

Building Knowledge: A Framework for a Translational Research Culture in Architecture

Mark Donofrio

University of Oregon, Eugene, Oregon

ABSTRACT: The built environment in the United States is failing. Economic, social, environmental and technological performance of buildings as well as the industry responsible for their creation has not kept pace with other industries essential to ensuring a healthy society. While research activity is prevalent in academia as well as, to some extent, in professional practice, the building industry is slow to change. This paper proposes a framework for the development of a translational research culture in the discipline of architecture as a means to more rapidly implement positive change within the building industry. Modeled after the successful approach implemented in the medical profession, translational research results in a feedback loop where basic research is tested in application. The results of this application become inputs to a new round of basic research, which will then be tested again. This cycle continues with the new research questions continuously being influenced by the limitations of the previous questions. Its application in medicine was originally intended to ensure that new treatments and research knowledge actually reach the patients or populations for whom they are intended and are implemented correctly. Establishing a translational research culture within the discipline of architecture provides a potential stopgap to slow and reverse the declining state of the building industry. By more directly connecting the efforts of research in academia with the application in practice, there exists the potential to make research more visible to both those with the power to implement it, practitioners, and those able to benefit from it, end users.

KEYWORDS: Architectural research, translational research, professional practice, collaboration, building production

INTRODUCTION

As has been pointed out by Paul Teicholz of the Center for Integrated Facility Engineering, Stanford University, productivity of the U.S. construction industry has been on a steady decline for close to a half-century. This is compared to all other non-farm industries, which have seen a steady increase in productivity as they have leveraged the benefits of integrated processes and digital technologies (Teicholz et al. 2001). Edward Mazria founded the non-profit organization, Architecture2030, with the goal of reversing the negative impact the building industry has on energy use, climate change and sensitive fluctuations in economic health (Architecture2030 2012). What is ironic is that this decline in productivity and these negative influences of the built environment have occurred while there has been rise in the quantity and size of research-oriented programs within schools of architecture. The first research unit in a school of architecture was established over 60 years ago (King 1984). Since that time, research-based M.Sc programs and PhD programs have only continued to increase in number and focus and now consist of a wide range of areas of specialization and emphasis including: design, history and theory, building science, computation, sustainability and urban design, to name just a few (Groat and Wang 2002). In addition to these post-professional degree programs offered to students of architecture, there are ever-increasing pressures on faculty to produce research as part of tenure and promotion. This influx of new knowledge generated by faculty and students could lead one to believe that the profession of architecture would be inundated with innovation and progress. While as Teicholz and Mazria have pointed out, just the opposite is true; the building industry is mired in inefficiencies and excess.

1.0 RESEARCH IN ARCHITECTURE: FROM PRACTICE TO THE ACADEMY

1.1. Learning by doing

If research is understood as “systematic inquiry directed toward the creation of knowledge”, (Snyder 1984, 2) then historically research occurred through the mere act of building. The master builder of the Gothic and Renaissance eras required the knowledge to coordinate and integrate all aspects of a project’s completion including aesthetics, proportion, function, acquisition of materials, scheduling of manpower, and controlling

of cost. Trial and error experimentation led to the development of new building materials, structural systems and building forms. The master builder was architect, engineer, material scientist, surveyor, and general contractor all rolled into a single individual and hence through systematic observation of these aspects of building projects was responsible for the creation and dissemination of new knowledge related to these fields (Groat and Wang 2002). This knowledge was not for dissemination to a broad audience, but rather was closely guarded by members of the various building guilds and only passed down to its members to be utilized on future building projects. While the master builder model, in one form or another, continued up to around the turn of the 19th century, Leon Battista Alberti dealt it quite a blow when he drove the first wedge between design and construction. Alberti was the first to call for the separation of design as an art from building construction as a craft.

1.2. From craft to profession: university education of architects

The split began by Alberti, with regard to the functions of design and construction, was only widened by the increased need for specialization encouraged by developments during the Industrial Revolution. Advancements in tools, means of production and material science led to internal division amongst the already separate disciplines of design and construction. A rise in expertise and a desire to improve one's status led in the 19th century to an increase in the creation of separate organizations and professional societies aimed at protecting the interest of their constituents. In turn, the need arose for educating future professionals and this responsibility fell upon the land grant universities formed in the decades following the Civil War (Woods 1999). The creation of early architecture programs at institutions such as the Massachusetts Institute of Technology, Cornell University and the University of Illinois led to a shift away from the apprentice model, to a more formal university based model for the education of architects.

1.3. Architectural research in the academy

Despite attempts by faculty in early architectural programs to ignore their relationship with the universities that housed them, university administrators soon began to expect these programs to behave similarly to other traditional academic programs; this meant the need for research. In order to acquire tenure and promotion within the university system, faculty members must show evidence of contributing to the advancement of knowledge within their respective discipline (Schluntz 1984). These institutional pressures, coupled with sheer human curiosity, fuelled early architectural research activity within the academy. As a discipline which resides somewhere between art and science, the role and definition of architectural research has always been a bit of a moving target. There are aspects of architecture that have ties to the more established research fields in the natural sciences such as physics, chemistry and biology. There are also parallels with the social sciences of sociology, anthropology and economics. Other fields where basic sciences are applied, such as the other professions - medicine, law and engineering – are perhaps most similar to architecture. Where architecture differs from these other professions is its close ties with the humanities and the arts (Leatherbarrow 2012). This wide spectrum of possibilities available to those exploring architectural research as well as the fragmented nature of the current building industry has led to discipline silos that hinder collaborative opportunities.

1.4. Architectural research in the profession

Contemporary architectural practice, long removed from its origins of master builder, cannot in and of itself claim to generate new knowledge in the same way as its historic predecessor. A discussion paper titled "What is Architectural Research?" issued by the Royal Institute of British Architect's Research and Development committee states that:

Designing a building is thus *not necessarily* research. The building as building reduces architecture to mute objects. These in themselves are not sufficient as the stuff of research inquiry. In order to move things on, to add to the store of knowledge, we need to understand the processes that led to the object and to interrogate the life of the object after its completion.

As a result of this need to understand processes and interrogate the life of a building, some design firm have become more reflective and begun to make research an integral part of their practices. These research-based practices include large-scale firms such as Gensler and HOK, with Gensler dedicating 5 percent of its annual profits to research. In addition to a few large firms, midsize firms such as KeirenTimberlake and Architecture Research Office (ARO) have included research agendas as integral parts of their business plans. Lack of size and resources can be overcome by small practices, which often subsidize their research through joint academic appointments (Beck 2012). The emergence of digital fabrication, building information modeling (BIM) and integrated project delivery (IPD) has resulted in the process of practice itself becoming a topic of research in academia as well as practice (Deamer 2011).

1.5. Need for translational research culture in architecture

Translational research, adopted by the medical profession, is a systematic effort to convert basic research knowledge into practical applications to enhance human health and well-being. Translational research was

designed for the medical world. It emerged in response to concern over the long time lag between scientific discoveries and changes in treatments, practices, and health policies that incorporate the new discoveries (Birmingham 2002). In general terms, translational research is a dynamic research model in which basic research is tested in application thereby revealing potential limitations which feed back into framing new research questions (Fig. 1). Just as the time between discovery and implementation in practice has been compressed within the medical profession, the promise exists for similar fast paced advances within the building industry. The building industry has traditionally been slow if not adverse to change. This is partly due to the deeply fragmented nature of the industry, with architecture being just one part of the multidisciplinary teams responsible for the design and production of the built environment. An advantage of translational research is that it is quite often multidisciplinary. This multidisciplinary nature helps to break down the disciplinary barriers within which research typically operates thereby more quickly implementing research into practice (Ewing 2010). Perhaps the most promising aspect of establishing a translational research culture in architecture is that practicing professionals have the ability to influence research agendas in academia (O'Donnell 2007). The approach to translational research has begun to be transferred to other discipline such as planning (Ewing 2010) and education (Jorgensen 2011). The need to establish a translational research culture in architecture is a necessary step towards improving the building industry by providing vested interests between those producing and those applying architectural research.

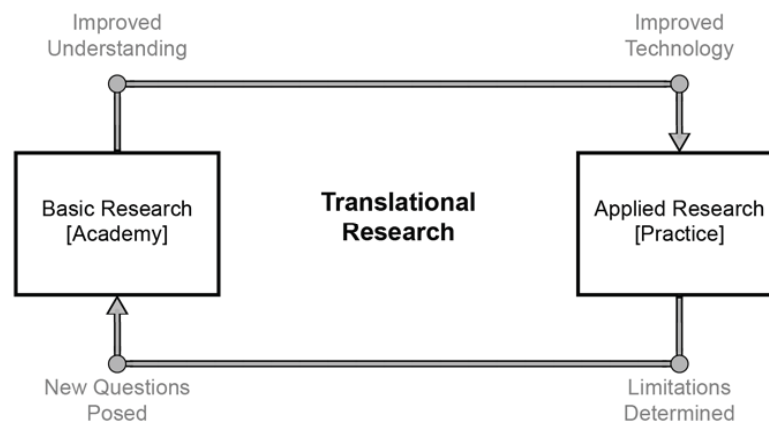


Figure 1: General translational research model in architecture between the academy and practice.

2.0 MODELS OF TRANSLATIONAL RESEARCH IN ARCHITECTURE

What follows are three models for establishing a culture of translational research within the discipline of architecture. While existing versions of these models are currently being implemented between academia and practice, in one form or another, both parties would benefit from more explicit definition of these relationships and an understanding of the theoretical cost to benefit ratios of each.

2.1. Practice embedded in the academy

The number of permanent faculty members teaching in architectural programs who are also active practitioners has declined as a result of the more rigorous qualifications for faculty required by universities (Gutman 2000). Professionals frequently teach design studios on an adjunct basis and while this often involves the practitioner utilizing a recently completed or currently active project brief as the focus of the studio project what is not usually achieved is a rigorous research-based approach to that project. By leading a research-based design studio, practitioners are able to leverage resources of the university and benefit from the knowledge gained, while at the same time exposing students to 'real-world' problems, whose complexities can never be equally simulated by boilerplate projects repeated year after year. The return on investment by the practitioner involves multiple solution variations with perhaps deeper levels of research than could have been achieved by the practitioner alone. Other opportunities involve leading subject specific seminars that either share the practitioner's existing knowledge or develop new area of expertise in the safety of academic environment.

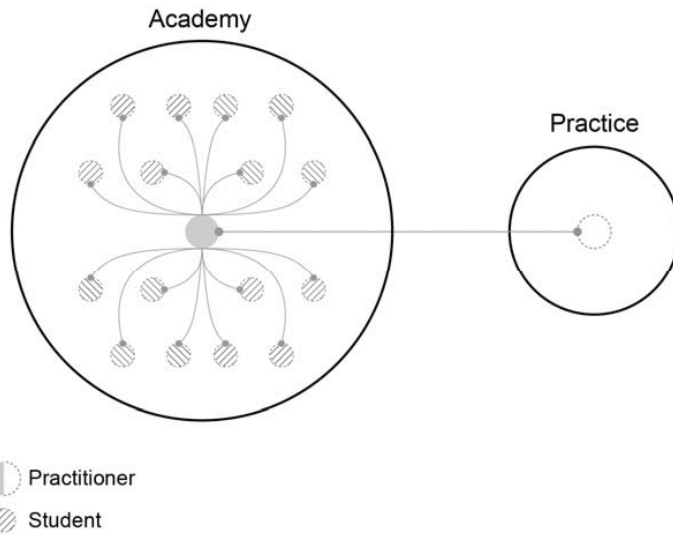


Figure 2: Practitioners embedded in the academy.

2.2. The academy embedded in practice

Another compelling model for the shift to translational research in architecture is the model proposed by Mark Burry and utilized by doctoral students in his Spatial Information Architecture Laboratory at RMIT in Australia (Burry 2012). Doctoral candidates are embedded within a design practice and participate in research that the practice might not otherwise have the resources to undertake (Fig. 3). This model is similar to ones implemented by doctoral students in medicine and science, but has yet to be widely adopted in architecture or other design disciplines. The fact that several candidates are embedded in different design practices simultaneously creates the possibility for cross-pollination of research agendas thereby informing new potential research opportunities (Burry 2012). This model is not exclusive to doctoral candidates alone and could be extended to other research-based degree programs as well as advanced professional-degree seeking students. While this model is similar to the longstanding tradition some universities have for practicum or internship programs that embed students within design firms to gain hands on professional experience, the difference here lies in the focus on utilizing the student's efforts on activities resulting in either the creation or application of research rather than completing rote activities such as picking up redlines.

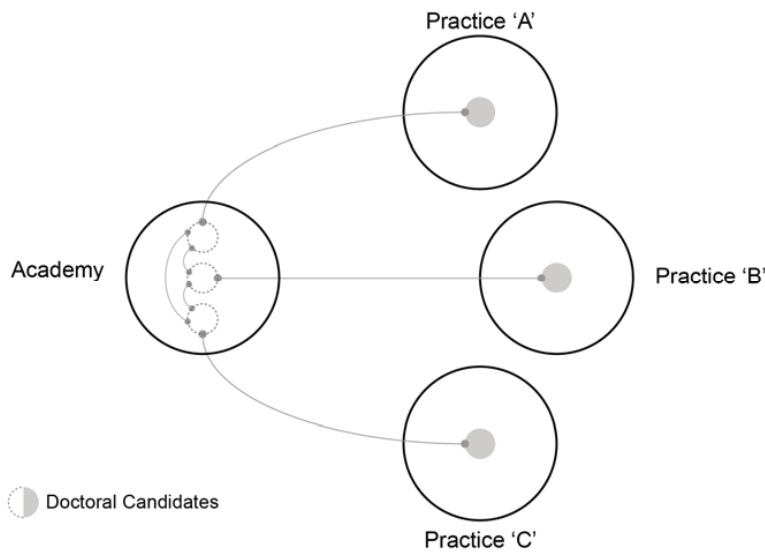


Figure 3: Doctoral candidates from the academy and embedded in practice.

2.2. Collaboration

The third model for translational research within the architecture discipline involves one of collaboration between practitioner and faculty/research center (Fig. 4). Firms with the resources to do so can sponsor research projects with faculty or research centers within the university. A good example of this form of collaboration is the Center for Architecture Science and Ecology (CASE). CASE is a multi-institutional and professional research collaboration co-hosted by Rensselaer Polytechnic Institute and Skidmore, Owings & Merrill LLP. CASE is pushing the boundaries of environmental performance in urban building systems on a global scale, through actual building projects as research test beds. A more approachable version of this model consists of faculty members with particular areas of expertise being hired as consultants to a design firm on a project-by-project basis thereby gaining direct access to that individual's knowledge and providing opportunities for direct implementation of this knowledge on realized projects (Reigle 2011).

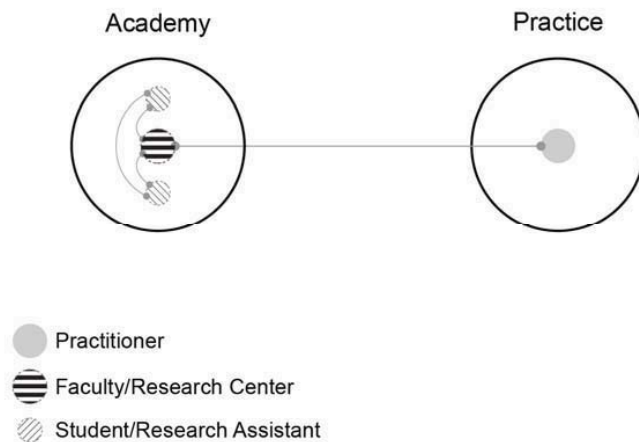


Figure 4: Collaborative research between the academy and practice.

2.3. Closing the communication gap

The form that the interaction between academia and practice takes is less important than the form in which the information resulting from this interaction is shared with a broader audience. The intention of translational research is not to only benefit the parties directly involved in the research and application, but to disseminate the knowledge created. This requires a closing of the communication gap that exists between academic and professional publications. Academic journals and conferences are too insular and often only used by academic faculty for the purposes of meeting university standards for tenure and promotion, essentially 'preaching to the choir'. Alternatively, the profession lacks rigorous research publications where in-house scholarly research can be shared. Therefore, firms often resort to self-publication of information via print or digital formats. The two major trade journals, *Architect* and *Architectural Record*, are not rigorous enough to compare with the standards of academic publications and often result in little more than marketing fodder for firms. Despite the efforts of organizations such as the Architectural Research Centers Consortium (ARCC) and the American Institute of Architects' (AIA) Knowledge Communities, there still exists a wide gap between academic and professional knowledge. Despite technological advances, this problem has not improved much since writing almost 30 years ago Jonathan King noted that:

Today most of our significant architectural research work is squirreled away in isolated pockets, inaccessible to most of those who need it. The architectural community ought to be moving toward the achievement of an openness that can include the academic institutions as well as the private and public sector research agencies and of course, the users of architecture.

The users, those who are most impacted and could benefit most this knowledge, are still yet to be fully brought into the fold.

CONCLUSION

The buildings industry is failing, research is not finding its way into the right hands and thus not fully impacting the quality of the built environment. The separation between academia (research) and practice (production) must be bridged in order to stop and reverse the damage done by the built environment. Establishing a translational research culture within the discipline of architecture lends itself to ensuring that

research has meaningful and practical impact of those who most need it, the end users. Achievement of this goal will reveal the value of the knowledge in influencing positive change in the built environment.

REFERENCES

- Architecture2030. 2012. accessed December 12, <http://www.architecture2030.org/>
- Beck, E. 2012. "Design by Numbers". *Architect*. 101 (1).
- Birmingham, K. 2002. "What is translational research?" *Nature Medicine*. 8 (7).
- Deamer, P. 2011. "Practicing Practice." In *Perspecta 44: Domain*, edited by Tala Gharagozlou, David Sadighian, Ryan Welch, and Robert A. M. Stern. 160-203. New Haven, Conn: Yale School of Architecture.
- Ewing, R. 2010. Research You Can Use: Translational Research: The Next New Thing. *Planning*. 76, no. 8: 40.
- Finkelstein, J. 2008. "Translational Research Going Mainstream". *Journal of the National Cancer Institute*. 100 (20): 1430-1431.
- Groat, L., and Wang D. 2002. *Architectural research methods*. New York: J. Wiley.
- Gutman, R. 2000. "Schools and practice in the United States." In *Changing architectural education: towards a new professionalism*. edited by David Nicol and Simon Pilling. 232-240. London: E & FN Spon.
- Jorgensen, J. 2011. "A new collaboration between EOP and WCER: Strengthening Translational Research: Bridging Research and Practice across UW-Madison SoE and our community partners." Executive Summary. UW-Madison.
- King, J. 1984. "Research in Practice: Generation, Use and Communication." In *Architectural research*, edited by James C. Snyder, 29-37. New York: Van Nostrand Reinhold.
- Leatherbarrow, D. 2012. "The project of design research." In *Design innovation for the built environment: research by design and the renovation of practice*, edited by Michael U. Hensel, 5-12. Abingdon, Oxon: Routledge.
- Linn, C. 2008. "Firm of the Year Award: KieranTimberlake's research-based culture puts the firm in the spotlight". *ARCHITECTURAL RECORD*. 196 (5): 172-175.
- Reigle, J. 2011. *Positioning for architecture and design firms*. Hoboken, N.J.: John Wiley & Sons.
- O'Donnell, M. 2007. "The Culture of Research." Paper presented at the American Institute of Architects (AIA) 2007 Research Summit, Washington, Seattle, March 23-24.
- Schluntz, R. 1984. "An Overview of Sponsored Research in Schools of Architecture." In *Architectural research*, edited by James C. Snyder, 38-50. New York: Van Nostrand Reinhold.
- Teicholz, P., Goodrum, P., and Haas, C. (2001). "U.S. Construction Labor Productivity Trends, 1970–1998." *J. Constr. Eng. Manage.*, 127(5), 427–429.
- Till, J. 2005 *What is architectural research? Architectural research: three myths and one model*. Discussion Paper. RIBA, London.
- Woods, M. 1999. *From craft to profession: the practice of architecture in nineteenth-century America*. Berkeley: University of California Press.