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Transitional edges: a conceptual framework for socio-spatial understanding of urban street edges

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Abstract
This paper develops a conceptual framework of transitional edges to enhance understanding of the social value of urban street edges. Building from theoretical principles associated with socio-spatial understandings of urban realms, transitional edges conceptualise urban street edges as integrations of their social, spatial and material dimensions. This is captured in a tripartite structure highlighting socially relevant properties of transitional edges that act along them (extent), across them (laterality) and within them (locality). This provides a foundation for developing an approach to practical application based on identification and evaluation of transitional edges as assemblages of territorialised segments. To progress this, a developmental study of a length of Sharrow Vale Road in Sheffield, UK was carried out to explore how theoretical principles of the transitional edge conceptual framework could be translated for practical application. This reveals the potential of transitional edges to highlight that locally focused small scale change and adaptation may be significant to the social potential of urban street edges. As a result, the current study sets out theoretical and practical foundations for a conceptual framework of transitional edges which will support development of an extensive funded programme of transitional edge case study research.

Keywords: transitional edge, extent, laterality, locality, segments, socio-spatial street edges

Introduction
Active street edges encourage social vitality in urban environments (Frank and Stevens, 2007; Gehl, 2010; Glaser et al, 2012; Dovey and Wood, 2015). Nevertheless, the creation of active edges in ways that successfully draws together their material and spatial structure with social processes remains hindered (Cuthbert, 2007; Gehl, 2010). An important limitation is that socially oriented benefits associated with urban street edge settings rarely feature directly in prevailing approaches to urban planning and design practice. '*For decades the human dimension has been an overlooked and haphazardly addressed urban planning topic…*' (Gehl, 2010:3). In response, the current paper develops an approach to urban street edge settings, called transitional edges, in which their built form, spatial structure and social dimensions can be integrated to inform theory and practice in urban design. In this way, the transitional edge concept and its application seeks to respond to changing patterns of use and engagement with urban streets increasingly associated with high street decline and diminishment of social vitality in urban environments (Gehl and Svarre, 2013; Harvey and Aultmann-Hall, 2016; Boys Smith, 2016; Crozier, 2018; Mehta and Mahato, 2019). This is achieved by contributing a means to mobilise the organisation and integration of bottom-up, localised agencies of change through theoretical and practical focus on the importance of small scale, ordinary and mundane aspects of urban street form and associated sociality (Franck and Stevens, 2007; Dovey and Wood, 2015; Chiesi, 2016; Porquedda, 2018).

The core of our approach draws from theoretical structures rooted in social studies which are gradually being incorporated into urban design discourse (Dovey and Wood, 2015; Muminovic, 2015; Harvey and Aultmann-Hall, 2016). This provides a platform of socio-spatial understandings of urban order enabling development of a conceptual structure for transitional edges. A key innovation of the transitional edge concept lies in its integration of social, spatial and material dimensions of urban street edge experience in the form of

assemblages of socio-spatial territorialised parts (segments) as the fundamental building blocks of transitional edges. Transitional edges are, therefore, distinguishable from facades in their definition as socio-spatial entities and their composition as assemblages of segments.

The principle of transitional edge segmentation has roots in aspects of assemblage theory (Dovey, 2010) enabling two key theoretical and practical contributions. Firstly, by drawing from wide ranging discourse which associates urban material and spatial structure with social benefits, segments bring into focus socially optimal qualities of transitional edges that can be attributed to a structure consisting of their extent, laterality and locality. Secondly, we will show that segments offer the means by which this theoretical framework can be applied to the identification and evaluation of transitional edges with the aim of strengthening their social and experiential responsiveness. The paper will show how this is achieved by first segmenting transitional edges and then evaluating each individual segment's social (appropriation, occupation), spatial (articulation, open-ness) and material (distinctiveness, temporality) dimensions. These terms have origins in themes derived from literature review outlined in section one, subsequently translated into a form more amenable to application, explained in section three. The resulting segment evaluation provides foundations from which to optimise the social potential of the transitional edge by enhancing: localised expression at localities 'within' the transitional edge; spatial porosity laterally 'across' it; and coherence and adaptability 'along' its extent.

To highlight the opportunities offered by the transitional edge concept we will outline in section three outcomes of a site based development study used to explore ways to translate the theoretical principles for practical application. The site chosen was a section of Sharrow Vale Road in Sheffield,UK. The principal aim of this study was to condense the themes derived from literature, outlined in section one, into a form that would enable transitional edge segments to be identified and evaluated. This would then form part of a broader methodological framework, including participant focused methods, for application in a more extensive future transitional edge case study research programme. The decision to use one locally accessible site for the study was influenced by two main considerations. The first was that only modest funding (University of Sheffield, Department of Landscape Research Support Fund) was available within the required timeframe. The second was a decision to focus on an urban street edge that exhibited characteristics consistent with the theoretical principles behind the transitional edge concept: specifically those that exhibited close integration of material form, spatial organisation and social vitality. In this way we hoped to develop the potential of the transitional edge concept to focus on localised small scale changes and adaptations which offer potential to optimise social benefits. Outcomes of application could therefore be an important source of information for professional practice decision making as well as local community and user processes of change. In this respect, the transitional edge concept also contributes research that seeks to systematically understand and assess socially relevant properties of urban streets (Ewing and Clemente, 2013; Gehl and Svarre, 2013; Mehta, 2014; Harvey and Aultman-Hall, 2016). However, it adds to these with a more explicit recognition of the integrated nature of urban street edges as social, spatial and material realms. From such a foundation, the current paper addresses three core questions:

- How can we understand the socio-spatial structure of transitional edges?
- What are the key components of a socio-spatial mindset which underpin socially optimal conditions for transitional edges?
- How can this be developed for practical application?

By this means the paper contributes to urban design theory by strengthening the significance of socio-spatial understandings of urban street edge settings, and to practice through translation of the transitional edge concept for practical application. This offers the opportunity to understand and deliver socially beneficial urban street edge settings contributing ways to enhance social vitality in urban environments.

Section One: Transitional Edge Socio-spatial Framework: Extent, Laterality, Locality

We begin by outlining development of socio-spatial understandings of urban realms and how these are beginning to converge on urban interface settings. This rests on theoretical insights that assert the importance of adopting more integrative approaches to human-environment relationships in urban realms. From these foundations we develop the transitional edge conceptual framework which gives primacy to integration of material, spatial and social dimensions of environment within theory and practice development, building on the understanding that *'Social space tends to be translated, with more or less distortion, into physical space'* (Dovey, 2005: 285).

Transitional edges are concerned with human-environment relationships at interfaces where human occupation and material form interact (Habraken, 1998; Gehl, 2006; 2010). In essence they are conceived as socio-spatial interpretations of urban street interfaces, distinguishable from 'facades' because their socio-spatial nature extends beyond material and aesthetic considerations. The socio-spatial perspective we draw from emphasizes the predominant importance of the pedestrian experience. As a result, our attention for transitional edge development lies with urban street edge settings at eye level where the principle focus is with pedestrian patterns of movement and occupation, an interest also evident in other recent works (Gehl, 2010; Ewing and Clemente, 2013; Gehl and Svarre, 2013; Heffernan et al, 2014; Dovey and Wood, 2015; Harvey and Aultman-Hall, 2016; Kickert, 2016). In using the term transitional edges, we highlight their complex and intrinsic transformational, or becoming, nature: where interior becomes exterior, enclosed becomes open, social becomes spatial, public becomes private, and where mood and atmosphere, function and experience continuously adapts in response to spatial organization and the social forces active there (Franck and Stevens, 2007; Dovey, 2010; 2018;). Transitional edges are formed and transformed as much by patterns of occupation and use as their spatial and material properties.

The way Habraken (1998) conceives the structure of ordinary built environments provides an important foundation for the development of transitional edges by shifting emphasis away from material and spatial structure towards relationships of control. These are especially active at the margins where human habitation and material form interact. *'In short, we are interested in the overlapping relationship between physical form and territorial control.'* (Habraken,1998: 127). Habraken describes a tripartite framework of *form, place* and *understanding* as inter-related levels of control he sees as determinant influences on the way urban structure becomes manifest. *Form* is what establishes an organising, structurally stable infrastructure which can then be occupied. Particular spaces within infrastructures become controlled as occupants determine what and who comes in and stays out. Occupation transforms space into *place* and therefore has an explicitly territorial meaning related to the human impulse to control their surroundings by identifying and defining territory. Habraken's third level of control is that of *understanding*, which means the general desire in humans to relate to one another via common structures or shared meanings. If *place* is driven by territorial factors associated with spatial occupation, *understanding* is essentially social in nature. What appears visible results from resolution of the need for people to assert their

individuality through territorial expression and the wider need for personal assertions to remain reconciled within commonly accepted norms.

Crucially, Habraken proposes that urban social sustainability requires balance of *form, place* and *understanding* through development of urban structure that can optimise territorial expression. We propose that the territorially oriented nature of Habraken's control framework for the margins of ordinary urban structure offers a platform for bringing a socio-spatial structure for transitional edges into focus. In pursuit of this we propose that Habraken's control level of *form*, as the overarching stable infrastructure of urban order, may be primarily associated with the material fabric of the transitional edge defining its overall structure, or *extent*. To be socially optimal, however, such material fabric needs to be able to be interpreted by users and occupiers in relation to necessary or desirable social functioning. In Habraken's terms, this requires levels of *understanding* to establish how occupation is expressed and through this embed the sense of *place*.

Habraken's concept of *place* is related to territorial processes of appropriation, occupation and use. Within the totality of transitional edge *extent*, therefore, spatial qualities need to be present which offer potential for such territorialisation, or place-making. We propose that this is more likely to occur when a transitional edge offers a degree of spatial depth, rather than abrupt boundary, across its *extent* which emphasises the structural significance of transitional edge *laterality*. Place-making along the transitional edge *extent*, therefore, requires configuration of material *form* to define spatial arrangement that can then facilitate social negotiation through expression of *understanding*. Convergence of transitional edge *extent* and *laterality* then define specific *localities* along the transitional edge. The place-making evident in these and the ways this becomes expressed by occupants and users are inherently social processes that resonate with Habraken's third level of control: *understanding*. Localities along the transitional edge are, therefore, predominantly about expressions of social action and negotiation, but need the establishment of *place* influenced by material *form* and associated spatial organisation for this to stabilise. In this way Habraken's control levels of *form, place* and *understanding* can be understood as interwoven within the transitional edge structural framework of *extent, laterality* and *locality* with varying degrees of emphasis.

This is represented in figure 1 where the varied text size shows the level of prominence in Habraken's control levels we associate with each aspect of the transitional edge structural framework. We suggest that establishment of e*xtent*, for example, requires a predominance of the stable infrastructure associated with *form,* represented by the largest text size. This enables processes of social interaction and negotiation to establish as *understanding,* which then contributes to territorial expression, or *place.* Similarly, we can associate *locality* predominantly with processes of *understanding* through which *place* then becomes embedded and expressed in *form.* This association of control levels with the transitional edge framework may point towards implications for practice. It begins to suggest, for example, that *extent* may emphasise need for a predominant focus on top-down, professionally oriented approaches, whereas at *locality* bottom-up, user and occupant oriented action might require more influence. This is explored in more detail in the development study outlined in section three, undertaken to develop a process for transitional edge segment evaluation.

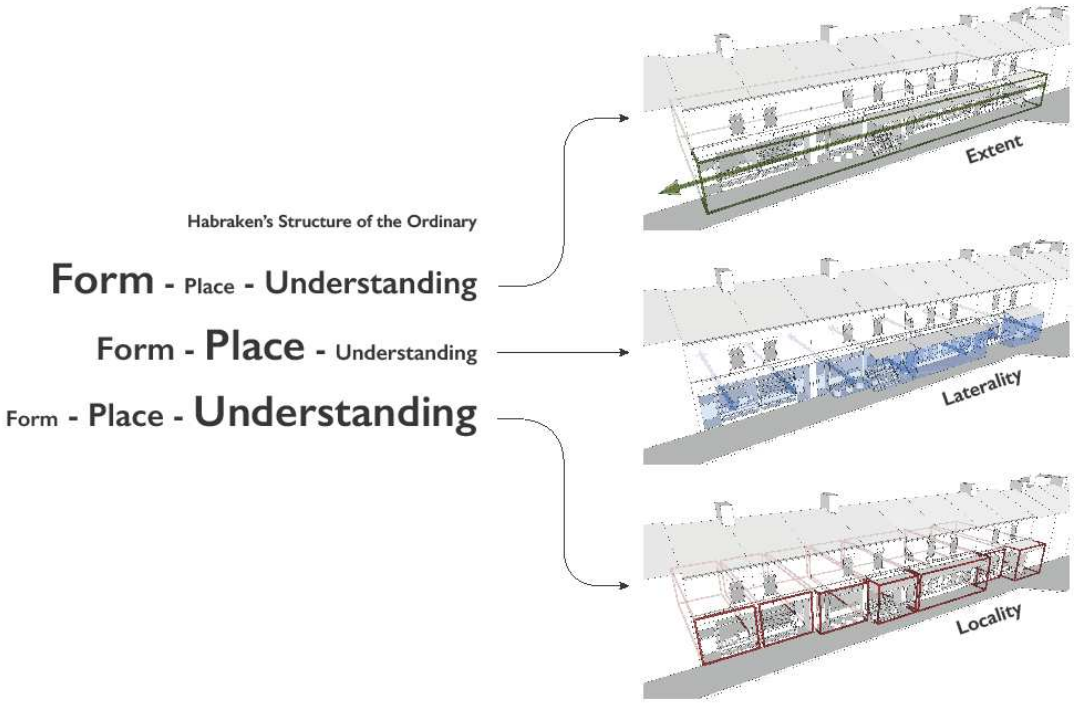

Figure 1: Transitional edge structure as interweaving of Habraken's control levels, *form, place* and *understanding* along a section of the Sharrow Vale Road evaluation development study site.

This conceptualised structure of transitional edge *extent, laterality* and *locality* offers a framework of integration for material, spatial and social dimensions of urban street edge experience. This further develops the ethos of Habraken's control model by providing a framework for transitional edges amenable to practical application in the identification and evaluation of socially optimal properties of urban street edges. The theoretical and practical validity of this transitional edge framework can be strengthened by reference to socio-spatial themes relevant to urban edge and interface settings evident in the wider literature. This is reviewed later in this section to establish socio-spatial attributes that can be linked to transitional edge structure: *extent*, *laterality, locality*. Following this, by reference to socio-spatial understandings of place, especially those associated with development of assemblage theory, we propose that there are optimal socio-spatial conditions for these structural features. This exploration also provides the means by which to make the transitional edge concept applicable.

Transitional Edge Socio-spatial Attributes

To progress the transitional edge framework towards a form that has potential for application, its abstract nature can be made more tangible through integration with themes emergent from extensive review of literature focused on social associations that can be made with urban street edge settings. This review reveals that a range of common factors can be grouped into a framework of ten broadly related yet distinguishable attributes which collectively define more specific socio-spatial characteristics of transitional edges. Although a degree of overlap is apparent, some characteristics capture socio-spatial attributes that appear significant along the length (*extent*) of a transitional edge (eg. *enclosure and looseness*). Others hold significance for transects across (*laterality*) transitional edges (*public-private gradient, spatial expansion, permeability and transparency*), and others at particular *localities* within them (*social activity, social interaction, hide and reveal, territoriality*). This enables a more

detailed understanding of the transitional edge structure to be developed. Following this we outline relevant features associated with socio-spatial understandings of place that enable development of a simple optimal framework for transitional edge *extent, laterality* and *locality* that can be applied to urban street edge evaluation of socio-spatial properties.

1. Transitional Edge Extent: socio-spatial attributes along it

- Enclosure: *Localised enclosure along a generally coherent edge.*
  Socially optimal experience of enclosure along an edge is associated with integration of coherent continuity with set-backs and projections that blend interior and exterior realms along it (Alexander et al, 1977; Moughtin, 1999; Rudlin and Falk, 1999; Porta and Renne, 2005). The most successful forms of edge enclosure are those that avoid extremes of rigid uniformity and random variations, but instead achieve a balance between the two so that there is overall coherence but localized variety along the edge extent (Cooper-Marcus and Sarkissia, 1986; Gehl and Gemzoe, 2004; McDonald, 2005). .
- Looseness: *Capacity for ambiguity, flexibility and evolution.*
  Looseness is a highly dynamic characteristic which captures the capability of space, the objects within, the practices accommodated, and meanings attributed to be in a continual state of transformation. It is an attribute of edge extent that embraces indeterminancy and freedom of choice (Habraken,1998; Franck and Stevens, 2007; Dovey and Polakit, 2010). The continuous play between ambiguity and clarity creates a socially active interface.

2. Transitional Edge Laterality: socio-spatial attributes across it

- Public-private Gradient: *Experience of a smooth gradient from private to public realms.*
  Optimal arrangements for diversity of social experience are those where there is a gradual transformation from public to private spaces rather than abrupt division (Altman, 1975; Alexander, 1977; Madanipour, 2003; Franck and Stevens, 2007; Carmona et al, 2003; Gehl, 2010). This is associated with the capacity to exercise personal choice about public-ness and privacy in relation to the amount of territorial depth available (Habraken, 1998; Biddulph, 2007).
- Spatial Expansion: *Socially absorbent spaces formed from the overlapping of adjacent realms.*
  Gradient across private and public experience implies a need for there to be sufficient spatial depth across an edge for this to be accommodated. Spatial expansion of these margins needs to be deep enough to allow people to feel private from the public realm, but not so expansive as to inhibit gestures of personalization at the margin or lead to complete detachment from events occurring beyond it (Bentley et al, 1985; Habraken, 1998; Nooradin, 2002; Porta and Renne, 2005; Franck and Stevens, 2007).
- Permeability: *Capacity for connection to other realms.*
  Socially optimal interfaces are not independent but integrated by physical and/or sensory porosity across realms (Bentley et al, 1985; Habraken, 1998; Franck and Stevens, 2007; Gehl, 2010). Permeability is more than mere accessibility, but an intrinsically social phenomenon subject to controls imposed by different agents and users (Habraken, 1998 Epstein,1998; Madanipour, 2003).
- Transparency: *Physical and sensory accessibility to adjacent realms.*
  Permeability and transparency are closely related but distinguishable in that transparency is predominantly about visual exchange allowing awareness of nearby settings other than the one occupied. Transparent edges are broadly viewed as desirable characteristics that facilitate social benefits by encouraging exploratory activities and by increasing perceived and actual levels of safety through the passive surveillance it facilitates (Newman, 1976; Jacobs, 1993; Rudlin and Falk, 1999; Carmona et al, 2003).

3. Transitional Edge Locality: socio-spatial attributes within it

- Social Activity: *The capacity to hold and encourage stationary activity.*
  This is emphasized as key to the social vitality of urban environments (Gehl, 2010). It may take the form of edges that encourage attention from people through openings, displays, set-backs, protrusions and other features of façade articulation and use. With good access, encouragement and opportunity to linger and engage in activity, they are more likely to become populated and socially active (Alexander, 1977; Gehl, 2006; Franck and Stevens, 2007; Bosselmann, 2008).
- Social Interaction: *The availability of interaction across, rather than abrupt division of, adjacent realms can encourage social cohesion.*
  Stationary activities afford opportunity for encounters generating diversity of social interaction that can influence social cohesion and community development (Gehl, 1977; Whyte, 1988; Franck and Stevens, 2007). Optimising potential for social activity at edges promotes an enduring sense of place and feelings of belonging (Hoogland, 2000; Bosselmann, 2008).
- Hide and Reveal: *Localised capacity to facilitate choosing private retreat or social interaction.*
  Community cohesion and healthy territorial functioning is associated with capacity for people to determine when they wish to withdraw from the attention of others (hide) and when they wish to be socially available (reveal) (Altman, 1975; Martin, 1997). Configuration of environment in this respect emphasizes a need for adaptability to enable modification in response to local needs and changing individual circumstances and desires. The expression of this adaptability influences the character and identity of the adjacent public realm.
- Territoriality: *Capacity for appropriation, occupation and expression.*
  Territorial characteristics of edges are associated with social, spatial and material exchanges that bring about territorial awareness and controls that sustain them as distinguishable realms (Altman,1975; Habraken,1998). This often manifests as territorial markers (personalization or barriers), forms of local expression signifying that they are under the influence of particular agents or users. (Habraken, 1998; Hoogland, 2000; Biddulph, 2007). Gestures of personalization become symbolic boundaries important to fostering social contact because personalisation makes places feel protected and encourages social communication and cohesion.

Collectively these attributes show an intimate and complex relationship between aspects of human social experience and the environmental settings where this takes place that are of particular relevance at urban street edges. This begins to highlight that, although integrated each structural feature can be associated with distinguishable socio-spatial attributes that offer potential for application in the identification and evaluation of socio-spatial characteristics of transitional edges in real-world contexts. Next we explore how this emergent framework resonates with discourse in understandings of urban place as forms of assemblage. This offers potential to bring optimal socio-spatial conditions of transitional edges into focus laying foundations for application.

Section Two: Transitional Edge Optimisation: socio-spatial understandings of place

'Place is an inextricably intertwined knot of spatiality and sociality. In this context there is a clear need for approaches that cut across the sociability/spatiality divide' (Dovey,2010: 6).

Dovey has contributed much in recent times to our understanding of the mutually defining relationship of social processes and urban order, arguing that people and their settings create a kind of totality where different contexts activate different habits and thus become part of the way those habits are expressed (Dovey,1993; 2005; 2010). This mindset sees the materiality of the world as socially established, and not just something pre-given and then experienced by people (Casey, 1998; Malpas, 1999; 2006; Cresswell, 2015). This shift towards more socially oriented notions of place challenges the primordial connotations associated with place as a pre-existent entity independent of human interaction and experience: genius-loci, for example. Instead is awareness of place as essentially socially constructed and in consequence a continuously dynamic and formative, rather than static, concept (Lefebrve, 1991; DeLanda, 2006; Dovey, 2010).

Place as Being and Becoming: In the context of exploring optimal socio-spatial conditions for the emergent transitional edge concept, this is most usefully captured in discourse about place in terms of a Heideggarian notion of 'being' (fixed and static) or the Deleuzian notion of place as 'becoming' (evolutionary and in flux) (Dovey, 2010). Becoming is, by definition, a transitional experience and therefore especially relevant to how we want transitional edges to be understood: as transformational components of urban order that integrate material, social and spatial dimensions. Place from a perspective of becoming envisions it as process: an entity in continuous state of flux and emergence driven by acts of ***localized expression*** and how these become materially and spatially manifest.

Of particular relevance is the application of this perspective on place to the analysis of urban interfaces (Dovey and Wood, 2015). Similarity in this respect is made with the kind of 'place-ballet' notion of mutually reciprocal exchange between urban street form and social activity advocated by Jacobs (1961) and Habraken (1998), meant to capture the fundamental adaptability and provisional nature of routine urban living (Dovey and Wood, 2015). This highlights an intrinsically transformative characteristic at the core of socio-spatial understandings of urban realm, highlighting that this may be especially prominent and important at places of transition from private to public experience and vice versa. From a spatial perspective relevant in design decision making, the graded transition envisaged here may hold implications for how expansive, rather than abrupt, spatial provision is across these domains suggesting, as Stravides holds, a need for open or ***porous spatial organization***: *'Defying any clear demarcation, spaces are separated and simultaneously connected by porous boundaries, through which everyday life takes form in mutually dependent public performances.'* (Stravides, 2007: 175).

Place conceptualised as either static (being) or transformative (becoming) do not need to be thought of as mutually exclusive. Muminovic (2015), for example, begins to develop a perspective which highlights place as something more integrated. This implies a much more time sensitive approach to thinking about the sense of place as something that has coherence across time, but at a level able to accommodate continuous processes of transformation without irreversible threat to overall coherence. This perspective is used in the analysis of the place identity of the Yanesen area in Tokyo (Radovic and Muminovic, 2011). The analysis provides an example of an evolving urban fabric sustained by balanced relationship of temporal coherence and localized change, evident in detectable persistence of legible identity rooted in its past, but which has sufficient flexibility to accommodate change without destroying the historically rooted identity (Radovic and Muminovic, 2011). Here, being and becoming are linked in the sense that it is processes of becoming that give rise to points of stability: being (Dovey, 2010). The significance of this to development of the transitional

edge structure is that full understanding of place requires recognition of the necessity for both, where urban place identity is best sustained in circumstances where a sense of ***overall coherence*** remains detectable (being) within more evolutionary ***processes of adaptation*** (becoming).

Segmentarity: In addition to assigning social significance to environmental form with capacity for ***localized acts of expression***, possession of ***spatially porous*** organization, and ***coherent yet adaptable structure***, socio-spatial principles rooted in assemblage theory in particular highlight the importance of ***segmentarity*** (Dovey, 2010). Assemblage is understood as a form of territorial whole characterised by interactions between its parts. It emphasizes the primacy of connections existing between elements of places and objects and between people and places. Segmentarity within assemblages relates to how social and spatial boundaries come into and out of existence and are used to explain how life is spatially and socially segmented (Deleuze and Guattari, 1987). '*For instance, a street is not a thing nor is it just a collection of discrete things. The buildings, trees, cars, sidewalks, goods, people, signs etc, all come together to become the street, but it is the connections between them that makes it an assemblage or a place.'* (Dovey, 2010:16).

In the context of developing a transitional edge conceptual framework, segmentarity holds significance as the means by which territories in assemblages are captured. Distinguishable stable places are seen as 'segmented' aspects of a wider transformative assemblage of social, spatial and material dimensions of human-environment relations. In the transitional edge conceptual framework, therefore, segments are conceived as distinct socio-spatial components of the wider transitional edge assemblage amenable to identification and evaluation in terms of their social, spatial and material attributes.

Transitional edge optimal socio-spatial conditions

The exploration of place as a temporal, continuously evolving and transformative experience, yields four core themes relevant to development of optimal socio-spatial conditions for transitional edge structure and its application.

- Place is essentially an expressive entity made manifest through mutually reciprocal *localized acts of human-environment expression*.
- Place is something in continuous evolution which gives rise to static points of stability enabling the sense of place as 'now', suggesting that a sense of *overall coherence and continuous adaptability* need to be considered in balanced relationship.
- Place as manifestation of social acts requires material and *spatial structure that is open and porous*, able to emphasise and accommodate gradient across, rather than boundary of, the sense of transition.
- Place as integration of material, spatial and social dimensions is conceptualised as a 'segmented' socio-spatial territory of the wider transitional edge structure.

These themes lay foundations for practical application of the transitional edge concept by segmenting a transitional edge in an explicitly socio-spatial way to enable their evaluation. This pragmatic aspect of transitional edges offers potential to extend socio-spatial theoretical principles with practically applicable tools, thereby contributing to research that seeks to provide empirical guidance for the study of urban public life at edge settings (Ewing and Clemente, 2013; Gehl and Svarre, 2013; Dovey and Wood, 2015).

Viewed through the lens of socio-spatial attributes and perspectives on place we begin to see how optimal socio-spatial conditions for the transitional edge framework begin to come into

focus. This suggests, therefore, that transitional edges can be considered socially optimal when there is: balance of coherence and adaptability along their extent; spatial porosity laterally across them; localised expression at localities within them. This is summarised as follows:

***Extent*:** The characteristics of 'enclosure' and 'looseness' establish that the optimal socio-spatial condition for transitional edges is that they possess a sense of overall coherence but not of rigid uniformity. A degree of coherent stability is important in maintaining an enduring sense of continuity across space and time to establish a sense of local identity. This should combine, however, with a degree of flexibility and open-ness to facilitate localized adaptability and evolutionary change to reflect and accommodate developing patterns of use and territorial negotiation. This balance of enclosure and looseness across the extent of transitional edges works to ensure that specific transitional edges retain identity as a recognizable whole but within which there is an inherent looseness to allow for accumulations of human and natural adaptations to take hold. This balance appears essential to retain the transitory (becoming) rather than static (being) nature of the transitional edge and can be associated with a requirement for transitional edge extent to exhibit balance of ***coherence and adaptability*.**

***Laterality*:** The laterality of a transitional edge is a structural property given by its unique nature as an overlapping of adjacent realms. Particularly significant here are socio-spatial characteristics that relate to transects across the edge and which characterize the gradual transformation of states across it. These include 'private-public gradient', 'spatial expansion' 'permeability' and 'transparency'. Collectively these determine the degree of smoothness from private to public states but also optimize opportunities for social interaction where realms across the transect merge. The social vitality of transitional edges is closely linked with the capacity to spatially integrate private/semi-private or semi-private/semi-public realms at intervals so that casual or spontaneous social encounters can occur. The permeability and transparency across a transitional edge determine both how visually and physically accessible the gradient across the edge is and also how connections are made to other edges. This is associated with a need for lateral aspects of transitional edges to have a degree of ***spatial porosity*.**

Locality: The locality of transitional edges is related to the need for there to be socio-spatial factors that inject a grain or texture into the edge which acts to slow down the sense of continuity along its extent. Of the ten attributes identified, 'social activity', 'social interaction', 'hide and reveal', and 'territoriality' are those most closely related to this property. These are what give a transitional edge its localized, stationary significance throughout its extent. These characteristics make a transitional edge socially absorbent facilitating how inhabitants appropriate, occupy and personalize. Varying degrees of spatial expansion enable this to take hold and facilitate how materiality can be manipulated over short or longer timeframes in response to changing needs for privacy, social interaction and exchange. The resultant projection of material, spatial and social integration manifests in a locality's capacity to encourage and sustain acts of ***localized expression*.**

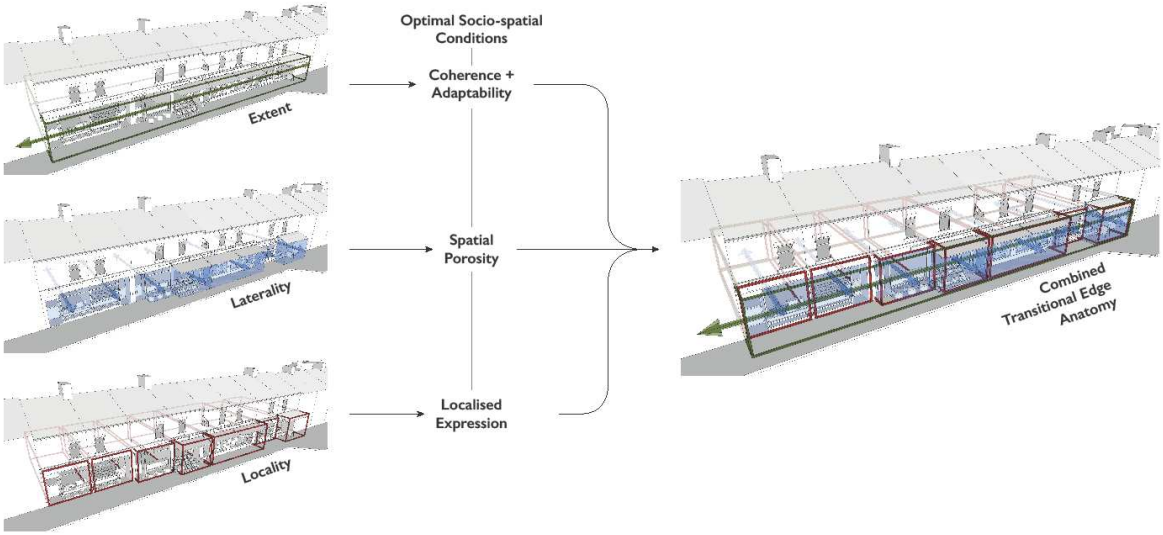

Figure 2: Transitional edge optimal socio-spatial conditions applied to the Sharrow Vale Road evaluation development study site.

The following section will show how this conceptual framework for transitional edges can be developed for practical application specifically by providing a means by which transitional edges can be identified and evaluated in real-world contexts and proposing how such evaluation can be used to inform recommendations for change.

Section Three: Transitional Edge Application: identification, evaluation and change:
Principles of segmentarity associated with assemblage theory offered potential to begin to develop a process of practical application for the transitional edge conceptual framework. This is because segmentarity enables distinguishable components of transitional edges to be envisaged as transformative human-environment interactions manifest through their continuously evolving material, spatial and social dimensions. Within this evolutionary and transformative conception of transitional edges, points of stability become manifest and these can be segmented, or captured, as distinct socio-spatial components of the wider transitional edge structure amenable to identification and evaluation. This can be established by developing social, spatial and material dimensions as socio-spatial attributes of urban street edge plinths: the ground floor of buildings constituting the materiality of transitional edges (Glaser et al, 2012). Transitional edge extent can therefore be 'segmented' in relation to the material, spatial and social consistency evident in their plinths. This is achieved by developing attributes of segments derived from the theoretical exploration in part one, translated into a form amenable to application. This is summarised as follows.

<u>Segment Material Dimension (distinctiveness and temporality)</u>
The materiality of a segment is embodied in its physical manifestation. In essence segments are distinguishable from one another according how 'distinctive' they appear to be against their general background and to their transitional and transformative nature. This means the extent to which this 'distinctiveness' can sustain across time as processes of adaptation and change occur: 'temporality'. In the context of the transitional edge conceptual framework, the distinctiveness of a segment can be related to the degree of *enclosure* its physical fabric contributes to defining and the *social activity* this facilitates. A segment's 'temporality' may be related to its capacity for multiple interpretations and uses through time: *looseness.* Such interpretations may be of a *territorial* nature or related to specific *social activity* either

fleeting or longer term. The 'distinctiveness' and 'temporality' of a segment can also be related to the extent to which it is, or is not, engaging, determining to a greater or lesser extent whether it is experienced primarily as a distinguishable location. As such, this material dimension can be used as a means of contributing to the identification of specific segments of transitional edges.

Segment Social Dimension (appropriation and occupation)

The way in which a segment's materiality is articulated and made distinctive affords territorial opportunities: how it becomes place. This introduces a further dimension of segment distinguishability: in this instance one where material manifestation and social processes are more convergent. This suggests that evidence of a segment's 'appropriation' and 'occupation' can also be used as distinguishing features. Within the transitional edge conceptual framework, 'appropriation' and 'occupation' are explicitly *territorial* in nature. How they become 'appropriated' may also be associated with a segment's *looseness* and the kinds of *social interaction* this can facilitate. Following this, 'occupation' may either respond to, deliver, or develop *enclosure* which in turn holds implications for *social activity* and affordance of opportunities for *hide and reveal.*

Segment Spatial Dimension (open-ness and articulation)

The 'appropriation' and 'occupation' of territory is a form of social process that makes segments distinguishable as place. Translated as a third distinguishable attribute of segments, the spatial dimension also needs to be understood as something dynamic and evolutionary, rather than static, in nature. This is related to a segment's capacity for 'open-ness' and how this is 'articulated'. In the transitional edge conceptual framework, the 'open-ness' of a segment can be associated with evidence of its *permeability* and *transparency,* how this supports the *public-private gradient* and the influence this has on potential for *social interaction.* How such social interaction is articulated may be related to the *spatial expansion* evident within a particular segment and how this is reflected in the articulation of *public-private gradient* which in turn may influence its capacity to facilitate opportunities for *hide and reveal*.

Segments can therefore be understood as distinguishable socio-spatial building blocks of transitional edges through the extent to which they exhibit consistency in their materiality, their social characteristics and spatial organization. Articulated in this way, segments provide a means by which the theoretical principles underpinning the transitional edge conceptual framework can be developed for application by enabling the socio-spatial qualities of transitional edges to be evaluated. They also provide the focus for recommending change.

Figure 3: Sharrow Vale Road transitional edge segment used to articulate integration of material, social and spatial dimensions as the foundations for evaluation.

Developing a process for transitional edge evaluation was progressed through a trial application of the material, social and spatial dimensions of segments developed from the theoretical principles outlined in section 2. The focus of application was a section of an urban retail and residential street in Sheffield: Sharrow Vale Road. Sharrow Vale Road was chosen partly because funding constraints required a locally accessible site, but primarily because it represents many of the socio-spatial attributes associated with the material, spatial and social integration at the root of the transitional edge conceptual framework. Situated to the south west of Sheffield city centre, Sharrow Vale Road is characterised by a wide range of independent shops, restaurants, pubs and local services. It hosts regular street markets and is highly regarded as a vibrant mixed use residential and commercial setting exhibiting a strong sense of social as well as commercial character. This is particularly evident in locally oriented decision making guided and sustained by the Sharrow Vale Community Association which coordinates a range of local activities, including events and maintenance initiatives, which manifest in expressions of the street's identity and sense of place. In this way Sharrow Vale Road exemplifies a desirable response to concerns about the decline of urban street vitality with a focus on how streets can become socialised and populated (Gehl and Svarre, 2013; Boys Smith, 2016; Crozier, 2018).

These characteristics were important influences in the choice of an appropriate trial site to begin development of transitional edge practical application because they provided opportunity to explore how a segment evaluation process could be developed to focus on specific, highly localised aspects of change. In this way, we wished to be able to show how the application of the transitional edge conceptual framework can optimise socio-spatial qualities of urban street edges by highlighting the potential significance of accumulations of

fine-grained, low level interventions which may be particularly amenable to processes of occupant and community led local actions.

To this end, the Sharrow Vale Road work was designed to be a first stage in development of a more comprehensive methodological framework for detailed transitional edge case study research. To inform this, the focus of attention was to develop theoretical principles into a form amenable to practical application by building on principles of segmentarity to identify particular attributes of the material, social and spatial dimensions of transitional edge segments (figure 3). This provided foundations for development of an evaluation framework applicable to each identified segment based on prompt questions answered in relation to a scale (1 = weak to 5 = strong). The collective results could then be made visible in the form of a streamgraph which would reveal specific segments that fell below an evaluation threshold. These would be segments deemed to require particular focus of attention to raise their socio-spatial qualities in relation to that of the overall transitional edge evaluated (figure 4). A key significance of this approach is that it enables a very specifically targeted, and therefore resource efficient, approach to recommendations for change and adaptation, often focused on very small scale, fine grained interventions. Figure 5 provides an example of how this very specific information might be compiled and communicated in a form that can be used in professional and/or occupant decision making.

An important limitation of the Sharrow Vale Road work was that time and funding constraints did not allow engagement with users, occupants and the general public. In the context of the theoretical emphasis of this current paper, this was not considered a crucial shortcoming. It is important to emphasise, however, that future application of the evaluation framework developed must be integrated with aspects of qualitative methodology that can capture transitional edge user and occupant authentic experience. In this respect the evaluation framework outlined in this section forms a basis to build on previous research into urban street experience which used mobile eye-tracking methodology as a principal tool for participant engagement (Simpson et al, 2018; Simpson, Thwaites and Freeth, 2019). Integrated with semi-structured interviews and open-ended questionnaires, the observational and visual aspects of the transitional edge segment evaluation framework will inform and combine with further development of mobile eye-tracking to provide a qualitative and quantitative methodological basis for advancing the transitional edge research trajectory. Research funding proposals are currently being developed to open these opportunities based on an extensive programme of transitional edge case study evaluation which will aim to inform more socially responsive design decision making in urban street settings. The following three stages of the segment application framework provide an outline structure and approach upon which to develop further methodological detail.

Step One: Segment Identification

Figure 3 shows how the material, social and spatial dimensions of segments can be assigned particular attributes derived from distillation of theoretical material outlined in section one. Observational field work carried out along a length of Sharrow Vale Road established that segments can be distinguished into discrete units of the ground floor transitional edge extent. This is achieved by making an assessment of the length a general uniformity is retained in relation to the material structure, consistency of social function, and spatial articulation. Transformation from one segment to the next occurs at the point where there is a discernible break in uniformity in one or more of these dimensions.

In practical terms this is achieved by application of a three stage process to make an assessment of:

1. where **material** distinctiveness, defined by clear striation or smoother looseness, starts and ends within the transitional edge;
2. how consistently evidence of **social** appropriation and occupation corresponds with this material distinctiveness;
3. the extent to which this sociality has relatively open **spatial** articulation.

It is important to emphasise that this assessment is more a matter of qualitative judgement than measurement of quantifiable factors. The finite, quantifiable bounding of segments is neither meaningful nor necessary to the evaluation process. It simply provides a means to establish a consistent reasonable approximation that enables transitional edges to be segmented in socio-spatial terms that are then amenable to evaluation. This approach provides a foundation for indicating the socio-spatial structure of transitional edges as strings of segments, each of which has distinguishable attributes in relation to its material, social and/or spatial dimensions (figure 3).

Step Two: Segment Evaluation

Once the strings of transitional edge segments are made explicit in this way, each one can be evaluated by means of an indicator framework. By this means each segment becomes subject to evaluation in relation to attributes associated with their material, social and spatial dimensions derived from the theoretical materials outlined in section one. In essence this approach follows Gehl and Svarre (2013) and Ewing and Clemente (2013) in their distillation of a wider range of properties for efficient practical application. The segment based transitional edge evaluation framework provides a more specifically focused method of evaluation for capturing the socio-spatial nature of urban street edge settings.

The evaluation process involves attributing a score between one (weak) and five (strong) for each of the indicator themes associated with the material, social and spatial dimensions. As with the segment identification process, this is also a qualitative, interpretive process which provides a framework of understanding about whether each of the six attributes have weak (1) to strong (5) presence along a continuum. The numerical output from this enables the generation of 'stream graphs' which represent the unique socio-spatial fingerprint of the transitional edge.

This visual representation device has the capacity to reveal segments or clusters of segments that are at significant variance with the overall consistency. This variance provides indication of particular segments that may require adjustment to optimise their socio-spatial contribution to the transitional edge as a whole: ie improve the social experience of the transitional edge. An advantage of this process lies in exposing which segment sequences are contributing little (low scoring segments) to the overall socio-spatial value of the transitional edge. This can then be used to prioritise those requiring attention for change. Adjustments (change/re-design/adaptation) may be of a spatial nature (change to spatial organisation), social nature (changes to activities, processes of appropriation) and material nature (changes to physical fabric), or combination thereof.

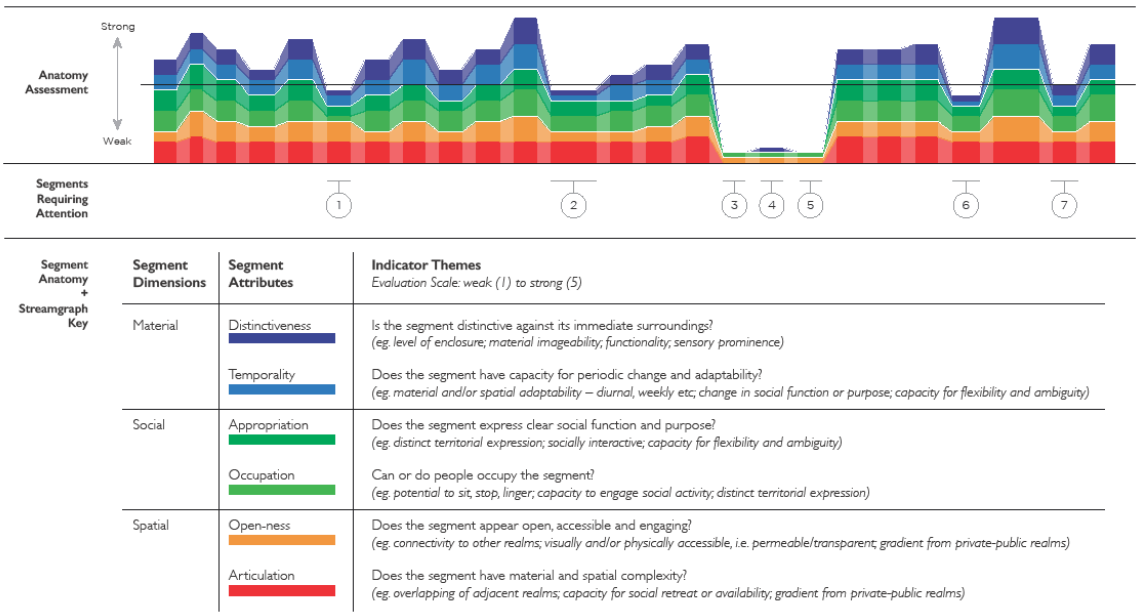

Figure 4: Segment evaluation prompt questions and the resultant stream graph output identifying 7 segments for closer scrutiny.

Step Three: Segment Change

This evaluation process can then be used to underpin recommendations for change in relation to social, spatial and material considerations. Drawing from the section one exploration of socio-spatial principles, we assert that distinguishable segments, through their connectivity and collective socio-spatial characterisation help identify fine-grained recommendations for change that aggregate to optimise the socio-spatial infrastructure of the transitional edge by enhancing:

- coherence and adaptability along extent (to exhibit an enduring sense of overall coordination whilst remaining flexible to localised acts of change)
- spatial porosity of laterality (to encourage and accommodate stationary as well as movement related activity)
- localised expression at localities (to enable territorial activity to become a significant factor in determining local identity)

The optimal socio-spatial condition of a transitional edge can therefore be achieved when it exhibits spatial porosity in its laterality, coherence and adaptability along its extent, and localised expression at localities. Figure 5 shows the evaluation outcome for segment 2 as an example of a segment exhibiting inconsistency with the overall transitional edge socio-spatial evaluation.

Segment 2: Electrical Appliance Store

Evaluation and Focus of Attention

- Evaluation reveals **consistency** in relation to overall transitional edge ***social*** and ***spatial*** attributes
- Evaluation reveals **inconsistency** in relation to overall transitional edge ***material*** attributes in both ***distinctiveness*** and ***temporality***, where:
  - ***Distinctiveness*** relates to the **enclosure** defined by the physical fabric and the **social activity** this could facilitate.
  - ***Temporality*** relates to **looseness**: ie multiple interpretations through time in expression of **territoriality** and/or **social activity** evident.
- The transitional edge attributes that come into particular focus for attention are therefore **enclosure**, **social activity**, **looseness**, and **territoriality** (see figure 3).
- These attributes are specifically related to transitional edge anatomical components of **extent** and **laterality** (see 'transitional edge optimal socio-spatial conditions').
- The focus of attention for segment 2 enhancement therefore lies with identification of interventions that can contribute to optimising ***coherence*** and ***adaptability*** along **extent** and ***localised expression*** at this specific **locality**.

Example Enhancements and Change

- **Attributes relevant to transitional edge extent** (optimise coherence and adaptability)
  - **Enclosure**: localised enclosure along a generally coherent edge.
  - **Looseness**: capacity for ambiguity, flexibility and evolution.
- **Attributes relevant to transitional edge locality** (optimise localised expression)
  - **Social activity**: capacity to encourage and hold stationary activity.
  - **Territoriality**: capacity for appropriation, occupation and expression.
- **Recommendations to enhance optimisation of extent and locality at segment 2 might include:**
  - Increase prominence of window and door framework to enhance distinctive street presence: **enclosure**, **territoriality**
  - Coordinate window display to enhance visual coherence across shop frontage to remove sense of four discrete views: **enclosure**, **territoriality**
  - Introduce regular variation in window display content and configuration: **looseness**, **territoriality**
  - Increase prominence and flexible use of awning (eg design, colour, articulation etc) as an overall unifying feature: **enclosure**, **looseness**
  - Enhance prominence of main doorway entrance (eg set-back, colour variation, entrance framework projection, awning variation, floorscape material change etc) **enclosure**, **social activity**
  - Increase visual access to shop interior (variation in blinds use, lighting etc) **social activity**, **enclosure**
  - Enhance shop front advertising and street presence: **territoriality**, **social activity**
  - Reconfigure right-hand small window panel to accommodate street facing sheltered seating: **enclosure**, **social activity**, **territoriality**.

Figure 5: Recommendations for change at segment 2

The key characteristics of this evaluation process are essentially twofold: first, that it provides for an integrated approach to material, social and spatial attributes in assessment of the qualities of transitional edges; second, that the segmenting of transitional edges enables specific components of the transitional edge to be targeted for remedial attention. This means that interventions can be focused on particular locations and may highlight how accumulations of small scale, minimal interventions could make a significant contribution to enhancement of the socio-spatial qualities of transitional edges. These may involve specialist professional design and technical inputs as appropriate, but may also highlight ways in which occupants and users may have influence through making minor changes and adjustments. This means that transitional edge enhancement need not always require costly and potentially invasive specialist attention, but could be activated through forms of participative locally based actions guided by the outcome of the evaluation process (Arefi and Kickert, 2019). Collectively, this introduces a potential means to revitalize urban street edge settings through targeted adjustments to the material, social and spatial attributes of specific segments. In certain circumstances this could be based largely on accumulations of bottom-up activity orchestrated in the interests of wider transitional edge enhancement through its structural features of extent, laterality and locality.

Conclusions

This paper has sought to translate theoretical principles associated with socio-spatial thinking emergent in urbanism discourse within investigation of the social value of urban street edge settings. Through focus on edges particularly relevant to pedestrian experience of urban realms at eye level, we have proposed a new conceptual framework: transitional edges. In

doing so we hope to have contributed to the development of urban design theory in the contexts of socio-spatial discourse and through an innovative approach to advancing understanding, definition and evaluation of urban street edge settings long associated with socially beneficial experiences of pedestrians.

The socio-spatial nature of transitional edges emphasizes them as components of urban form capable of attracting, accommodating and sustaining a diversity of socially oriented experience. In this respect the principal priority in terms of their structural and social organization is the need to optimize the social benefit inherent in key structural features. By using this as a core theoretical foundation we have sought to show that coalescence is possible between structural features of transitional edges (extent, laterality and locality) and the need for these to possess capacity for coherence and adaptability, spatial porosity and localized expression in order to optimize socio-spatial benefits.

These characteristics of transitional edges offer the possibility to frame an approach to their identification and evaluation. By drawing from the principle of segmentarity associated with assemblage theory, we have been able to identify and define a potential means by which this may become operational. Through bounding segments from coalescence of material, social and spatial dimensions, distilled from ten core attributes which define the transitional edge conceptual framework, we have identified fundamental socio-spatial building blocks of transitional edges that can facilitate practical application. Outcomes from an initial pilot study of Sharrow Vale Road, Sheffield indicate that, as an approach to urban environmental change, the transitional edge conceptual framework holds particular relevance for approaches to socially oriented urban change that emphasise small scale, fine-grained forms of intervention. We anticipate this being of particular value to locally oriented initiatives to urban change that have a participative, bottom-up led emphasis. To this extent, the transitional edge concept adds to the legacy of Habraken's (1998) framework of control levels as influences on the structure of urban fabric. The socio-spatial foundations of transitional edges in this respect are especially conducive to the empowering of *place* and *understanding* levels of control in delivery of urban structure, thereby challenging the dominance of *form* based levels of control, exemplified by concerns about the social limitations evident in top-down masterplan driven approaches (Madanipour et al, 2018; Porquedda, 2018; Arefi and Kickert, 2019).

In this respect we propose that transitional edges offer potential to respond to the need for a shift in mind-set capable of challenging prevailing disciplinary boundaries that maintain a persistent duality of interior and exterior realms at urban edge settings. *'The need at this point is to move from an intellectual position which discriminates inside from outside…., towards a more unified logic.'* (Cuthbert, 2007: 210). By taking this approach we also hope to establish the transitional edge concept as a pathway towards addressing concerns about limitations in sociological awareness in processes of urban design theory and practice. *'…there has been little or no concerted attempt within the discipline to link the material creation or 'designing' of urban space and form to fundamental societal processes. This linkage is desirable and can be made.'* (Cuthbert, 2007: 177).

The transitional edge concept contributes to theoretical discourse in this respect by proposing an original socio-spatial interpretation of urban street edge settings. The translation of the concept into a transitional edge evaluation framework offers potential for a significant contribution towards making socio-spatial principles of urban design amenable to practical application. An extensive programme of transitional edge case study based research will

build from the theoretical and practical foundations established in the current paper to deliver wider empirical evidence in support of this contribution. We see particular relevance for application in the kind of mixed-use, compact urban development increasingly associated with the delivery of urban social sustainability in general and the revitalization of social experience in the urban high street in particular (Rudlin and Falk, 1999; Urban Task Force, 1999; Gehl, 2010; Boys Smith, 2016). Specifically this will help further the understanding and delivery of socially responsive urban interface settings.

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