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BEYOND PROXIMITY: AN INTEGRATED MODEL OF ACCESSIBILITY FOR PUBLIC PARKS

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ABSTRACT

This article aims to critically analyse the concept of accessibility in the academic literature with the end goal of developing a new integrative framework for defining and measuring accessibility. Access to urban public facilities such as parks and green space is alleged to contribute to community well-being, as well as the development of social capital and inclusive neighbourhoods. Accessibility, however, is a complex concept difficult to define but much harder to measure. Our analysis indicates that while accessibility has been developed as a multidimensional construct, its measurement has been limited to its physical and temporal dimensions, leaving other relevant factors such as social conditions and personal constraints, largely unexplored. We argue for the relevance of these latter factors to realistically assess accessibility to urban public facilities. We present an alternative concept of accessibility, which is an integrated model of park accessibility containing both spatial and non-spatial dimensions and propose that this model be used to facilitate future research into more effective public facility delivery.

Keywords: Accessibility; Perceived Accessibility; Urban Public Parks; Urban Public Facility Distribution

INTRODUCTION

Modern cities are considered as service dependent environment (Lineberry and Welch, 1974, Neutens et al., 2010, Joerin et al., 2005). Public services, including the provision of urban parks and green spaces, are vital to the quality of life of city dwellers. To ensure that each individual gains equal access to these services, it is critical that no systematic difference in accessibility are found across individuals and communities (Neutens et al., 2010). Equitable access means that urban facility distribution must take into account the needs and aspirations of people who live in the areas (Rose and Stonor, 2009). Accordingly, the concept of accessibility, used by governments and academics as an indicator for urban quality of life, must accurately reflect its dimensions. There is a need to go beyond the spatial-physical measurement to include the concept's social-psychological dimension into evaluation. However, knowledge about public facility accessibility in general, and its dimensions in particular, is currently incomplete (Kruger et al., 2007). It therefore becomes imperative to appropriately define accessibility through its dimensions.

Accessibility is "slippery" to define and is linked with numerous ramifications (António and Peter, 2007, PIRIE, 1979) depending on the definition. Current accessibility research generally evaluates the spatial-physical dimensions of accessibility, leaving other relevant

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and important dimensions unexplored. Relatively little research has been devoted to examining accessibility from the perspective of potential facility users. For example, in urban park planning, physical indices such as distance and proximity, total park area, park area per capita, and number of parks, are used by park planners as criteria to evaluate the level of access of local communities public parks (Oh and Jeong, 2007). These indices however are orientated towards the spatial-physical dimension of park accessibility. Although the physical standard provides a relatively easier and more straightforward means of operationalizing accessibility, it does not represent people's perception of accessibility. The latter is claimed to be critical in gaining a better understanding of and predicting human behaviour, subject to personal values and constraints. These arguments highlight the importance of critically examining the concept of accessibility to develop a more thorough understanding of the concept in planning context.

This paper aims to address the following questions: Is accessibility more than a physical concept? If not, what additional variables help explain accessibility to urban parks and green space? Do current accessibility measures sufficiently address these variables? To illustrate the multidimensional construct of accessibility, we argue for a more comprehensive and integrated accessibility model that includes both spatial and non-spatial dimensions of the concept.

In the subsequent sections, we begin by describing the shift in planning culture that calls for a more integrated approach to define accessibility that incorporates individual, perceptual variables. Section three describes the historic shift in conceptual emphasis from the spatial-physical dimensions to the non-spatial dimensions of accessibility. Section four presents a review of popular accessibility measures with a goal of identifying addressed accessibility variables. And in the final section, we propose an integrated accessibility model for public parks as an authentic representation of the concept that combines both spatial and non-spatial dimensions.

THE SHIFT IN PLANNING CULTURE

Urban change demands for more inclusive and sustainable outcomes (Alexander, 2009) wherein equitable access to urban public services has been embraced as central to this change. Post-war urban development in developed world was dominated by the Garden City movement (initiated by Ebenezer Howard in his book TO-MORROW: A peaceful path to real reform in 1898), and its successor the New Town development (represented by The New Town Act 1946 in the UK). The planning principles associated with these publications advocate functionally separated cities with the purpose of improving living conditions for urban poor in congested areas of industrialised cities (Alexander, 2009). However, these principles have been heavily criticized for their high social and environmental costs because they advocate car-oriented urban layouts and spatial separation of functional cores. For example, one of the important trends for post-war new town development in the UK was a modernist design (Alexander, 2009) that emphasised mobility via private vehicles. Recent research showed that historic town centres have higher levels of accessibility and land values when compared with their new town counterparts (Rose and Stonor, 2009), suggesting most of the new towns failed to deliver higher attractiveness to for people settling in them. Although some new towns may appear more affluent based on economic performance such as Cumbernauld in Scotland (Welch, 2007), they appear less desirable as a place to live.

Research indicates that access to certain urban facilities such as public parks and green spaces, affects land and property values, social activities, and even people's attitude to quality of life (Anderson and West, 2006, Hannon, 1994, Colwell, 1985, Coughlin et al., 1974). This

makes public facility accessibility a central issue in contemporary urban planning principles. The modern planning culture advocates inclusive urban development and compact city design (Alexander, 2009). These principles differ from modernist design by acknowledging that planning practice should actively address people's needs and preferences (Rose and Stonor, 2009). Accordingly, measures of accessibility used by planners need to fully account for the meaning and importance of accessibility to people. This requires that accessibility research move beyond proximity-based measures to examine accessibility at the individual, perceptual level with greater emphasis on its non-spatial dimensions (i.e. social-psychological factors).

EVOLUTION OF THE ACCESSIBILITY CONCEPT

Early Definitions with a Geometric Focus

With a purely geometric origin, the study of accessibility was founded in *location theory* (Hass, 2009) and advanced by *central place theory* (Marten and Gillespie, 1978). *Location theory* seeks to identify and explain the effects of geographic space on the spatial patterns of economic activities with the key variable being physical distance (Larkin and Peters, 1983). The variable of physical distance or proximity is also the major component of the geographic definition of accessibility. An earlier definition of accessibility focused on *the amount of physical distance between the provider and the service user* (Marten and Gillespie, 1978). The definition was enhanced by *central place theory, which* posits that human settlements function as *central places* that provide services to surrounding areas. One of the important assumptions of the theory is that consumers are only willing to travel as far as necessary to obtain their desired services (Larkin and Peters, 1983). That is, people always minimize the distance to be travelled to reach the services. Thus, early accessibility research focused on maximizing the efficiency of service distribution while minimizing operational costs of the system (Nicholls, 2001, Marten and Gillespie, 1978). While limited, this served as the basis for the development of an urban system performance evaluation.

On the other hand, it was already acknowledged early on that accessibility is more than just the simple measurement of physical distance between origin and destination and that it should include qualitative attributes such as the convenience or ease of overcoming distances (i.e. transport availability). For example, Penchansky and Thomas (1981) posited that client transportation resources, distance and travel cost were all important factors for understanding the relationship between location of supply and the location of clients. The concept of accessibility is defined as *the ease with which a site may be reached or obtained* in 2nd edition of the Dictionary of Human Geography (Johnston et al., 1986). These early definitions of accessibility identify ease and physical distance as key accessibility variables. Some contemporary studies adopt similar geographic definitions of accessibility in their empirical studies, but more refined the meaning of "ease". For example, Preston and Raje (2007) defined accessibility as *ease of reaching*, in contrast to the notion of mobility which is defined as *the ease of moving*.

An Evolving Concept

The conceptualisation and understanding of accessibility is continually evolving to respond to the changing environment, to adapt to the increasingly multi-disciplinary nature of the planning field and to satisfy the diverse needs of individuals. Likewise, there was also recognition that the development of a conceptually robust and incisive notion of accessibility was as important as improving accessibility measurement (Pirie, 1981). The concept has been adapted to a number of fields outside the geographical discipline to include not only the

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physical attributes but also other critical dimensions such as social needs, information availability etc.

Aday and Andersen (1974) provided the principal study to distinguish the socio-organizational and geographic aspect of accessibility. They proposed the notion of "friction of space" to be a function of travel time and physical distance to represent geographic accessibility. Socio–organizational accessibility refers to non-spatial attributes that influence people's ability to obtain service. They argued that accessibility should be gauged by the actual use of service provided, which may be influenced by *financial, informational* and *psychological* conditions of the individual user. such as the quality of service (Aday and Andersen, 1974). Expanding on Aday and Andersen's definition of accessibility, Marten and Gillespie (1978) suggested that aside from the concept of friction of space, social barriers and user characteristics should be integrated with other geographic factors that affect accessibility. G. Pirie (1981) reckoned accessibility as *a synonym of reachability and convenience,* which implies that accessibility should be examined as attribute of potential users rather than a simply physical measure of distance between origins and destinations.

These definitions reveal the shifting conceptual focus of accessibility from the spatial dimensions to non-spatial dimensions that account for both the ability of individual and the capacity of the activity site. Accessibility research has progressed beyond its spatial dimension with a recognition that lack of access is far more than just spatial mismatch (Johnston et al., 2009). In order to determine its influential factors, the complex and broader nature of accessibility concept must be acknowledged while also requiring a comprehensive and integrated analysis. Derived from the earlier analysis, in the context of public facility accessibility, these influential factors include user characteristics, social barriers, attributes of the facility, and interaction with other facilities in the system.

ACCESSIBILITY MEASURES AND VARIABLES ADDRESSED

The previous section reveals great advances in conceptual development of accessibility in recent decades. Meanwhile, there has been unprecedented progress in measuring and modelling accessibility, thanks to the increased spatial analytical capabilities offered by the Geographic information system (GIS) and the availability of spatial and activity data (Weber, 2006, Murray et al., 2003, Neutens et al., 2010, Oh and Jeong, 2007, Talen and Anselin, 1998). The history of accessibility research can be typically expressed as the history of the development of particular measures (Weber, 2006). Nevertheless, as accessibility serves as a critical indicator in evaluating public facility distribution (Neutens et al., 2010), its measurement imposes direct impact on evaluation outcomes. Academics have recognized the significance that variation in accessibility measurement influences the outcome of empirical researches (Talen and Anselin, 1998, Neutens et al., 2010, Kwan, 1998, Weber, 2003, Guy, 1983). To distinguish various accessibility measures, it is important to uncover the aspects of accessibility that they are concerning with, and the variables that they are measuring. This section presents an in-depth examination of the major accessibility measures using variable analysis.

The major accessibility measures can be grouped into two categories: location models and space-time (ST) measures. Location models have long been used and still are most popular methods adopted in accessibility assessment (Murray et al., 2003, Kwan, 1998). Based on location theory, this group of accessibility measures is produced by evaluating impedance effect of spatial separation between origin and destination, which can either be measured by the intention to minimize average access (in terms of distance, travel time or transport cost), or to maximize opportunities within an cut-off travel distance or travel time. Five major

location models are reviewed in Table 1 with their respective definitions and formula expressions. Variables analysis reveals that physical distance (between origin and destination) and availability of services are prevalent variables addressed in these five models.

Table 1. Location models and variables they addressed

	Accessibility Measures	*Definition*	*Formula*	*Addressed Variables*
Access characterized an given travel distances or times	***Container Index***	The number of facilities or services contained within a given unit	$Z_i^C = \sum_j S_j, \quad \forall j \in I,$ Where, S_j : number or aggregate size of facilities I: the boundaries of i	• Number or area of services
	Cumulative Opportunity (CUM)	The number of opportunities within a specified cut-off travel time	$\mathrm{CUM} = \sum_q \mathrm{P}(t_{hq})$, where $\mathrm{P}(t_{hq}) = \begin{cases} 1, & \text{if } t_{hq} < \text{cutoff}, \\ 0, & \text{otherwise}. \end{cases}$	• Travel time • Car ownership
Access characterized by relationship between origin and destination	***Gravity Potential***	Facilities are weighted by their size and adjusted for the 'friction of distance' to measure the potential supply of services by every facility in the urban area	$Z_i^G = \sum_j \frac{S_j}{d_{ij}^{\alpha}}$ Where, S_j : number or aggregate size of facilities d^a :distance decay factor	• Number or area of services • Proximity/ Distance
	Minimum Distance	The distance from a residential location to the nearest facility	$Z_i^E = \min\lvert d_{ij} \rvert$ Where, d_{ij} is the distance between a residential location i and facility j ,	• Proximity/ Distance
	Travel Cost	Total distance between each origin and all destinations (public facilities)	$Z_i^T = \sum_j d_{ij}$ Where, d_{ij} is the distance between a residential location i and facility j ,	• Proximity/ Distance

Adapted from (Talen and Anselin, 1998, Kwan, 1998, Neutens et al., 2010)

As the most widely used accessibility measures, location models present a variety of strengths: they are practical (Pirie, 1981) and easy to implement (Neutens et al., 2010); they provide spatial simplification of accessibility problems with minimum data requirement (Kwan, 1998), etc. On the contrary, they are criticized for 1) being restricted by their assumption with origin and destination, which is all origins are known and people will take the closest facility as travel destination (Kwan, 1998, PIRIE, 1979, Murray et al., 2003); 2) the lack of consideration for space-time constraints and temporal variation (Murray et al., 2003, PIRIE, 1979, Kitamura et al., 2001). Space-time (ST) measures are initiated to overcome the above limitations. Advocators of ST measures argue space and time are two essential components in shaping people's access to facilities and opportunities. Table 2 compiles five commonly used ST measures. Our analysis shows that, besides the two common physical variables, additional variables such as travel time and people's available leisure time are taken into account (see Table 2).

Accessibility research acknowledges the challenges of operationalizing the concept of accessibility given such complex notion. Variable analysis of current accessibility measures confirms that most of the advances in accessibility measurement are limited within its spatial-

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physical dimension (Bisht et al., 2010). Nevertheless, the above analysis reveals that contemporary accessibility research acknowledged the importance of measuring non-spatial dimension of accessibility. Space-time measures have started to take certain variables from social-personal dimensions into measurement considerations (i.e. people's available time), but leaving many other variables unexplored. To facilitate understandings of accessibility dimensions and variables, we propose an integrated model of accessibility using urban public parks as the context.

Table 2. Space-time (ST) accessibility measures and variables they addressed
Adapted from (Kwan, 1998, Joerin et al., 2005, Neutens et al., 2010, Miller, 1999)

ST Accessibility Measures	*Definition*	*Expression*	*Addressed Variables*
NUM	The number (NUM) of opportunities in the feasible opportunity set (FOS)	$\mathrm{NUM} = \sum_q \mathrm{R}(q)$, where $\mathrm{R}(q) = \begin{cases} 1, & \text{if } q \in \mathrm{FOS}, \\ 0, & \text{otherwise}. \end{cases}$	• Travel time • Available leisure time
NUMD	Accounts for the spatial proximity of the opportunities in the FOS	$\mathrm{NUMD} = \sum_q \exp\left(-\lambda_m \frac{t_{p,q} + t_{qp_{i+1}}}{2}\right)\mathrm{R}(q)$,	• Travel time • Available time • Proximity/ Distance • Car Ownership
BAGG	Aggregate individual's benefit resulting from the choice possibilities to perform an activity in certain space ^ time	$\mathrm{BAGG} = \sum_q a_q (t_q^e - t_q^s) \exp\left\lvert -\lambda_m \left(\frac{t_{p,q} + t_{qp_{i+1}}}{2}\right)\right\rvert \mathrm{R}(q)$	• Travel time • Available time • Proximity/ Distance • Number or area of services
BMAX	Maximize the benefits an individual can potentially attain from the choice possibilities to perform an activity in space ^ time	$\mathrm{BMAX} = \max_{\{q\}}\left[a_q (t_q^e - t_q^s) \exp\left(-\lambda_m \frac{t_{p,q} + t_{qp_{i+1}}}{2}\right)\mathrm{R}(q)\right]$	• Travel time • Available time • Proximity/ Distance • Number or area of services
AI	Sum of suitable weighted opportunities	$A_i = \sum_{j=1}^{m} S_{ij} P_j, i \in 1, \ldots, nj \in 1, \ldots, m,$	• Travel time • Available time • Number or area of services

AN INTEGRATED MODEL OF ACCESSIBILITY FOR URBAN PARKS

Existing Integrated Accessibility Models

Contemporary research calls for a more integrated discussion about accessibility as a concept and research focus with the end goal of identifying opportunities to improve accessibility levels in various context (António and Peter, 2007). Integrated approaches become an alternative research perspective in developing a more accurate definition of accessibility. Whereas there lacks integrated models designed specifically for park accessibility, two general accessibility models will be analysed below.

Bisht et al. (2010) argued that non-spatial dimensions are integral parts of accessibility. They offered a definition of accessibility consisting of three major dimensions, which are mobility, information, and development. Using census data, an integrated accessibility index was

derived. This index represents an integrated approach because it incorporates both spatial and non-spatial factors, but fails to represent perceptual constraints such as social exclusion. While the accessibility index is one useful step toward integration, the use of aggregate measures, such as census data, limits the index's ability to incorporate individual constraints (i.e. disabilities). António and Peter (2007)'s five-layer model provides another example towards integrated accessibility approaches. They posited the accessibility concept should be examined as a multi-layered model by integrating the five layers, namely a transport-based approach, a demand-aware approach, a time-aware approach, a perceptions-aware approach and an institutionally aware approach. Unlike Bisht et al focused on developing accessibility index using aggregate measures, António and Peter (2007) presents a more comprehensive discussion of accessibility from the perspective of its dimensions. However, the practical implications of this model are limited because their layers do not appear mutually exclusive and require appropriate sequencing to facilitate planners' reasoning processes. Being aware of these limitations, the authors suggest that planners might need to select or change the sequence of the five layers to match specific situations in planning practise. Therefore, António and Peter (2007)'s model may improve understanding of the accessibility concept, but it provides relatively limited powers in solving practical planning problems. These two integrated models represent innovations in conceptualizing accessibility. However, neither of these models examines specific accessibility variables that are crucial for predicting behavioural intentions. This paper, therefore, puts forward an integrated accessibility model that has the capacity to inform practical planning decisions using urban parks as the context.

An Integrated Model of Accessibility for Urban Parks

Urban public park provides an important category of urban services that contribute to community well-being, development of social capital, and inclusive neighbourhoods (Chiesura, 2004). Within the context of urban parks, this paper proposes that public facility accessibility should be examined as an integrated multi-dimensional construct, represented by dimensions and variables.

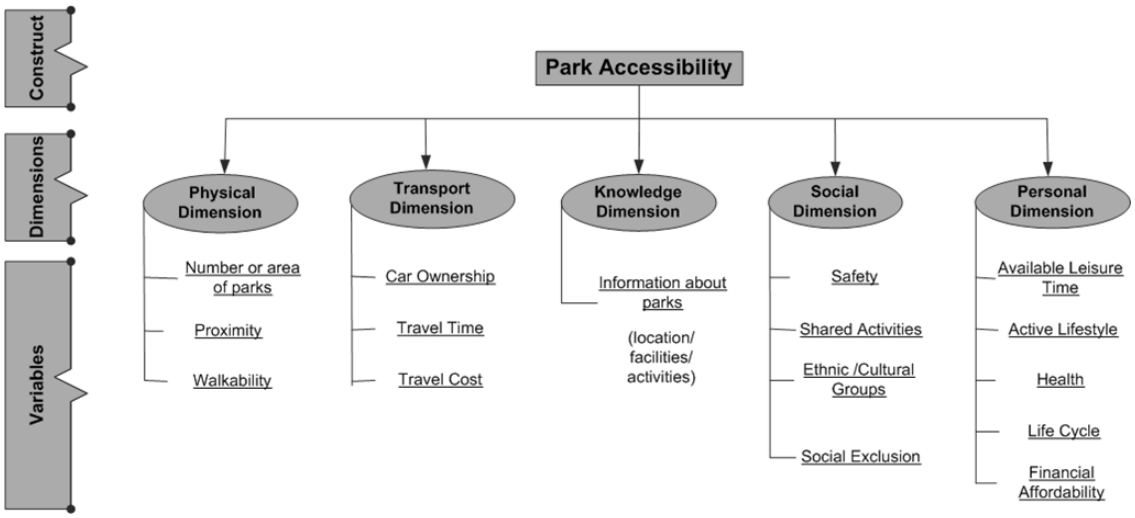

Figure 1. An integated model of park accessibility

The proposed park accessibility model (see Figure 1) consists of five dimensions, which are *spatial*, *transport*, *knowledge*, *social*, and *personal*. Spatial and transport dimensions are included in the proposed model to represent the geographic aspect of accessibility. As described in the conceptual review above, these two dimensions are established accessibility

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dimensions that encompass a variety of geographic and transport variables such as distance, area, car availability etc. Information is argued to be one of the important constraints that influence people's access to services (Johnston et al., 2009). In the context of accessibility to public parks, awareness of park location and activities is a common barrier to access the facilities. Knowledge dimension represents an aspect of accessibility that associates with availability of information and people's cognitive progress (Aday and Andersen, 1974, Bisht et al., 2010, António and Peter, 2007). Social and personal dimensions are developed to cover socio-personal variables, such as life style, safety, etc., that may influence people's ability to obtain park service. The dimensions are described above in Figure 1.

Physical Dimension and Transport Dimensions

Accessibility literatures point out that proximity and inconvenience of overcoming distance are presumed most important influential factors in determining the level of access to parks and green space in urban areas. The transport components, such as availability, distance, travel time and cost, determine the level of convenience in overcoming spatial separation (Penchansky and Thomas, 1981). António and Peter (2007) posited that intellectual abstraction of a geometric space defines access to public facilities. That is, people adjust or deform the reality of geometric space to conform to their beliefs. For example, locations with better transport connections are much closer or more accessible than the locations with less transport connections in this deformed intellectual space. Besides transport availability, we posit physical obstacles to parks such as train tracks or freeways can diminish perceived accessibility while a well-designed footpath linking one's home to the park can increase the perceived accessibility to parks.

Knowledge Dimension

Knowledge dimension is another important accessibility dimension. Accessibility literature recognized that information conditions influence people's access to services (Johnston et al., 2009). In addition, knowledge contributes to one of the three major dimensions in Bisht et. al. (2010)'s accessibility index. In their model, knowledge connects to people's ability to seek information that is measured by aggregate census data such as the level of formal education or internet access.

Nevertheless, the knowledge dimension identified in this paper has a different focus. Knowledge dimension in this model refers to the level of information awareness that individuals have. It connects people's subjective impressions as the outcome of people's cognitive process. This process filters relevant information that is available to potential users to form subjective impressions of information awareness about the place (António and Peter, 2007). Given the context of a park facility, this dimension associates with information about various aspects of parks, such as location of parks, facilities in parks and activities held in parks. Such variables can be elicited as self-reported information, and can, therefore, be empirically tested to determine its contribution to park use behaviour.

Social Dimension and Personal Dimension

Social dimension and personal dimension provide two socio-psychological dimensions for park accessibility. Geographic factors alone are not able to represent people's perception of access to public facilities (Marten and Gillespie, 1978, Aday and Andersen, 1974, Johnston et al., 2009). People interact with their urban environments to access services near their place of residence, for example public parks and green spaces. Pirie (1979) posited that it is people's interaction process that creates accessibility. Meanwhile, this statement alleges that

non-spatial factors associated with social-economic constraints and individuals capacities (i.e. health status, life-style, stage of life) account for people's accessibility to parks.

Aday and Andesen (1974) used the term 'socio-organizational accessibility' to distinguish non-spatial factors from geographic factors. These factors are claimed to influence the ability to obtain service. Similarly, António and Peter (2007) described an *institutionally aware approach* to explain the influence of social dimensions. In their approach, *institution* refers to the social structures and mechanisms including cultural, ethnic, economic, and demographic attributes. Although *institutions* is said to influence accessibility in general, the term *institution* appears too broad for direct use in empirical accessibility research. For example, in the António and Peter (2007) model, the term *institution* encompasses a wide range of concepts from segregation brought about by the presents of social barriers (i.e. age groups, social classes, ethnic groups) to the inability to participate (i.e. physical disabilities, mental problems such as anxiety, and financial resources).

In this study, however, it is essential to treat social and personal dimensions as two separate, but interrelated dimensions as the representation of a list of their related variables. The social dimension of accessibility consists of four main components (i.e. safety, shared activities, ethnic/cultural groups and social exclusion). Security and safety are important public concerns that significantly influence perceptions of park spaces (Byrne et al., 2009, Chiesura, 2004, Winter and Lockwood, 2005). In addition, two other factors including shared activities/programs and ethnic/cultural groups are considered to either facilitate social cohesion or encourage segregation between groups in public spaces. While the way people perceive public spaces is largely shaped by their cultural backgrounds and values, common interests in certain activities or programs (i.e. sports, supervising children at a playground) can also create affinities to places and produce solidary benefits. Social exclusion and its antipode, social cohesion, are related to individual perceptions of social identity, connectedness, support, and trust in people. For example, self-reported community perceptions of trust play a significant role in predicting physical activity behaviour (Chen and Jim, 2010). Additionally, strong community bonds also play a role in social capital development and positive perceptions of public spaces (UN, 2010, Chiesura, 2004). In addition to social factors, public park accessibility is subject to a range of personal factors including self-reported physical and mental health, personal life style, stages of life cycle, available leisure time, and financial resources. Health status and life cycle stage influence both the ability and desire to use facilities such as urban parks. Available leisure time and individual financial resources are personal constraints that may limit an otherwise natural propensity to access urban facilities and services.

How Well Do Major Accessibility Measures Address These Variables?

Park accessibility model presents a new approach of defining accessibility to urban public parks. This model integrates both spatial and non-spatial variables that have the potentials to influence people's accessibility to public parks. It provides an easy way to understand the complexity of accessibility construct as well as its potential influential factors. Have accessibility measurement addressed the complex nature of accessibility concept? To address this question, we use the proposed park accessibility model to examine current accessibility measures. Our result indicates a clear knowledge gap is shown on the non-spatial dimensions (see Table 3). This finding confirms previous studies that contemporary accessibility research has focused on spatial physical dimension of accessibility, leaving other important dimensions largely unexplored.

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Table 3. How well do major accessibility measures address variables in the park accessibilty model?

		Accessibility Dimensions and Variables																		
		Spatial Dimension			***Transport Dimension***			***Knowledge Dimension***			***Social Dimension***				***Personal Dimension***				
		No. or Area	**Proximity**	**Walkability**	**Car Ownership**	**Travel time**	**Travel cost**	**Information about Parks/Facilities**	**Information about Activities/ Programs**	**Safety**	**Shared Activities**	**Ethnic/Cultural Groups**	**Social Exclusion**	**Avail. Leisure time**	**Active Lifestyle**	**Health**	**Personal Life style**	**Life cycle**
Accessibility Measures	**Container Index**	√																
	Gravity Potential	√	√															
	Minimum Distance		√															
	Travel Cost		√															
	CUM				√	√												
	STP					√								√				
	NUMD		√		√	√								√				
	BAGG	√	√			√								√				
	BMAX	√	√			√								√				
	AI	√				√								√			√	

CONCLUSION

Accessibility is central to the urban planning discipline in general and public facility delivery in particular. Our review suggested that accessibility concept can be enhanced by recognizing its multidimensional nature as well as the knowledge gap between its conceptual development and measurement. In this paper, we proposed a new integrated model of park accessibility. The strengths of the model include:

1. The logical extension of existing concepts from the accessibility literature
2. The ability to empirically test and validate the model using survey data in a variety of urban settings
3. The identification of five separate dimensions that can be operationalized and individually and collectively analysed for their contribution to the overall accessibility construct
4. The relative ease to generalise the model to other non-park public facilities and services with minor modifications

The proposed model will require testing, validation, and refinement. Key research questions include: which dimensions and dimensional variables are most significant in contributing to perceptions of park accessibility? Does perceived accessibility actually predict park use behaviour? How much park use behaviour can be explained by the physical-spatial dimensions of accessibility compared to the social and personal dimensions? Does this model apply to different urban, social, and cultural settings?

In the real world, accessibility is not an abstract concept—people routinely evaluate and integrate multiple dimensions resulting in behavioural choices for the use (or non-use) of urban facilities and services. This model and related future research will contribute to our knowledge of the conditions that lead to the effective provision and use of urban facilities and services that sustain the quality of urban life.

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