizations on the leading edge of Science and Technology. What we learn from these exchanges energizes our design process. Earlier this year, SmithGroup hosted a guided client engagement charrette exploring key drivers, current trends, challenges and opportunities as well as what the future holds. We brought together experts from **Arizona State University, Wexford Science & Technology, DPR Construction and Transwestern** for in-depth conversations around the following topics:



FLEXIBILITY



RESILIENCY



PRIVATE PARTNERSHIPS



RETURN ON INVESTMENT



SPEED TO MARKET



AN ERA OF URGENT CHANGE AND ADAPTATION

The week following our event, the World Health Organization (WHO) declared COVID-19 a pandemic. While much is still unknown months later, SmithGroup is exploring—with clients and industry partners— how the R&D landscape is shifting to the ‘new normal’. In the midst of the pandemic, we conducted a survey to understand what trends would be accelerated by the long-term effects of the pandemic. Learn more about our survey and the survey findings:

[HOW WILL COVID-19 INFLUENCE THE RESILIENCY OF LABS IN THE FUTURE](#)

FLEXIBILITY → ADAPTABILITY

Flexibility and adaptability are probably the most overused and least well-defined terms in the lab designer’s arsenal. The words have too many expectations associated with them, they are hard to define and can lead to disappointment for the owner / user.

In his discussion of adaptability in architecture, Finch has proposed that universal flexibility (adaptability) “is both technically and economically unachievable.”¹ Using Schmidt and Austin² as a basis, we can characterize the type of adaptability, as shown in the table on this page. However, the amount of effort or disruption needs to be understood in terms of its value by either owner or tenant. Another dimension that needs to be added to the discussion to be considered is the clients ‘responsiveness’ or the time it takes an organization to recognize and act upon a new requirement.

TYPOLGY OF ADAPTABILITY ²	TYPES OF CHANGE	COMMENTARY
Adjustable	Change of Task	Furniture, fixtures and equipment can be reconfigured
Versatile	Change of Space	Spatial layout of a room, movable walls, open plan spaces, add / remove walls
Refitable	Change of Performance	Altering skin, space or services
Scalable	Change of Size	Adding or removing space
Convertible	Change of Use	Conversion to new functions - repurposing
Movable	Change of Location	Temporary structures or mobile units

DRIVERS OF CHANGE

TECHNOLOGY ADVANCEMENTS

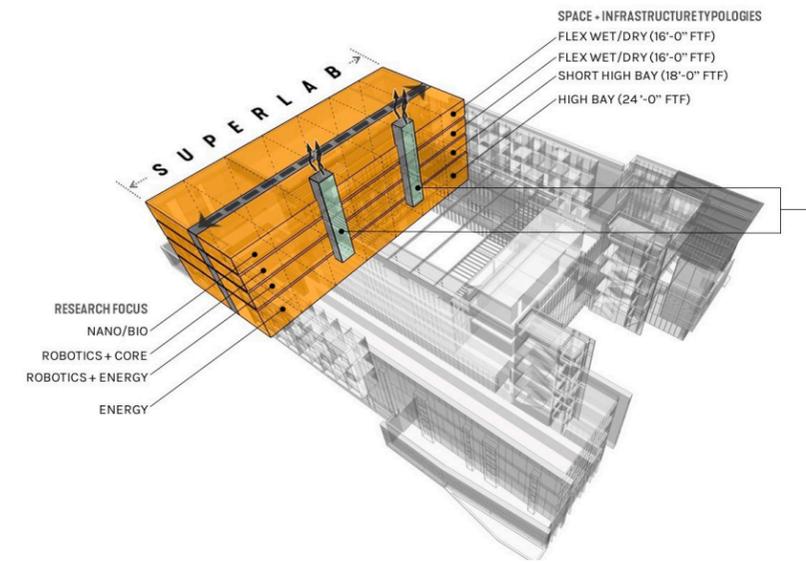
The technology fueling research is changing quickly. In some cases, the research equipment originally desired as part the lab planning and design can change even before the documentation of the lab is complete. It’s important to plan and design infrastructure to accommodate for the future.

COLLABORATIVE INNOVATION

Collaboration, both inside and outside of an organization, can impact the design and size of spaces. Additionally, the technology required for collaboration—remote conferencing, sharing of data—means the infrastructure of a lab and its associated spaces must be revised to meet these quickly changing demands.

FUNDING AND SCHEDULE

Research funding mechanisms and schedules impact how a research facility may change over time. For academic research, grant cycles and tenure roles are driving the need for efficient and timely change. Design-build delivery schedules affect research productivity and trajectory. It is best to first balance cost and life cycle cost against diverse programmatic needs.



SUPER LAB BLOCK, A HIGHLY ADAPTABLE CHASSIS WITH NO MAJOR OBSTRUCTIONS, EXPANDING THE LIFE EXPECTANCY OF THE BUILDING

UNIVERSITY OF TEXAS AT DALLAS ENGINEERING & COMPUTER SCIENCE BUILDING

KEY TAKEAWAYS

- Take time to understand clients definitions of Adaptability, then their attitude towards value in decision-making.
- Planning with a modular allocation of space enables the development of a ‘kit-of-parts’ that can quickly pivot to accommodate a range of scientific needs.
- Utilizing flexible lab furniture systems and overhead utility distribution systems can help avoid impediments.
- Central distribution spines for mechanical, electrical and plumbing systems can help simplify distribution modifications down the road.
- Open laboratories support a more rapid redistribution of bench space while closed lab areas better isolate more hazardous activities.

¹ Flexibility as a design aspiration: the facilities management perspective. Finch, Edward. (2009).

² Adaptable Architecture: Theory and Practice. Schmidt III, R. and Austin, S. (2016).

RESILIENCY

For the past decade, institutions have become increasingly aware of the growing number of disruptive events taking place around them. In 2020 alone we have seen a global pandemic which has stressed resources, social justice issues refocusing priorities and wildfires raging from California to Australia, to name a few. External forces continue to expose the frailty of laboratory continuity with regard to facilities, staffing and operations. As a result of these conditions, institutions and businesses are increasingly evaluating their risks and working to determine mitigation strategies to help ensure ongoing viability. Recent events have provided the opportunity to collect data on effects and to analyze potential mitigation strategies. Technology advancements are enabling mobile monitoring and connectivity that decreasingly rely on physical proximity.



DRIVERS OF CHANGE

RESOURCE UTILIZATION

We must pivot our relationship with the built environment and our natural resources through unifying and attainable strategies.

Land: As development continues to expand, we must develop creative strategies to allocate the supply while minimizing area hazards.

Water: To help stabilize water availability and food production, a comprehensive water strategy is as important as energy planning and the reduction of greenhouse gases.

Energy: It is critical to leverage traditional grid systems while augmenting with renewable sources and increasing reliability.

PROTECTING RESEARCH ASSETS

Dynamic events have underscored the fragile nature of the built environment. These can be triggered by either natural or human events (or a combination of the two) and can impact food, water, the environment and a host of other systems.

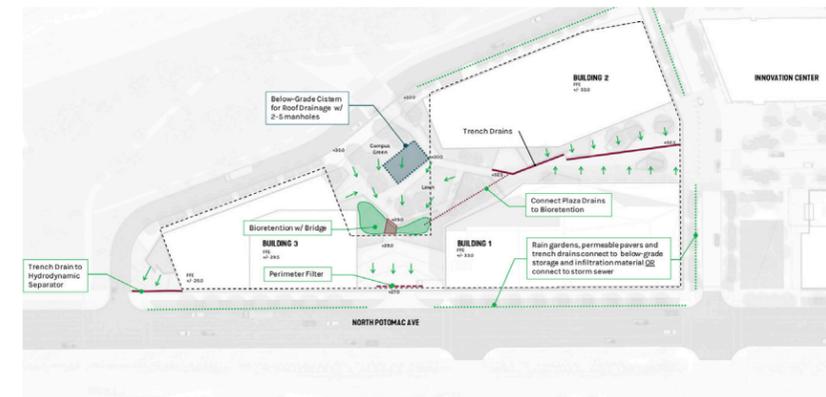
We must look to protect research assets and ensure institutions retain the leadership roles in their invested research areas.

GOVERNANCE

Across the world, cities and institutions are reevaluating their design and policy decisions to ensure that what is done today sufficiently protects their constituency and has a positive impact one, five and even fifty years from now.

The speed at which resources are prioritized and support is mobilized can significantly impact recovery.

Analyzing recent data can help to better identify risks and prepare to mitigate impacts. Updating building codes and risk maps helps areas prepare for the unknown.



STATE-OF-THE-ART COMPUTATIONAL AND GENERATIVE DESIGN TECHNIQUES TO INFORM PASSIVE DESIGN STRATEGIES, STAGED TO OFFSET ENERGY USAGE WITH AN ADJACENT ECOSYSTEM PARK

VIRGINIA TECH INNOVATION CAMPUS

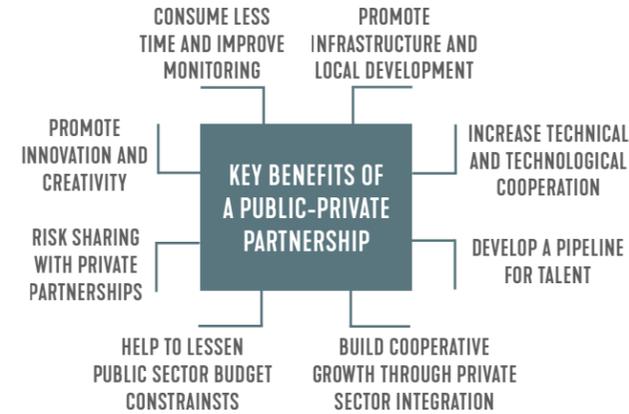
KEY TAKEAWAYS

- Push the boundaries:** Facilities need to think more broadly about adaptability both in terms of core utilization as well as potential uses during disruptive events.
- Smart proactivity:** Decisions regarding appropriate protection measures against potential disruptive events need to make determinations based on data trend lines not historic averages.
- Automated observation:** Artificial intelligent systems could be employed to analyze real-time data against established parameters to more rapidly implement a predetermined response. For example, relying on air quality sensors to shift an administrative space from natural ventilation to mechanical ventilation during a wildfire event.



PRIVATE PARTNERSHIPS

Research and development (R&D) drives both economic and corporate growth. Federal spending on R&D has been steadily declining, while at the same time, the cost of R&D has been increasing. To fill this widening gap, there has been a growing interest in public/private/academic partnerships both in the form of sponsorship of, and direct participation in, research. Innovation partnerships with large organizations, academic institutions, and emerging companies are becoming the norm. While this shift in the research landscape offers many benefits, it requires us to consider new stakeholders and drivers of change.



DRIVERS OF CHANGE

REGIONAL INFLUENCE

Talent is what drives innovation clusters. In order to attract and retain talent, the lab environment must be adjacent to academic research hubs and reflect the community’s unique culture. As many innovation districts expand into low-to-moderate income neighborhoods, private and public partnerships seek to bridge the social inequity gap by providing educational opportunities, expanded employment, affordable housing and mobility access.

REAL ESTATE STRATEGY

Continued reduction in federal and state funding for academic institutions is requiring universities to lease their real estate for long-term land ownership. In addition, small and mid-size institutions are being forced to consolidate. Corporations are maintaining headquarters campuses and leasing satellite space near their talent pool. These trends are leading to a rise in speculative buildings and a demand for speed-to-market.

CHANGING LANDSCAPE

High throughput research and increasing automation are transforming the industry. Generational shifts are requiring alternative education methods, new work styles, and entrepreneurship. As technology and work styles continue to evolve and change, spaces must be adaptable to accommodate change.



A PARTNERSHIP AMONG GOVERNMENT, ACADEMIA AND INDUSTRY, ESTABLISHING A CENTER OF EXCELLENCE IN BIOTECHNOLOGY AND THE LIFE SCIENCES

UNIVERSITY OF DELAWARE AMMON PINIZZOTTO BIOPHARMACEUTICAL INNOVATION CENTER

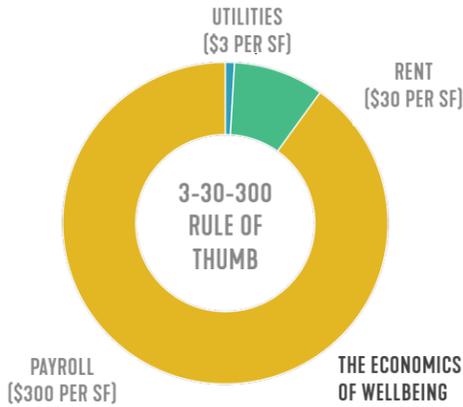
KEY TAKEAWAYS

- Capitalize on existing amenities such as retail, campus life, etc.
- Online education will continue to shape the real estate needs.
- Talent follows and drives the activity. Provide space that matches the culture you’re trying to promote.
- Automation will drive many areas of development.
- Continued push downstream of ownership/outsourcing.
- Unintended market shifts due to change in ownership typologies.
- Support of emerging companies is key to the innovation districts’ health.
- Shared research space resulting in innovations and cost savings.
- Opportunity for new funding resources and cost sharing.

RETURN ON INVESTMENT

Today's global challenges have driven many businesses to contribute to society as a whole. Accessibility, universal design and features that enhance health and wellness support social justice. Use of on-site renewable energy and green and blue infrastructure promote a circular economy. We must lengthen a building's lifecycle and develop scalable solutions.

There are four primary partners in the pursuit of optimal Science & Technology environments—the Client-User, Investor-Developer, Architect-Engineer and Contractor-BUILDER. Below we have outlined some expectations of each stakeholder, however, exploration with each partner is critical to the success of a project.



DRIVERS OF CHANGE

DEMAND



CLIENT-USER

Location: convenience, close to amenities, promotes quality of life/work

Right-sized: to be efficient and cost effective with net/gross area and cost/square foot

Adaptable: to meet changing scientific needs, flexible, re-assignable, expandable

DEVELOPMENT



INVESTOR-DEVELOPER

Community: enhancement of location, lifestyle, wellness

Timing: economic climate, tenant demand/saturation

Logistics: optimized infrastructure, effective rents and load factor net/usable

DESIGN



ARCHITECT-ENGINEER

Form and Function: elevated experience, programmatic fit

Performance: code and safety compliance

Sustainability: energy goals, low operational costs

DELIVERY

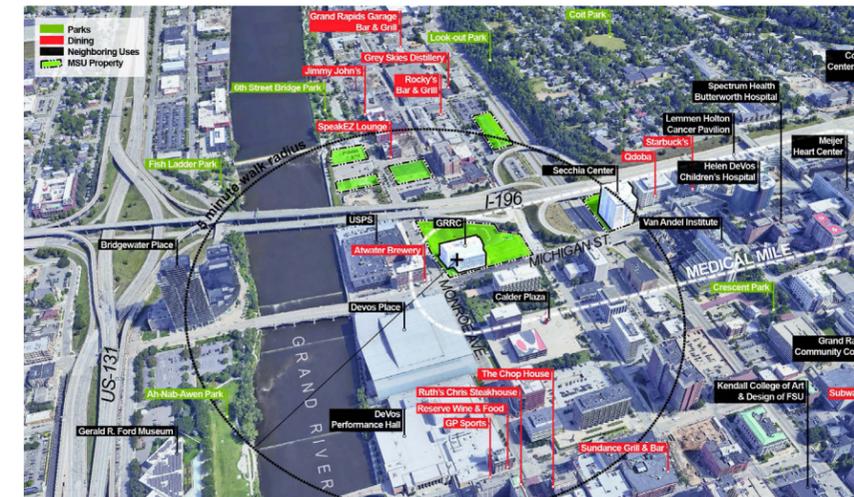


CONTRACTOR-BUILDER

Speed to Market: saving time and resources, integrated technologies

Risk Mitigation: partnered sub-contractors, available skilled trades

Value Enhancement: budget controls, communication platforms



UNDERSTANDING POTENTIAL TO ATTRACT DEVELOPERS, RETAINING A P3 TEAM, SECURING A DONOR AND CREATING A MULTI-TENANT RESEARCH HUB

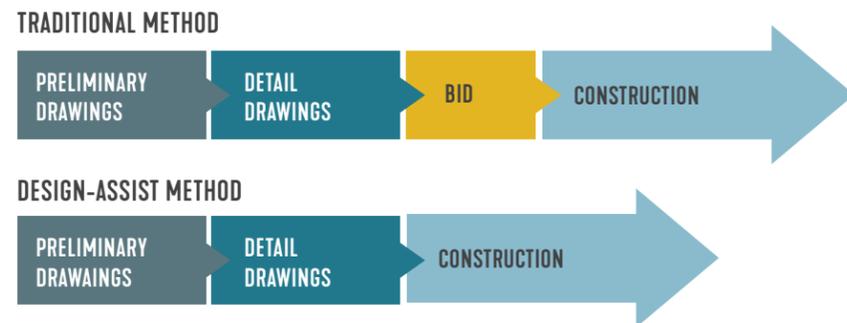
MICHIGAN STATE UNIVERSITY, GRAND RAPIDS INNOVATION PARK | BIOMEDICAL INNOVATION BUILDING

KEY TAKEAWAYS

- Build towards long-term health and wellbeing of people, and associated increased productivity.
- Consider broker and/or industry partners to provide options for expanding space.
- Convenience is key for employees—select sites close to amenities.
- Partner with trusted trades to minimize risk.
- Utilize integrated technology (BIM/Revit) that allows for trades to see clashes well in advance, limiting construction errors in the field and saving time and money.

SPEED TO MARKET

There are a variety of reasons a client may value how quickly their project can be up and running. From disaster response to production, identifying the ‘why’ driving the schedule can help reveal the correct delivery method for the project. Projects requiring complex integration of architectural, engineering and site systems tend to lend themselves toward a more customized process, such as Design-Assist, whereas more generic programs can often find efficiencies in a less tailor-made approach. Automation of the built environment will become more akin to manufacturing with pre-fabrication, modularity and rapid-prototyping.



A SERIES OF PROJECTS SETTING THE STANDARD FOR A “WEWORK-TYPE LAB” OFFERING IN THE BOSTON MARKET—REPURPOSING OLD BUILDINGS ORIGINALLY NOT BUILT FOR LABS

NAN FUNG LIFE SCIENCES

DRIVERS OF CHANGE

MODULARITY

- Technique lends to coordination and simplification of project components (structural, mechanical, etc.).
- Repeating common elements provides opportunities for a more efficient design and construction process.
- Using spaces of similar size can more easily accommodate reassignment of departments or research types in the future.

PRE-FABRICATION

- Potential for time and cost savings depending on the project site’s distance from manufacturing facility.
- Safer construction environment, more sustainable and controlled process.
- Requires stricter adherence to construction systems and products, limiting design flexibility.
- Emerging technologies include cross laminated timber—allows for improved acoustic, fire, seismic and thermal performance—concrete, steel and 3D printing.

DESIGN PROCESS

- Early and responsive decision-making helps shorten time frames and reduce cost impacts.
- Working in a virtual 3D environment assists in early detection of constructibility issues and reduce conflicts in the field.
- Delivery methods, such as Design-Assist, that align the design team with a contractor, can be especially valuable in high-risk, complex projects. Those with sophisticated systems, confined site conditions, accelerated schedules, phased construction, and advanced materials and equipment procurement methods benefit most from these integrated delivery methods.

KEY TAKEAWAYS

- It is crucial for the client and design team to share an understanding of the key reasons for speed to market at project initiation. This ensures that all opportunities are explored and that decision-making is timely.
- There is no one-size-fits-all approach. The team determines which members to engage and how each party can best contribute at each stage of the project and when transitions should occur to maximize efficiency.
- Design-Assist can provide a positive impact on design efficiency, cost, speed to market, and constructability.

IN SUMMARY

Through the discussion in these various focus groups, we found each of these topics to be interwoven. For example, facility adaptability can help support a rapid pivot of utilization during a disaster event in order to support multiple client types, increasing ROI potential. Identification of target partnerships can provide a framework for the level of adaptability required and support speed to market goals. The interplay of topics continues.

While the COVID-19 pandemic has undoubtedly changed “business as usual” for the near future, we remain focused and dedicated to understanding the future trends influencing research and laboratory environments.

Each of these topics will be increasingly important to consider as we look to develop the next generation of innovation spaces. Tackling the challenges will require a holistic understanding of the inherent challenges, and a willingness to think beyond traditional approaches to seek new synergies and opportunities.



THANK YOU TO OUR PARTICIPANTS

- ARIZONA STATE UNIVERSITY
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- DPR CONSTRUCTION
- TRANSWESTERN

Design a Better Future

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