IDENTIFYING OPPORTUNITIES AND PROMOTING DISCOURSE BY MODELING FUTURE DEVELOPMENT INITIATIVES

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ABSTRACT

Based on the development of case study research into the proposed rapid expansion of the Deakin University waterfront campus, this paper presents a computational approach to identifying and modelling future development initiatives within the urban context. The aim of the model is to augment cross-discipline discourse by generating an array of permutations that extend the range of potential design scenarios beyond the limits of an ad-hoc, piece-meal or discipline specific approach.

Keywords: generative modelling, analysis, workshopping

INTRODUCTION

Holdsworth (2002) described planning exercises as being “mostly about process, not solutions, but about directions and philosophies, not designs”. The following paper acknowledges Holdsworth’s position by presenting a generative model which attempts to assist urban designers in ideation, scenario building and vision making within current strategic planning practice. The model is intended to promote cross-discipline discourse by broadening discussion during the vision making stages of the process with the generation and context mapping of a diverse range of autonomous scenarios. This process attempts enhance conventional brainstorming and workshopping practices by inhibiting premature convergent thinking and design fixation - two conditions which often give rise to limited or unresolved development options and/or fall short of providing a balanced response to the needs of the stakeholders.

BACKGROUND

The two components fundamental to an urban planning process are analysis, or context assessment, and synthesis or ideation and strategic thinking. How well both factors perform is conditional on two considerations:

- Understanding the needs of all stakeholder groups and anticipating the implications and consequences of change.
- Being aware of the depth and breadth of professional expertise being channelled into the process, i.e. understanding the limitations of the skill/knowledge base on both context assessment and ideation.

Immersed in this process is the issue of knowledge transfer, in particular the means by which analytical data is collected, processed and communicated, and the mechanism by which opportunities and ideas are canvassed/generated, explored and evaluated. The model presented in this paper addresses both aspects of this process from an extensive body of research compiled on the proposed expansion of the Deakin University waterfront campus from a present cohort of 700 students to a planned cohort of 5000+ students.

UNIVERSITY CITY - FROM 700 TO 5000+ STUDENTS

The university’s current location is approximately 9km south of the city centre. Built in the mid to late 70’s, it was expected that the campus would become the centrepiece of a new city centre. However this shift did not eventuate and the campus became a distant education centre, accessible mainly via car and limited public transport. The university recently sought to develop a more sustainable campus within the Central Activities Area (CAA) of Geelong. The advantage of owning prime waterfront land adjacent to the current waterfront campus was seen as a catalyst for the university to expand and shift the majority of its undergraduate students to the new site.

In October 2001 the Department of Infrastructure, in partnership with the City of Greater Geelong and Deakin University, embarked on an 18 month strategic planning process known as the “Western Wedge” project, which examined opportunities and constraints relating to the dormant strip of industrial land between the Geelong Railway Station and Western Beach. The process involved three design workshops. The first focused on movement, in particular the different paths, desire lines, routes and journey experience which traversed the site between the CAA, the waterfront, the station precinct and the inner city suburb of Geelong West. Working with
a smaller focus group, referred to as a Geronimo team\textsuperscript{7} a second workshop examined the integration of the surrounding precincts and specific development sites with the transit cities initiative planned for the redevelopment of the train station. The third set of workshops was conducted as part of the Urban Heart Surgery Design Research forum for 2002. Building off the two previous initiatives, the Western Wedge forum operated for five weeks culminating with the generation of twenty highly developed schemes operating around five generic scenarios. These examined different combinations of land use, movement and built form/open space strategies.

During the development of the Urban Heart forum a small research team embarked on the task of examining the extension of the current campus facilities at Deakin waterfront to accommodate up to 5000+ on campus students. Significantly extending Deakin’s higher education operations within Western Wedge precinct promotes a large range of opportunities and constraints within the CAA, with varying implications and consequences for the major stakeholder groups. Working with the 'University City' paradigm (see Figure 1) as a construct to anchor the research, the team examined three approaches in an attempt to canvas a large range of different generic scenario types. Two of these approaches, which are invariably linked, followed current practice methodologies. These are: the analytical method, where concepts are developed based on a highly informed appraisal of the study area, and the workshop method, where focus groups, comprised of a range of skill/discipline bases, explore scenarios based conventional brainstorming strategies.

Figure 1: Same scale figure-ground comparison between four inner city urban university campuses: Geelong waterfront (750 students); RMIT Melbourne city campus (32,000 students); Cambridge University (16,500 students); Oxford University (16,500 students).

\textsuperscript{7} The Geronimo team was first developed by J Rollo in 2002 at Deakin University. It is an intense think-tank working group, consisting of one coordinator and between three and six participants. It draws on a range of brainstorming techniques and is divided into a prolific four part process: ideation, schema categorisation, concept development and representation. Designed to operate for a continuous period through a rotational system of predetermined breaks, a single team can operate for up to 48 hours. The naming of the group was coined by Richard Denby, who utilised Geronimo as a call sign for the progressive data capturing, transfer, and storing of the workshop material on the University server. Other members of the first Geronimo team included: Yolanda Esteban, David Sowinski, Jo Bandy and George Forty.
The research team soon discovered that while both approaches had significant merits, especially when linked, they also had limitations. When designing from a highly informed analytical basis it became apparent that those who had been significantly involved in the data collection and assessment, and therefore had extensive association and exposure with the study area, often had difficulty in thinking outside the cognitive boundaries imposed by the existing conditions. On the other hand, depending on the composition of a design team and the constructs utilised to drive the process, workshopping can invariably be ad hoc, and until the process has been followed through it is difficult to assess the value of the outcome.

The third approach borrows from the concept of workshopping in that ideas are cultivated in an attempt to extend thinking and gather and enrich ideas, which may not have emerged in the first instance. However rather than relying on the arbitrary “what if?” which workshopping often thrives upon the third approach borrows from the Shape Grammar paradigm developed by Stiny (1975) and adopts a computational means of seeding a design world of opportunities which throws up ideas generated outside of the immediate cognitive process. Many of the concepts generated will not have been thought of before and, when measured against an analytical database of predetermined axioms will be of little use. However, there will be a cohort of ideas, which could assist in driving further exploration and when processed through a workshop could yield a rich core of generic directions.

While the analytical method relies solely on the user; it is a personal response to the situation informed by traditional land use, built form and movement indicators and benchmarks. On the other hand, the computational method, is a front-end design generation process, where sets of predetermined variables and parameters are applied to a model to extend the world of possible design outcomes and responses.

**THE COMPUTATIONAL PROCESS**

Sir Leslie Martin in his essay "The Grid as Generator", attempted to "provide a strong theoretical basis for urban design", by demonstrating how changes in the relationship between built form and space can affect the city as a whole.

Martin’s presentation virtually took the spatial qualities of the city and composed them into purely mathematical arrangements or groupings that could be manipulated depending on density and grain to reveal the possibilities available to urban planners, architects, developers and engineers. Taking the concept of the ‘Fresnel Square Diagram’ Martin studied the consequences of distance on space and built form in the development of medium
density and terrace housing models to counter argue the generation of the high rise apartment block, especially in lower socio-economic neighbourhoods.

Following the idea presented by Leslie Martin and Lionel March during their urban form studies at the Centre for Land Use and Built Form Studies during the late 1960's, the computational model presented in this paper uses a base grid and two key parameters: dispersion distances and floor area requirements.

The grid

The grid, illustrated in Figure 2, utilised to form the mathematical models, is based on research established by the West Australian State Government: that a comfortable walking distance in an urban area consists of about 400 metres or 5 minutes. It is assumed that people using the new university would expect buildings to be within a comfortable walking distance. The grid therefore begins as a 400 by 400 metre arrangement, which is then broken down further into a sub-grid of 25 by 25 metre cells in order to conform to the floor area requirements of the university.

Figure 2: Generating the base grid and cell size

![Diagram showing the grid and cell size](image)

Step 1: Generating the base grid

Step 2: Generating the cell sizes

Dispersion distances

The dispersion distances between the university buildings are based on the aforementioned comfortable walking distance culminating in a sequence of distances of 100 metre increments between 100 and 400 metres. The different increments of distances between buildings form the genesis of the array of computational models.

Floor area requirements

The floor area requirements for the new university were based on the requirements for both teaching and associated university spaces. The data provided by Deakin University, Buildings and Grounds Division involved the relocation and accommodation of five faculties commanding a net floor area of almost 16,000 m²: Business and Law; Education; Koorie Education; Health and Behavioural Sciences; and Science and Technology. The total floor area required for each faculty of the university was then divided into the 25 by 25 metre cells and together with the dispersion distances forms the mathematical models.

The next stage in the process consists of two parts, model generation, and context mapping.

Model generation and context mapping

Manipulating cells by the addition of incremental units in both vertical and horizontal stacks and the dispersion of the stacks with respect to time and distance, facilitates a range of abstract computational models on a wireframe grid. These models, in first instance, have no reference to any urban context and exist purely as spatial arrangements of building density on an imaginary plane.

However when they are overlayed as a seeding plan on a same scale plot boundary map, with either a pre-determined fixed or floating point of origin (in this instance, correlating with the location of the existing waterfront campus facilities), their application and mapping to context forms the basis on which a range of associations, ideas and design drivers can be cultivated. While the seeding plans could, in themselves be interpreted as real built form, they are designed more to be interpreted as location points on a Cartesian framework. Facilitating discourse they essentially enable a two-way question and feedback loop between the
analytical criteria that describes the current framework of the city and a projection of how that criterion may change if subject to a particular seeding plan. The implications of this type of scenario mapping becomes more evident on development and stakeholder opportunities relating to aspects such as current and future land use, movement, and built form issues, when one examines different distribution patterns of net floor space and user student population groups. For example it would appear that there would be greater opportunities for the retail and service sectors of the CAA to benefit from a university structure that was distributed throughout the city in a network of two and three story buildings, than to have the faculties housed in a single homogeneous development close to the railway station.

Figure 3 shows the process of one of the radial abstract models through to its application to the city and adjustment to the context. The process of adjusting the abstract model to the context and developing a scheme is driven by the built form, land use and movement urban design parameters. These parameters are in effect facilitating the progress from abstract model to possible implementation of the urban university.

Figure 3: Illustrates the process of one of the radial abstract models from grid definition to its same scale context mapping and the adjustment to context

Step 1: Generation of abstract model on grid.

Step 2: Application directly to the context.

Step 3: Adjustment to the context with application of indicators and benchmarks.
Important to the design process are the boundaries placed on the distribution patterns. The following presents an example four pattern types based on different types of urban form: (a) radial, (b) linear, (c) plume, and (d) radial network (see Figure 4).

Figure 4: Important to the design process are the boundaries placed on the distribution patterns. The following presents an example four pattern types based on different types of urban form: (a) radial, (b) linear, (c) plume, and (d) radial network.

Plumes

Radial

Radial Network

Linear

Radial

The radial model is a generic mathematical model that examines the effects of density change over a 400-metre diameter. The exploration of the different dispersion levels allowed for the generation of two extremes, the tower and the edge university. The radial model is the mathematical model most closely related to those generated by
Martin at the Centre for Land Use and Built Form Studies as it demonstrates how the same floor space can be distributed over different distances.

Linear

The arrangement of buildings strictly according to the school breakdown of the university's faculties was another method of generating university structures. The linear nature of the university allowed for the investigation of possible direct paths within the city itself, leading to enhanced opportunities at street level.

Plumes

The plume model investigated the effects of dropping a directional growth plume over the city, which had a start and an end point. In the lower dispersion levels, the arrangement of buildings created interesting relationships, sometimes forming implied university 'districts' in which other existing built form can develop and thrive.

Radial network

The radial network model takes the qualities of the 'radial' and 'linear' models to produce an interesting hybrid model that works on two levels of dispersion. This two-tiered dispersion allows for buildings to form 'precincts' that expand as the dispersion level increases. This is the only model used for the study that does not rely on the base grid. It does however still rely on the pre-determined 400-metre walking distance parameter.

CONCLUSION

Seeking to introduce an abstract arrangement of buildings, the computational models highlight the opportunities and challenges arising from the insertion of buildings with varying densities. These challenges and opportunities apply to both the inserted building and the city, therefore confronting the designer with a set of totally new issues. Subsequent analysis of the city fabric will begin to unearth issues beyond the built form, such as the impact on infrastructure, transport systems and land use patterns as the city is progressively re-shaped.

It is strongly believed generative modelling process outlined above should not challenge or replace the core workhorses of analysis and conventional workshopping techniques. We believe that it can play a significant contribution in the future development of our cities if it is applied as a front end abstraction process (Figure 4) so that it can inform both workshopping procedures and cause and effect relationships with analytical profiles.

REFERENCES


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*Disclaimer. The research presented in this paper is the informed opinions of the authors and should not be interpreted as representing the opinions of the professional practices mentioned in the paper.*