INNOVATION IN EDUCATION: FIVE SCENARIOS THAT OFFER INSIGHTS INTO A PATH FORWARD FOR THE FUTURE OF EDUCATION

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Abstract - Breakthroughs and innovations in technology [1, 2] are drivers of disruptions in the information age. These disruptions are having impacts on higher-education at the institutional, societal, and professional levels. They are requiring institutions to reassess their organizational structure and learning models, society to question higher education’s ROI, and professions to “expand their capacity and effectiveness” in an informed world to avoid disabling effects on the professions [3]. While the traditions and practices of education and the professions remain strong, how does the education sector innovate? While we know some of the disruptive technologies and innovations that are impacting higher education and that they are likely to continue, where do we go from here? To have a clearer vision into the implications and options for higher education and the profession, we propose a scenario visioning process to uncover the challenges and uncertainties that lie beyond the disruptions [4].

This paper presents five scenarios developed in response to the critical question, what is the future of design education [5]? Given the changing landscape of higher education, the University of Texas, School of Architecture undertook a scenario visioning process, with input derived from other universities, along with the five regulatory and professional organizations to anticipate and prepare to meet the future that awaits design education and the design profession. The challenges and forces that undergird changes in design education have implications that will need to be considered in the future of higher education, overall. The interviewees and benchmark respondents were canvassed for insights and changes in architecture education and related future trends. This work provides a framework for how continuing engineering education can begin to understand the critical uncertainties, key factors, and environmental forces that might affect the continuing engineering education strategies. The work provides an example for how the current continuing engineering education model might respond to the disruptions, risks, and opportunities of changes in the global workforce, innovation, industry, and university continue to unfold. The process, key factors, and five scenarios that define possible evolutionary and revolutionary paths for changes in higher education, and specifically, architecture education, will be presented.

I. INTRODUCTION

“The profession and its educational system are inseparably interdependent...the closes liaison with the profession in order to adjust content and method to the changing needs of practice.”

-Alfred North Whitehead
The above quote by Alfred North Whitehead underscores his definition of [architecture] education as “the acquisition of the art of the utilization of knowledge”. This quote could be applied in a broader context to the traditional relationships between the educational programs and the professions they serve beyond architecture; certainly to include the various engineering disciplines. Yet we have entered an era in which much is uncertain about the present and future state of professional education within the context of higher education in the US. Changes emerging in higher education are causing many educational institutions to take pause and consider what they might do differently to meet the needs of their students, the profession, the institution and the community in which they operate. In response we should act now to prepare for the changes yet to come.

This paper proposes to explicate, through a strategic scenario visioning approach, the potential implications and options facing a professional school within a public funded university emerging as a major research institution. As higher education and the professions pursue opportunities to address changing social, economic, and cultural conditions that have emerged as a result of the technological changes and innovations, the case of the School of Architecture provides an example of a way forward which can serve as a framework for better understanding the changes faced by continuing engineering education profession in these times of disruption.

Given the increasing need of transparency, accountability, productivity and flexibility, higher education institutions are demanding internally that their constituent components become more innovative, creative and accountable in advancing the institutions overall mission and objectives. This includes rethinking the institution’s role in meeting the needs of the changing workplace and society in general; looking for collaboration and cross-disciplinary ways to explore and develop knowledge of economic value, while simultaneously developing new business models to support the universities in the future.

Working over a two-year timeframe, a customized cross-functional strategic scenario visioning process was designed and facilitated to gain foresight into the changing landscapes of architectural education and related design disciplines of interior design and landscape architecture. Two resulting workshops, informed by research and analysis of schools of architecture and the profession architect, created five alternative scenarios.

The strategic scenario visioning workshop utilized scenario development to help the school of architecture first in its’ understanding of the implications of the changing contexts in which the School operates; these are grouped as: higher education in general, the University of Texas in particular, socio demographic, and professional practice, and to develop and consider options to address this uncertain but changing environment. The scenarios were specifically designed to be outwardly focused and intentionally did not include a critical self-examination of either the past or present state of the school for fear of the effort becoming entirely self-referential. The effort consciously evaluated external vectors that had a high probability of acting upon the school and forming the future context for success and in which the school would have to succeed. They were to provide a strategic direction that can help guide the vision of the School of Architecture beyond current disruptions.
II. UNIVERSITY OF TEXAS SCHOOL OF ARCHITECTURE

The need to define a future for The University of Texas at Arlington School of Architecture is an imperative of the professional community its graduates enter and, closer to home, the institution it is a part of. At no time in the history of the School have so many critical factors been in flux. The practice of architecture has been upended by rapid changes brought about by digital technologies of the design process and its impact on building construction and performance. Architectural firms report that their business practices revise monthly yet few firm leaders can predict the nature of practice in the coming decade. It is this uncertain environment that higher education must be able to predict in order to institute change in curricula, faculty qualifications and incentives, budgetary planning etc. The global design community is responding to heightened expectations for expedited construction processes and building performance with a desire for relevant academic research partnerships, as well as graduates that are digitally savvy problem solvers, now.

In the broader context, the higher educational institutions in which these schools reside are challenged to defend the value of a college degree given the increasing costs of a college education and the investment by students, their families, and state and federal funding in obtaining degrees. As state and federal funding has decreased, universities are looking for alternate educational models such as the establishment of research centers, the development of certificate programs, and leveraging of technology to broaden their impact including reaching greater number of students through massive online courses or other innovative means of curricula delivery. UT Arlington is grappling, as all universities are, with the question of what learning environments will best serve future students to insure the viability of the learning achieved, at the same time investing in research enterprises that generate income and reputations for excellence.

From a position of strength and stability the School of Architecture convened some of their influential colleagues and community members in a dialogue to anticipate the challenges and forces that will define the future regarding higher education, design education, and the design professions. A clear, objective appraisal of what is happening outside the school in the contexts of higher education, design education, and the design professions provide points of reference beyond the ability of the School to change or control but yet must be accepted to remain a viable educational provider in the future. This allowed the School of Architecture to build a set of future scenarios that might describe the future they are anticipating and to uncover futures not linked to their status quo. The School is able to consider the scenarios and their impact on University of Texas Arlington’s School of Architecture to better help them move beyond the disruptions within the external contexts.

Under forward thinking leadership at UT Arlington the focus is on establishing the priorities that will drive the university to Tier One status. With new presidential leadership the focus is increasingly on, how the university can position itself for a transformative leap? That is the question that the School of Architecture has been examining for several semesters. The strategic scenario visioning process, that enabled the strong future possibilities, is outlined here.
Exhibit 1: School of Architecture Approach
Strategic scenario visioning process for SOA context. Variations on this process, not shown here, may better serve other institutions

<table>
<thead>
<tr>
<th>Scenario Visioning Elements</th>
<th>Benefit</th>
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<tbody>
<tr>
<td><strong>Strategic Facilitation</strong></td>
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<tr>
<td>• Determine the vision’s scope and time frame;</td>
<td>Hold the agenda and focal question to explore the more general areas of risk and opportunity for the SOA.</td>
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<tr>
<td>• Identify the current assumptions and views of the faculty who are influenced/impacted by the outcomes</td>
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<td>• Create divergent, yet plausible, scenarios with underlying assumptions about the future</td>
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<td><strong>Steering Committee</strong></td>
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<td>• Select universities/program areas to benchmark</td>
<td>Engage diversity of thinking, perspectives, and roles, including unorthodox thinkers</td>
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<td>• Identify key performance metrics</td>
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<td>• Collect data on performance and future vision</td>
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<td>• Analyze data and categorize emerging themes</td>
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<td><strong>Internal Stakeholders</strong></td>
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<td>• Input from those closes to the issue</td>
<td>Identify what is most relevant to the SOA’s focus in the near- and long-term future.</td>
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<td>• Determine the “gap” between what is current and what ought to be from the faculty perspectives</td>
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<tr>
<td><strong>External Stakeholders</strong></td>
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<tr>
<td>• Stakeholder engagement</td>
<td>Provide information to help form benchmarking questions and the SOA’s current state</td>
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<tr>
<td>• Ideas from the most influential stakeholders</td>
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<td>• Shape scenario issues at early stages</td>
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<td>• Improve quality of scenario outcomes</td>
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<tr>
<td><strong>Benchmarking</strong></td>
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<tr>
<td>• Survey peer and competitive universities</td>
<td>Identify the driving forces and key trends influencing the architecture and higher education worlds</td>
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<td>• Understand processes and practices driving the institution’s architecture program and future performance</td>
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<td><strong>Scenario Contingency Planning</strong></td>
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<tr>
<td>• Explore and prepare for implications of several alternative futures</td>
<td>Delineate those forces that are pre-determined and are most likely to significantly change the nature of the scenario.</td>
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<tr>
<td>• Avoid the dangers of single-point forecasts</td>
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<tr>
<td>• Surface challenging and alternative beliefs; faculty test assumptions against their vision</td>
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III. STRATEGIC SCENARIO VISIONING

Strategic scenario visioning (SSV) is a strategic thinking process by which components of strategic planning, visioning, and scenario planning are employed to generate divergent and creative thinking. While application of these methodologies is not new, their integration provides for a customized strategy process to explore and make sense of complex and disruptive issues [6]. For the School of Architecture, the design of this process linked the institution’s mission and vision to the future view of architecture education and the architecture profession. Thus, it enabled decisions, informed by insights and data, to be made in the present in anticipation of unpredictable future events. In essence, SSV provided the School with “the ability to act both with confidence and full knowledge of uncertainty” [7] as it looked to the future.

As a disciplined way to think about the continuing growth of the School of Architecture, Strategic scenario visioning helped leadership to learn and tell stories about the unknown future. These stories embody a wide range of ideas and possibilities that are integrated in a coherent way that made them useful. The content of these stories emerged through a facilitated process that involved data collection through a steering committee, benchmarking, and interviews of aspirant university programs in architecture, interior design, and landscape architecture. This body of
information was brought into reality in conversations that allowed future scenarios to emerge with the School’s faculty and the architecture profession. Each of the data collection stages are summarized below, starting with the facilitation.

**Strategic Facilitation**

The use of strategic facilitation in this process provided the School with the freedom to “perceived, understand, and act upon” the larger world of design education. Facilitation provided the space for the School to explore potential outcomes in order to address the overarching question of how does the School of Architecture ensure that they remain a competitive and viable entity for their institution and the profession. Data collection began with the facilitators, who brought a useful blend of strategic expertise, academic knowledge, and workshop facilitation to help the School take a future look at its programs by:

- Working with faculty to understand their perspectives and use their experience, knowledge, and networks to assess the changing context outside of the university and its environment
- Helping to build and balance stakeholder needs
- Gathering and interpreting data for this project, considering local and national contexts, and understanding the university’s challenges
- Benchmarking other universities, including peer institutions and leading universities in the field
- Building and coaching a steering committee composed of experts from the university, community, and the profession

Data collection was focused on a series of activities (Exhibit 2) that created a mixed triangulation set of qualitative, quantitative, and case-analysis data to help the School consider multiple realities and explore various possibilities to guide their scenario work. This triangulation of data pushed the boundaries for uncovering the key elements that were known, unknown and imagined to be considered as relevant influencing factors by all stakeholders. The stakeholder engagement process engaged many different voices to the discussion.

**Exhibit 2: Data Collection Activities**

![Diagram showing the sequence of activities: Internal Survey, Stakeholder Engagement, Benchmark Leading Practices, Scenario Planning]

**Stakeholder Engagement**

Stakeholder management is critical to the success of every project. By engaging the school faculty, the institution’s leadership, the profession, community, and other academic institutions,
this increased the likelihood that various perspectives would be considered. Those most impacted by the process and by the implications of disruptions on architecture education provided the information, influence, and support needed.

The benefits of using this stakeholder-based approach were that:

- The opinions and insights of the stakeholders help shape the project and the quality of the input at an early stage.
- Support from key stakeholders helped in the outreach for the right resources
- By communicating with stakeholders early and frequently, and ensuring that they fully understood what was being done and the benefits of the project, they became critical advocates for the process.
- The right stakeholders provided the perspective to anticipate what people's reaction to the project and allowed for interactions to gain and build people's support.

This stakeholder engagement exists on three levels. The first level used a steering committee consisting of sixteen representatives internal and external to the School of Architecture. The second level was an internally focused effort that solicited input from leaders, faculty, students, and other relevant schools within the institution. The third level was an external effort that included other schools of architecture, professional firms, and the accrediting and professional licensing bodies and associations. Most of the data was collected through survey and qualitative interviewing; however benchmarking was used to gain insights on what other schools of architecture were doing to address the disruptions.

**Benchmarking**

Gaining perspective on the changes within higher education by observing the efforts of peer institutions provided the opportunity to assess and better understand the disruptive challenges being faced at a more global level. External benchmarking focused on schools of architecture across different types of institution. The Benchmarking instrument used questions to uncover what participants knew and observed about their program and educational environment from past, present, and future perspectives. Benchmarking also identified program implementations being considered to position their institutions for the future. Example of the benchmarking criteria used for the School of Architecture is illustrated in Exhibit 3.

**Exhibit 3. SOA Benchmarking Criteria**

| A. Schools of comparable size | Architecture schools on a continuum from private to state to public institutions |
| B. Schools with integrated programs | Programs that included architecture, landscaping architecture, interior design, as well as other multi-disciplinary programs |
| C. Schools with professional affiliations | Schools with strong connections to external constituents, including AIA, NAAB, NCARB, professional architecture firms and other architecture schools – nationally and globally. |
Scenario Planning Process

The above series of activities provided the foundation to explore the constraints, changes, and relationships between the driving environmental forces that would become the fundamental sources of future change for the School. While the components of the strategic scenario visioning process involved aspects of strategic planning, scenario planning, and strategic visioning, at the heart of the process was scenario planning (Exhibit 4). This process began with establishing a clear view of the focal issue. That is, “what is the strategic problem that requires attention and consideration? In this case, the issue for the School was uncovered through numerous interviews, both within and outside the institution, and aligned through a facilitated process with the School’s faculty. Key factors that included environmental forces were gathered through a number of methods including brainstorming, conversations, expert interviews, as well as consulting reports, articles, books within the domain of architecture education interest and adjacent to this domain of interest. A fully explored list of social, technological, economic, environmental, and political ideas emerged that led to identification of categories of critical uncertainties and the development of the scenario logic. Challenging, plausible, relevant and divergent scenarios emerged that illuminated the focal issue. These scenarios are presented below in the Beyond Disruptions section.

Exhibit 4: Scenario Planning Steps

With scenario in hand, the School was able to then engage in an open discussion about their vision for the future. The School was able to have confident in some of their assumptions, and that certain trends might unfold in a particular way. Assumptions were able to be challenged in some cases and adopted as certainties in other cases. Some assumptions and trends were found to be unimportant and would not change underlying factors related to the future of the institution. Significant uncertainties were prioritized to use the scenarios in a useful way to challenge the assumptions made about how the School’s situation might come to fruition. The alternative scenarios provided the School alternative views into more unknowns that might come to pass.
Therefore, they are able to focus their strategic visioning efforts to explore disruptive impacts. The School based their assumptions on the evidence of data.

**Strategic Visioning**

The visioning process (Exhibit 5) focused on changes in the contexts in which the School of Architecture operates among: higher education, The University of Texas System and University of Texas Arlington specifically, and the design profession. Data driven analysis addressed the state of higher education and changes in the architecture profession and design education to identify value positions that the School of Architecture could develop as an integral part of an emerging Tier One institution. In addition to alignment with the university and the profession, it was important for the School to consider their unique value position and to understand how other schools are competing in the architecture education arena. By going through this exercise the School have an appreciation for what makes them who they are and what makes the School stand apart from others. This visioning process was intended to make the School aware of their current position and what changes might be required to enhance their future position.

**Exhibit 5: Strategic Visioning Process**

- **Gather Data**
  - SWOT (strengths, weaknesses, opportunities, threats)
  - PEST (political, environmental, social, technological)
  - Benchmarking
  - Interviews

- **Analyze Data**
  - Scenario Planning (Broad macroeconomic and Sociopolitical Trends)
  - Deep Dives

- **Act on the Data**
  - Align Activities for Consistency (with Vision, Mission and Values)

**IV. BEYOND DISRUPTIONS**

The School of Architecture’s vision continues to unfold. This summary outlines the scenarios which presented the School of Architecture with four different visioning environments. The School continues to develop its strategic plan to reflect the integration of the University and its global community in refining how they might address the issue of future architecture education.

This section introduces five scenarios to move beyond disruptions to design, and align the School of Architecture’s strategy and the changing organizational structures resulting from technological innovations.

The five scenarios from the School of Architecture strategic scenario visioning process were examined using two contrasting views of the future structure of architecture education. They were “adaptability” and “technology”. Four narratives were then derived from the variability of these two factors resulting in the scenario categories; Pervasive Technology/High Adaptability, Pervasive Technology/ Evolutionary Adaptability, Discrete Technology/High Adaptability, and Discrete Technology/ Evolutionary Adaptability. In addition, a wild card scenario was produced which questioned what the School of Architecture would be like if it were released from accreditation and other external controls.
At a broader level, the SSV process provides an effective framework for other entities, including the professions, to assess the robustness of their current state against different possible alternative futures. For the School of Architecture, these scenarios provided the narratives that opened up a dialogue to explore the implications and strategic options to move beyond the disruptions in architecture education. The five scenarios developed during this process are:

- **Right Tool for the Right Moment** - This scenario presents a view for achieving that balance between the evolving tools and methods of digital technology and the mental, physical and creative capability that is furthered by having the wisdom to recognize the difference between tools and thinking, and to choose the right tools for the right moment. Finding itself in the midst of the most breathtaking technological and cultural shifts since the Industrial Revolution, the School of Architecture recognizes that the key to responding to shifting needs and an unclear future lies not in a costly and never-ending technological “arms race,” but in our ability to foster understanding and creative capacity, so that these qualities can be employed in any situation. This scenario seeks a balance between the evolving tools and methods of digital technology and the mental, physical and creative capabilities that define us as human. This approach is well served by an evolutionary response to change, and a discrete approach to technology that builds higher technological capabilities and then provides targeted rather than universal access to the higher end, more sophisticated computer resources.

- **Slow and Steady Wins the Race** - The scenario advocates an evolutionary, as opposed to revolutionary, approach regarding the future of design education that emphasizes an egalitarian distribution of resources – especially technology – to its students. This scenario therefore seeks to maximize the fortuitous geographical and demographic reality, and it does so by underscoring that a tight focus upon serving the local population is the best strategy for successfully adapting to whatever unforeseen changes in design education might occur. An education system that is characterized by its severely unequal distribution of resources, [maximizing the geographical reality], the School of Architecture can respond to these realities of demographics and education in a positive manner by adopting an ethos of egalitarian distribution of resources, especially regarding technology. The evolutionary approach underscores those who are excellent at developing ideas, as opposed to creating them, once again mirroring the reality that designers rely heavily upon colleagues who know how to develop and implement their visionary ideas.

- **Robolution: Pervasive Revolution** - This scenario presents the possible adaptation of an institution that realizes the influence technology has in education and production, and how high levels of technology affect the way architecture and the design professions are being developed and taught. Adaptation to the new technology began with the revised lap top policy and redesign of the underutilized resources - all sponsored by private companies and firms interested in the experimentation of new materials, lighting, biomimicry, and behavior sciences, among others. It became something like “an open source studio” encouraging truly collaborative design, with all students in a particular studio working on the same design, rather than all working on separate designs with the same program. The studios are now taught in collaboration with other faculty and invited professionals, alternating duties to free up time for faculty research. Enrollment in studio
became also open to students in other design disciplines, who bring a different view to the work produced. Lecture courses adopted flip teaching to augment classroom instruction, making use of online media to introduce basic material while using class time for more in-depth exploration workshops. Intro to Architecture (ARCH 1301) is now taught as an online course making it accessible to non-majors; robots could be used by the teachers to give a lecture or review students’ work, by the students completing aspects of their education as distance learning. These robots, a kind of Segway with screen, are placed in different stations throughout the school, facilitated a new way of teaching where people from all around the world are allowed to teach or learn “side by side” to those in the locality.

- **Innovative Research Labs** - This scenario presents the extraordinary measures needed to embrace a position of revolutionary adaptability moving forward given external pressures to address growing student and population diversity, the exploration of new revenue streams, and the over-arching influence of digital technology will now necessitate an organizational shift of sizable magnitude. Within the next ten years the state of architectural education will undergo a radical metamorphosis to assimilate the social, cultural, and technological changes currently taking place at an unprecedented pace today. External pressures to address growing student and population diversity, the exploration of new revenue streams, and the over-arching influence of digital technology will now necessitate an organizational shift of sizable magnitude. Seizing the opportunity to make substantive and structural changes to the school focuses on the generation of Innovative Research Labs as the vehicles for both broad and deep response to these various external forces and the changing internal dynamics brought in by today’s students. While these Labs will serve as distributors of critical information – the charge of the School to these Labs will be to produce transformative knowledge. The School will seek strategic partnerships to identify the types of specialization tracks that will be offered. As a result of this new direction the UTA SOA will produce adaptive support structure for faculty capable of providing new and continuing educational opportunities. Large Format Robotic Lab will provide the collaborative platform for not only professional/industrial/manufacturing research and interaction – it will also become the fertile ground for cross-disciplinary interaction.

- **The Wild Card: Research, Innovation, Design** - Following the wild baccalaureate celebration on the arrival of the news that the Accreditation boards had been exiled from the School, an academic storm brewed. In the midst of what might appear to be a golden age of complete academic freedom, the School of Architecture came to realize that without the bounds of the accreditation overseer, all chaos would break loose, a tempest! To set its sights straight, a course to reshape the school adopted a new trajectory, which incorporated three basic tenets: Research, Innovation and Design. RID projects a curriculum, which incorporated the strengths of the school as a high quality design program, which embraces research, and innovation as inherent factors in a design education. Moving beyond the traditional attributes of craft, history and studio design, the idea of a distinctive competency established the idea of new ways to behave and think differently. Design is reiterated as a process, which includes collecting data, evaluation and experimentation; a clearer pedagogy focused on the development of the Management
Skills Acquisition Program; addressing the growing need for professional development, the act of training a student to “think like an architect” embodied the base education of the design pedagogy with real world experiences in project management, negotiations, team management, team dynamics, construction management and project feasibility. Combined with the Management Skills Acquisition program, the student-architect would establish themselves as professionals in training.

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REFERENCES