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Design Paradigms and their Impact on Education

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ABSTRACT

The article outlines three generations of design theories and methods based upon review of two volumes: Jean-Pierre Protzen and David J. Harris. *The Universe of Design: Horst Rittel's Theories of Design and Planning.* Routledge, 2010; and *Non-Essential Knowledge for New Architecture* (ed.) David L. Hays. 306090 Inc. 2013.

Design paradigms outlined in the two volumes are based upon ways of thinking, linear and lateral, convergent and divergent. They are reflected in methods developed to solve problems: algorithms, argumentation, and grounded speculations. The first generation was based upon linear thinking and technical rationality; second generation acknowledged design as a wicked problem and used argumentation as a method; and the third generation advocates lateral thinking.

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Three Generations of Design Paradigms

The review article outlines evolving paradigms of design theories and methods based upon review of two volumes: Jean-Pierre Protzen and David J. Harris. *The Universe of Design: Horst Rittel's Theories of Design and Planning.* Routledge, 2010; and *Non-Essential Knowledge for New Architecture* (ed.) David L. Hays. 306090 Inc. 2013. The design paradigms are based upon ways of thinking, linear and lateral, convergent and divergent. They are reflected in methods developed to solve problems: algorithms, argumentation, and grounded speculations.

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Academic discourse on the implications of design theories and methods on professional education is relatively recent given the long history of design practices and their professionalisation at the beginning of twentieth century. The scientific approach used post World War II for technological development shaped the first generation of design methods originating in operations research and cybernetics. In following the model of technical rationality founded upon logical positivism, this paradigm ignored the long-standing apprentice model of design education centered on precedents, exemplars, and atelier learning from the master architect. The second generation of design methods repudiated scientific rationale based on causality and espoused the subjective nature of design. Argumentation and reflection-in-practice were recognised as valid modes of design enquiry. The third generation builds on the insights of the previous generation and advocates lateral thinking and grounded speculations in design.

Design as a Wicked Problem

Horst Rittel's (1932-1990) publications and unpublished papers written over two decades for faculty seminars at the University of California, Berkeley and collected in the volume *The Universe of Design* edited by Jean-Pierre Protzen and David J. Harris reject the assumptions and procedures of the first generation methods. Rittel's writings offered a new paradigm for thinking about design, a striking departure from the older linear model of problem framing through analysis leading to generation of solutions, their implementation, and evaluation in recurring feedback loops. Rittel described design as a wicked problem that cannot be solved in discrete steps in a linear sequence leading to the correct solution. He pointed out that in design there is no clear separation between problem definition, synthesis, and evaluation as the designer's understanding of goals and how they may be achieved changes through the design process. Although his background was in mathematics and theoretical physics, and he was one of the founders of the first generation Design Method Group, Rittel's teaching experience at Ulm School in Germany and later in the Department of Architecture at the University of California, Berkeley, brought about a radical shift in his understanding of the nature of design, its methodology and knowledge base. He understood design to be subjective, an exercise

in the application of power, and recognized its practice to be beyond the reach of systematic procedures that rely on a definite problem formulation made possible by lack of ambiguity and uncertainty (Rith and Dubberly, 2006).

Rittel's brilliant insights - the design problem cannot be clearly formulated and is therefore wicked, is unique and cannot be generalised, is

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a symptom of another, higher-order problem, and in its formulation lies its solution-revealed the inadequacy of the first generation systems approach. Its shortcoming lay in what he called the 'paradox of rationality' meaning that following the causal chain of consequences into the future can only lead to uncertainty. Rittel recognised the 'epistemic freedom' of the designer, i.e. s/he has many ways of formulating the problem to bring about the desired state of the world. Since design takes place in the world of imagination, he believed that the consequences of actions in the real world should be carefully deliberated to avoid two kinds of failures—when the plan does not accomplish what was intended and when its implementation causes harmful side- and after-effects. Designing for him was an act of social responsibility.

Rittel made no distinction between planning and design and proposed that the process should be argumentative in order to articulate underlying values, negotiate goals for maximizing collective interests, and arrive at an acceptable compromise among conflicting positions. To solve planning dilemmas he developed the digital tool–Issue Based Information Systems–that has had significant impact in improving the design rationale in computer science. Rittel's immense contribution to design pedagogy lies in understanding design as a communicable process, de-mystifying it and bringing it out of the mental black box. However his impact on architecture (and its sister disciplines) has been limited likely because he did not fully explore historical precedents, site conditions and materiality, as well as the designer's embodied experiences and tacit knowledge in shaping the design process. Schon (1983) described the design method as trial and error and reflecting-in-action where there is no separation of thinking from doing. Cross' (2011) protocol studies of product designers' thinking in action revealed the emergence of design concepts in the process of framing problems. Designers had the ability to move easily between concrete representations and abstract thought, and between thinking and doing.

Examining the Accepted Wisdom

(Non)-Essential Knowledge for (New) Architecture edited by design theorist and landscape historian David L. Hays exemplifies the third generation approach to design theory and methods. This volume, fifteenth in the series published by 306090 Inc. brings together cutting edge thinking in eighteen essays by young designers. As the title promises, the

book breaks new ground in design discourse and is essential reading for those interested in design epistemology. Hays' introduction is a thoughtful essay on design knowledge and its positioning at the center and margins of the discipline. He provokes the reader into examining what is accepted as essential knowledge for architecture. He warns us of the danger of it becoming a dogma, an ossification

> **Hays' introduction is a thoughtful essay on design knowledge and its positioning at the center and margins of the discipline. He provokes the reader into examining what is accepted as essential knowledge for architecture. He warns us of the danger of it becoming a dogma, an ossification that tolerates no deviance from the straight and narrow path towards an established goal.**

that tolerates no deviance from the straight and narrow path towards an established goal. Modern architecture and its global counterpart, the International Style, is a prime example of a creed that outlived its promise of being innovative and socially progressive and ended up destructive of place making building traditions, especially in the third world.

Rittel categorised design knowledge as: factual (what is), conceptual (meaning), explanatory (understanding), instrumental (how to solve), and deontic (what ought to be). His knowledge taxonomy was tied to problem solving within the social-political economic realities at hand, even as it espoused a non-linear method in achieving a desirable future. Hays opens up our knowledge vistas by advocating non-essential knowledge as 'broadening, enriching, clarifying', to be employed in lateral thinking as a way of 'viewing the problem in a new and unusual light'. He describes it as 'the previously forgotten, the currently undervalued, the generally misunderstood, or the not yet recognized'. He justifies its use in design as 'well-suited to contemporary interests in complexity, emergence, and resilience, which prioritise versatility and adaptability'.

As a landscape historian, Hays is interested in taking semantic section cuts through history for charting shifting meanings of design concepts and formal typologies. As an artist and designer he considers 'making' a form of design research, in which firsthand knowledge of materiality promotes grounded speculations on new forms, materials, technologies, and ultimately meanings (Hays, 2011). As a design teacher he encourages his students to take an experiential design approach towards understanding and transforming landscapes through full-scale design installations, portable or fixed in space. As he describes, landscape is 'structured perception and situated event, a way of perceiving action in place' (Hays, 2014). This understanding of place making expands the ambit of design beyond the purely formal and visual to include human intentions and values. He considers design experiments to be crucial for developing embodied knowledge of site conditions and materials in the novice designer that become the foundation for expertise valued by the profession (Hays, 2010). This third generation design method centered on physical models and concrete experience, although similar to historic and traditional ways, is unlike the use of mathematical and linguistic models in first and second generation methods.

The volume is an interesting compendium of essays grouped under the headings - *Prognostication, Reversal, Historical Space, Mathematics and Form, Profession, Visualization, Thought Experiment,* and *Empathy*. They cover what would be considered non-essential knowledge in contemporary design education - projective geometry, geometric model making and mathematics; reception of historic landmarks such as the Seagram building and medieval cathedrals; ethnographic literature on trapping; and archaeological archives - among other topics. The chapter by Catherine Seavitt Nordeson on feral bestiary, a semantic section through landscape history, discusses the meaning of paradise and its inversion in the East for drawing a parallel with current efforts by conservation biologists to return domesticated animals to wilderness. The sensual experience of spaces generated by new and unusual media such as cinematic-aided design and dream architecture is proposed to be the subject of design research in two essays by Amir Soltani and Chris Teeter. The chapter on futurology by Ludwig Engel and Johannes Gabriel discusses forms of complexity and types of knowledge for dealing with uncertainty in planning scenarios. Ellen Hartman employs the magical art of geomantic divination in face of inevitable uncertainty, in proposing the rehabilitation of nuclear missile fields in the Great Plains of North America. Read together the essays in the volume successfully elaborate upon the conceptual frames of third generation design thinking in Hays' introduction.

New Thinking in Design Curricula

What would be the impact of the emerging design paradigm on the professional design curricula? It calls for flexibility and open-endedness, and the possibility for building a specialisation in a chosen area of interest, however non-essential to contemporary concerns it may seem to be. For example, in the heyday of International Style in Architecture, the discourse on regionalism was peripheral, until it assumed center stage in the current preoccupation with sustainability. The universal design vocabulary gave way to local and regional vernacular styles that are climatically adaptive and enhance the sense of place. History was not central to the professional curricula built around Modern Architecture, but assumed importance in post-modern design styles and has become increasingly relevant as globalising societies strive to protect their urban and environmental heritage. Landscape architecture, considered to be a discipline auxiliary to architecture for much of the last century, has assumed centrality in design discourse with the abandoning of the ideal of building as a static and isolated object for dynamic, adaptive, and flexible models (Hays, 2004).

The need for change is pressing in design education in India where courses imparting technical skills form the core in majority of professional curricula. For design innovation to occur the technological emphasis needs to be complemented with the humanist traditions of place-making celebrated in the arts and literature. To take one example, mythology has played a central role in imparting meanings to the vast artistic corpus produced by Indic civilisations over three millennia. Its oral traditions have survived but are barely alive today, and certainly not considered in any way to be essential knowledge for informing planning and design. Their coded language speaks of ways of achieving harmony with nature's rhythms in producing human habitat and in everyday spatial practices. In the twenty first century technology-driven world of today, incorporating their esoteric meanings in design to reclaim the lost environmental ethic is essential for a sustainable future. ■

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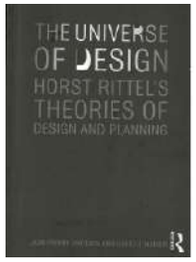

Excerpt from *The Universe of Design: Horst Rittel's Theories of Design and Planning* by Jean-Pierre Protzen and David J. Harris. (Routledge, 2010), pp. 187-188.

Everybody designs sometimes; nobody designs always. Design is not the monopoly of those who call themselves "designers". From a downtown development scheme to an electronic circuit, from a tax law to a marketing strategy, from a plan for one's career to a shopping list for next Sunday's dinner - all of these are product of the activity called design.

The scope of entities designed is vast and the knowledge employed in design is very diverse, ranging through all aspects of human experience. Only if there is some specific commonality between these activities in spite of the great diversity of the objects they deal with, it is justifiable to talk about design in general terms. I contend that there are such characteristic commonalities which demarcate design from other forms of coping with difficulties.

What are these commonalities? All designers intend to intervene into the expected course of events by premeditated action. All of them want to avoid mistakes through ignorance and spontaneity. *They want to think before they act.* Instead of immediately and directly manipulating their surroundings by trial and error until these assume the desired shape, designers want to think up a course of action thoroughly before they commit themselves to its execution. Designing is plan-making. Planners, engineers, architects, corporate managers, legislators, educators are (sometimes) designers. They are guided by the ambition to imagine a desirable state of the world, playing through alternative ways in which it might be accomplished, carefully tracing the consequences of contemplating actions. Design takes place in the world of imagination, where one invents and manipulates ideas and concepts instead of the real thing—in order to prepare for real intervention. They work with *models* as means of vicarious perception and manipulation. Sketches, cardboard models, diagrams and mathematical models, and the most flexible of them all, speech, serve as media to support the imagination.

Design terminates with a commitment to a plan that is meant to be carried out.

The act of designing can be fun: what would be a more rewarding pastime than to think up some future and to speculate how to bring it about? However, what is troublesome is the recognition that the plan may actually be carried out. If so, the designer faces two possible kinds of failure. A type-1 failure has occurred if the plan does not accomplish what was intended. A type-2 failure has occurred when the execution of the plan causes side and aftereffects that were unforeseen and unintended, and prove to be undesirable. Normally, mainly the fear of the latter types of failure spoils the fun of design: have I forgotten something essential? Designers worry.

Many forms of mental activity take place in the course of design. Designers think more or less coherently; they figure, they guess, they have sudden ideas "out of the blue," they imagine, speculate, dream, let their fantasy wheel freely, scrutinize, reckon, they "syllogize." Much of the mental activity (some would say most) resides and occurs in the subconscious. We certainly do not understood, and we may never know, everything about all the intricate workings of our mind. But a very significant part of design happens under conscious intellectual control. Since design is intentional, purposive, goal seeking, it decisively relies on reasoning.

Studying the reasoning of designers becomes a way of attempting to understand how design happens - possibly the only way. We may not know much about reasoning either, but at least it is not nothing.

Excerpt from Introduction by David L. Hays (ed.) in *Non-Essential Knowledge for New Architecture*, (306090 Inc. 2013), pp. 19-20.

In contemporary design, center and the edge are no longer the exclusive sites of knowledge formation. Instead, meaningful work is being pioneered laterally, in unexpected yet relevant ways. That diffusion of capability and significance has redefined the terms[i] of disciplinarity just as guerilla tactics once transformed the experience of war. The center has been decentered. The margin has been marginalized. The front line is no longer a line. In the past, the military front line was literally a line - for example, the trench systems of the Western Front during World War I - but conflict, like innovation, is now pervasive. It can emerge anywhere, at any time, and at any scale. The ability to effect broad change through discrete gestures - for example, deploying a building a park to catalyze urban economic redevelopment—was formerly the preserve of -crats[ii] and -archs[iii]" autocrats, bureaucrats, and technocrats; monarchs, oligarchs, and (st)architects[iv]. Now the novice has that capability, operating from the side lines. The start-up is both an upstart and a star.

Prioritizing non-essential knowledge as a path to new architecture means eschewing linear frameworks in favor of later methods, diverging from the conventional path without losing relevance: for example. By repeating, reversing, or returning. Categories of non-essential knowledge might include the

previously forgotten, the currently undervalued, the generally misunderstood, or the not yet recognized. Lateral methods are idiosyncratic[v] but not arbitrary[vi]; in fact, they are predicated on relevance, as they linger[vii] on matters at hand rather than abandoning them for some distant, preconceived goal. Inefficient relative to linear conventions, such approaches are well suited to contemporary interests in complexity, emergence, and resilience, which prioritize versatility and adaptability.

In this new architecture, expertise is demonstrated through the ability to generate many distinct yet plausible responses, rather than one ideal solution, to any given problem. Such virtuosity is a function of resourcefulness. Within education, that sort of open-endedness is at odds with the well-intentioned yet narrowing and reductive culture of learning objectives, outcomes, and assessments, in which "effective"[viii] teaching means declaring in advance what students should know and guiding them to that point. Educators can, and likely will, continue to teach fundamentals in such a way, presenting education as transmission of a useful body of knowledge. But, in truth, they do not know, nor can they know, what students will actually do with that knowledge, if they make use of it at all. A more reasonable approach is to equip students for an open range of possibilities - the future-we-cannot-know. And that calls for a new way of thinking about disciplinary knowledge, one that abandons the corporate model defined by essential lines in favor of something more distributed and abstract: not a form but a condition or quality: a mood; an attitude, sensibility, or ethic. Less a modus operandi than a modus essendi - a way of being.

Not linear and determinate but lateral and indeterminate. Non-essential as both fundamental and necessary - and therefore new. ■

[i] Term: "Middle English (denoting a limit in space or time, or (in the plural) limiting conditions): from Old French *terme*, from Latin terminus 'end, boundary, limit.'"

[ii] -crat: "from French –*crate*, from adjectives ending in -*cratique* (see-cratic):"from French –*cratique*, from -*cratie* (see –cracy); from French –*cratie*, via medieval Latin from Greek –*kratia* 'power, rule.'"

[iii] -arch: "late Middle English: from late Latin –*archa*, from Greek *arkhein* 'to rule.'"

[iv] Architect: "mid16th century: from French *architecte*, from Italian *architetto*, via Latin from Greek *arkhitekton*, from *arkhi*-'chief'+*tekton* 'builder.'"

[v] idiosyncratic:"late 18th century: from idiosyncrasy, on the pattern of Greek *sunkratios* 'mixed together'; idiosyncrasy:"early 17th century (originally in the sense 'physical constitution peculiar to an individual'): from Greek *idiosunkrasia*, from *idios* 'own, private'+*sun* 'with'+*krasis* 'mixture.'"

[vi] Arbitrary: "late Middle English (in the sense 'dependent on one's will or pleasure, discretionary'): from Latin *arbitrarius*, from *arbiter*, judge, supreme ruler,' perhaps influenced by French *arbitraire*."

[vii] Linger:"Middle English (in the sense 'dwell, abide'): frequentative of obsolete *leng* 'prolong,', of Germanic origin; related to German *langen* 'make long(er), ', also to long.'"

[viii] Effective: "late Middle English: from Latin *effectivus*, from *efficere* "work out, accomplish" (see effect): effect: "late Middle English: from Old French, or from Latin *effectus*, from *efficere* 'accomplish,' from *ex*-'out, thoroughly'+*facere* 'do, make.'"