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ESTABLISHING DESIGN DIRECTIONS FOR COMPLEX ARCHITECTURAL PROJECTS: A DECISION SUPPORT STRATEGY

ABSTRACT

The paper seeks to identify characteristics of the design decision-making strategy implicit in the first placed design submissions for three significant architectural competitions: the Sydney Opera House competition, and two recent design competitions for university buildings in New Zealand. Colin Rowe's (1982) characterisation of the design process is adopted as a basis for the analysis of these case studies. Rowe's fertile analogy between design and (criminal) detection is first outlined, then brought to bear on the case studies. By means of a comparison between the successful and selected unsuccessful design submissions in each case, aspects of Rowe's characterisation of the design process are confirmed. On the basis of this analysis several common features of the competition-winning submissions, and their implicit decision-making processes, are identified. The first of these features relates to establishing project or programmatic requirements and the prioritizing of these. The second concerns the role of design parameters or requirements that appear as conflicting or contradictory, in the development of a design direction and in innovative design outcomes. The third concerns the process of simultaneous consideration given by the designer to both project parameters or requirements, and to design solution possibilities - a process described by Rowe as "dialectical interanimation".

INTRODUCTION

Complex architectural design projects typically possess a large number of design parameters and requirements and a large number of potential design solutions. Increasingly such projects are becoming the subject of design competitions. Design competitions offer the opportunity to compare successful design submissions with unsuccessful submissions, in order to more fully understand successful design decision making strategies and to develop decision support systems.

This paper focusses on three design competitions for significant architectural projects, with the aim of identifying characteristics of the design decision-making strategy implicit in the successful architect's design approach in each case. While the actual thinking processes followed by the architects are inaccessible, the design outcomes are nevertheless a trace of those strategies, and careful analysis of design solutions provides a means for drawing inferences concerning thinking and decision-making processes in each case.

The variety of design solutions that are typically evidenced in the results of such design competitions may be thought of, in simple terms, as reflecting the number of design parameters and requirements pertaining to the project in question, and as reflecting the differing priorities that each architect assigns to these parameters and requirements. However, this alone is an insufficient basis for understanding the dynamics of the design decision-making process, and for developing decision-support strategies. The analysis of case studies must necessarily assume or adopt some general model or conception of the nature of the design decision-making process in order to progress.

Much of the literature on this matter may be understood in terms of two competing models - one based on the analysis of functional or programmatic requirements, the other asserting a dependence on type solutions as a necessary basis for design. While this paper does not trace the history of these competing views of the design thinking process, progress towards the resolution of this debate has been significantly advanced by Colin Rowe's seminal paper on this issue (Rowe, 1982), and his arguments will be adopted in analysing the three case studies.

PROGRAM VERSUS PARADIGM

Rowe compares programmatic and typologically-based conceptions of the design process and finds both deficient. Like other commentators, for example Colquhoun (1969) and Summerson (1957), he rejects the program as the legitimate and neutral generator of all acts of design, a view he terms 'program worship'. Unlike Colquhoun however, Rowe also rejects the typical or the typological as a necessary starting point for design, despite the fact that the idea of type has what Rowe describes as 'the cultural upper hand' over the program. He argues that both program and type (or paradigm - a term Rowe uses to refer to the type and its associated ideas) disallow the possibilities of genuine novelty, and in the end both 'envision the solution, the synthetic statement, as no more than an extrapolation of an existing present in the case of the program, and an existing past in the case of the type.' Both, in Rowe's view, leave the world without hope.

Given the inadequacies of both positions, Rowe suggests the possibility of a design process based upon their 'dialectical interanimation' - a kind of vital discourse between the two.

Rowe compares the design process in architecture with the process of investigation enshrined in the genre of the detective novel as initially formulated by Edgar Allan Poe, and he invites us to consider the parallels.

The great detective (or architect) restricts empirical investigation to that necessary to make preliminary postulations. Moreover, the detective needs a knowledge of the great criminal paradigms, because only in this way will the true significance of empirical facts become apparent. Similarly, the architect can make sense of programmatic data only in terms of some spatial or formal paradigm.

The great detective typically has an idiot friend (sometimes institutionalised as the police) who favours a strategy of simple induction and thus rushes around energetically accumulating the facts pertaining to the crime. Here Rowe draws a parallel with those who subscribe to a purely empirical and inductive problem-solving model of design, But the great detective remains ever patient and polite towards his empiricist friend, knowing that ultimately these facts must be conflated with the detective's own postulations if naive and disembodied abstractions are to be avoided. Thus the process hinges upon the organisation of empirical material in terms of an appropriate paradigm. And the truly great detective, like the accomplished architect, is one who knows just which paradigm to choose.

If Rowe's characterisation of the design decision making process is accurate, then it should be possible to account for the work of competition-winning architects at least in part by reference to Rowe's model. The following analysis of the winning designs for three significant architectural competitions attempts to do this, as a basis for identifying elements of a decision-support system.

I have chosen the Sydney Opera House as my first case study because it, and the design competition on which it was based have almost legendary status. The two other case studies are of competitions for significant university buildings, in which I have been involved as an assessor.

CASE STUDY ONE: THE SYDNEY OPERA HOUSE

Jorn Utzon's Sydney Opera House was the first-placed entry in the 1956 international design competition. An account of this competition, together with a number of design submissions, is included in de Haan and Haagsma (1988). What distinguished Utzon's design from the 232 other entries was not simply the sculptural forms of its roof shells, as there were other submissions which employed free-form roofs. Nor can Utzon's achievement be fully attributed to the fact that his forms were more poetic than those employed by other competitors.

Utzon's design was the only one which placed the two performance spaces - the opera hall and the concert hall - side by side on the narrow Bennelong Point site, rather than in front and behind. By this simple move Utzon was able to establish a processional approach which passes alongside each performance space, and climbs the podium base to reach the foyer spaces at the outermost end of site. From this outward drama, one turns back towards the land, and to the inward drama of the performance.

How might Utzon's design be understood in Rowe's terms, as a dialectic between programme and paradigm, and as a great piece of detection? Rowe notes that the paradigm precedes empirical investigation. Utzon's paradigm - the idea of a podium or raised platform with hovering roofs above - appears in drawings from the early part of his career, and derives initially from his experiences of Mayan temple precincts and the power of this architectural type. These sources have been well described by the architect (Utzon, 1962).

Rowe also alerts us to the importance of prioritizing programmatic requirements when he observes that one must choose a paradigm which will give the facts their proper place. Utzon has clearly attached high priority to the implicit programmatic need for a dramatic sense of occasion, not just within the performances spaces themselves, but equally in the processes of approach and arrival, and he has exploited the processional possibilities inherent in the raised and stepped podium form, to achieve this. Utzon's stature as a Sherlock Holmes or Hercule Poirot of architecture resides in his ability to sift programmatic material to identify truly significant clues, and his refusal to be distracted or deterred by seemingly confounding evidence - in this case the lateral restrictions of the site.

We might anticipate that had the thought of a side-by-side arrangement of the auditoria occurred to other competitors (and it may not have, since it is associated with the processional possibilities inherent in the stepped podium paradigm), then site restrictions may have extinguished this idea immediately. But for Utzon the apparent contradiction between these two 'facts' simply called for their ingenious resolution in the final design proposition, leaving the Dr Watsons of architecture agog.

CASE STUDY TWO: FACULTY OF COMMERCE BUILDING, UNIVERSITY OF CANTERBURY

In 1993 seven New Zealand architectural practices prepared detailed design proposals for a new Faculty of Commerce building for the University of Canterbury. The program called for a mix of individual study offices, teaching spaces and computer laboratories, and common rooms for staff and for students. The majority of teaching spaces and laboratories were required at the lower levels for general Faculty use, although some of these were to be located alongside individual Departments on each of the upper levels.

The new building was to be inserted into the campus at a point between several existing buildings, and competitors were asked to carefully consider the relationship between the new building and the existing, and to take account of prevailing winds from several directions.

A majority of submission adopted as their parti a single block of 6 or 7 floors, covering the whole of the site, and either with or without an internal atrium space. This may be viewed as a simple matching of the floor area requirements of the brief with the given site area, these being two of the most obvious and immediate parameters of the project.

Wellington architect Ian Athfield saw a monolithic deep plan building type as being inherently unresponsive to the subtleties of program and site. Focussing on a different set of programmatic and contextual clues, Athfield gave them their proper place by taking as his point of departure a paradigm already prevalent on campus - the slab block with central corridor. Thus Athfield's slab block, located along one edge of the site, accommodates individual study offices while meeting client requirements for natural light and ventilation in a way that the deep plan of the monolithic building could not achieve.

Teaching spaces are placed within a smaller block which is aligned obliquely to the first block, and vertical circulation locates itself quite naturally at the junction of these two. In this way students may reach seminar rooms and laboratories on any level without disturbing those working in individual studies. The oblique alignment of the smaller block also helps to avoid a confrontational relationship with the neighbouring building.

In the space created by the oblique alignment of these two blocks Athfield introduces an element which is simultaneously entrance, circulation concourse and student social space. A faculty conference area, common room, and several other briefed spaces are also released from the confines of the slab block type, and allowed to settle in the social heart of the scheme. It is a social heart which, although not referred to in the competition brief, highlights the need for the institution of the University to make this kind of provision, particularly in a building that accommodates a number of different departments within a large faculty. Also highlighted here is the architect's role in elaborating the programme as devised by the client institution.

This case study suggest that by means of the dialectic between an exacting programme and an explicit paradigm, an architecture of genuine innovation (or genuine novelty to use Rowe's phrase) becomes possible. It is also possible to discern at work here exactly the kind of process that Rowe depicts as common to great detection and great design alike - a relatively modest affair, two-pronged and hybrid, its success deriving from a conflation (a bringing together) of findings that flow from an interrogation of both programme and paradigm.

What appears to distinguish Ian Athfield's design approach from that of the other competitors is the careful selection of an initial paradigm - the slab block type - and its reconfiguration in order to achieve the closest possible correspondence with programmatic demands, both explicit and implicit. The architecture is both familiar and unique and presents the 'genuine novelty' which Colin Rowe suggests must be possible if we are to leave the world with hope.

Few would disagree that creativity is a hallmark of Athfield's thinking process, and yet it is a creativity in response to project constraints, rather than a creativity which seeks to operate free from any such constraints. Without explicit project parameters, evidence of creativity in design is likely to take a very different form from that where exacting constraints are operative. Baron (1988) has identified two traditions in this regard. In one tradition, freedom from constraint is emphasised in the creative thinking process (for example, 'brainstorming' as promoted in the 1960s by investigators like Frank Barron and William Gordon, and as popularised by Edward de Bono). A second tradition derives from John Dewey's original ideas on reflective thinking and the educative process, as published in his 1933 book 'How We Think'. These ideas (and their more recent revival) emphasise reflectiveness and active open-mindedness, and Dewey's account brings to mind the particular kind of creative reflection which characterises the speculations of the great detective.

CASE STUDY THREE: MATHEMATICS AND COMPUTER SCIENCE BUILDING, UNIVERSITY OF CANTERBURY

Encouraged by the successful outcome to the design competition for the Commerce building, the University of Canterbury initiated a design competition in 1994 for a sector of its campus to contain several new buildings. Fourteen pre-selected architectural firms were invited to submit design proposals for the Sciences West Precinct, to include a new Sciences Library building, and accommodation for the Departments of Mathematics and Computer Science.

While a number of different precinct development plans were proposed, analysis of site factors pointed towards a preferred development concept, in which the larger Maths/Computer Science building would be positioned along the southern edge of the site, in order to create a sheltered sunlit open space to the north, partially defined by a low existing building positioned centrally on site. The smaller Sciences Library would be positioned to the north and west of this existing building, with the potential to define the western edge of the site and to screen academic areas from the boilerhouse and maintenance workshops immediately to the west. A small stream at the northern boundary provided a possible amenity for library users, as well as contributing to precinct open space.

Frustrating the easy realisation of this preferred precinct plan was the size (8,700 m^2) of the Maths/Computer Science building. Several site parameters would limit the building profile: the restricted dimension of the site along the southern boundary, the need to minimize any obstruction to the outlook from the existing nine floor Physics/Chemistry building immediately to the east, and the need to minimize overshadowing of the open lawn to the south by any new building of excessive height.

In response to these constraints, competitors developed several different design concepts. In some cases an L-shaped building extended along both southern and western boundaries of the site. In other cases the building bridged across a campus road, and extended to the west. Building heights varied from four to eight floors. However both these design concepts presented certain disadvantages.

The winning design, by the consortium of Architectus: CHS: Royal Associates was unique in its proposal of two back-to-back buildings linked by a linear circulation atrium. To the south a lower block accommodated teaching and computer laboratories in a column-free structure, permitting future layout changes. Extensive south-facing glazing provides light and outlook without solar gain, thereby minimizing air conditioning cooling loads.

This teaching block is linked via the atrium space, to staff offices and postgraduate studies grouped into three linked towers to the north. By this means acoustic separation of potentially noisy undergraduate student areas from quieter staff and research areas may be achieved, while satisfying requirements for sun and outlook from all offices.

What distinguishes this winning proposal from the others is the way in which site constraints and the exacting functional requirements of the brief have been resolved through rigorous analysis, and the careful selection and development of the design parti. The decision to locate teaching spaces and staff/research areas in two separate but linked buildings has allowed the architect to achieve a deep-plan building that is nevertheless substantially naturally lit and ventilated, in accordance with the University's objective to minimize energy consumption. Because of the overall depth of its plan, it has been possible to minimize its linear dimension along the southern boundary, thereby achieving a significant separation distance from its eastern neighbour. In addition the need to bridge the campus road and occupy land to the west is avoided.

Like the Commerce Faculty building, this design achieves genuine innovation on the University of Canterbury campus, in the face of stringent contextual and programmatic constraints. In fact the Architectus proposal could be viewed as achieving the status of a new prototype for the generic university teaching building.

CONCLUSION: ELEMENTS OF A DECISION SUPPORT STRATEGY

Several common features of these three competition winning designs are worthy of note. Firstly in each case the architect appears to have made a very careful study of programmatic requirements, placing clear design priorities on what were viewed as the most important requirements in each instance. It should be noted that the competition brief was not necessarily sufficient to successfully complete this step. While site parameters and functional requirements were clearly set out in the brief for the Mathematics/Computer Science building, the importance of a central social space and its close relationship to circulation routes in the Commerce Faculty building was part of the architect's vision. Similarly in the case of the Sydney Opera House, the architect has clearly introduced and prioritized a number of key design considerations that while it could be argued were implicit in a project of this kind, were not explicitly stated in the design brief. It could be suggested that in both cases the architect's awareness of architectural possibilities (understood in terms of types or paradigms) was instrumental in the elaboration and prioritizing of design requirements.

Secondly, in each case the architect has not been deterred by physical parameters such as site restrictions, in the search for an appropriate design concept or parti. Instead it would appear that these parameters have been allowed to interact with prioritized design requirements via a thinking process that may be viewed as intrinsically creative.

Innovative design outcomes appear to have been triggered by the fact that seemingly contradictory project requirements have necessarily ruled out obvious solutions. In order to achieve a resolution of the apparent conflict or contradiction, a novel design response is required. The effect of these apparent conflicts is to dramatically reduce the number of design options (ie. to reduce the size of the solution space available to the designer). A much smaller number of options exist that will achieve this resolution. By this means a productive design direction may be established in the early stages of the decision making process.

In each case the architect has been able to sift through project information (both contextual and programmatic) and identify a small number of significant parameters or requirements. In terms of the analogy advanced by Rowe between design and detection, these may be thought of as clues that will allow the architect to "solve the case" in an "unexpected" way. But this "solving" requires a broad understanding of architectural possibilities or paradigms, a factor which perhaps explains why many architects do not produce their first truly significant building until well into their careers.

Thirdly, the case studies suggest that at all stages of the design decision-making process considerations of project parameters and requirements, (particularly the prioritizing of these) and considerations of design solution possibilities (viewed as types or paradigms) are informing each other in a continuous process of development that Rowe refers to as "dialectical interanimation".

It is tempting to conclude that decision support strategies that inhibit the operating of these fundamental kinds of design thought processes will find little favour with architects working with exacting and constrained design projects.

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