Designing the Urban: Reflections on the role of theory in the individual design process

Abstract

This paper offers an overview of PhD research that seeks to explore the ways in which theories in urban design might influence the individual creative process of urban design. Its objectives are to study existing theory related to design, examine the process of design and urban design, and relate knowledge of urban design theory to the design process. Having reviewed possible research by design methodologies and identified four approaches, a reflective one is taken based upon Donald Schön’s ‘The Reflective Practitioner’ (1983). This is executed through the generation of an urban design (site evaluation, framework and masterplan for a site in London) and accompanying commentary that records the design activity, followed by an analysis of and reflection on the design and commentary offering insights into the use of theory within the process.

Keywords: Reflection; urban; theory; design.
Introduction

This paper gives an overview of research undertaken for a PhD by design, the interest of which is the role of urban design theory in the individual creative process of urban design. The background to the work is briefly introduced, and a summary of the literature review given leading to the research question, aim and objectives. This is followed by a synopsis of the methodological approach, empirical work, key findings and conclusions drawn.

In Urban Design International (2007) Alexander Cuthbert described a lack of theoretical basis for the discipline of urban design. This, along with an attempt to base an urban design project on the principles of the Situationists provoked an initial interest in the relationship between theory, practice and praxis in urban design. This led to a preliminary study of literature in these areas. The scope of interest in terms of substantive content refined to the more specific areas of theory’s role in design, the design process and urban design as a process and product.

Simultaneously, explorations were made into research by design to establish the methodological potential. In part the thesis summarised in this paper is the product of an initiative by the School of Architecture at Edinburgh College of Art (ECA), to encourage postgraduate students to pursue research degrees using design as a methodology. Within ECA practice-led research is well established for other creative disciplines and interest arose in how this might be enacted in disciplines that deal with the design of the built environment. Whilst traditional research degrees are recognised as having textual output, the development of design as an integral part of the research process and product is emerging in a number of disciplines. Throughout design education, design skills are cultivated and become inextricably linked to the parallel skills of problem-solving and communication (Lawson & Dorst, 2009, Cross, 2011). It seems appropriate, then, that design as means of exploring and expressing ideas should be able to extend beyond taught programmes into research, broadening and enriching the methodological potential (Pedgley & Wormald, 2007, Montague, 2011). Four possible approaches emerge – quasi-scientific, creative practice, speculation and reflection – all of which are identified as having the capacity to study design in different ways.

Before one can be selected for this research, objectives are identified by studying existing knowledge through a review of literature relating to urban design, theory and the design process.
Urban design, theory and the design process

In seeking to understand what is already discussed about theory and design in urban design, the literature review is organised into two sections. The first considers urban design: various definitions, its context, the location of urban design within areas of scholarship and the outcomes of urban design. The final part of this section considers what urban design theory is and what its role is thought to be. Section two of the review explores existing knowledge of the design process, both in generic terms and in terms specific to urban design, attempting to understand how it works. This refines the area of interest, and identifies the specific focus, question, aim and objectives within it. A summary of the key findings of the Literature Review is now presented.

Urban design and theory

Although there is little consensus about a definition of urban design, Kirk (1980), Castells (1983) and Cuthbert (2007) regard it as a conflictive process in which the urban designer must negotiate multiple and, at times, competing interests in “...the symbolic attempt to express urban meaning in certain urban forms” (Castells, 1983). As a formal discipline/activity, urban design is regarded as only part of what contributes to the eventual form of the built environment.

Cuthbert (2011) argues for a social science basis for the discipline proposing that it become rooted within spatial political economy. However, he acknowledges the relationship to architecture and planning. Within the interpretative process that generates urban form this relationship enables the use of approaches more common in the area of art and design. Madanipour (1996) describes it as the ‘creative process’ of urban design, in which the individual designer uses his/her skills, knowledge and judgment to develop spatial proposals - distinct from the technical process (when designers are interacting with the objective world through application of science and technology) and the social process (when designers are involved with other individuals and institutions constituting their social setting).

As a product, the urban designer may generate a site evaluation, which leads to development objectives, an urban design framework, which provides the context for more detailed development in the form of strategic thinking and two-dimensional planning, and a masterplan which consists of three-dimensional spatial design (Cowan, 2003).
For the purposes of this research, the term theory refers to urban design theory as distinct from the broader category of urban theory (Parker, 2004, Cuthbert, 2006). The distinctions drawn between procedural (theory of) and substantive (theory in) theory are used to focus on theories in urban design - those which study the discipline’s own operations by providing observations and explanations of urban phenomena or processes (Faludi, 1973, Cuthbert, 2007). There are suggestions that theory influences design in some way (Wolfe & Shinn, 1970, Schön, 1983, Madanipour, 1996, Moughtin, 1999, Lang, 2005). More specifically there is some indication that substantive theories might guide and be tested by design (Lang, 1987, Carmona & Tiesdell, 2007). However, beyond the notion that theory provides abstract generalised knowledge that can be applied to site-specific projects, it is not clear how this might happen.

The design process

The literature review concludes that, rather than an intangible creative act, entirely unique to each project, the view of design as a process with underlying stages and recognisable actions is accepted - a foundation is laid by Wolfe and Shinn (1970), Schön (1983), Madanipour (1996), Lang (2005), Lawson (2006, 2009) and Cross (2011). Furthermore, whilst some design activity and the reasoning behind it are done explicitly, it is widely thought that some is done implicitly, and that furthermore it might use tacit knowledge (Wolfe & Shinn, 1970, Schön, 1983, Moughtin, 1999, Lawson, 2006, Heylighen, Cavallin & Bianchin, 2009, Cross, 2011).


Suggestions were found that theory is a possible influence, sometimes broadly described as theoretical constructs (Wolfe & Shinn, 1970, Schön, 1983, Moughtin, 1999, Lang, 2005) and sometimes as currently accepted paradigms (Schön, 1983, Madanipour, 1996, Moughtin, 1999, Lang, 2005, Lawson, 2006, Cross, 2011). However there is little indication of how this might happen. Beyond the application of abstract generalized concepts to a specific project. There is some suggestion that the use of episodic knowledge (precedents) is favoured by designers over the use of semantic

The issues raised in both sections of the Literature Review and summarised above illustrate that there is a gap in current understanding concerning the way that urban design theory relates to and is related to the interpretative, creative stage of the process of urban design. This opportunity prompts the research question, aim and objectives for this thesis:

**Research question:** In which ways might theory be used in the individual design process of urban design?

**Research aim:** To explore ways in which theories in urban design influence the process of urban design and the extent to which they may inform design decisions in addition to the other constraints which a designer must consider.

**Research objectives:** to study existing theory related to design; examine the process of design and urban design; and relate knowledge of urban design theory to the design process.

**Methodology**

As a consequence of the research aim and objectives, this study requires a methodology that allows examination of the design process within urban design. Scrutiny of the designer’s decision-making process and tacit knowledge is necessary in order to allow the explicit and implicit theoretical influences to be examined.

Research by design is understood as research that employs generative design as an integral methodological component, the output being both text and design. It is argued that certain aspects of design, chiefly the designer’s tacit knowledge and decision-making process, are not accessible using more traditional research methods but that they can be examined by using design as a methodology (Lang, 1987, Buchanan, 1999, Cross, 1999, 2001, Heylighen, 2007, Friedman 2003, Niedderer, 2007, Niedderer & Roworth-Stokes, 2007, Cavallin & Bianchin, 2009). For this reason the system of inquiry for this study is research by design. Some authors argue that it is somehow special and that traditional research paradigms and criteria do not apply (Frayling, 1993, Rust, 2004, Dunin-Woyseth, 2005, Findeli et al., 2009,). However others conclude that it is not only unnecessary for design-based research to be categorised differently from all other academic research but undesirable, as Michael Biggs and Daniela Büchler (2007) argue that the same criteria for rigour, knowledge
progression and communicability are required of it. Essentially, design in a research context is just another means of generating an evidence base for analysis, in the same way as case studies, interviews or historical surveys (Steino & Markussen, 2011). Textual elucidation of the design work is required by the University of Edinburgh’s regulations. From a review of literature and completed PhD theses that use creative practice, four possible methodological approaches appear to exist. The categories that emerge are quasi-scientific, creative practice, speculation and reflection (Montague, 2011). These possible strategies were reviewed and the approach of the reflective practitioner was selected as it gives the opportunity to look back at both the process and the product of an urban design and consider where and how theory appears to have influenced it. It is recognised that in order to identify the knowledge which is “...implicit in our patterns of action” (Schön, 1983) additional efforts must be made, beyond the type of reflection which is integral to design practice, in order to articulate the process (Friedman, 2003). The design process is made explicit by the researcher/designer and he/she then reflects retrospectively on information in relation to the original theoretical context (Montague, 2011). By doing this he/she may “...gain new insights and understanding upon practice – as post rationalisation on ‘ordinary’ practice” (Niedderer, 2007).

Certain tactics are then determined in order to execute this approach: a literature review, design, commentary, analysis and reflection. Having already summarised the findings of the literature review earlier in this paper, the remaining tactics will now be described.

**Design & Commentary**

The design and reflection on it are used “...to gain new insights and understanding upon practice – as post rationalisation on ‘ordinary’ practice” (Niedderer & Roworth-Stokes, 2007). Therefore the design component includes the standard outputs of urban design as identified in the Literature Review – a site evaluation, framework and masterplan. Croydon [Figure 1], in London, is selected at the site for the design as it has a live brief for development and is of sufficient size for an urban design intervention within the physical context of an existing built context, as information is readily available and as it can be easily visited for a site survey.

Alongside the design activity, a commentary is kept to make explicit the implicit activity and reasoning within the design process. This is not an analytical commentary but a record of direct and immediate actions and reactions in the design process. It might be termed ‘descriptive reflection’ – “...a factual account of an event” (Hatton &
Smith, 1995, quoted in Pedgley, 2007). It could be seen also as Schön’s reflection-in-action (1983), as it documents the designer’s reasoning when engaging directly with the design process.

The commentary is presented in a tabular format. Each entry records the action undertaken, the reason for that action and the associated sketch if applicable. All sketches and models generated during the development of the urban design framework and masterplan for Croydon are collated and presented in the thesis for cross-referencing.

**Analysis**

Due to the volume and detailed nature of the material generated through the design and commentary, some difficulty is perceived in locating and analysing the design activity it records (Matthews, 2007). A strategy for dealing with this difficulty has been used by Pedgley (2007), who takes various steps to prepare, process and analyse the raw data produced by the diary. Seen to be key in this strategy is the use of categories and ‘codes’, to organise and distil the large volume of raw data (Gero &
McNeill, 2006, Matthews, 2007, Pedgley, 2007). The categories for analysis are derived from the research aim. As the aim is to facilitate discussion of theory’s role in the individual design process, each commentary entry is analysed in terms of the type of design activity which is taking place and the types of influence that are thought to be acting upon it. Where this seems to include theory, further analysis is used to discern whether it is explicit or implicit and whether the theory is substantive or procedural. The codes within each category are informed by the findings of the literature review and the content of the commentary. This category-based analysis is appended to the each commentary entry within the tabular format and this material as a whole then, along with the design drawings and reports, provides the substance for reflection.

Reflection

Reflection on the design and analysed commentary discerns any relevant patterns or phenomena within the data, and relates them to the existing knowledge appraised in the Literature Review. First, it is considered whether or not urban design theory appears to have been an influence in the development of the site evaluation, urban design framework and masterplan for Croydon and, if so, where. This is then compared to the extent to which other influences affect the design. What was found was that urban design theory had been an influence on the design process and the design product (proposal) but that it was subservient to other influences. The nature of theory’s apparent influence was then more extensively considered. Three examples of this will now be presented.

Explicit and implicit use of theory is perceived to have taken place, and instances of both are examined. Several theories such as Bill Hillier’s Space Syntax (1984) and Kevin Lynch’s ‘A Theory of Good City Form’ (1960) have applications that are used both in the site evaluation and in evaluating design proposals. An example of this is in the designer’s use of space syntax theory to analyse an aspect of the urban environment. Commentary entries 3.52 and 3.53 [Table 1] show how a new layout of built form and open space is proposed by the designer [Figures 2 and 3] through the generation of an alternative that seeks to respond more favourably to the objective of improving integration. She engages the technique of space syntax analysis to evaluate the alternatives and facilitate the selection of the first.
### Table 1: Commentary entries 3.52 to 3.53

<table>
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<tr>
<th>Commentary</th>
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<tr>
<td><strong>Commentary</strong></td>
<td><strong>Analysis</strong></td>
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<tr>
<td>Action</td>
<td>Reason</td>
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<tr>
<td>3.52</td>
<td>Test a second option for making the connection through to George Street with two connections forming three small blocks along the south side of George Street. Check integration values of both in Space Syntax model.</td>
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<tr>
<td>3.53</td>
<td>Decide on the original option.</td>
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Additionally, Peter Calthorpe’s ‘Transit-Oriented Development’ (1993) is seen to have been explicitly consulted in the initial stages of developing the urban design framework – documented in the design commentary and analysis [Table 2] and related design development sketches [Figure 4]. The designer refers directly to the theoretical framework of ‘Transit-Oriented Development’ (Calthorpe, 1993). The situation that prompts this consultation seems to be one where the designer has an emerging understanding of multiple issues that are particularly significant for Croydon. This then causes her to seek out guidance, from a body of theory, on how to approach this aspect. This involves referring to published material containing the theoretical ideas. The concepts of the theory are then clarified in the designer’s mind by sketching abstract representations of them before interpreting how it relates to Croydon by assigning contextual references to its different levels. This step allows the site to be understood initially in the broad terms of the theoretical perspective. The commentary records that the designer’s rationale for this action, at the time, is to consider the implications of this theoretical approach for the site. This appears to amount to theory as a source of guidance, selected by the designer as appropriate for
the particular issues confronting her, as capable of forging a direction for design by providing a basis for initial ideas. Subsequently, the designer interprets how these ideas can be translated to the spatial context of the site.

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<tr>
<td>Action</td>
<td>Reason</td>
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<tr>
<td>2.13</td>
<td>Decide that movement is a, or even the, major driver for this scheme and that a clear strategic approach is needed.</td>
</tr>
<tr>
<td>2.14</td>
<td>Refer to Calthorpe’s ‘Transit-Oriented Development’ (Calthorpe, 1993). Note points of relevance.</td>
</tr>
<tr>
<td>2.15</td>
<td>Sketch Calthorpe’s</td>
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abstract ideas of transit-oriented development and associate the levels with the site in hand.

the context and find a strategic approach to guiding the concepts of the framework.

alternatives

F04

Generation of alternatives

Theory

Explicit

Substantive theory (theory in)

Table 2: Commentary entries 2.13 to 2.16

FIG. 4: Framework development drawings F03, F04, F12, F15, F16, F17

Across the design development of the framework TOD first informs a strategic direction for various elements of the framework proposal. Subsequently, it is used to
steer the design development by repeated referral to its principles, which appear to form the criteria for evaluation of alternatives. This period of the design shows a progression from abstract, generalised ideas to interpretations specific to a site in keeping with Wolfe and Shinn (1970) and Lang (1987).

Whilst some design activity and the reasoning behind it is done explicitly, it is widely thought that some is implicit, and that, furthermore, it might use tacit knowledge (Wolfe & Shinn, 1970, Schön, 1983, Moughtin, 1999, Lawson, 2006, Heylighen, Cavallin & Bianchin, 2009, Cross, 2011). There are also some suggestions that a designer may use theory implicitly, without it being explicitly acknowledged (Moughtin, 1999, Allen, 2008). Theory is perceived to have had some implicit role in the design for Croydon in instances where the designer demonstrates, in her thoughts and actions, an adherence to certain values. An instance like this is recorded in commentary entries 3.41 to 3.44 [Table 3], which describe the negotiation between the designer’s preference for perimeter blocks and the physical restrictions of the site. Entry 3.42 depicts a further layer to this negotiation, in which the desired typology, having been arranged on the site [Figure 6], is then also subject to the client’s objectives. Here, the goals of permeability and division of fronts and backs are articulated by the designer but are not questioned. Rather they seem to be assumed as valid goals. These goals and values seem to suggest the possible tacit input from the arguments of Hillier and Bentley et al. around permeability, connectivity and integration as well as extending to Bentley’s preference for legible division of public fronts and private backs, and perhaps Gerhard Curdes’ (1993) thoughts on built form typologies. However, they are not acknowledged within the design process as being theoretically based; the association only becomes apparent when reflecting on the individual and collective commentary entries. This may be related to the idea articulated by Lawson (2006), Cross (2011), and Wolfe and Shinn (1970) that a designer approaches a project with implicit criteria, goals and priorities.

Reflection on the design and commentary, in the context of the findings of the literature review, allows the research question to be re-addressed, findings to be proposed and conclusions to be drawn. The final section of this paper offers the key points from these as well as consideration of the qualifying factors for the findings.
<table>
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<tr>
<td><strong>Action</strong></td>
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<td><strong>Type of design activity</strong></td>
</tr>
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<td>3.41</td>
</tr>
<tr>
<td><strong>M09</strong></td>
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<tr>
<td>3.42</td>
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<tr>
<td><strong>M09</strong></td>
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<tr>
<td>3.43</td>
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</table>
row typologies to the north-west of Mid Croydon by mirroring them to the south and forming a perimeter block.

and private backs.

| 3.44 | Indicate where service access can be incorporated within each block. |
| M09 | Respond to council’s requirement for the development and principles to preserve the quality of the public realm. |
| Generation of alternatives | Client/brief Objectives Guiding principles Theory |
| Implicit | Substantive theory (theory in) |

Table 3: Commentary entries 3.41 to 3.44

FIG. 5 and 6: Masterplan development drawing’s M08 and M09

Findings

The research question this PhD thesis addresses is: ‘In which ways might theory be used in the individual design process of urban design?’ Its aim is to explore ways in which theories in urban design influence the process of urban design and the extent to which they may inform design decisions in addition to the other constraints which a designer must consider. The research objectives are to review literature about the relationship between theory and design; to examine the role of theory in the individual creative process of urban design; and to reflect on the process of design in

Theme I - Knowledge
order to conclude how it was informed by theory. Drawing from the reflection on the design and commentary, a number of substantive findings can be proposed. Urban design theory does appear to have been an influence in the design created for Croydon as part of this research. The frequency of its influence is significant but less than that of a variety of other influences. Although theory has often been subservient to other influences, in terms of the importance of its influence, its contribution to the development of the urban design framework for Croydon is quite extensive in determining the overall approach. At this strategic level, decisions can have far greater impact than those that follow in the more spatial masterplan level. Other influences were also found to act upon the design process and product, namely guiding principles, site, policy, client/brief, site evaluation, objectives, precedents, previous experience, education, framework, land ownership and reports/grey literature. Collectively, these other influences appear within the analysis frequently, contributing to the vast majority of diary entries. This would suggest that although theory has some impact, other factors influence the process far more often. Reflection on the design, commentary and analysis suggests that the more conceptual and strategic the stage of design, the more extensive and explicit theory’s influence is. Conversely, the more spatial and detailed the stage of design, the more tacit and fragmented theory’s involvement appears to be. It is often implicit, embedded within the guiding principles that the individual designer exercises, evidenced in the design process and design product.

Three distinct ways in which the urban designer uses urban design theory emerge:

i. As a tool for analysis of existing situations or proposed designs. This tends to be done through established techniques that are associated with the theory in question. It seems to be used in this way during stages when the urban designer is defining the problem, evaluating alternatives and synthesising/selecting alternatives. Varying degrees of interpretation are required in the execution of techniques, in understanding the results, and in judging their implications using the theory’s own principles in combination with the designer’s experience.

ii. As a source of guidance/information which is actively sought by the urban designer as a basis for design decisions. This involves a greater degree of interpretation on the designer’s part, in determining how, in the absence of any given method, to apply abstract principles to a specific situation. This use of theory is observed in the setting of objectives, generation of alternatives, evaluation of alternatives and synthesis/selection of...
alternatives. Instances such as that discussed in paragraph 5.2.10 also raise interesting issues: where the designer selects an approach (TOD), the designer applies the approach, and the designer evaluates the application of it using criteria from that approach, is it not inevitable that the move will be judged as successful?

iii. As an underlying foundation which tacitly informs the urban designer's decisions. This use of theory extends across all stages of design - from how a designer defines a problem, sets objectives, generates, evaluates and synthesises/selects alternatives. It seems likely that this use of theory is largely informed by the designer’s theoretical preferences, dictating their perspective.

The way in which the individual approaches designing can seemingly be attributed, to a significant extent, to a foundation of education, previous experience, guiding principles and paradigms of the field. However, closer examination of these influences reveals that they also have a theoretical underpinning. The extent to which the influence of guiding principles and education seem to coincide with a perceived tacit theoretical influence suggests that it is a large part of how the designer is implicitly influenced by theory. It would seem to imply that the design process and product may be more profoundly contingent on urban design theory than the marginal discussion in existing literature might suggest.

Qualification of findings

Had a different approach to the empirical stage of research been used instead of research by design, such as an ethnomethodological study of a number of urban designers, a broader picture of how they thought theory is used may have been achieved, with increased ability to generalise findings. However, the experience of keeping a commentary alongside designing made the designer/researcher conscious of a significant amount of implicit activity, values and decision-making which in her normal design practice is not made evident. It seems unlikely, then, that this information would have been made available for scrutiny either by asking designers to talk about their own processes and/or by observing their design activity.

The validity of the evidence base, discussion and findings is open to scrutiny through examination of the design documentation, which attempts to make the process explicit. Chronologically, the research started with the Methodology and Literature Review before moving on to the design for Croydon, therefore the
researcher/designer was aware of what she was doing when designing. It is conceivable that this could have affected how the design was executed and therefore impacted the evidence base. However, no intentional deviations were made from the researcher/designer’s usual design process, various steps were taken to ensure objectivity (as far as is possible in this type of research) and designing took place in the individual’s usual conditions. The commentary is an honest record of the actions undertaken and the instantaneous reasons for those actions. Furthermore, as the design was being developed, focus was directed towards the business of designing, not towards the research implications of the commentary being kept simultaneously. Instances of inefficiency and ineffectiveness in parts of the designer’s process, which would not normally be presented to others in the course of practice, remain unedited in this record.

Part of the aim of research is to derive generalisations, rules and theories in order to further knowledge in or of a field. However, in humanities and social science research, absolutes and falsification are not the medium we are dealing with but rather indications of likely trends and possibilities (Coyne, 2012). As the methodological approach to this research has involved an individual researcher/designer reflecting on her own design activity, the extent to which its findings are specific to the individual or may be more widely applicable can be debated. However it does construct a position from which the author can speculate on their broader bearing and draw conclusions from her experience. In this instance they offer some confirmation of the use of theory in the urban design process and indicate several ways in which an urban designer uses theory in the course of her normal design practice. It is the opinion of the author that it is highly probable that these are representative of the types of interaction that occur generally. In particular, it seems likely that individual designers each design from a certain perspective with embedded values, derived from urban design theories. The degree to which this is outwardly evident in a designer’s work may vary, as might his or her own awareness of it. Whether conscious or unconscious, it could be inherited from a variety of sources including his/her education, previous experience and the currently accepted paradigms of the field.

Conclusion

This paper has given an overview of PhD research research that seeks to explore the ways in which theories in urban design might influence the individual creative process of urban design. From this research substantive and methodological conclusions can be drawn.
There appear to be three primary substantive findings, all of which might reasonably have been predicted prior to the research. In addition, there is one main outcome in relation to the working process:

- Theory’s influence in the creative process of urban design is distinctive although it is subservient to a variety of other influences, particularly constraints such as site, brief and policy.
- At a strategic level it is used more extensively and explicitly while at a spatial level its contribution is more implicit. Initial analysis indicates that, in a conscious manner, a theory’s principles can be employed directly or interpreted in a new scenario.
- Unconsciously, it can be seen to be embedded within guiding principles applied to the generation and evaluation of design ideas.

While these findings are specific to an individual and the way that individual designs and evaluates the design process, they do confirm the use of theory in the urban design process and may act as indicators of trends in the relationship between theory and practice in urban design.

In terms of methodological findings, the reflective approach appears to have provided sufficient and credible evidence of theory’s role in urban design’s creative process and product. Several tactics have been used to deploy this approach – an urban design for Croydon, a commentary kept simultaneously to record design development, and analysis of the raw commentary data followed by reflection. As anticipated by Pedgley (2007), maintenance of the commentary was unavoidably disruptive to designing, requiring interruptions to the design process that sometimes affected momentum. However, provided the recording of material (sketches, models and commentary) is rigorously administered, it seems capable of making design activity, including tacit aspects, transparent and communicable. It has succeeded in providing an evidence base for reflection, from which, ultimately, it has been possible to draw conclusions in relation to the research question. Most importantly, considering the research aim, it has allowed investigation into the tacit aspects of design and role of theory amongst a variety of other influences, whilst ensuring that the process of inquiry has been transparent and communicable, allowing scrutiny by others. This would seem to confirm Niedderer’s (2007) support for post-rationalisation on ordinary design practice as a means to acquire new knowledge.
References


