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IMAGEABILITY AND LEGIBILITY: COGNITIVE ANALYSIS AND VISIBILITY ASSESSMENT IN GALLE HERITAGE CITY

Tharushi ABEYNAYAKE, Lakshika MEETIYAGODA, Nayomi KANKANAMGE*, Palpola Kankanamge Senevirathne MAHANAMA

Department of Town and Country Planning, Faculty of Architecture, University of Moratuwa, Katubedda, Sri Lanka

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Abstract. The concepts of imageability and legibility are important aspects of urban design. Many scholars use the terms "imageability" and "legibility" interchangeably, usually examining one concept and applying the implications to the other. This research explores the relationship between these two concepts by answering the research questions: 1. how do people perceive the saliency of landmarks (imageability) and 2. how does the spatial configuration facilitate the visibility level of landmarks (legibility)? The Galle Heritage City in Sri Lanka is considered as the case study. The first part of the empirical study is to assess the level of imageability of urban space users by completing 100 cognitive maps and producing a composite cognitive map that indicates the structural landmarks' salience or the level of imageability. The second part is the level of legibility of the landmarks by employing the visibility assessment process and the third part compares the two results with a concurrence matrix. The findings highlight that there is a positive relationship between people's perception (imageability) and level of visibility (legibility). Further, imageability mostly depends on semantic properties than legibility, but legibility predominantly depends on structural properties and visual properties are almost equally important to both concepts.

Keywords: cognitive studies, heritage city, imageability, landmarks, legibility, visibility assessment.

Introduction

Cities are external to the human mind but internally represented in the human mind. Visual, haptic, auditory, olfactory and kinetic sensory inputs determine the environmental perception of people. The common understanding is that out of all senses, visual perception is dominant (Szczepańska et al., 2013). When people collect the city elements into their cognition through their senses, they can imagine the city which is important to the successful functions of the city. Moreover, it is commonly agreed that the comprehension of the visual perception of urban users is important for urban planners in making a more vivid and memorable city. Lynch (1960) is the pioneer in explaining imageability and legibility. Lynch (1960) suggests the imageability of the city and legibility of the physical context to be preconditions of the visual quality of the city environments. Nevertheless, Taylor (2009) claims, that legibility is not necessarily a significant criterion of the perceptible quality of a townscape. He argues that there can be townscapes that are legible but from the point of urban design would be judged to be of poor quality and vice versa. Meanwhile, Google Scholar search results show that many scholars use the terms "imageability" and "legibility" interchangeably (Berleant, 2012; Abel, 2013; Monk, 2019). In that context, it is important to understand the similarities and differences between imageability and legibility and what makes such similarities and differences if one concept is criticized, the criticisms may apply to another if it is unknown the exact relationship.

The legible cities contain five main imageability heightening elements: paths, nodes, districts, landmarks and edges and out of these, landmarks are prominent in an urban environment and facilitate its visual identification and structuring. The landmarks provide important wayfinding assistance in urban areas, particularly in touristic heritage cities. As same as the other urban elements, landmarks also have three main properties: visual, structural and semantic. Visual means the distinctive quality that a particular element has from the rest of the urban elements in terms of façade, color or form; structure means the relationship to the larger pattern of other urban elements and semantic denotes the intangible and emotional value for the observer (Damayanti & Kossak, 2016). Visual and structural properties are visible, but semantics comes after

*Corresponding author. E-mail: *nayomie@uom.lk*

the first two and with the experiences, memory and culture of the users. The common perception is that highly visible objects are highly attracting people's attention (Lynch, 1960; Davis & Peebles, 2010; Dong et al., 2020). Nevertheless, some scholars point out the important role of meaning and knowledge about imageability (Tuan, 1979; Quesnot & Roche, 2015; Damayanti & Kossak, 2016). Henderson and Hayes (2017) found that the semantic salience of the landmarks dominates visual attention. Quesnot and Roche (2015) verify that local people's memory holds semantically salient landmarks and strangers focus on visually salient landmarks. According to this discussion, a salient landmark means a most imageable landmark.

In this background, this research aims to find the relationship between the imageability and legibility of Galle heritage city in Sri Lanka, particularly considering the landmarks. Though scholars understand that cities with imageable elements tend to be legible and vice versa (Jiang, 2013), this research questions whether there is an agreement between the results obtained by cognitive analysis (imageability level) and visibility analysis (legibility level). The objectives of the research are, to explore the landmark saliency or the level of imageability of city users; to examine the visibility level of landmarks or the level of legibility and to find the relationship between the level of imageability and legibility.

The next sections of the paper review literature on the concepts of imageability and saliency of landmarks and legibility and visibility; explain the qualitative methodology which was used for data collection and analysis and the research findings. This study is significant theoretically and practically as it expands the knowledge of the concepts of imageability and legibility and encourages practitioners to explore diverse analysis methods to understand the level of imageability in addition to the visibility analysis.

1. Literature review

1.1. Imageability and saliency of landmarks

Imageability is a quality in an urban area that evokes a strong and vivid image (Morello & Ratti, 2009; Jiang, 2013). According to Lynch (1960), the image is a product of two main reasons, that are immediate sensation and of the memory of the experience. Further, he explains how the environment perception is held in the cognition of urban users as an image and he introduces a method that records the mental image as a cognitive map. A cognitive map defines how a city user perceives the main visual elements of the urban area (Lynch, 1960). Some scholars identify objectivist and subjectivist dimensions of the urban image (Jacobs, 2011; Fisher-Gewirtzman, 2018). The objectivist dimension includes measurable qualities, namely, size, shape, and arrangement of buildings and objects in the city and the subjectivist dimension consists of qualitative aspects which can be cognitively perceived and includes genius loci, architectural style, the life of the city, pattern and rhythm.

Filomena and Verstegen (2021) define landmarks as "fixed environmental features that are known and remembered for their distinctiveness within a specific environment". Duckham et al. (2010) argue that people imagine the city by using cognitively salient elements and landmarks are considered one such element. Moreover, Richter and Winter (2014) conclude that landmarks form cognitive anchors, marks or reference points for orientation, wayfinding and communication. In absence of landmarks or when the urban environment is in visual chaos, the harmony between people and the urban environment relationship is destroyed. Landmarks are categorized as global landmarks and local landmarks, depending on the level of spatial representation (Presson & Montello, 1988). According to Winter et al. (2008), landmark hierarchy is dependent upon its uniqueness, prominence or salience features which are also called the primary characteristics of visual anchors (Bernardini & Peeples, 2015). Al-Shams and Badarulzaman (2014) identify eight important criteria in considering an urban element as a landmark, namely, unique, memorable, legible, historic, design, scale, meaningful and color. Historical landmarks are usually powerful in constructing urban identity (Oktay & Bala, 2015).

The level of the salience of landmarks is determined by visual (facade, form and color), structural (location) and semantic properties (cultural and historical value) (Sorrows & Hirtle, 1999). Filomena and Verstegen (2021) consider for their study that Landmarkness is the combination of visual, structural, pragmatic and cultural components. Bernardini and Peeples (2015) highlight that visually unique landmarks are useful because they are readily distinguished from similar landmarks and background visual noise, for example, a building can be visually distinctive being the only red building in a street of grey ones (Claramunt & Winter, 2007). When considering the structural salience properties, comes from the location or the position along a route (Klippel & Winter, 2005). For example, an urban element can be structurally distinctive because it is located at an intersection and further determined according to the number of streets intersecting at that intersection, the number of streets, a street is connected with or the function of the street for the connectivity within the street network (Claramunt & Winter, 2007). Landmarks bear special meanings (semantic properties) that distinguish them from the other elements of the city. The distinct meaning can be personal, cultural or historical. For example, a place may have no special visual quality, but if it is where someone met their partner for the first time, it tends to constitute a landmark for the person. If the same place is selected for a wedding of a very popular person, it would be a landmark for many citizens. A small house, which is not visually attractive is not considered a landmark, but if that small house has a long history and archaeological value, it could be qualified as a landmark. Scholars identify one reason as memory, which is distinguished as individual and collective memory. Memory is defined as "a response that as

confirmed by the subject, referred to an event that has happened at a particular place and time and lasted no longer than a day" (Williams et al., 1996). Nora (1989) explains the difference between memory and history and says, "memory takes root in concrete, in spaces, gestures, images and objects and history binds itself strictly to temporal continuities". If inhabitants keep a memory in their mind about space, it is an individual memory, whereas collective memory is shared by a group and is socially manifested (Halbwachs, 1950/1980). Further, according to Halbwachs (1950/1980, p. 50), "personal" and "autobiographical" memory is individual memory and "social" and "historical" memory is collective. Likewise, the recognition of a landmark varies from one person to another and depends on different aspects, while some landmarks are included in the cognitive maps of many urban users.

1.2. Legibility and visibility

Legibility is the clarity of the cityscape (Morello & Ratti, 2009). Lynch (1960) firmly acknowledged that legibility is one of the important properties of a beautiful city. Cities are legible either because of their physical form or activity pattern or because of both (Bentley et al., 1985). Moreover, Koseoglu and Onder (2011) conceptualize legibility depends on spatial configuration/complexity of layout and saliency/recognisability of landmarks.

When considering spatial configuration/complexity of the layout, legible urban environments enable people to form clear and distinct layouts, thus easy to shape the urban image in the human mind and, thereby, people feel easy to orient themselves (Taylor, 2009; Jiang, 2013). Nurgandarum and Anjani (2020) state legibility means "the possibility of structuring and organizing an environment within a coherent and imageable pattern". As same as the other form of reading, spatial information can be grasped when reading about the urban environment and that is the level of legibility (Koseoglu & Onder, 2011). The reading is easy if the material side of the urban environment is visible and can be experienced by the sense of sight (Nurgandarum & Anjani, 2020). As legibility is influenced by spatial configuration, some clear networks of connections and nodes between the city places are necessary to achieve good legibility (Cheshmehzangi, 2014). When it is not clear how one space is connected to the other, wayfinding becomes challenging (Koseoglu & Onder, 2011). Likewise, the reviewed literature implies the clarity of spatial configuration or visibility, thus, visibility analysis is necessary to assess the level of legibility. The second aspect of legibility, saliency/recognisability of landmarks is determined by visual, structural and semantic properties and has already been discussed in the previous section.

Contemporary discourse on the visual experience of the city identified that the role of landmarks in wayfinding is an important topic and several scholars investigate the visibility, legibility and visual salience of landmarks (Klippel & Winter, 2005; Omer & Goldblatt, 2007; Kalin & Yilmaz, 2012; Silavi et al., 2017). Some of the methodologies that are used for the visual analysis are fractal dimension (Hagerhall et al. 2004); View shed approach (Sander & Manson, 2007); streetscape analysis (Meetiyagoda & Munasinghe, 2016); serial vision analysis (Kalin & Yilmaz, 2012) and so on. Among these studies, Kalin and Yilmaz's (2012) study is significant in terms of visibility as it considers the kinaesthetic experience of moving through urban space, which is emphasized in Cullen's townscape approach too. One benefit of this approach is that the observer gets the opportunity of observing the total structure. Therefore, it is easy to identify relatively distinct, prominent or obvious landmarks in contrast with the environment.

1.3. Imageability and legibility

The theoretical underpinnings of imageability and legibility lead to understanding the relationship between the terms, imageability, the saliency of landmarks, legibility and visibility (Figure 1). In some instances, scholars firmly state the characteristics or properties of these concepts,

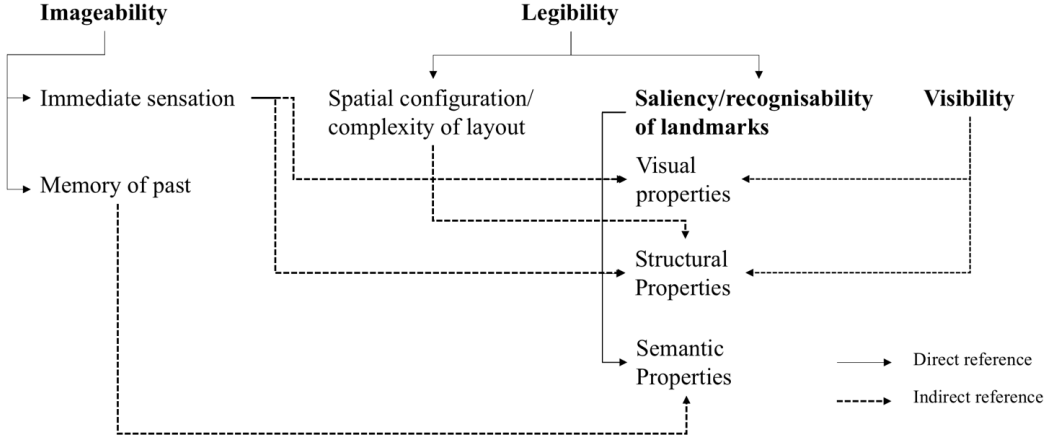

Figure 1. The conceptual relationship between imageability and legibility

but some characteristics and relationships are implied. According to the conceptual diagram, visual, structural and semantic properties of landmarks are important in enhancing imageability, but more attention is paid to semantic properties as memories of the past has a strong impact on the identification of landmarks. The legibility is also determined by visual, structural and semantic properties of landmarks, but spatial configuration/complexity of spatial layout is significant and related to structural properties. Moreover, visibility has a great role with legibility and the level of visibility is depended on visual and structural properties.

2. Method and study area

2.1. Study area

Galle is a Sri Lankan city and the largest town in the Southern Province with a population of about 94,000 (2020). It is located 115 kilometers away from the capital of Colombo (Figure 2). Galle city is famous for a Fort which was inscribed on the World Heritage List in December 1988, and it is considered a living heritage. The modern city is virtually developing along the main highway with a concentration towards the center where the main bus stand and the rail station are located.

In the twenty-first century, the world's highest-ranking industry is tourism, and Sri Lanka also aims to shift the paradigm to a tourism-based economy. It is included in the political manifestos and politicians as stakeholders with power in decision making fully supportive to develop Galle city as a Tourism city. Therefore, city planners strive to create a distinctive image and city branding by enhancing the imageability and legibility characteristics of the city. The heritage city of Galle has numerous types of new and old landmarks. However, Abeyweera and Kaluthanthri (2018) note that the city failed to brand itself as a unique city and tap opportunities in tourism. Therefore, Galle is a good case to study the relationship between imageability and legibility.

Moreover, as depicted in Figure 2, the study area consists of three different characteristics. The Dutch Galle

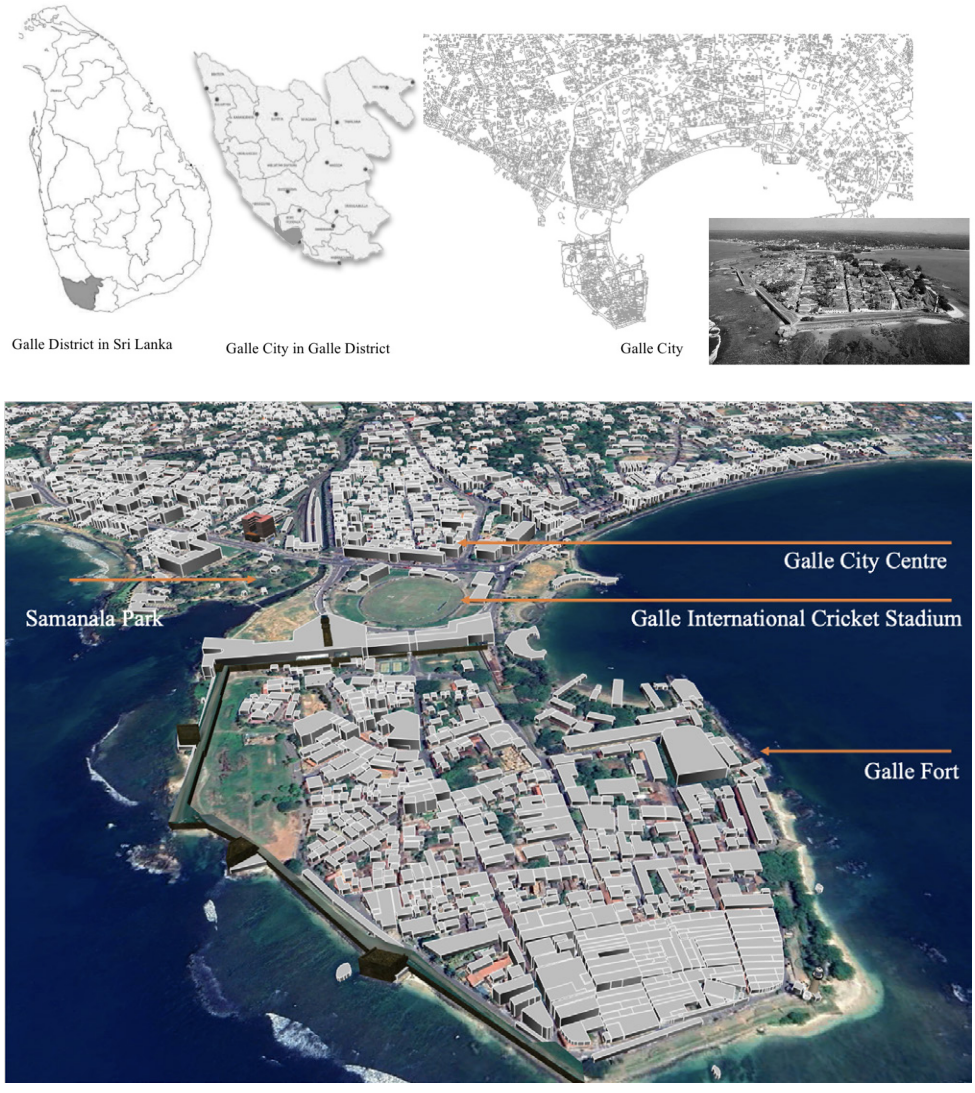

Figure 2. Location of the city of Galle

Fort was first built in 1588 by the Portuguese. Then fortified by the Dutch during the 17th century (from 1649 onwards). The road network of the Dutch Galle Fort reflects the grid patterns of straight but narrow streets. The houses built in each block bounded by the narrow streets consist of distinctive architecture i.e., low-roofed with ornate. The distinct architectural buildings, ramparts, old lighthouse on ramparts, and Dutch churches have made Galle Fort a place that attracts both local and foreign tourists. Due to these unique characteristics of the area, the government has its regulations to monitor the development activities that take place in this area as well.

In between the Galle Dutch Fort and the Galle city two main open spaces can be identified. They are The Galle International Cricket Stadium and the Samanala Park which act as a transition zone that separates the Galle Dutch Fort getting disturbed by the busy Galle City Centre. Galle City Centre accommodates the lengthiest bus stand in the country and the railway station close by. Except most of the administrative offices such as the Municipal Council, Divisional Secretariat Office, Post Office and Police Station are also located within the city center. The city center further accommodates many commercial activities which attract a considerable number of commuters per day. Except for the railway station and the Municipal Council building, almost all the buildings located closer to the city center carry modern building architecture. The aforesaid factors qualify Galle heritage city as a potential case study to examine imageability and legibility.

2.2. Method

Based on the objectives of the research, it follows a qualitative research approach. Figure 3, shows the methodological framework adopted in the study.

Dong et al. (2020) present a quantitative method (computer vision model) to compare the roles of landmarks' visual salience and semantic salience. At the same time, Raubal and Winter (2002), Duckham et al. (2010) and Quesnot and Roche (2015) also compute landmarks salience by using models. In contrast, this research followed a qualitative research approach. The first phase of the empirical study attempted to find the level of imageability in terms of landmark saliency. For this purpose, the sample of respondents (n = 120) included commuters, inhabitants, local tourists and foreign tourists. It considered different social categories such as the level of familiarity and the individual's cultural background about the place as their level of imageability can be varied (Jiang, 2013). For example, a local cab driver would have a complete image of the city including many landmarks, whereas a foreigner may have a small impression of limited landmarks. The sample of respondents was asked to draw a quick sketch map of the City of Galle, indicating the most interesting and important features. According to Lynch, these are cognitive maps. Once the 100 cognitive maps were collected, analyzed for frequency of mention of landmarks. Then, the number of references is divided into 5 classes to develop the landmark hierarchy based on the number of references and located on a composite map with an identified symbolization. This composite map can be considered "a wisdom created by crowds" (Surowiecki, 2005).

As the second objective is to examine the visibility level of landmarks or the level of legibility, a photographic survey was conducted in a sequential view process along the streetscape to understand the serial vision of each landmark. Lynch (1960), Kalin and Yilmaz (2012) mentioned a procedure of conducting visual analysis based on a photographic survey-based scene capturing methodology. Firstly, sequential view frames were captured along the routes toward the landmark. The photo shoots were initiated from a 30 m distance (V1) and continued until the landmark disappeared (Vn), with intervals of approximately 25 meters. These photographs were taken using Canon IXUS 160 digital camera. Then sequential view frames were developed for each selected landmark which represents the location which the

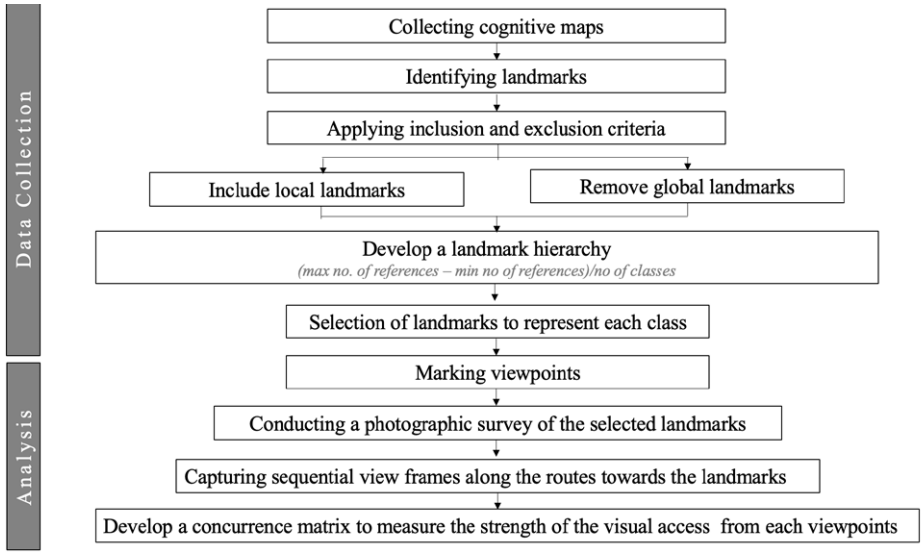

Figure 3. Methodological framework

photograph has taken, the route of the movement, yellow frame, and coloured landmark in the grey context to highlight the visibility of the landmark. The level of visibility is depicted on a scale: Very high (5) (More than 80% visible without obstructions); High (4) (60–80% visible without obstructions); Moderate (3) (40–60% visible without obstructions) and Poor (2) (20–40% visible without obstructions) and Very poor (1) (Less than 20% visible without obstructions). Finally, a concurrence matrix was developed to find the relationship between the level of landmark saliency and the visibility level.

3. Results

This section describes the results of an empirical study related to landmark saliency analysis, visibility analysis, and the analysis of the relationship between the aspects of imageability and legibility.

3.1. Level of imageability and saliency of landmarks

In total, 100 people responded to a cognitive map survey and identified 102 landmarks. 62% of inhabitants and commuters, 20% of local tourists, and 18% of foreign tourists were the respondents. However, a significant difference between the different user groups was not considered in this study and can be further studied. Out of 102 landmarks, 48 landmarks were identified only by one respondent, thus, such landmarks were removed when producing the composite cognitive map. The Galle Fort which received the highest number of references (n = 65) was also removed from the study, as it acts as a global landmark. Accordingly, 53 landmarks were selected to develop the landmark hierarchy.

The maximum number of references received per landmark was 61, and the minimum number of references was 2. Accordingly, the number of references is divided into 5 classes to develop the landmark hierarchy based on the number of references (61–2/5; Table 1). The class with the highest number of references was categorized as hierarchy 1 (50–61), and the class with the lowest number of references was identified as hierarchy 5 (2–13). Accordingly, the base of the thresholds of this division was the number of references received per landmark. As per Table 1, 36 landmarks belonged to the 5th hierarchy. These include the landmarks such as Lighthouse, Black bridge, and Galle harbor. Only 2 landmarks were categorized in hierarchy 1 with the highest number of references. 26–37 respondents identified seven landmarks and named them as hierarchy 3. Six landmarks belonged to hierarchy 4. Most of the landmarks were categorized into the last hierarchy with the least number of references through the landmarks in the last hierarchy are also located within the city center.

The spatial distribution of these landmarks is given in Figure 4. Accordingly, almost all landmarks from the hierarchy 1 and 2 are located within the city core and the landmarks of hierarchy 3 onwards can be seen a little away from the city core. Thus, it indicates that the visual and structural properties of landmarks have a significant role in imageability.

Table 1. Classification of landmarks

No of references	Hierarchy level	No of landmarks (n = 53)	List of landmarks
50–61	1 (Mostly referred)	2	Bus stand, Railway station
38–49	2	2	International Cricket Stadium, Municipal council
26–37	3	7	Siva Kovil, Prison complex, Police Station, Galle Municipal Council, International Cricket ground and Stadium
14–25	4	6	St. Mary's Cathedral, District Secretariat office, Galu Maha Bodhiya, Post Office, Darmapala Park, Navy Square, Samanala Ground
2–13	5 (Least referred)	36	Light House, Black Bridge, Filling Station, Viddyaloka Collage, Galle Harbor, Olcut Statue, Bo Tree, Mahamodara Hospital, Fruit Market, International Buddhist Center, All Saint's Church, Clock Tower, Fishery Harbor, St. Convent, Dutch Reformed Church, Keels, Co–op Hospital, Municipal Fish Market, Queen's Film Hall, BOC, Sampath Bank, Fort Clock Tower, Kachchiwatta Mosque, Siva Kovil, KFC, Southland Collage, Laksala, HNB, NDB, Dutch Hospital, Court Square, Pagoma food mall, Kiththange Jewellery, Ariyadasa Bookshop, Maritime Museum, Highway Bus Stand, Buddha Statue, AI Hussain Mosque, Pizza Hut

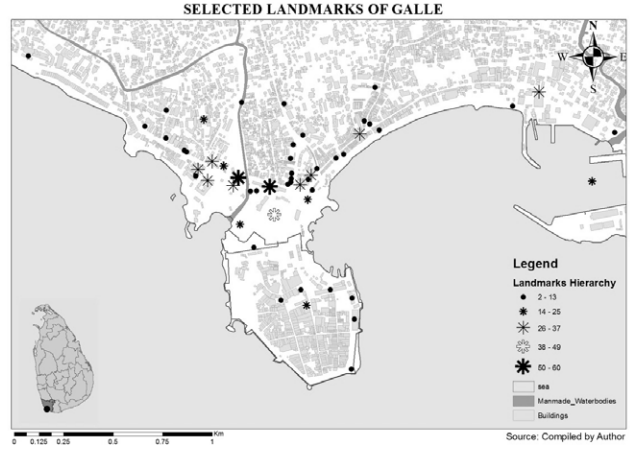

Figure 4. Landmark saliency level in Galle heritage city

3.2. Legibility and visibility

Out of the 53 landmarks, a sample of 10 was selected to conduct the visibility analysis. In selecting the landmarks for the visibility analysis, two landmarks from each category were selected. Accordingly, the Galle bus stand and the railway station were selected from the hierarchy 1 (H1). The international cricket ground and stadium and the Municipal council building were selected from hierarchy 2 (H2). Among the 6 landmarks in the hierarchy 3 (H3), Siva Kovil and the Prison complex were selected. Of the 7 landmarks in the hierarchy 4 (H4) St. Mary cathedral and the District Secretariat office were selected and from 36 landmarks of the hierarchy 5 (H5), lighthouse and black bridge were selected to conduct the visibility analysis.

The locations of the photo shoots (Viewpoints – V) were identified for the visibility analysis and are indicated in Figures 5 to Figure 9. The visibility degrees were determined by walking along the roads which give physical access to the landmarks. First, the researcher walked to the end of the road which provides the least visual access to the landmark along the accessible road i.e., an average 30 m distance (V1), and continued until the landmark disappeared (Vn). Then the distance was equally divided to mark viewpoints to conduct the photo shoot. Accordingly, V1 is always the least visual point and the first point to start the photoshoot.

Most of the landmarks can be physically accessed through many arteries, but visual accessibility is limited. For instance, the Galle bus stand can be physically accessed through six routes, but visually it can be accessed through only three routes (Figure 10).

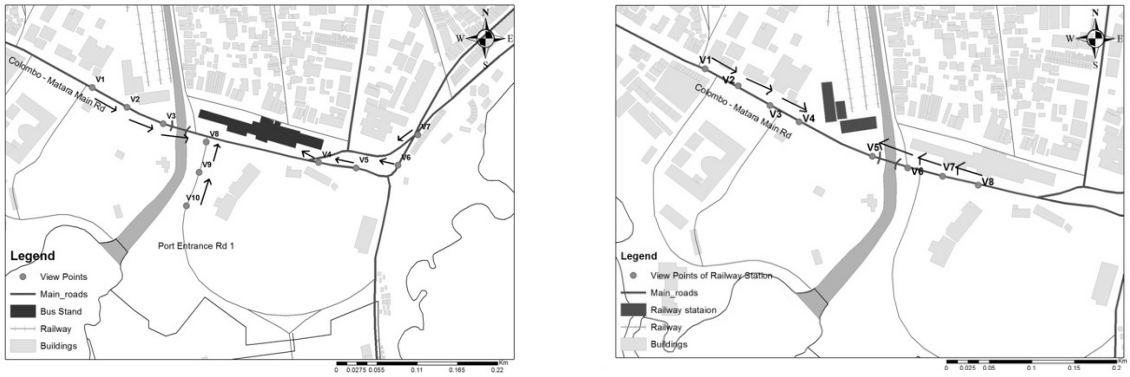

Figure 5. Viewpoints of the landmarks from H1 (Left: Galle bus stand; right: railway station)

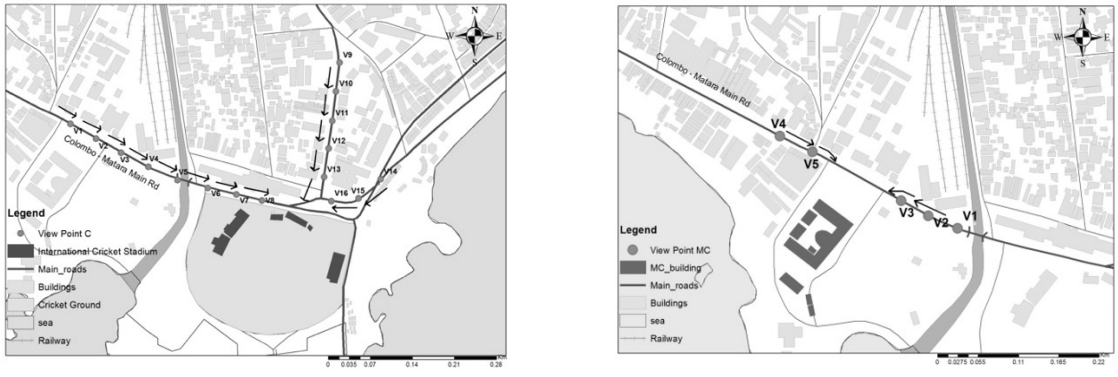

Figure 6. Viewpoints of the landmarks from H2 (Left: Cricket stadium; right: Municipal council building)

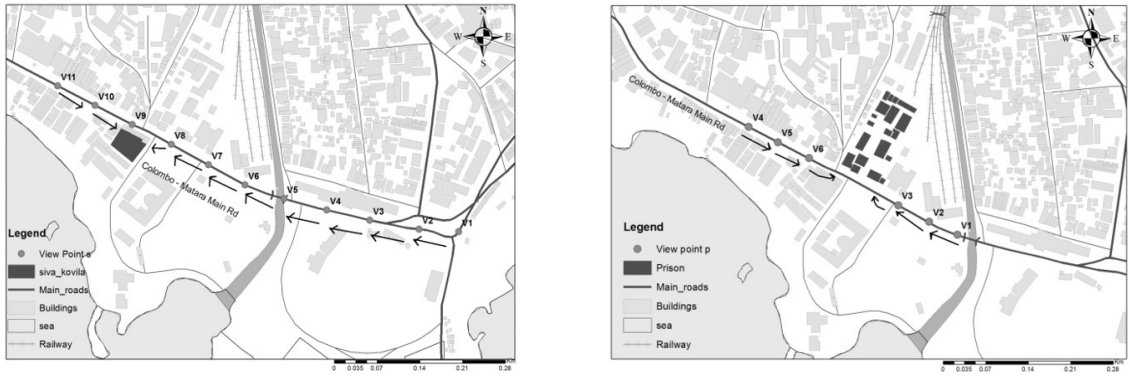

Figure 7. Viewpoints of the landmarks from H3 (Left: Siva kovil; right: Prison complex)

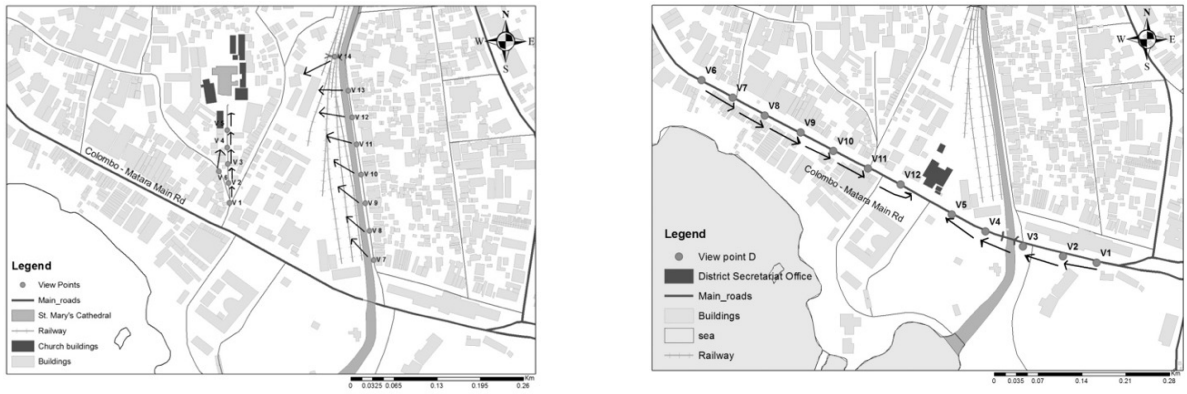

Figure 8. Viewpoints of the landmarks from H4 (Left: St. Mary cathedral; right: District Secretariat Office)

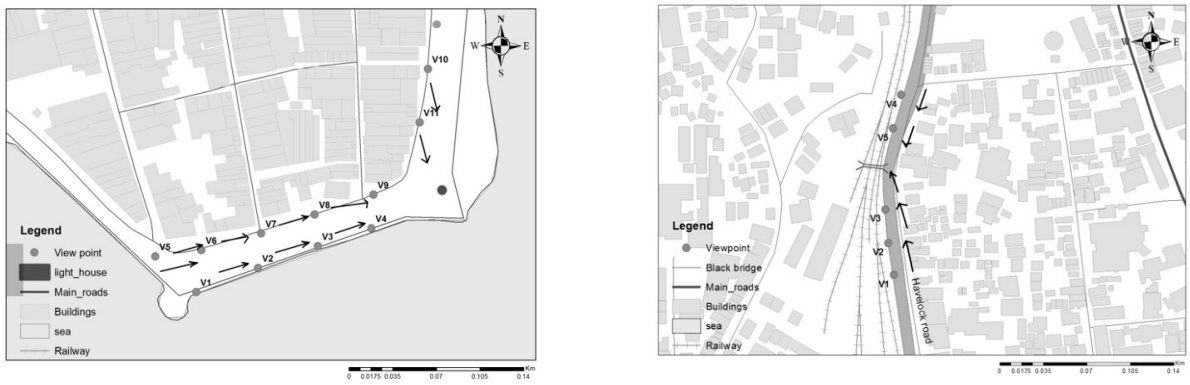

Figure 9. Viewpoints of the landmarks from H5 (Left: lighthouse; right: black bridge)

Figure 10. Exemplar demonstration of the view assessment analysis of the Galle railway station (H1)

3.3. Relationship between imageability and legibility

Table 2 depicts the strength of the visual access from each viewpoint. The analysis indicates the nature of the relationship between imageability and legibility. Accordingly, when the visual, structural and semantic properties of landmarks attract urban users, such landmarks are imageable and legible, thus, there is a positive relationship between the two concepts. When the landmarks are visually and semantically salient, but not that structurally salient, such landmarks highly imageable and less legible. When the landmarks are visually salient, some people perceive them as landmarks, but if not semantically and structurally salient, imageability is low as well as legibility. Apart from the visual, structural and semantic properties of landmarks, legibility is determined by the visual obstructions, which means the quality of the surrounding environment. These findings were illustrated in Figure 11 and the following detailed analysis.

Firstly, the central bus stand is in the highest saliency level (H1) and has the highest visibility level (Table 2). This central bus stand is recently constructed (after the 2004 Tsunami) and has modern architectural features, thus, it implies that cultural and historical semantic properties have a minimum significance, but the salient in terms of functional, visual and structural properties. On the other hand, Tsunami in 2004 was a greatly memorable incident for Galle city people and in a way combined with citizens' culture and identity. Thus, this bus stand symbolizes a collective memory of people and semantic saliency still exists. Accordingly, this research calls to perceive recent memories also have a role in deciding the landmark's saliency by reflecting the definition of Williams et al.' s (1996) definition of memory. At the same time, Hussain and Ujang (2014) also conclude that new landmarks are higher or equally identified by people with historic landmarks.

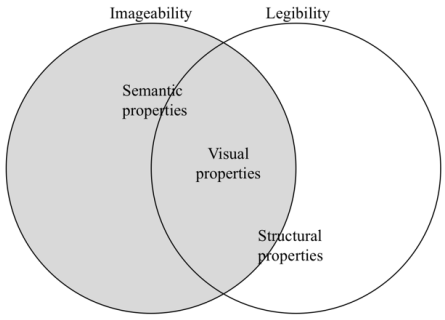

Figure 11. The relationship between imageability and legibility

Secondly, the Railway station belongs to the first level of the hierarchy which means highly imageable, maybe as it is a historical building (built in 1894 by the British) with British Architecture and people have a collective memory, therefore, it is semantically salient. Nevertheless, it lies under the moderate visibility level which indicates poor legibility. Thus, it contradicts the fact that Jiang (2013), Nurgandarum and Anjani (2020) present, that 'higher imageable landmarks are always legible'.

Further, some other landmarks such as the International Cricket Stadium, and the Galle municipal council building belonged to the second hierarchy level (H2), but the average visibility level was low. Although the Galle municipal council is located closer to the main road, it is structurally not that salient due to its locational characteristics. Thus, it indicates and aligns with Quesnot and Roche's (2015) understanding that due to semantic and visual properties some of the landmarks become imageable but not legible due to the poor structural saliency.

Thirdly, when considering the less imageable landmarks, Siva Kovil, Prison complex, St. Maru's Cathedral, Lighthouse in Galle Fort, and Dutch hospital in Galle Fort are less imageable though visually salient based on the architectural values. But, those are not semantically salient as Galle people perceive Galle fort as a landmark but not these individual elements of it. At the same time, these landmarks have poor visibility mainly due to obstructions (structural properties) therefore poor legibility. In this instance, there is a clear relationship between imageability and legibility that less salient landmarks are less visible.

When analyzed further, the international cricket stadium (H2), and the Galle bus stand (H1) are located facing each other with a comparatively high number of visual access points than others. The international cricket stadium

Table 2. Concurrence matrix

Landmark/Hierarchy level	Visual strenghth of the viewpoint																					
	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20	V21	V22
1. Central busstand (HI)	1	1	4	5	4	4	1	4	5	5	5	4	1	1	5	1	5	5	5	4	1	4
2. Railway station (H1)	1	1	4	4	5	1	1	4	4	4	4	1	1									
3. International cricket playground	1	1	1	2	2	3	5	5	1	1	1	4	5	2	5	5						
4. Galle municipal council (H2)	1	1	5	1	5																	
5. Siva kovil (H3)	1	1	1	1	1	1	2	4	5	5	2											
6. Prison complex (H3)	1	1	2	1	1	2																
7. St. Maru's Cathedral (H4)	3	3	3	4	5	1	1	1	1	1	1											
8. District secratariat office (H4)	1	1	4	4	1	1	1	1	1	4	4	5										
9. Light house-Galle fort (H5)	3	3	1	1	1	3	3	3	1	1	1	1	1									
10. Dutch hospital-Fort (H5)	1	1	4	1	3	4																

is popular since many international cricket series take place there. Still, according to the cognitive mapping, it lies at the H2. This emphasizes the complex nature of understanding the relationship between imageability and legibility.

Fourthly, Siva Kovil and the prison complex are landmarks on the H3 level. Although both the Siva Kovil and the prison complex are located next to the main road, the visual access is disturbed due to natural and man-made structures such as bends and buildings. However, Siva Kovil (Very high visible = 2) has more visual access points (11) compared to the Galle Municipal Council (5). This is especially due to the visual properties, namely, height and architecture.

Conclusions

The city is a complex system and city users are dynamic. This paper examined the relationship between the concepts of imageability and legibility by analyzing the imageability and legibility level of landmarks in the Galle heritage city using a qualitative approach. Consequently, this paper concludes with three main findings.

First, the imageability and legibility of landmarks are related as both concepts deal with the semantic, visual and structural properties of landmarks. However, imageability mostly depends on semantic properties than legibility, legibility predominantly depends on structural properties and importantly, visual properties are more or less equally important to both. Though the landmarks are poorly legible, people have their sense, memory and image of the landmarks, which is because of their semantic properties. Lynch (1960) also points out that people imagine the elements of the city through their memories, meanings and long-term relationships. The study findings align with the study of Henderson et al. (2009) which proves that "meaning" plays a significant role in guiding people's visual attention.

Second, it is advisable not to replace visual assessment which is used to examine the level of legibility with a cognitive study which is used to examine the level of imageability as well as may not consider imageability and legibility as similar aspects when conducting practical and theoretical exercises related to urban planning and design. Hamburger (2020) also mentions that other than vision, the other four senses also can be important to improve legibility or for landmarks-based way-finding. Meanwhile, this research is contrary to some extent to existing theoretical knowledge that presumes "cities with imageable artifacts tend to be imageable or legible, and legible cities contain vivid imageable artifacts or elements that make up the image of the city" (Jiang, 2013). The availability of technologies, namely, the Google Maps application, is also helpful to have legible cities in this contemporary era. The analysis confirms that semantic, visual and structural properties determine the imageability and legibility of landmarks to a varying degree, therefore, in some instances highly imageable landmarks are not legible and vice versa. Semantic and visual properties play a significant role in imageability and structural and visual properties in legibility (Figure 11).

Third, the cities with historic significance evoke unique meanings to the users, therefore, studies related to this nature should be conducted by using a more qualitative methodology. According to Jacobs (2011), imageability depends on peoples' biological, cultural, and individual factors, but this research does not discuss how these factors impact the imageability level but can be done in future research.

This research presents several limitations, namely, less focus on façade characteristics, the assumption of all respondents are in the same knowledge of the urban environment and some limitations inherent to the qualitative approach. In terms of less focus on façade characteristics, the photographic survey was conducted in a sequential view process along the streetscape towards the landmarks and identified some obstructions to the visibility, but did not pay attention to the quality and characteristics of the rest of the built environment. Some variables related to the characteristics of the respondents (cultural background, education, employment, length of stay, etc.) were not analyzed. Moreover, this research was based on a qualitative approach that involved the collection of cognitive maps which may be not completely accurate due to fallible memory and subjectivities.

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