TRANS-DISCIPLINARY INQUIRY THROUGH CONVERGENCE OF ARCHITECTURE, DESIGN, ART AND HUMAN SCIENCE

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One process of thinking collectively and systemically is trans-disciplinarity by means of human inquiry. Two dimensions complexify research process: Engaging other inquirers from other disciplines and utilizing those disciplines in furthering inquiry. Research Activity System is promoted as a conceptual framework to facilitate productive, collaborative inquiry. The convergence of architecture, design, art and human science provides fertile ground for research foci. Particular attention is given to the construct inducement and its relations to induction and emergence to illustrate purpose, meaning, and value of trans-disciplinary inquiry.

1. Introduction

Remaining within one's specialization, what one knows most deeply, follows classical tradition, training, and socialization into a field of study. There are few today who would question the value and productivity of specialty science in the relentless pursuit by scientists to advance what can be known in every field of study, as evidenced in the mushrooming of our encyclopedic knowledge. As important as these pursuits may be, the questions posed for inquiry and demands on knowing to address contemporary problems through research make it increasingly difficult with each passing decade for us to expect answers that can come from a single discipline. Water pollution involves more than simply consulting a chemist. Species extinction is not the sole interest of biologists. Genetic mutation attracts researchers in fields adjacent to genetics. Poverty has gone beyond the purview of the economist and sociologist.

Whether it is a disease, a human predicament, or a changing topographical condition, it seems there are multiple factors relevant to a phenomenon of interest. In each case, a set of disciplines and fields of study emerge best positioned to inform us about each relevant factor. To confine one's knowledge and pursuits strictly within one discipline leads us to fall drastically short of understanding what one is studying. Such delimitations hamper applying sufficiently what one knows to the amelioration of human beings and the environment. Calling upon the collaborative input of colleagues in other disciplines having some relevance to the research focus becomes increasingly attractive and important in the hopes of more informative and effective outcomes, hence, reason and motivation for inter-, multi-, and trans-disciplinary research.

The purpose of this chapter is to build upon my prior contributions[1,2] and discuss further that architecture, design, art, and human science represent an important convergence illustrative of trans-disciplinarity. They represent a long-standing association expressed in our built environments and give a plentitude of foci for trans-disciplinary research.

2. Human Inquiry That Is Both Humanistic and Trans-disciplinary

Human inquiry entails research process that means its know-how or methodology directed towards a knowing or outcome. The inquiry traverses reality in space and time that becomes its ontology, while drawing upon the knowledge domains of one to several disciplines, that is its epistemology. An outcome is expected to further one to several knowledge domains. The inquirer depends upon at least one subject discipline or field of study to inform while engaging in the research context and process. While restricting inquiry to one or two knowledge domains may permit mono-, inter-, and cross-disciplinary study, research so confined can not become trans-disciplinary inquiry.[1]

I use the phrase human inquiry to mean research oriented to human beings, where the human being is put at its center. In this sense it is humanistic, or as sometimes stated, human science research. However, it would be to misunderstand the contemporary use of these phrases to define the language use narrowly, to think that its human-centeredness is so constricted as to be conceited and neglect vital relationships human beings have with other lifeforms and the environment. Human being is merely a point of reference from which all relationships are studied and ameliorated, ideally, for the welfare of all lifeforms. Since the nature of trans-disciplinarity and trans-disciplinary research is systemic in its orientation and use of multiple perspectives, the focus is on the relationships human beings have with other beings and the environment, not the human beings themselves. The essential facts are symbiotic, interdependent, and relational; one entity can not sustain without the other. In other words, contemporary perspectives on human inquiry are ecologically oriented. I intend the term humanistic to be understood in this broadened meaning. Where the enlightenment and humanism historically may be seen in the narrower conceptual meaning of humanistic, when a trans-disciplinary approach is adopted, because the inquirers are human beings, it is inherently honest and authentic to embrace their humanness as inquirers to use their strengths and weakness in the service of collaborative inquiry for a higher purpose that is beyond the benefit of individual human beings.

In my earlier contribution[1] I discussed a discipline or field of study in its various forms: mono-, multi-, inter-, trans-, and meta-disciplinarity. Salient characteristics were described that distinguish each form. Those most relevant to trans-disciplinarity can be recapitulated here.

In trans-disciplinary inquiry, a social dynamism energizes inquiry, where the collaborators bring to the process their disciplinary expertise to bear on the research focus without any preset agenda regarding it place and a priori contribution to the inquiry. There is only an implicit assumption of relevance and potential of contribution. The process is team oriented and collaborative with the common goal of addressing the research question from a multitude of perspectives that may provide a more comprehensive and informed answer.

The trans-disciplinary research team typically uses the well known and productive track of the general research cycle to follow the course of inquiry, that is: formulating clearly the problem, reviewing current status of what is known about the problem from all relevant fields of study, posing a researchable high priority question, constructing a methodology, observing and collecting data, processing the data, interpreting findings, reporting, and applying what becomes known to further inquiry.

Elsewhere[3,4] I have discussed the general movement through the process of inquiry in terms of a feedforward cybernetic loop monitored and steered through numerous feedback loops connecting various phases of the general cycle. In trans-disciplinary inquiry, moving from one phase to the next is enabled via group process and team oriented decision making, typically through assessment of feedback, with group realization of progress made in hindsight that one phase has been met at the time engagement occurs in the next phase.

3. Two Exemplary Challenges

There are two particularly prominent aspects or dimensions that complexify trans-disciplinary inquiry. The first concerns the number of inquirers that constitute the team of researchers. The second is the number of disciplines and fields of study pertinent to the inquiry.

There is no magic number of inquirers that determines what becomes productive and collaborative inquiry to produce answers. However, extensive literature on effective teams does recommend a small group,[5,6] with additional persons if necessary being a second tier in a consultative role to the core group. Effectiveness will depend on teamwork, in which each inquirer has a clear understanding of his and her role, and contribution to be made. Experts in the relevant disciplines and fields of study are usually selected as representative of those disciplines, but there is no privileged status to be given to any one discipline. Experience leading teams effectively is a more appropriate criterion to decide who is to lead the trans-disciplinary research team than the apparent centrality of any given discipline and field of study to the research focus. If need be, a leader independent of the relevant disciplines is also an option. In general, the more inquirers participating in the core group, the more complex the inquiry becomes, due simply to the level of interactions required and concordance necessary to bring about feedforward through the research cycle.

The concern usually arises, how many disciplines and fields of study need be tapped and represented in the inquiry to improve the chances the process will be productive and lead to answers? The problem focus always has a context. The field or fields of study affiliated with and drawing interest to the problem typically define the initial disciplines. The issue more often than not becomes where to draw the line to delimit those primarily constituting the core group, leaving others to make peripheral and consultative inputs. In general, the more disciplines and fields of study that become primary, the more it complexifies the process of inquiry, per same reason noted above for team size. One dynamic and flexible solution to this tension is to have a committed core group of three to five persons, for example, with other experts moving between this group and the periphery as needed over the course of the inquiry. In this way, several relevant disciplines can participate, and the chances of producing truly trans-disciplinary knowledge becomes much more likely as a result.

Early decisions on team size and primary disciplines focus inquiry. These decisions are critical to team formation and often anchor the inquiry with an institutional home that enables securing subsidy, because core persons become the principal investigators seeking and accounting for funding the inquiry.

Various aspects that complexify small group dynamics are indigenous to the conduct of trans-disciplinary inquiry. The two dimensions discussed are merely representative of several the team must consider to navigate the research cycle successfully. It is helpful to consider the team approach converging a multitude of disciplines as a complex human activity system.[7]

4. Research Activity Systems

Human Activity System (HAS) is a construct of convenience and meaningful to conceptualize a group of persons interacting for an agreed upon purpose, common need, or shared pursuit. As stated in an earlier contribution,[8] its defining characteristic is interaction among persons. Activity that makes the system visible consists of interactions. Much of the time it exists only in our imagination; however, when we are actively participating, we contribute to its vitality and sustainability. We participate in many such systems throughout our lives, specifically, social networks, associations, institutions, and business establishments of all kinds.

HAS was initially given recognition through the development of soft systems methodology.[9] I have found it a very useful construct applicable to forms of trans-disciplinary inquiry. A human activity system devoted to trans-disciplinary inquiry described above, I call a Research Activity System (RAS).[3] For example, a doctoral dissertation I supervised illustrates one form of trans-disciplinary inquiry, in this case the construction of a web site for professionals helping children with disabilities.[10]

In my current pursuits, other applications of RAS can be found under the acronym ADAHS, meaning Architecture, Design, Art, and Human Science. During the last two years, I have been developing the basis for this track through the graduate programs in Human Science at my university in collaboration with a group of my colleagues in the Department of Building and Environment Science and Technology (BEST) at the Politecnico di Milano, Italy. The Project, as we call it, is a proposed agenda that affords a range of opportunities for graduate students, their faculty, and experts from various sectors outside the university to converge their common interests on a research focus and engage in trans-disciplinary inquiry.

5. In the Eyes of the Beholders

Salient in our collaboration is the experience of space traversing the built environment organizing a place. Our common interest is truly in the eyes of the beholders. What is it like to live and be in a place, the spatial organization, the composition of objects that surround us? Is the horizon visible? What can we see standing on the ground, in contrast to elevated areas in close proximity? Is the place claustrophobic (other built structures and natural objects crowded together)? Where is there openness, where objects are scant and spaciously distributed? The ontology of places are the experiences of being preoccupying their inhabitants as they do the architects who design them. We came to a common understanding that this general research focus was one worthy

of trans-disciplinary studies within and between our education institutions.

6. Architecture

Architecture is a discipline and profession that concerns transecting and organizing the spaces in which human beings inhabit. Its practices result in spatial contexts designed to control, steer, and induce a wide range of behaviors and experiences. The architect must bring to bear not only known principles and properties of physical matter and stable materials of construction, but also such seemingly disparate knowledge domains as aesthetics, functionality, utility, and the human sciences (p ex anthropology, economics, history, political science, psychology, and sociology).

From a human science perspective, the architect has been placed by definition of the discipline at the very center of designing our built environment, and for this centrality, it has seemed to us that this discipline is primary for trans-disciplinary studies of space and place. Architecture provides a convenient center, even executive position in many inquiries, interacting with many other disciplines pertinent to making key decisions that transect and organize space and place.

7. Design

The construct has several meanings, all of which can be applied to the Project and trans-disciplinary research. Particular organizations of space can readily become templates of design. Prominent lines and curves, volumes and shapes, solids and empty hollows are important design features for transecting, sculpting, and organizing space. Any focus on place, from an object (micro-level applications, p. ex home furnishings) to a sector of the environment (macro-level applications, p. ex urban planning) has many possible designs to consider. Think of the kind of furniture that occupies a room, the trim on the outside of a house, or the layout of a village.

Another kind of design is the configuration of all resources and persons that need to be coordinated to progress through all phases of the research cycle of any specific trans-disciplinary inquiry. In such uses, the construct is termed the research design of the inquiry. Various design decisions, such as team size, forms of data collection, and materials to enable inquiry, can follow particular patterns, that is, research designs.

In sum, there is a general quality about design that enters into all fields of study and disciplines, whether patterns in nature or floor plans of buildings, that lead us to bring this construct into primacy for trans-disciplinary research, hence its prominence in the ADAHS track.

8. Art

The third general aspect and resource we have brought to ADAHS and our Project is any kind of artistic dimension relevant to the inquiry, because art enhances the human experience of space and place. While there have been periods in human civilization of extremes, from the elaborately ornate facade to the minimalist modern plane, few places of inhabitation remain untouched by human hands once occupied. Once a place is occupied for a period of time, human beings have a compelling

propensity to add and alter something in an artistic fashion to make the place a home.

Artistic dimensions bring to inquiry many possibilities that are truly human. Humans are the only living beings to our knowledge that engage in art making with intentionality and purpose generative of adding meaning to and evoking appreciation of their world. Art has become an inherent part of space and place as we experience them.

To interplay art and science is advantageous in trans-disciplinary studies. Where art reminds us of the innovative, creative, and intuitive sides of conducting inquiry, science reminds us of the training, decision rules, and proven step-by-step methodical procedures that ensure discipline in inquiry. But it does not to follow that one lacks in or should be kept separate from the other. The artist relies on the science of inquiry for knowledge of construction and materials, and the scientist relies on the art of inquiry for inspiration and breakthroughs. In other words, there is an art and science present in every trans-disciplinary study.

9. Human Science

ADAHS draws upon all disciplines and fields of study pertinent to the four key constructs, the fourth referencing the science of what is applicable to human beings. Several statements have already been made alluding to the meaning of the phrase human science. The contemporary delineation is vastly broadened from its narrower central European definition of the nineteenth century, often translated from the German "Geisteswissenschaften" as Human, Cultural, or Humanistic Studies. This narrower definition favors such disciplines as history, hermeneutics, and select humanistically and culturally oriented areas of study.[11] However, since the middle of the twentieth century, social and behavioral sciences as well as the arts and humanities have been tapped collectively. There are various research methodologies being advanced to conduct research with human participants. One such arena illustrating the point is the increasingly complex genre of ethnography.

I think one impetus for this broadened view of human science has been the sweeping influence of general systems theory since the 1950s, in which researchers have been encouraged to cross disciplinary boundaries to study and explain phenomena of all kinds across all disciplines and fields of study, in terms of systemic relationships.[12] To seek knowledge with maximal generalizability is to foster trans-disciplinary knowledge. Sixty decades later, the many systems oriented societies, associations, ongoing journals and textbook publications, and annual conferences have become global human activity systems. We can easily perceive this massive development to be essentially a social cultural movement toward trans-disciplinarity. But we must keep in mind the trend toward a broadened view of human science is but a side regional consequence, perhaps benefactor, being dwarfed by the larger and global general systems theory movement.

In the first decade of the twenty-first century, this broader meaning of the phrase human science continues to expand, as inquirers advancing research methodology for human oriented inquiry frequently ignore the established divisions among the disciplines and fields of study that have dominated ways and means of advancing knowledge domains in prior centuries.

Regarding the Project, we have taken the broadened view to define human science to be any set of disciplines and fields of study that have relevance to the human relationships of the research focus. To reiterate an earlier point which needs repeated emphasis, the relation between humans and their environment is implicit in this humanistic orientation. In fact, the relationship helps tremendously to make evident those disciplines most connected to the research interest. For example, imagine a research interest in a new planned senior residence community and its impact on its future inhabitants and surroundings. A trans-disciplinary action research oriented inquiry would not only involve architects, designers, artists and social scientists, but also prospective seniors who would consider living in this community, neighboring residents and regional planners. Furthermore, economic, political, socio-cultural, historical, and environmental interests, through expertise from these disciplines, often become equally relevant to the inquiry. How best to consolidate the research team, drawing upon ADAHS and these inputs, exemplifies the complexity and challenge of conducting trans-disciplinary inquiry.

10. Confluence and Integration

The rationale presented previously and elsewhere[1,8] for trans-disciplinary research is best communicated by the ideas of confluence and integration. The general challenge is to relate several disciplines and fields of study to define the research focus. In the case of the Project, as discussed above, we have favored architecture, design, art, and the human sciences to give shape to possible foci for trans-disciplinary studies. Ideally, any set of disciplines and fields of study may be chosen, again, depending on the research focus.

On the one hand, as we are doing with our Project, we have found common interests, which in turn generate possible foci for trans-disciplinary study and research. As the participants become more involved, a specific focus can become clear. Eventually a researchable inquiry takes shape with key principal investigators and secondary experts. For example, graduate students embark on focused theses and dissertations involving trans-disciplinary inquiry in an aspect of ADAHS expressed in terms of their research interest. Faculty embark on collaborative inquiries that integrate in some fashion ADAHS with students and colleagues.

On the other hand, an inquirer enters the field to make known his or her research interest. This call can act as an attractor to draw together various persons from several disciplines and fields of study possibly relevant to the inquirer's research interest. From this conference arises a trans-disciplinary team to seek support, resources, and conduct the inquiry.

It may appear to be a contradiction whether the focus defines the disciplines or the converse. The confluence is a dynamic, not a rigid conceptual dichotomy. Once the process begins, by however means, I find they drive each other. There is a reciprocal relationship, a feedback loop if you will, that can commence inquiry from either direction, and once underway, what may appear to be a contradiction dissipates.

The idea of integration appears most importantly in the efficacious teamwork through various phases of inquiry as well as the contributions of trans-disciplinary knowledge to various knowledge domains. One of

the great advantages of trans-disciplinary inquiry is the need to integrate knowledge it generates, so that it can be communicated and used in those disciplines streamed together to address the research focus.

11. Induction, Emergence, and Inducement

Both induction and emergence were defined and discussed in my prior contribution on their relevance to the study of space and place.[8] At this juncture, I triangulate these two ideas with inducement.

There is an important link between induction and emergence. In the sense of input and output, we can think of the manifestation of input as the induction, and that of output, the emergence. This simplistic conception is intended for research purposes only and not theory building for the sake of parsimony. What I find promising for inquiry is a more careful examination of an earlier interest, stemming from environmental psychology,[13] in knowing living conditions that influence human beings in particular ways. What are the essential induction-emergence relations for various configurations of the build environment? Colors, volumes, horizons, densities, art forms, and objects provide an extensive array of inductions. Interactions, moods, emotions, productivity, creativity, gregariousness, memories, and well being constitute an extensive array of emergent processes, states and consequences that can be studied on both individual and collective levels. The study of these linkages is one aspect of ADAHS and the Project.

But the processes, states and consequences manifest in the relationships must not be confused, as subtle as the distinction may appear, from emergent properties that come to be associated with the space and place itself. Familiar to us is the knowledge that the color and texture of an object are two of its emergent properties. Similarly, from particular organizations of space manifest in the built environment there emerges characteristic relationships one can term emergent properties. For example, orderly queuing by and large is an emergent property of placing posts and ribbons at airport check-in counters, compared to chaotic queuing without them in this environment.

As to inducement, I consider it an equally important construct, because it is anticipatory to induction. An inducement has a potential to induce. It is an empirical question what that might be and to what strength an inducement might by induction become an emergent property in the space and place. One major type of inducement is a particular way of organizing space in a specific place, hence, its critical relevance to making architectural decisions. To give one blatant example, cutting the space into thoroughfares that allow persons to pass each other going opposite directions is altogether significant compared to completely separating streams of transiting persons into two one-way corridors. Knowing the consequence of inducements in advance may be critical to wisely organizing space for efficacious human activity. In this simple example we can come to know what the emergent properties of the place will likely be from the choice of inducements involved in the architectural decision. However, there are no guarantees such knowledge can be applied to related locals, as the unintended consequences also have to be studied. Human beings are amazingly adaptive and given to surprising those who section space to induce human activity. Being able to modify spaces to adapt to human behavior helps, as evidenced on many college campuses in the United States that have added concrete

and asphalt paths like chords across quads and grassy areas, rather than fence to fight rebellious traffic flows.

Another exemplary area for trans-disciplinary study of inducements is the interface between real and virtual space. Our world increasingly is no longer what it was fifty years ago. Invasions of the television, mobile phone, and computer have significantly altered our built environments. In numerous places we socialize, dine and meet, we have lost the choice to turn on and off a virtual realm, as exemplified by the stream of television images on the large flat screen that competes continuously for our attention with live human beings. These virtual spaces link us to virtual places. With televisions streaming on walls and neighboring cell phone conversations where ever we are, formerly quiet private places become public domains. We experience a more porous existence, not enclosed in the physical room at hand, but occupying a place of its own character with virtual windows into other worlds. These technological inducements lead to what inductions and emergent properties in the spaces and places we inhabit? Under what conditions and circumstances are they useful, ameliorative, and detrimental to the human condition and the environment? We expect trans-disciplinary knowledge reaped from answers to such questions will be most helpful to architectural decision making.

There is one further example of inducement that likely illuminates its importance between the real and the virtual, that is, the imaginary. Road signs induce us to imagine what there is supposed to be and where various landmarks (places) supposedly exist in space (Figure 1). Road signs assist us to enter, traverse and exit various places, and find anything indicated in the place. They prompt us to organize our cognitive map of the territory accordingly. They are anticipatory to what they communicate. They influence our relationship to the environment often before we reach the indicated destination. Human beings simultaneously engage the real, virtual, and imaginary realms. Road signs, which are full of signs and symbols, illustrate poignantly inducements, imaginary as they may be, that mediate experiencing, navigating, negotiating, and adapting to the build environment.

Fig 1. Road signs are inducements that organize space and place.

12. Programmatic Trans-Disciplinary Studies and Research

The thrust of ADAHS is programmatic research. ADAHS provides an arena for students, faculty, and colleagues to conduct many studies compliant with the goals of the Human Science program of the author's university, as well as, to prompt parallel developments with my colleagues and collaborators[14,15,16] in BEST, Italy.

From the prospective of the ADAHS, we posed a set of general questions that help to communicate parameters and potential directions for trans-disciplinary studies and graduate student research. The list emerged through enthusiastic pushes for several initiatives to address the ADAHS convergence and integration in depth. Although subject to continual improvement, at this writing they are presented in Table 1.

- What contributions can the human sciences make to architectural design and decision-making for a better understanding of the ways people perceive their built environment?

- What advances can be made to improve methods of building processes, such as Post-Occupancy Evaluation and Building Performance Evaluation, and related methodologies and metrics, in assessing the "success" of architectural projects and in improving the design decision-making process?

- With keener attention to the heritage values of historical urban settlements and landscape, what contributions can inhabitants' perceptions of their built environment and their values make that can be brought to bear on architectural design and decision making?

- What can be done to improve the efficacious use of systemic approaches to architectural design and decision making?

- What social and psychological effects of architecture on our daily life are the critical ones to know and take into account in making built environments for healthier, "greener," and ecologically more viable domiciles adjacent to as well as within larger communities?

- What qualities of and innovations for organising space foster transformative effects for human and ecological betterment without adverse secondary effects of environmental degradation?

- From the architects, builders and designers to the residents, what are the qualities and innovations that produce the landscape-dwelling interactions that produce and sustain their best practices for healthier living?

Table 1. General research questions for ADAHS and the Project.

These questions create a foreground. We expect the range of questions pursued to take on greater specificity and definition with particular trans-disciplinary research teams, collaborative inquiries among faculty, our publications, and student dissertations and theses.

We also worked through several drafts of the Project to express our aims, as stated in Table 2, that seemed to cover the chief interests of our group.

- The systemic nature of architecture as a complex mean to produce the built environment.

- The concept of emergence to describe and analyse architecture and the built environment, as simpler higher-level order processes resulting from the conscious and unconscious interactions of many agents in the more complex lower-level order processes belonging to the larger system represented by society as a whole.

- The systemic contributions of different sciences to architectural design and decision making for a better understanding of the ways people perceive their built environment and social systems acquire emergent properties.

- The importance of sound methods, such as Post-Occupancy Evaluation and Building Performance Evaluation, in assessing the built environment and in evaluating the success of architectural projects at different scales according to the users' perceptions, thus offering an important feedback methodology for the building activities as well as architectural practice.

Table 2. Main subject interests and aims of the Project.

Finally, we noted five foci especially important to be pursued by means of trans-disciplinary studies, research, and professional activities. They are listed in Table 3.

- The systemic approach to architectural design and decision-making.

- The contributions of the human sciences to architectural design and decision making for a better understanding of the ways people perceive their built environment.

- The contributions of the science of complexity, its methods and models to the theoretical base of principles establishing the Project.

- The social and psychological effects of architecture on our daily life.

- The inhabitants' perceptions of the built environment and their values, with keener attention to the heritage and landscape values of historical settlements.

Table 3. Foci of special importance necessitating trans-disciplinary inquiry.

Despite the overlap and repetition across tables, we considered it helpful to work with all variations to maximize interest from others in ADAHS and the Project. From resultant programmatic research within and between both of our institutions we expect applications that will take full advantage of positive inducements anticipatory to healthier built environments of the future.

13. Summary and Conclusion

The admission of knowledge into inquiry from multiple disciplines and fields of study requires a form of thinking that transcends disciplinary boundaries built up over decades specializing knowledge domains. The process of formulating such an inquiry engages inquirers in trans-disciplinarity.

The process of trans-disciplinary inquiry is conceptualized in terms of a general research cycle of feedforward with numerous feedback loops, conducted as a group oriented collaborative form of human inquiry. Overall, the aim of this kind of inquiry is to generate trans-disciplinary knowledge applicable to the knowledge domains contributing to the inquiry.

Several aspects of doing trans-disciplinary research complexifies inquiry. Two aspects are of particular interest: The number of inquirers forming the core research team, and the number of primary and secondary disciplines represented and contributing to inquiry.

As to dynamics of research process itself, what is known about the effectiveness of the small group in action and the RAS are helpful applications for conducting trans-disciplinary research.

While our intentions are modest in promoting ADAHS and the Project between our two universities, it is our desire that these pursuits may contribute new graduates and advance knowledge domains for the larger cause of more humanistic and human science oriented built environments of the future.

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