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Perceptional Dimension Towards More Walkable Communities: An Assessment Tool Approach.

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ABSTRACT

In the active living community, Walking is one of the oldest and most basic forms of transportation. Although, walking has generally received little or no attention in the planning, and development of urban communities. Having more walkable communities is a connection and intersection of three overlapped layers of the research main domains; urban physical features, perceptional qualities, and individual reactions.

The research has developed operational definitions for the urban physical features believed to be related to walkability, investigating the interaction between human activities and individual reactions as a feeling of safety and comfort, through a clear perceptional dimension of image-ability, legibility, complexity, etc., within-group of urban physical features as street width, proportion, buildings height, etc. However, the research aims to extract the conceptual walkability framework elaborated from the literature and offering empirical study based on a quantitative tool of the formative scenario analysis.

Moreover, the research is addressing an assessment approach to have an insightful indication of the values of the variables based on the conceptual walkability framework, as opportunities to improve conditions for walking to make communities more Liveable. Finally, the research offers a field survey instrument, through applying the formative scenario analysis technique to study walkability in one of the mixed-use neighborhood gated community, indicating the impact of each variable and its relative weight, concluding with the graphical representation, and the impact matrix of the walkable variables of the studying area.

KEYWORDS

Walkable Communities, Urban Physical Features, Perceptional Dimensions, Formative Scenario Analysis.

INTRODUCTION

Creating a walkable community has recently received a great attention from designers and urban planners for its various benefits, which can be related to sustainability, public health, and socio-economic aspects (Speck, 2018). Therefore, there is a rising need for research knowledge and investigation about the walkability and the walkable communities of the urban built environment. (Barnes et al, 2005)

On an elementary base, walkability can be defines as an area which promotes walking (Cervero et al, 2009). The term ‘walkability’ was most likely brought forward

to the urban design field by Bradshaw (1993) in order to provide a way to rate how walkable the neighbourhoods were. It was defined as the quality of a place that was a "foot-friendly" man-made, physical microenvironment; a range of useful, active destinations within walking distance, such as shops; a natural environment that moderates the extremes of weather and has no excessive pollution; A recently growing field of research started referring to walkability as an active investigation about the relation between the built environment (as the urban physical features) and the perceptual qualities of the walking behavior (Abley, 2011) taking into consideration the individual reactions towards their walking community experience (Fitzsimons D'Arcy, 2013).

Walking in general is facing a problem that the design factors that are often discussed as promoting walking or creating 'pedestrian-friendly environments' in urban design theories and discourses are often based on physical urban features (Bereitschaft, 2017), disregarding other factors as perceptual qualities and individual reactions, considering them to be insignificant in the quantitative analyses on the amount of walking (Carol S., 2002). This research adopts the conceptual walkability framework, to contribute to the broader field of "walkability" by refining the methods and measures, used to analyse the relation between walking behavior and physical environment (Speck, 2018).

1. CREATING A WALKABLE COMMUNITY: The World "Back On Its Feet"

Walkability has many health, environmental, and economic benefits. Factors influencing walkability include the presence or absence and quality of sidewalks, pedestrian rights-of-way, traffic and road conditions, land use patterns, building accessibility, and safety, among others (Bentley et al, 1985). Walkability is an important concept in sustainable communities (Bereitschaft, 2017). "Cars are happiest when there are no other cars around" while "People are happiest when other people are around." Dan Burden. Designing Walkable Communities are based around the human foot, moreover, that can lead to more sustainable and future community prosperity. (Brownson et al, 2009).

1.1 Walkable community characteristics

- People from all different age groups and abilities can easily access to their own community "on foot" (Bereitschaft, 2017),
- People are able to walk more, in addition, the neighbourhood, and the community are more safe, and friendly places (Speck, 2018).
- Parents are usually feel more comfort about their children being outside within their neighbourhoods. (Abley, 2011)
- Children spend more active times playing outside with their friends, in a healthy urban environment (Forsyth et al, 2007).
- Streets and pathways are designed to provide comfort and safe facilities for pedestrians, for safe and easy crossing for all different ages and abilities (Fitzhugh et al, 2010).
- Pedestrians must be given priority in designing the neighborhood, school, work, and shopping spaces. Motor vehicle speeds must be reduced (and, in

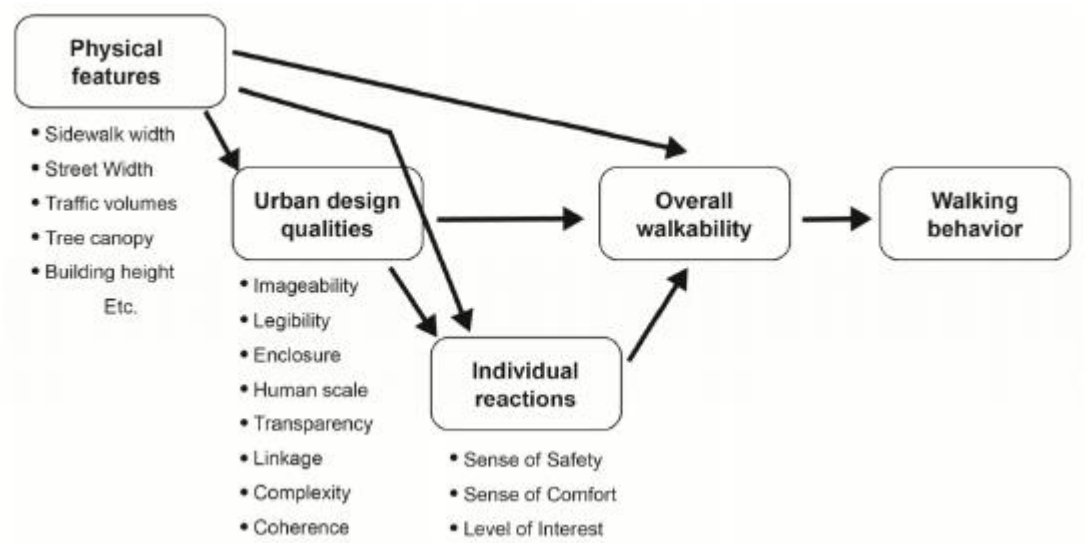
some areas, motor vehicles have been excluded completely) to guarantee compatibility with pedestrian movement (Speck, 2018).

1.2 The Conceptual Walkability Framework

The research has adopted the conceptual walkability framework addressed by Ewing & Handy, 2009, as an approach to measuring the Unmeasurable walkability variables Related to physical features (Abley, 2011), in addition to non-physical qualities of perceptual aspects and individual reactions (Ewing et al, 2009).

A recent study from the urban design approach has attempted to analysis subjective qualities of walkability, with the aim of providing a different perspective for a significant walking behavior approach (Ewing & Handy, 2006).
Debates that urban physical features individually may not capture people's overall perceptions to promote walking and create walkable communities, this conceptual framework investigates perceptual qualities that may affect the walking environment of what the urban design literature indicates (Ewing, 1996). The conceptual framework illustrated below, is a stimulating analysis of the multi-displinary relationship between the urban physical features of the built environment, the perception of the environment, and walking behavior (Ewing et al, 2009).

Figure (1) The conceptual walkability framework



Source: (Ewing et al, 2009).

The conceptual walkability framework consists of three main domains: the main domain is the physical feature of the built environment, representing the sidewalks width, street width, traffic volumes, tree canopy, building height, number of people, weather….etc. the second domain is the perceptual qualities of the walkable communities, that has to have a great deal with Imageability, legibility, complexity, coherence, enclosure, human scale, linkage, and transparency (Speck, 2018). The final domain is the individual reactions towards the walkable communities, which reveals the feelings of comfort, safety, and the level of interest

(Bereitschaft, 2017). The table below defines each variable and address its connection to promote more walkable community (Ewing & Handy, 2006).

Table (1) Walkability variables definitions.

Domain	Variable	Definition
Urbanphysicalfeatures	Sidewalk width	The distance between the curb and the buildings, Sidewalks require a minimum width of 5.0 feet if set back from the curb or 6.0 feet if at the curb face.
	Street width	The more street width increases, the less walkable it is. Walkability requires intimate spaces with human scale oriented.
	Traffic volumes	The more traffic volumes increases, the less walkable it is. Walkability requires less noise and safer environment.
	Tree canopy	Desirable from 1-2 m width along both sides of the walk way.
	Building heights	Spaces where the height of vertical elements is proportionally related to the width of the space between them have a room-like quality.
	Number of people	It depends on the sidewalk width, in general walking is more pleasant without having a crowding feeling and preserve the personal space from strangers.
	Weather	Environmental status in general affect the rate and quality of walking, temperature, humidity …and others
Perceptualqualities	Imageability	Imageability is the quality of a place that makes it distinct, recognizable and memorable.
	Legibility	It is the ease in which the physical structure of a place can be comprehended and understood as a whole.
	Complexity	It is about the visual wealth of a place. It can be defined through the diversity of the physical environment, and the numbers and types of buildings, architectural diversity and ornamentation, street furniture, landscape elements, and human activity.
	Coherence	Presents the sense of harmony, visual order, and compatibility.
	Enclosure	It presents the degree to which streets and other public spaces are visually recognised by buildings, walls, trees and vertical elements, in general.
	Human scale	Human scale indicates the size, and texture, of physical elements that match the size and proportions of humans and, related to their walking speed. Building details, and street furniture are also physical elements important to refine human scale.
	Linkage	Refers to the connections from building to street, “building to building”, “space to space”, or one side of

Domain	Variable	Definition
		the street to the other which incline to amalgamate disparate elements. The extent to which the pedestrian environment is connected linked; joined; attached; networked, and interfaced.
	Transparency	It presents the degree to which pedestrian can perceive what lies beyond the borders of a street and, more explicitly, the degree to which pedestrian can perceive human activity beyond the street boundary. Physical elements that affect transparency include walls, windows, doors, fences, landscaping and openings.
ndividualreactions	Sense of safety	About how safe people feel about the moving vehicles, and walking along a street and through road crossing.
	Sense of comfort	The percentage of which the walking environment is easy; pleasant; relaxed; protected; sheltered; untroubled.
	Level of interest	It shows how pleasant the sidewalk is, present diverse activities that promote walking.

Source: (Ewing et al, 2009).

2. METHODOLOGY OF THE CASE STUDY

Many efforts were done in an attempt to increase communities' levels of walkability, based on this perspective, the conceptual walkability framework will be applied on the local community at certain urban setting "Hadayek El Ahram" Giza, Egypt, to study the most effective variable that promotes walkability, and those of less importance and effectiveness. The case study has been selected based on certain criteria: the project has to be a planned residential area, with a mixed use activities offering services and facilities, the centrality of the services in order to define the walking distance from the gates.

2.1 Case Study Background

"Hadayek El Ahram" is a private neighborhood residential gated community for middle and upper middle income, located in the beginning of Cairo-El Fayoum desert road directly off El Remaya square, Giza, Egypt.

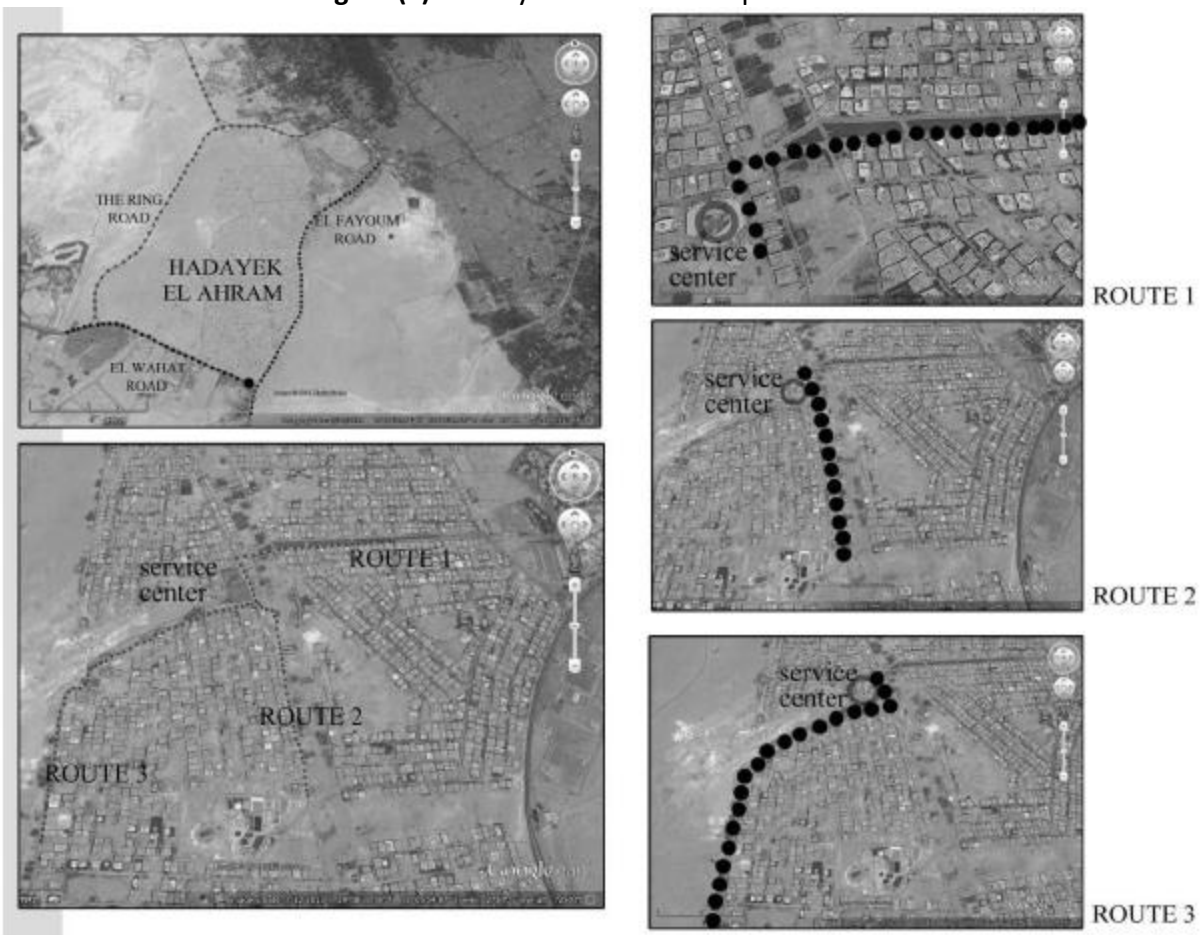
It has a beautiful view overlooking the pyramids. It has four main gates, with a central service centre, "Route 1" started from gate "Khofo" along the main spine "El Tharwa El Maadanya road" street width of 40m, a mixed used spine with a lots of shops and restaurants, and a crowded residential areas on both sides, with a large garden street island with a lot of activities of setting areas and playing zones for kids.

Figure (2) "Hadayek El Ahram" private gated community

Source: (The Researchers, 2019).

"Route 2" started from gate "Khafraa" along with less important road of width 25m, with less activities, more quite residential parts with small shopping activities at the building s' ground floor. "Route 3" started from gate "Mena" along with very important road "El Geesh Street" of width 36m, having on side of the road of residential highly mixed use buildings, and on the other side a very restricted military area. As seen in figure 2,3

Figure (3) "Hadayek El Ahram" maps



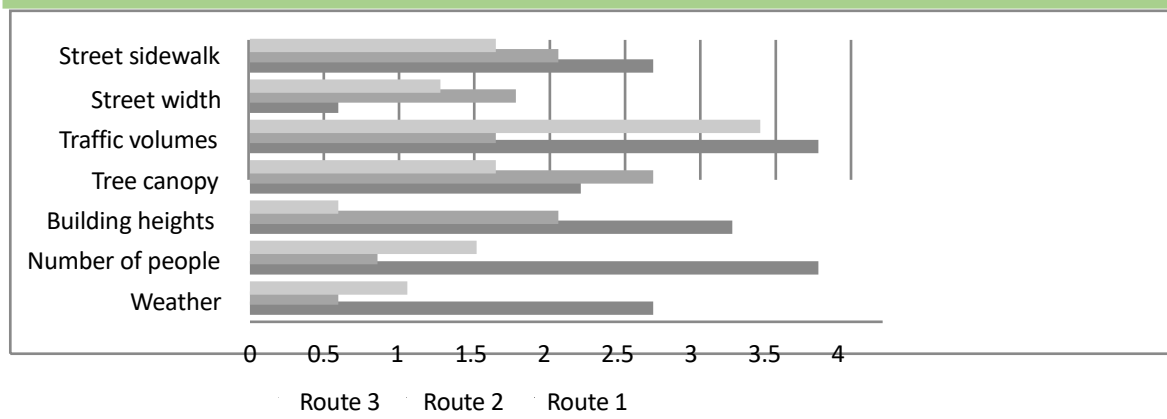
Source: (The Researchers, 2019).

2.1.1 Sampling process – questionnaire application

Sampling is a method of selecting a certain number of residents from a total population. Define the population (n) frame: Target sample should have lived not less than 5 years in the urban setting. Therefore, their age is in a range between (18-60 years old). The sample population has covered both genders. Determine sample size: Total research sample is 138 of the local residents, with a group of 76 men and 62 women; about 70% of the sample is employed while the other 30 % are undergraduate students. About 85% of the sample populations are local residents, while the 15% of market owners. This sample is considered a random sample, has been interviewed based on the researcher observations of visitors regularly practice walking for the selected routs different timing of the day for different reasons. Before distributing the questionnaire, a pilot test has been conducted, to study the workability and communicability of the questions, as the walkability conceptual framework is relatively a new methodology approaching the walkable communities.

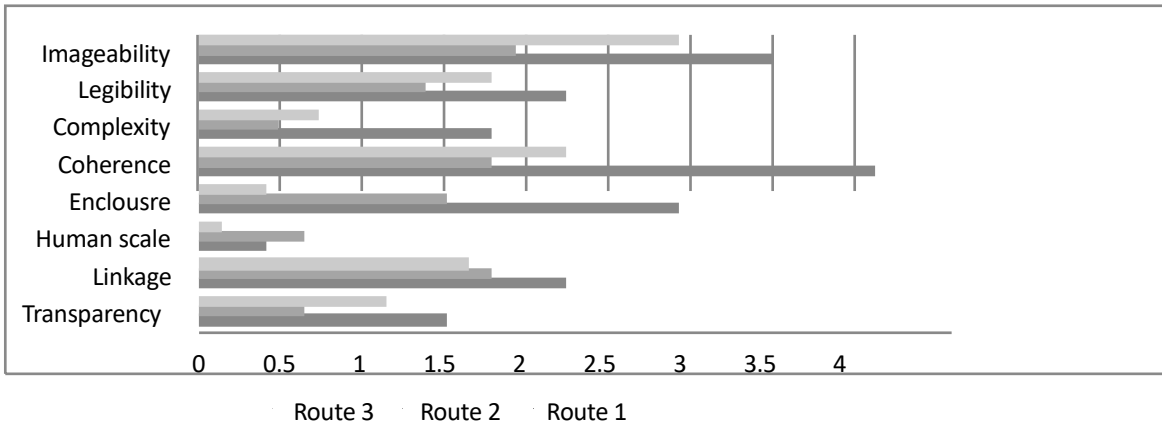
Table (2). Walkability variables analysis

Urban Physical Features



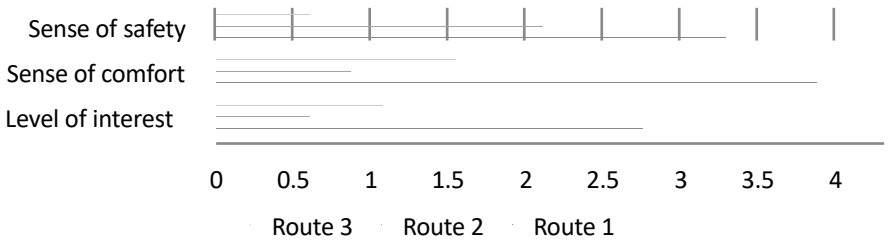
From the graph, route 1 is having a relatively high scores in both building heights and number of users, while route 2 is more preferred from the participants regarding the tree canopy, on the other hand traffic volumes affected the quality of walking in both route 1,and 2, and remained route 2 more preferred due to less traffic volumes.

Perceptual Qualities



The three routes scored very week values on the human scale variable, due the building heights and street width that doesn't create a pleasant human scale feeling

Individual Reactions



Route 3 is scoring high values especially in the sense of comfort, due to having a lot of activities that promote walking and creates a comfort walking environment.

Source: (The Researchers, 2019).

3. ASSESSMENT TOOL

Data analysis within the approach of the quantitative research is the systematic scientific investigation of quantitative values and figures and their relationships. The aim of quantitative analysis is to develop the data evaluation mathematically, theories and/or hypotheses pertaining studying walkability in residential settings. The process of assessment provides the fundamental relation between empirical observation and the mathematical expression of quantitative relations and connections (Scholz, R. and Tietje, O. 2002).

The analysis of the questionnaire shows the high values of "Route 3", therefore, the research will focus on applying the quantitative assessments to analyze the results of this route and have more deep insights upon its values.

3.1 Walkability Variables Assessment "Route 1"

An approach that is representing one of the quantitative analysis theories, which will be used as a data analysis for studying and analyzing the walkability aspects in residential urban settings; **Formative Scenario Analysis.**

Formative Scenario Analysis provides hypothetical future states of a system or a case (as the issue of studying walkability in residential settings) that called scenarios. The scenarios are based on a sufficient set of system variables (impact factors). These variables are related to different disciplines and subsystems (Carol S. Aneshense 2002).

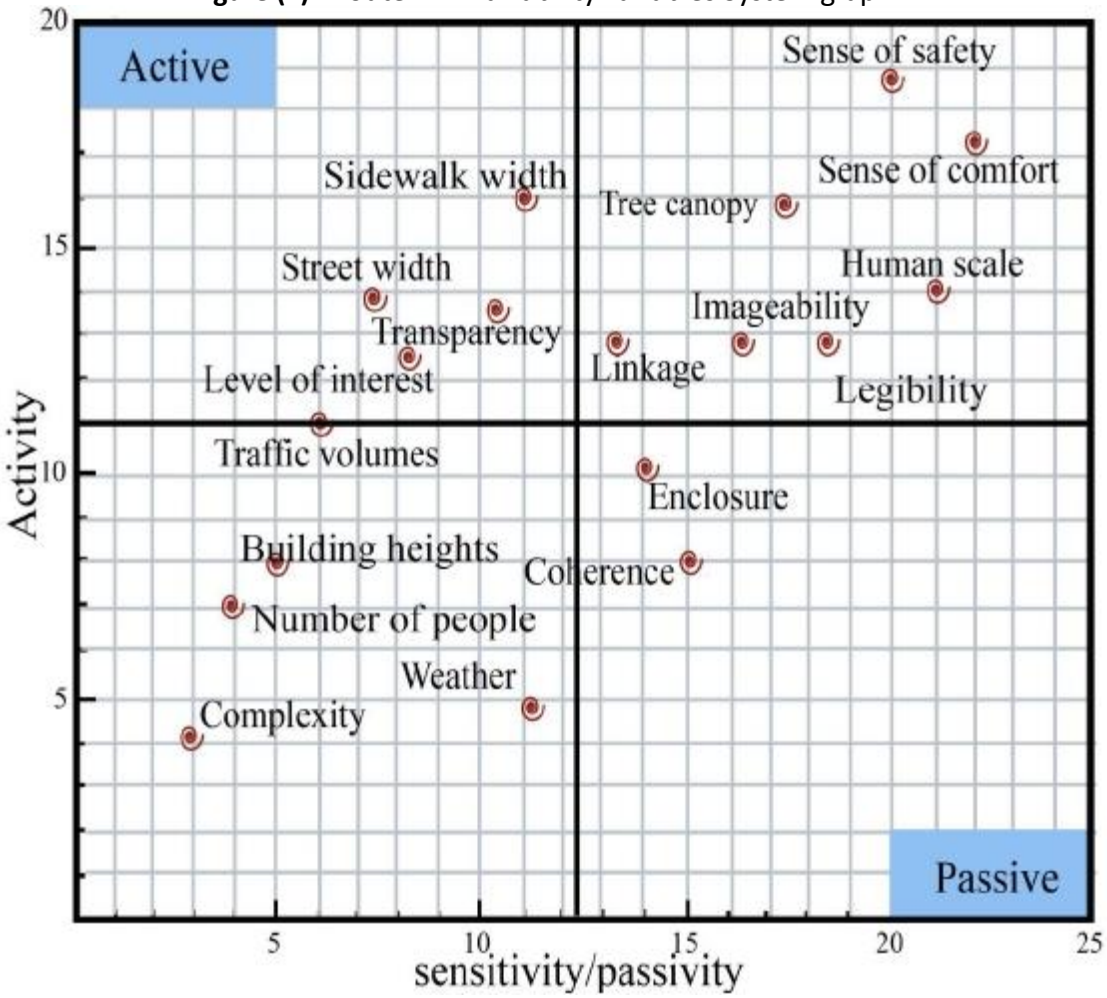
Formative Scenario Analysis procedure acts on a concept based on the impact of variables over each other's, the significance of how they are affected and effected, through a graphical representation of a system graph. The X-axe represents the passivity (which indicates how variable "V" is affected by the other variables "Vn") and it shows how sensitive the variable is. The Y-axe represents the activity (which indicates how variable "V" effects on the other variables "Vn") and it shows how significant and important the variable is (Scholz, R. and Tietje, O. 2002).

The graph consists of **Four Quadrants**, *Activity* and *Sensitivity* ratings are displayed in two quadrants, top left, and down right, respectively, The variables Values and Impacts are considered above average in both sensitivity and activity, which places them in the *Ambivalent* quadrant on the top right of the graph, The variables Values above average in activity and below average in passivity; they are located in the Active quadrant, variables located in the Passive quadrant because they are below average in activity but above average in passivity.

Buffer Variables are located in the down-right quadrant because they are below average in both activity and sensitivity/passivity (Scholz, R. and Tietje, O. 2002) .

By applying Formative Scenario Analysis onwalkanility variables, the relation between different variables as shown in figure 4

Figure (4) Route "1" walkability variables System graph



Source: (The Researchers, 2019).

4.RESULTS AND CONCLUSIONS

Walkability is a multidisciplinary field of study, it adopts various aspects related to urban design qualities of the built environment, in addition to broader scoops of social connections and individual reactions. The application of the walkability conceptual frame work upon a residential gated community "Hadayek el Ahram" shows various results related to the importance of the human scale compared to other variables, in addition to the unpleasant effect of the traffic volumes and its bad influence on the walking environment. Focusing on "Route 1" to have more insightful results by applying the quantitative assessment of the formative scenario analysis to obtain a graphical representation of the relation between the walkability variables, the graph shows the great importance of the variables "sense of safety, sense of comfort" by having high scores on both the activity and passivity, taking part at the Ambivalent quadrant, in addition to, variables "tree canopy, human scale, Imageability, legibility, linkage". However, the variable "complexity" is having a very low value in both activity and passivity, taking place at the Buffer Variables quadrant, indicating that having complexity in the architecture styles and level of details did not affect the quality of walking within the context of "Route 1" at "Hadayek el Ahram".

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