Design (re)thinking: reflective practice as design research

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Abstract

This paper contends that reflective practice constitutes a form of design research, and will build an argument around design in the discipline of architecture to support this statement. The paper will consist of four parts: a design process model based on the work of Bernard Leupen *et.al.* at the Delft University of Technology; a discussion of Donald Schön's work around the theory of the reflective practitioner; a design research approach to enable reflective practice, derived from the analytical approaches of Geoffrey Baker, Paul Righini and Bernard Leupen *et.al*.; and an example of the design research approach in practice.

Designers must have a considerable knowledge of comparable solutions in order to resort to experience, and this professional knowledge is core to the concept of the reflective practitioner. Schön suggests an epistemology of practice that recognises knowledge in the practical competence and artistry that some practitioners bring to the divergent situations of practice.

Analysis is an important enabler of reflective practice, and can be construed as the temporal opposite of the design process. All three analytical approaches discussed rely on the use of diagrams to uncover the forces that influenced the design process, thereby retracing the steps of the architect through the design process.

It is evident from the approach to design research presented and applied that reflective practice does constitute design research, and that it has the potential to address the complex issues that confront design researchers today. In utilising reflective practice as a form of design research, practitioners and researchers can establish a synergy of combined conceptual, theoretical, empirical and practical considerations.

Keywords

Design research, architecture, reflective practice, critical regionalism, concept, diagram

Introduction

This paper contends that reflective practice constitutes a form of design research. A model of the design process in the discipline of architecture will be presented in part 1, as a base for the subsequent discussion. Design analysis and form-based (morphological) analysis are well established components of architectural education and research, and such analysis can assist architects in becoming reflective practitioners, as discussed in part 2. In parts 3 and 4, a design research methodology based on three related approaches to architectural analysis will be presented and applied.

One analytical approach is that of Geoffrey Baker, who states that cultural forces have been manifest in buildings since antiquity, and that the pyramids, the Greek temple, the Gothic cathedral and the skyscraper (figures 1 to 4) represent the key concerns and technological capacity of each era (2006:xix). All the analytical approaches that will be discussed rely on the use of diagrams to uncover the forces – cultural and otherwise – which influenced the design process, thereby retracing the steps of the architect through the design process.

Figure 1. The pyramids at Giza were built to house and protect the remains of the pharaohs who ruled Ancient Egypt and was believed to facilitate their transformation and ascension to the afterlife. (http://www.culturefocus.com/egypt_pyramids.htm)

Figure 2: In Ancient Greece temples, such as the Parthenon on the Acropolis in Athens, housed the deity statues of Greek paganism. (http://www.acrosstheplanet.net/acropolis-of-athens).

Figure 3. The Gothic Cathedral of Notre Dame in Paris was as a sign of wealth and pride in twelfth century Europe, and achieved greater heights by means of pointed arches and flying buttresses. (http://opentravel.com/notre-dame-cathedral-cathedrale-de-notre-dame-de-paris-paris-france).

Figure 4: At eight hundred and twenty eight metres from base to spire, the Burj Khalifa in Dubai is the tallest building in the world (a title held by the Great Pyramid at Giza until the twelfth century), reflecting the wealth of the United Arab Emirates. (http://panfilocastaldi.wordpress.com/).

As stated above, the paper will consist of four parts: (1) a design process model based on the work of Bernard Leupen et.al. at the Delft University of Technology; (2) an epistemology of practice – a discussion of Donald Schön's work around the theory of the reflective practitioner, made relevant to architecture; (3) a design research approach to enable reflective practice, derived from the analytical approaches of Geoffrey Baker, Paul Righini and Bernard Leupen *et.al*., and (4) the application of the design research approach to analyse four architectural designs by the author of this article.

1. A design process model

"Unlike painting, music or literature, architecture is of the earth. It belongs to the ground as a container for the activities of man and as such is part of his very existence. This intrinsic link is evident in the basic need for shelter – buildings give shelter and in doing so engage architecture in man's survival against the hostile forces of nature." (Baker, 2006:xvii)

Architecture is set apart from other design disciplines in that it is inextricably linked to a specific physical context. The characteristics of that context, the site, are the most palpable set of informants to impact on the design process: amongst others, it includes topography, microclimate, orientation and access. Functional requirements, contained in the programme or brief from the client, also inform the design. The third set of informants is that of culture, which consist of a series of fixed precepts, social processes, conventions and traditions which impact on the design process in many different ways (Baker, 2006:xviii; Leupen *et.al.*, 1997:13, 17).

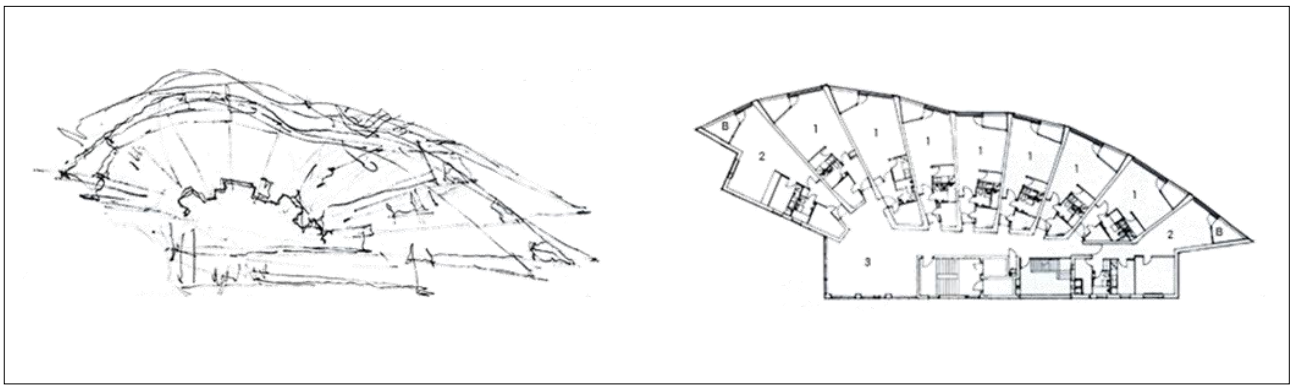

Figure 5. Concept sketch and floor plan of Alvar Aalto's Neue Vahr apartment building in Bremen, Germany. (http://hokuouzemi.exblog.jp/2679638/).

Once a designer has become aware of the informants, these can be interpreted and the relative importance of the various requirements and expectations pertaining to the design task can be adjusted. After this preliminary step, the designer will develop a concept, which expresses the underlying design idea and gives direction to subsequent design decisions by organising them and excluding variants.

While concepts can take various forms, most often they are expressed as diagrams or sketches. Leupen *et.al.* (1997:13) cites the Finnish architect Alvar Aalto's concept sketch for the Neue Vahr apartment building in Bremen (figure 5) as an excellent example: a few lines indicate the essence of the design, delineating the main form of the plan with apartments fanning outward for maximum exposure to sunlight and the resulting compact circulation space and undulating frontage line.

While a successful concept holds a richness of information regarding the designer's underlying idea, an entire design development process lies between the abstract concept and the final design. Information embedded in the concept informs the iterative process of design development where possible formal elaborations are formulated; tested against the requirements of context, brief and culture; and possibly rejected or adjusted for further testing. The initial concept continually gains depth as it undergoes this hybrid cyclical-directional process, arranging and rearranging material, forms and spaces until they crystallise into the final form of the design (Leupen *et.al.*, 1997:16-17) (figure 6).

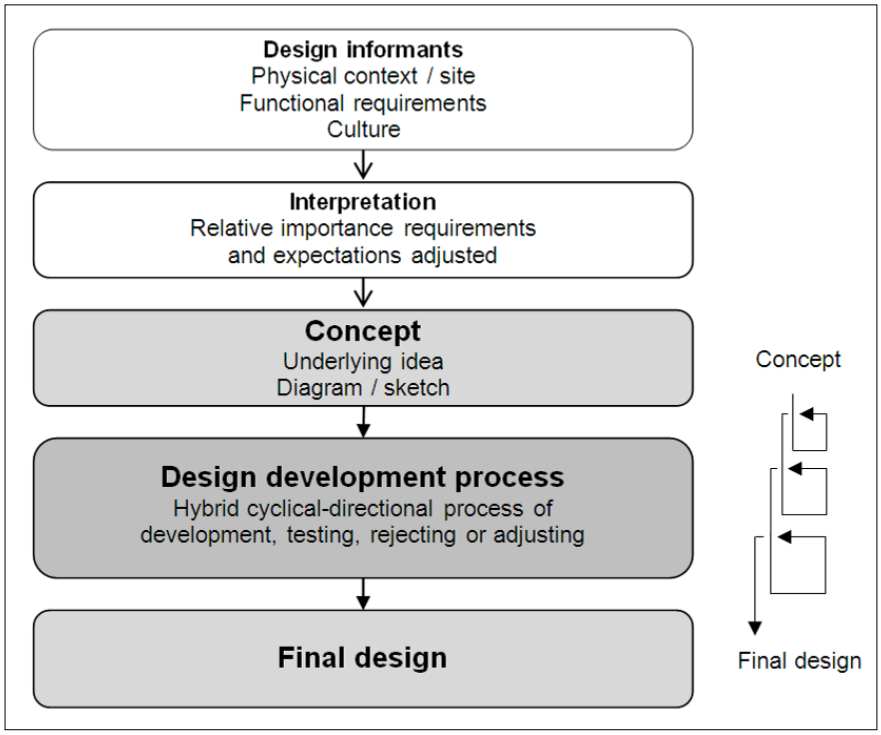

Figure 6. Design process model illustrating the hybrid cyclical-directional design development process.

The designer's method of ordering ultimately dictates the character and appearance of a design, and basing form on previous experience – where a comparable task in similar circumstances has yielded satisfying results – is the customary procedure.

Designers must have a considerable knowledge of comparable solutions in order to resort to experience, and this professional knowledge is core to the concept of the reflective practitioner.

2. An epistemology of practice

The theory of reflective practice was developed by Donald Schön and has been one of the most popular theories of professional knowledge in the last twenty years. Schön suggests an epistemology of practice that recognises knowledge in the practical competence and artistry that some practitioners bring to the divergent situations of practice (1983: 49, as paraphrased in Kinsella, 2009:6). This is in contrast with the paradigm of technical rationality, which reduces practitioners to instrumental problem solvers who merely apply knowledge developed by teaching and research institutions to solve problems (Schön, 1987:4).

Kernaghan (2009:n.p.) states that technical rationality has long dominated the relationship between research, education and practice in the professions, resulting in the role of the researcher being seen as distinct from and superior to that of the practitioner. In the design professions it is clear that this perception is incorrect; the uncertainty, instability, uniqueness and value conflict inherent in practice is fertile ground for designers to develop their own theories about practice (Kinsella, 2009:6).

As awareness of the crisis of confidence in professional knowledge grows, this pragmatic artistry is increasingly being recognised as an essential component of professional competence (Schön, 1987:14). Schön's theory of the reflective practitioner is in itself an example of pragmatic artistry, as evidenced in Eraut's critique that Schön does not have a coherent view but rather presents a set of overlapping attributes that is pulled together to suit particular situations (Kinsella, 2009:5). This description of Schön's work as bricolage – albeit intended as a critique – suggests similarities between the conventional theorising of knowledge and the design process, which is essentially the informed and artful weaving together of space and materials to respond to a particular problem.

Kenneth Kernaghan (2009:n.p.) builds on the theory of reflective practice by writing that, indeed, academic assertions need some qualification grounded in firsthand experience, rather than the other way round. The practitioner is conceptualised as a source of learning by being involved in research through reflection-on-action; a deliberate effort to reflect on the tacit norms and appreciations underlying judgements and on the strategies and theories implicit in the way in which problems are framed.

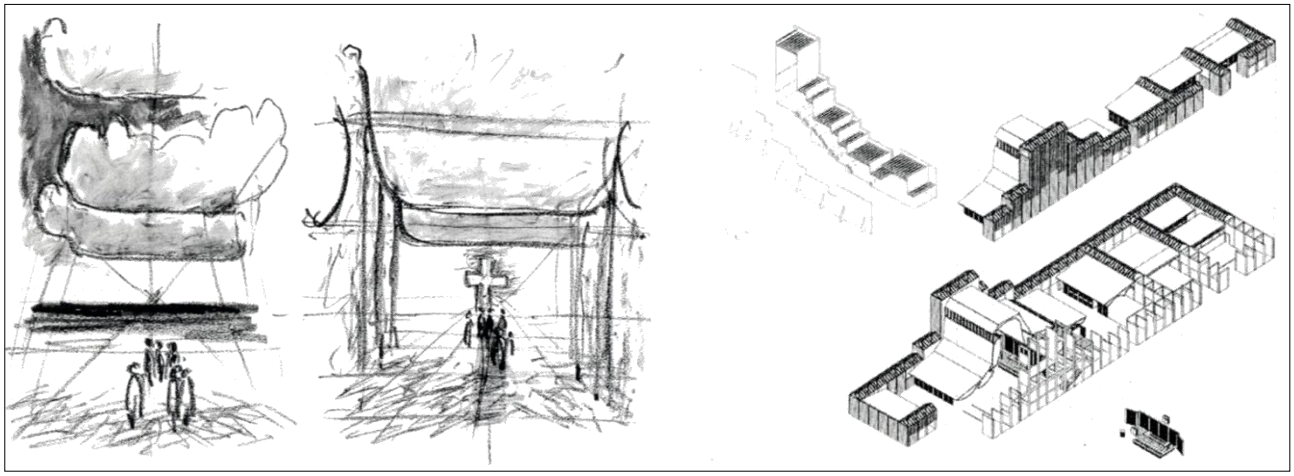

Figure 7. Concept sketches and isometric view of Jørn Utzon's Bagsvaerd Church in Copenhagen. (Ferrer Forés, 2006:21; Møller and Udsen, n.d.:90).

Critical regionalism, an architectural approach developed by Alexander Tzonis and Liane Lefaivre, exemplifies reflection-on-action. They describe this approach as a strategy of self-examination, critical in the sense that it challenges both the world as it exists and underlying world views through a process of identification, decomposition and recomposition (Nesbitt, 1996:483). Kenneth Frampton (1992:314) states that critical regionalism intends to identify regional schools of architecture whose primary aim has been to reflect and serve the limited constituencies in which they are grounded, thereby generating of a body of professional knowledge rooted in experience.

This process of assimilation and reinterpretation described by Tzonis and Lefaivre is clear in the work of the Danish architect Jørn Utzon. In his Bagsvaerd Church in Copenhagen (figure 7), standardised pre-cast concrete infill elements are combined with *in situ* cast concrete vaults which span the principal public volumes. This combination of modular assembly and *in situ* casting may appear to be nothing more than the integration of available concrete techniques, yet the case can be made that the way in which these techniques are combined alludes to the dialogically opposed values of universal civilisation and idiosyncratic culture (*ibid*:315).

If Frampton's argument regarding the meaning inherent in Utzon's use of concrete in the Bagsvaerd Church is correct, how would such knowledge be uncovered and made explicit? Furthermore, how does one reflect on the tacit norms and appreciations underlying decisions and on the strategies implicit in the way in which problems are framed? Drawing on the analytical approaches of Geoffrey Baker, Paul Righini and Bernard Leupen *et.al.*, a design research approach to enable reflective practice will now be proposed.

3. An approach to design research

If one were to illustrate the causal relationship between a design informant (e.g. a client brief) and the resulting design object (building or artefact), the design process would be the intermediary between the two. Following the design process model described earlier (figure 6), the client brief and other contextual informants would first be interpreted; then a concept will be developed to give direction to subsequent design decisions; and lastly a hybrid cyclical-directional process of design development will produce the final form of the design.

As stated at the onset, this paper contends that reflective practice constitutes a form of design research. Analysis is an important enabler of reflective practice, and can be construed as the temporal opposite of the design process. In other words, where the design process is the link from the client brief to the resulting building or artefact, analysis forms a link from the building or artefact back to the client brief or design problem (figure 8).

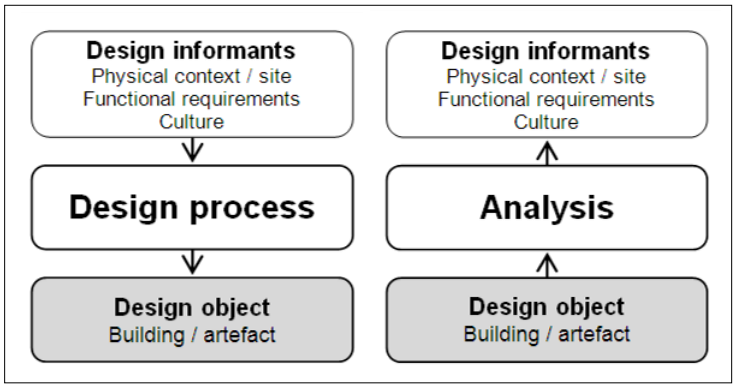

Figure 8. Design and analysis as temporal opposites.

All three analytical approaches discussed here rely on the use of diagrams to uncover the forces – cultural and otherwise – which influenced the design process, thereby retracing the architect's steps through the design process. James Stirling's commentary on Geoffrey Baker's analysis of his proposed extension to the National Gallery in London attests to the aptness of this strategy:

"I felt that he had 'understood' most of the formal design moves we made in evolving the scheme – indeed he interpreted several design subtleties which I only felt intuitively, and until his exposition had not fully perceived. It seems he is able to clarify and describe a work of modern architecture in ways that others have been able to do for historic buildings. His skills promote a deeper and more sophisticated understanding of the design process related to a particular building." (Stirling, 2006:xiv).

Righini (2009:193) contrasts explanatory or presentation drawing with drawing for oneself, which he describes as facilitating thinking and imagining in order to represent, organise and gain insight into complex spatial relationships. Thus drawing becomes a way of thinking; a fundamental skill which arranges thoughts, develops observational skills and

communicates with the world. Such analytical drawings or diagrams are drawn with the particular intention of communicating the essential structure and logic of that which is being drawn (*ibid*: 207). Giambattista Nolli's figure-ground map of Rome (figure 9) is a prime example, highlighting and articulating the spatial structure by means of black blocks representing buildings and white representing the open or negative space inbetween.

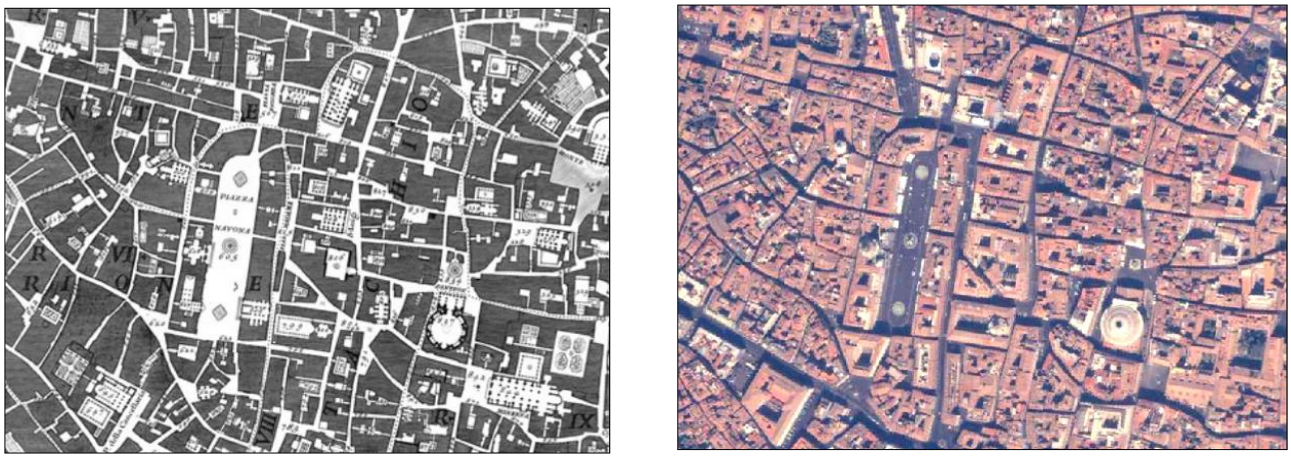

Figure 9. An excerpt from Giambattista Nolli's Map of Rome, showing Piazza Navona and the Pantheon, and a contemporary aerial photograph of the same area. (http://nolli.uoregon.edu; *cf*. Leupen *et.al.*, 1997:19).

Baker (2006:66) ascribes several characteristics to diagrams: they are selective, clear and simple, allow a degree of artistic license and explain form and space better than words or photographs. Leupen *et.al.* (1997:18) concurs that diagrams are not faithful reproductions, but rather examines a design or building by reworking existing drawings or models, omitting and adding information as required. Three analytical drawing techniques facilitate this reworking: reduction, addition and démontage.

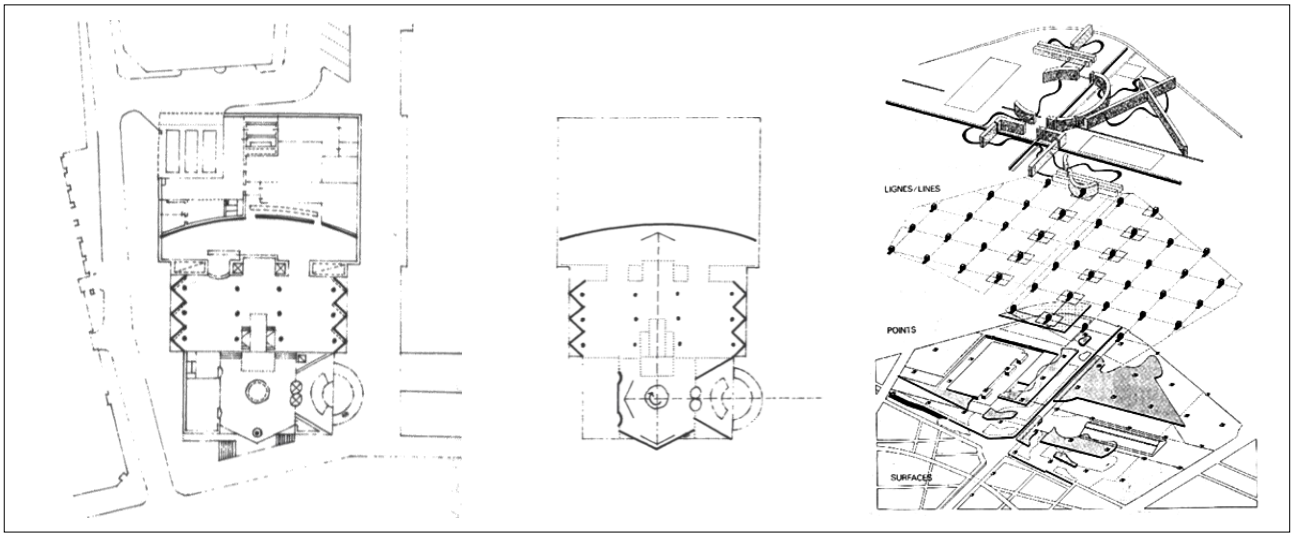

Figure 10. Two diagrams from Baker's analysis of the proposed extension to the National Gallery in London, utilising the techniques of reduction (left) and addition (centre); and Bernard Tschumi's usage of démontage (right) to illustrate the conceptual layering of his design for Parc de la Villette in Paris (Baker, 2006: 262-3, 270; Leupen *et.al.*, 1997:63).

Reduction is the most elementary of the three, and entails the omission of all information that bears no relation to the main composition of space and material, thereby exposing the structure – morphological, typological or physical – of a design. After reduction has taken place, addition introduces non-visual information to the drawing; about function or the underlying geometric system, for example.

Démontage is the drawing of a design as though it had been taken apart, to illustrate the relationship between different components or aspects. In this manner the superimposition of drawings can assist in examining the relationship between different systems in a design, such as several layers in a plan (*ibid*:18-19).

Diagrams are used to reveal the intent and preoccupations of the designer; using the techniques of reduction, addition and démontage (see figures 10 and 12) to gain insight into the primary organisational factors of a design – volumetric disposition, geometric and structural systems, composition, function, circulation patterns, spatial relationships and the design-context relationship (Baker, 2006:64; Righini, 2009:208).

All three analytical approaches refer to the establishment of major themes or categories in order to understand a design, as is the case with literary or musical analysis. Accordingly, when analysis (and reflective practice, by inference) is used as a tool for design research, it is crucial that the knowledge that is generated and encapsulated in the form of diagrams, address the research question. Given Baker's description (2006:65) of analytical drawing as a selective and subjective exercise, a reflective practitioner can direct the research process in such a way as to ensure that the knowledge that is generated remains focused on the research question.

4. The design research approach applied

In order to provide a brief illustration of the design research approach discussed above, four architectural designs by the author of this article will be analysed in order to identify any patterns or recurring themes that are present in the work. The designs, shown below in chronological sequence, are each illustrated by means of aerial views, photographs, layout plan, typical sections and a brief description.

A. Kitchener Road House, Woodstock, 2005 - 2006.

Figure 11. Aerial view showing urban context of row housing, with building circled.

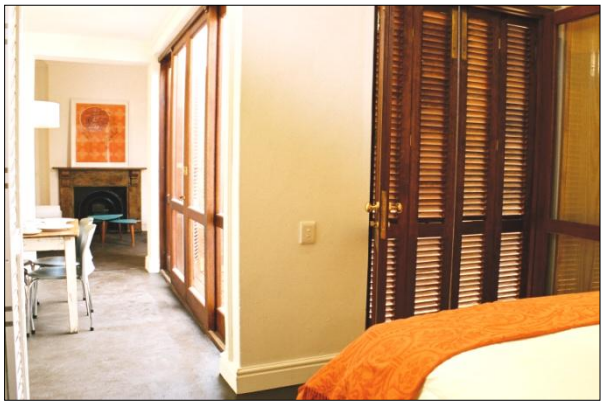

Figure 12. View from bedroom to living room past courtyard doors, which provide indirect light.

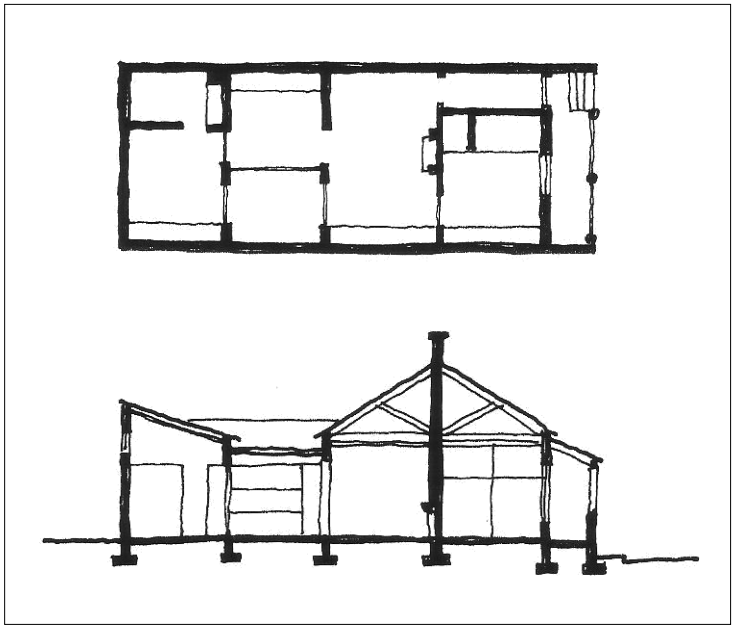

Figure 13. Kitchener Road House layout plan and long section.

The existing row house (two rooms and stoep, to the right of the plan) was retained and the rear portion demolished and replaced with a kitchen leading onto a courtyard and a bedroom with en suite to the rear. A roof deck over the kitchen separates the bedroom roof from the rest of the house, making clear what is original and what is new.

A long entrance hall and studio shields the living room from the street, while the courtyard brings reflected light into the private areas of the house (bedroom, kitchen, living room).

B. Falcon Street House, Durbanville, 2007 - 2011 (under construction).

The site is located on the urban edge of Cape Town, and abuts a seasonal wetland with several protected plant species. As a result, development on the site had to be compact and as close as possible to the street edge. The brief however included a main dwelling, space for a small vintage vehicle collection and a second dwelling. To provide privacy for the main dwelling, the garages and the second dwelling were arranged in a L-shape along the street, forming two edges of a courtyard in front of the main dwelling.

The mono-pitch roofs of the L-shape fall towards the courtyard, forming a high screen to the street while providing a human scale edge to the courtyard. The third edge of the courtyard is a covered walkway, part of an entrance route from the street through the garages and the main dwelling, terminating in a double volume staircase looking out over the wetland. Together with the elongated service areas, the entrance route stitches together the different components of the project into a compact form in the landscape.

Figure 14. Aerial view showing suburban context and green belt, with cleared site circled.

Figure 15. View from green belt to site, showing second dwelling to left and main dwelling to right.

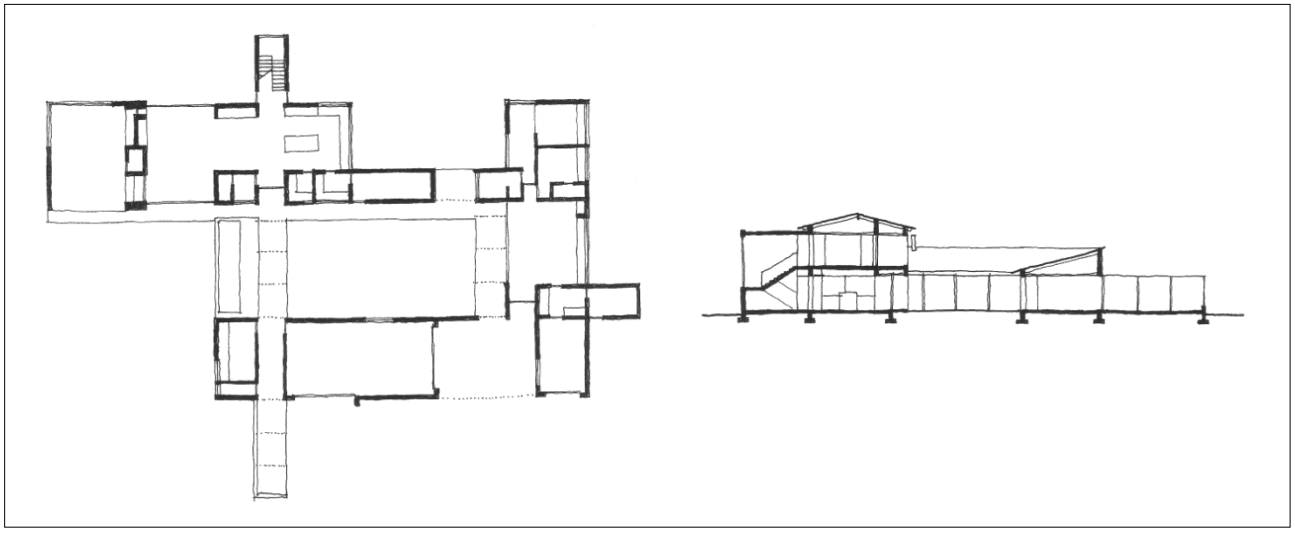

Figure 16. Layout plan of Falcon Street House (left) with garages below, main dwelling top left and second dwelling right; and section along entrance route (right).

C. Tiobelles Street House, Jamestown (Stellenbosch), 2007 - 2010.

Figure 17. Aerial view of building, with northwest facing raised courtyard to the left.

Figure 18. Street view showing direct relationship with the street and absence of perimeter fencing.

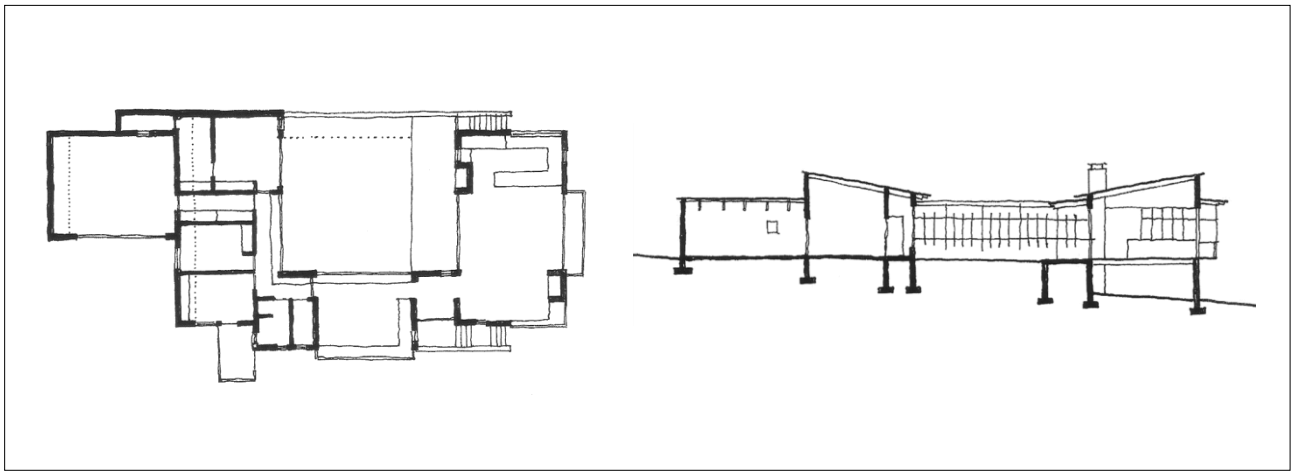

Figure 19. Tiobelles Street House layout plan (left) with sleeping and living areas on either side of the raised courtyard, connected by the entrance hall and studio; and long section through the raised courtyard (right).

Tiobelles Street House is in located in Jamestown, a steadily gentrifying working class neighbourhood outside of Stellenbosch. The clients' wish to respect the development pattern of the area by not separating the house from the street with perimeter fencing, as well as the slope and orientation of the site resulted in a courtyard layout which allowed the three main components of the building - living area, studio, and sleeping areas - equal access to daylight.

The house is on one level from the top of the site, resulting in a raised courtyard and living area to make the most of the mountain views towards Stellenbosch. As with project B, the mono-pitch roofs over the three wings fall towards the courtyard, with the resulting high wall on the street edge being brought down to human scale by a lean-to roof which clips onto the main building to protect the entrance stairs and porch from rain.

D. Church Street House, Prince Alfred Hamlet, 2009 - 2012 (under construction).

Figure 20. Aerial view of rural context and cleared site (circled) bordered by fruit orchards.

Figure 21. Site seen from street, with new trellised vineyard in the foreground.

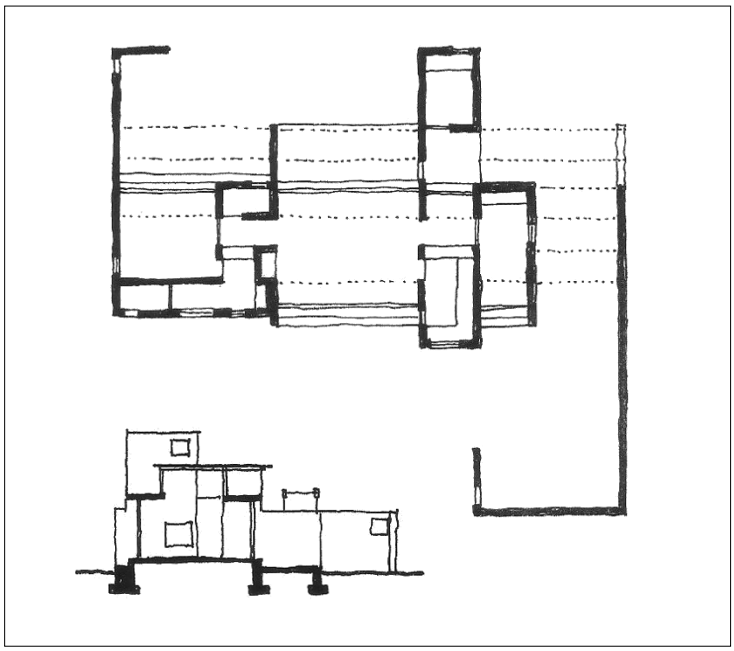

Figure 22. Church Street House layout plan and cross section.

The development pattern in this rural town is that of a street grid with houses clustered around corners. In order to respect this pattern, the house is located at the back of the property, with a vineyard towards the front of the property.

The living and sleeping areas open to the outside to differing degrees, with partially walled open courtyards and pergolas extending the interior space into the landscape. Services are organised in narrow bands which define the different areas.

The cross section is designed for passive climate control, using air circulation and sun shading to contend with the harsh climate.

In order to establish if there are any patterns or recurring themes one set of diagrams have been generated, using the techniques of reduction and addition. The diagrams show the internal area of each design in relation to the external spaces (e.g. courtyards) or partially open spaces (e.g. stoeps, pergola's). The investigation into patterns or themes will be done by means of exploring three aspects of each design: (1) the approach and entrance sequence; (2) the internal circulation; and (3) the relationship between indoor and outdoor spaces. Information relating to these aspects were later added to each reductive diagram. Thus each design now has a diagram which is both simpler (by virtue of reduction) and more complex (by virtue of addition) than the layout plans presented earlier.

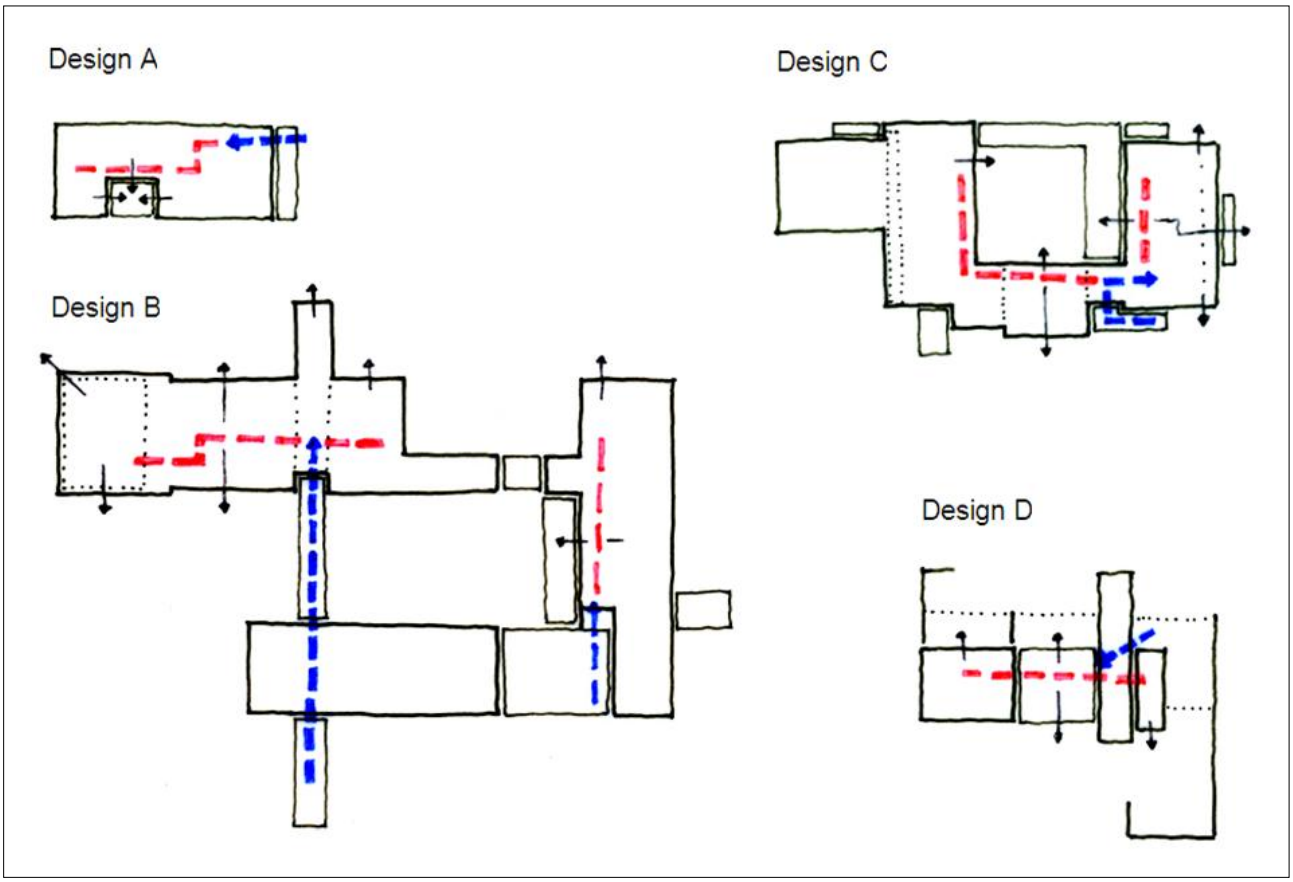

Figure 23. Diagrams using reduction and addition to show the main form and spatial organisation of the four designs, thereby facilitating comparison and analysis.

1. Approach and entrance sequence:

Due to its urban context, design A has a direct entrance, from the pavement over the stoep and through the entrance hall into the living area. As mentioned earlier, the long entrance hall serves as a buffer between the public realm of the street and the private realm of the living area. The stoep is enclosed with a lattice screen to reinforce the threshold between public and private. Design B is much more expansive than the former, and the function of the approach and entrance sequence is to stitch the different parts of the building together rather than to provide privacy. Access to the main dwelling is along an axis which starts as a pergola on the far side of the garages, progresses through the garage wing, becoming a covered walkway which defines one edge of the courtyard, and enters the main dwelling by cutting through one of the elongated service areas.

The approach and entrance sequence for design C has a two-fold funtion: it confirms the building's direct relationship with the street by aligning itself with the street edge, while simultaneously providing privacy by stepping up two short sets of stairs to the covered porch, from where one enters the house by turning around through the entrance hall into the living area. Design D is set towards the back of the property and approached along a long driveway to one side of the vineyard, from where the entrance is onto a simple porch and diagonally into the living area from the entrance hall.

From the analyses above, it is evident that the entrance sequence is always treated as a layered transition from public to private, using a succession of architectural elements to form a threshold to the building. Depending on the scale and context, this succession is rapid as in design A (stoep + entrance hall = 4 metres) or extended as in design B (pergola + passage + covered walkway + porch + entrance hall = 24 metres). Depending on the context, this sequence can be straight as in designs A, B and D, or turn through 180 degrees as in design C.

2. Internal circulation:

In design A, the internal circulation is oriented parallel to the one edge of the courtyard, extending into the bedroom and living room on either side. It is also parallel to the entrance axis, but offset to prevent sight lines from the street into the house. A diagonal line from the hall to the courtyard links the entrance sequence to the internal circulation. In contrast, the internal circulation of design B is perpendicular to the entrance sequence, which extends through the building and out into the landscape through the double volume staircase. The entrance sequence and internal circulation of the second dwelling, however, follows one line through the building.

The internal circulation of design C follows the same pattern as the entrance sequence, running along the three edges of the courtyard from the living to the sleeping areas. When these two routes meet in the entrance hall, however, they pull in opposite directions and balance each other out. In design D the entrance sequence meets the internal at an oblique angle, with the internal circulation running through the centre of the combined indoor-outdoor living area (albeit off centre in relation to the indoor living area).

In the smaller designs (A, the second dwelling of B, and D), the internal circulation is – almost by virtue of necessity – an extension of the entrance sequence, but offset in order to ensure visual privacy. The larger designs (B and C) place their internal circulation perpendicular to the entrance sequence, providing the user with a choice upon entering the building. In the designs where the courtyard separates the living and sleeping areas (A and C), the internal circulation defines on or more edges of the courtyard; whereas the internal circulation in design B and D runs roughly along the centre line of the building.

3. Relationship between indoor and outdoor spaces:

The courtyard is the only private outdoor space in design A, providing light and ventilation to the entire house. It results in a direct relationship between indoors and outdoors, with the indoor spaces forming a cohesive unit around the courtyard. In design B the courtyard acts as a thoroughfare to the main dwelling, while forming the outdoor space of the second dwelling. The main dwelling open up to the landscape laterally, partially shielded from the street by the garages.

In design C the building is placed hard up against the building setback lines in order to establish a direct relationship with the street. This arrangement is also crucial in order to maximise the size of the courtyard, which is the only secure outdoor space, both by virtue of being raised and by being enclosed by the house on three sides and a trellised roof along the fourth. Most of the spaces in the house have a visual relationship with the courtyard, with only the living area and main bedroom opening up to it directly. Design D is the only instance where the courtyard walls serve more as screens than as space-defining elements. With the house set some distance away from the street, the pergola along the front of the house extends the indoor living area out into the landscape.

Courtyards are the primary ordering device used in all the designs; however, the degree in which the courtyard plays a role in the indoor-outdoor relationship differs. In design A and C, the courtyard is the primary outdoor space, with the indoor spaces arranged around it. In design B the courtyard forms an outdoor space to the second dwelling, while the main dwelling relates directly to the landscape. Lastly, in design D the two courtyards are not fully enclosed and the indoor spaces have a direct relationship with the landscape (as in design B), albeit screened by the courtyard walls to some extent to establish visual privacy where needed.

5. Conclusion

This paper has argued that reflective practice constitutes a form of design research, and built an argument around design in the discipline of architecture to support this statement. The definitions of design and research are as follows: "*the arrangement of features of an artefact, as produced from following a plan or drawing*" and "*the systematic investigation into and study of materials and sources in order to establish facts and reach new conclusions*" (Oxford Online Dictionary, 2011:n.p.). If one were to combine these definitions, it becomes clear that the function of design research is to retrace the steps of the designer in order to identify and comprehend their responses to design informants.

This process holds great value for both design practice and education. Schön (1983:26) first stated that practitioners who reflect on practice are engaged in a form of research almost thirty years ago, yet Kinsella (2009:9) found recently that educators are disturbed because they have no satisfactory way of describing or accounting for the artful competence which some practitioners reveal in what they do. The approach to design research proposed in this paper aims to address this situation; indeed, James Stirling's commentary (2006:xiv) on Geoffrey Baker's analytical technique shows that traditional architectural knowledge and theory has been obtained through the retrospective analysis of historical buildings.

It is evident from the approach to design research and its application presented above that reflective practice does constitute design research, and that it has the potential to address the complex issues that confront design researchers today. In utilising reflective practice as a form of design research, practitioners and researchers can establish the synergy of combined conceptual, theoretical, empirical and practical considerations which Kernaghan (2009: n.p.) describes. Hence there is a responsibility on tertiary institutions that teach design – especially architectural design – to recognise, support and reward such research.

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