

ORIGINAL RESEARCH PAPER

Wayfinding characteristics and familiarity indexes in an urban environment

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ABSTRACT: Many people are encountered with finding the best way to reach to their destination. One definition for wayfinding is “the act of travelling to the destination by continuous processes of making route-choices whilst evaluating previous spatial decisions against stable cognition of the environment. General understanding and keen appraisal of the environment can aid decision-making process of how to navigate around an area in the form of mental schemas. However, having a level of familiarity and attachment to a place is the underlying factor. The study is aimed at evaluating what is the level of familiarity of people and what is their attachment to notable landmarks in the town of Muar, Malaysia. To do so, the traditional survey analysis with the focus on data set that is attributed to a specific phenomenon and the quantifiable variable using statistical analysis on the tabularized format is undertaken.

KEYWORDS: *Familiarity; Landmark; Orientation; Urban Environment; Wayfinding*

INTRODUCTION

Most of the ordinary person’s wayfinding task in daily life is to find the destination from familiar places to unfamiliar destination within their region. However, the studies of wayfinding have focused on the explorer type such as a traveler’s navigation to unfamiliar environments (Denis, 1997; Raubal, 2001; Timpf and Frank, 1997). Many scholars revealed the factors such as the level of familiarity with environment or landmark, visual access, plan configuration, and individual differences as factors influencing human wayfinding when they use landmarks in their urban environments (Lynch, 1960; Sorrows and Hirtle, 1999; Winter *et al.*, 2005).

Types of landmarks

In terms of undertaking landmarks in urban areas, understanding what kind of urban elements consider as landmark is very important. In this regard, Lynch

(1960) revealed five primary urban elements such as paths, edges, districts, nodes, and landmarks undertaking his seminal work on urban planning and cognitive maps. In addition, he argued that particular functions could be served by each type of mentioned elements while each of which could be undertaken multifunctional task (refer to Table 1), (Lynch, 1960). As people undertake those mentioned elements (landmarks) for navigating, it can be concluded that the Lynch’s elements will support navigating in urban areas. Thus, urban designers and planner need to notify all five types of mentioned elements while each element supports navigating in its own way.

The characteristics of landmarks

Due to improve human navigation, including the elements in urban areas that consider as landmarks is vital. Moreover, designing those elements in the way that users consider them as landmarks is very important.

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Table1: Landmark/Element Types and Functions (Lynch, 1960)

Types	Examples	Functions
Paths	Street, canal, transit line	Channel for navigator movement
Edges	Fence, river	Indicate district limits
Districts	Neighborhood	Reference point
Nodes	Town square, public bldg.	Focal point for travel
Landmarks	Statue	Reference point into which one does not enter

Additionally, focusing on the physical features of landmarks and landmarks' distinctiveness are two options for constructing landmarks in urban areas. Those two options are more clarified as follow.

The feature of landmarks

Creating and designing landmarks should be in the way that make them noticeable regarding helping urban users to memorize their position in urban environments. So they can be beneficial as reference point and survey knowledge. As an example, determining a user's position in an urban environment could be possible by relying on the position of existing landmarks. Thus, the special feature in urban landmarks could be supporting factor for people navigation. In this regard, Evans et al. (1982) empirically considered the relationship among feature of buildings and recall in the work of Appleyard and Kaplan (Evans et al., 1982).

According to this research, memorable feature of buildings and the features that ease recalling the location of them are highlighted which could improve the distinctiveness of the buildings. They revealed that the socio-cultural importance, function and the surrounding traffic patterns of the buildings are the significant factors to make them more memorable for urban users. The next step is to define the wayfinding as the main issue in navigation. The roles of landmarks are to facilitate the wayfinding direction and path memory (Cornell and Heth, 2000; Lovelace et al., 1999).

The following sections will focuses on wayfinding definition and its effect on place and user's navigation.

Wayfinding

▪ *Definition*

Golledge (1999) highlighted the wayfinding as a cognitive psychological procedure for people to move from an origin to their final destination. In this research also he mentioned the complexity of wayfinding procedure while users' purpose of traveling and respond to external environmental condition is deferent (Golledge, 1999). Meanwhile, Allen (1999) clarifies the wayfinding as a purposeful, directed, and motivated mean of travelling from a start point to the final destination which consists of choosing and following a range of pathways from an existing routs (Allen, 1999; Golledge, 1999). The wayfinding process is the process of transforming the virtual cognitive map into reality or action (Kitchin and Freundschuh, 2004). With reference to the definition of wayfinding, landmark and types of landmarks, wayfinding can be defined as a navigational process which is chosen by users to go from one point to another by using the urban elements; which concern as a landmark in their cognitive map. These landmarks may consist of buildings, open spaces, natural places like mountains or rivers or even the sounds or the smell in the places. All the landmarks ease the way finding process for people to reach them to their destination (Song and Norman, 1993).

▪ *Review of wayfinding and related factors*

Recently, the rapid advance of technology increases the usability of Location Based Services (LBS) and

the research of wayfinding or navigation is an essential part in the design process to build a cognitive navigation system. Wayfinding or navigation is the very basic human activity in our daily life. In general, the case of navigation can be categorized as two kinds. The first is to explore the new region and the second is to navigate the familiar region (Allen, 1999). In case of latter, the city image has a critical role in place recognition for regional community. Except the case of a person travelling to inexperienced regions, most of the ordinary person's wayfinding task in daily life is to find the destination from familiar places to unfamiliar destination within their region. However, the studies of wayfinding have focused on the explorer type such as a traveler's navigation to unfamiliar environments (Denis, 1997; Timpf and Frank, 1997). Humans keep track of their orientation and location by a normally easy and reliable sensory integration process, even when visual cues are momentarily absent. Nonetheless, people occasionally need to reorient themselves when they view a familiar environment from an unfamiliar direction. In such situation, the ability to imagine the spatial structure of an environment from a different direction is presumably important (Cornell and Heth, 2000).

According to the relationship among urban elements, people undertake different behavioral roles in wayfinding procedure. The topological relationship such as separations, proximities, enclosures and orders as well as topological knowledges are the examples of mentioned point. According to Raubal (2001), the inherit knowledge and habits of the tourists have an important role in their wayfinding procedure. He continued by the example relying on the wayfinding procedure when urban users drive home every day by following the same sequences of routes, turning at the same intersections and relying on the same landmarks due to reach their destinations. In this regard, Allen (1999) highlighted that the level of familiarity of users in urban environments is one of the main factor for diverse respond of their wayfinding. In addition, the landmarks may or may not chose by people, which depends on the environment that is being navigated. Furthermore, Ruddle *et al.* (1998) highlighted that different landmarks in the same environment could be chosen by different urban users (Ruddle *et al.*, 1998). The wayfinding task consists of two components such as decision-making and movement. The route of motion (points and lines), the velocity of motion (direction

and speed), time parameters related to movement (arrival or departure time, duration of stay), and the mode of movement or motion (for example by walking or via mechanized transport such as car or bus) are the important attributes of movement in wayfinding. The distance between the origin and final destination depends on the mode of movement in wayfinding task and this movement is controlling by users' decisions, which are invisible, random to a certain extent, non-periodic, and hence difficult to predict (Couclelis *et al.*, 1987).

Studies on wayfinding in the tourism context focus on travel route identification, tourist route preference, individual difference of wayfinding, landmark utilities and wayfinding decision-making. Recently many new techniques used to identify travel routes such as global positioning system (GPS) receivers. (Tezuka and Tanaka, 2005), timing systems (Winter *et al.*, 2005), camera based systems (Montello, 1998), personal digital assistant (PDA) tracking (Winter *et al.*, 2005), and mobile phone tracking (Otte and Rousseau, 2002). Individual differences such as gender, age, education, occupational or cultural differences directly or indirectly influence wayfinding. There has been much discussion about the influence of gender difference on wayfinding. Sorrows and Hirtle (1999) investigated sex roles in wayfinding strategies and environmental knowledge acquisition, and found that unlike men, women prefer the use of landmarks rather than being given route directions. Gender differences in wayfinding strategies studied further by Lawton and Kallai (2002), who stated that man, are more likely to be accurate in landmark location and use cardinal direction, whilst women are more reliant on their memory to identify landmarks. Lawton and Kallai (2002), discussed the individual differences in spatial cognition in a virtual environment. Wayfinding routes were classified by Winter *et al.* (2005) based on gender, age, and education differences.

The other factors in which affect wayfinding task in urban environment need to be considered. As an instant, visual access to the landmarks, level of familiarity of users to urban environment, the configuration of plan and users' differences in wayfinding all affect wayfinding (Lynch, 1960; Sorrows and Hirtle, 1999; Winter *et al.*, 2005). In tourism field of research, landmarks are the noticeable tools for navigating. In this regard, the tourism wayfinding signs categorized into 11 factors such as "region welcome

signs”, “region trailblazer”, “gateway markers”, and “resource direction signs” and applied these to the Pocono Mountains way finding signing program. Cognitive maps were originally used by [Garling et al. \(1984\)](#) who regards them as representations formed within the mind and have the same function as hardcopy cartographic maps. In this regard, internal representation of the physical environment is the definition of cognitive map highlighted by [Golledge \(1999\)](#). [Kitchin and Freundschuh \(2000\)](#) argued that this representation denotes “spatial knowledge” of the environment regardless of form. In this research the cognitive map is considered as virtual map relating to special knowledge and ability.

[Darken and Peterson \(2004\)](#) mentioned the development and use of cognitive map as an essential part of wayfinding. According to [Ruddle et al. \(1998\)](#) during the wayfinding process people comprehend and remember routes by “chunking” routes into a set of discrete path segments, decision points (turns), and landmarks that are located at decision points or along that route. However the decision-maker may not be completely conscious of using specific wayfinding strategies or criteria ([Golledge, 1999](#)). During their wayfinding decision-making processes, people may use landmarks to remember and recognize paths they used or plan to use. As result, the roles of landmarks are to facilitate the wayfinding direction and path memory ([Cornell and Heth, 2000](#)). [Cornell and Heth \(2000\)](#) has shown that people can reach their destination even without a comprehensive knowledge of the environment. Similarly, as assumed by [Golledge \(1999\)](#), acquisition of cognitive maps is a necessary condition of adaptive spatial behavior, but people are still adaptive in environments in which they have incomplete spatial representations. People use schemas of typical building layouts to find their way in new settings. As suggested by [Whitaker and Cuiqlock-Knopp \(1992\)](#), general knowledge of buildings, in the form of schemas, helps people to orient themselves in unfamiliar settings. In the case of regional navigation, the kinds of landmarks are differently conceptualized, comparing with the explorer type of navigation. The navigation of a regional community is highly dependent on the image of city, which is the critical reference frame for regional navigation.

A landmark means a place, building or location that has a salient feature, which is composed of visual, historical, or cultural factors ([Nothegger et al., 2004](#))

and the visual characteristic is the most important factor when we are traveling or exploring in inexperienced region. However, the meaning of landmarks is conceptualized differently when we navigate our urban region. Additionally, their navigation behavior or the social communication is the critical factor that affects the characteristics of landmarks. In case of regional navigation, many parts of wayfinding tasks highly depend on the familiar landmarks and they have an important role to orient the target place and generate the directions for regional community ([Golledge, 1999](#)).

Though sociologists have developed over 90 definitions of community, the only commonality among all of them is that communities consist of people and community implies social interaction among a group of people ([Lyon, 1987](#)). In other words, community is about a geographically defined territory, similar to a neighborhood, or represents an extended-space community, for example, a church, a job, a professional group, or a club. Though people’s living place is scattered over the urban environment, they belong to a certain community according to their social activities. Thus, regional landmarks of a community are the selected ones from large geographic scale areas, according to their social interaction.

▪ *Sense of familiarity*

Familiarity means close acquaintance with or knowledge of something or the quality of being well known from long or close association. Regarding to the definition of familiarity, familiarity plays a critical role in wayfinding. In that case, familiarity means the way or implement which users being well known from their surrounding area like sign board in roads or elements which refer user’s mind to the especial story or landmarks and etc. There are many studies about the familiarity to the place such as familiarity and its effects on route choice behavior by [Denis \(1997\)](#).

Accordingly, sense of familiarity can be defined as knowledge about surrounding area which is categorized to network and information system. As mentioned, these elements recognized by the implements in the places and their interrelation. One of these main elements which can make place more familiar for users is urban landmark. According to the researches above it can be conclude that sense of familiarity can improve the amount of orientation in the place.

The Role of Landmarks in LBS Age

Mathematical and scientific methodology in geography has essentially contributed to urban planning and management, and successfully combined a systematic approach with Geographic Information Systems (GIS) (Tversky *et al.*, 1994). However, when we reviewed the history of the modern geography, there was a challenge in the paradigm of positivism in geography and another alternative emerged. It was behavioral geography that focused on the subject related to decision-making in spatial context (Cox and Golledge, 1981). The aim of behavioral geography has been to derive alternative theories and human behaviors are observed in the context of satisfying rather than optimizing.

As behavioral approach started from the critique of positivism in geography, so the cognitive navigation systems, which reflected user's own interests or preferences, began with questioning the mechanical answers that has been produced from current GIS. Based on user's level of experience and knowledge, different answers might be asked. Some may want the fastest route, while others may want less turns and path; still others may want a more familiar one (Hong, 2006). At present, LBS is the technology that attracts the attention from GIS domain, as GIS has an essential role in producing wayfinding or navigation services for LBS users.

The concept of landmark has been increasingly used to account for the services, as a route direction can be enriched with cognitive, reasonable, and salient geographical features, which is called as landmarks (Deakin, 1996; Sorrows and Hirtle, 1999; Michon and Denis, 2001; Raubal and Winter, 2002; Tom and Denis, 2003). With the help of familiar landmarks, users might have more comfortable navigation. In general, the most of users of LBS are not the GIS professionals who are trained in the area of GIS or geography. Instead, they are the non-expert who does not have any chance to learn about map related courses or do not good at map reading (Egenhofer and Mark, 1995). Thus, they may want various alternative solutions, depending on his or her experience or understanding of regional geography (Galea and Kimura, 1993; Heth *et al.*, 1997).

The Characteristics of Landmarks for Regional Community

To urban residents, the urban navigation is highly dependent on the image of city. Lynch (1960) provided

the fundamental guide for this. His research conducted the various methods such as the sketch maps of city, the verbal descriptions of parts of the city and the survey responses. One of Lynch's findings was that the urban residents share an abstracted image of city and the position of a clear image makes the easy and quick movement possible. As opposed to Lynch's qualitative study, Gould and White (1974) developed a quantitative method to visualize the mental image among places. They believed that the image of place had an important role to understand the human behavior to spatial structure, pattern and process. They applied analytical methodology to human subjects to visualize human preferences to place. If we apply their method to local area, the preference of rank-ordered data might be rephrased as a popularity or familiarity of the spatial feature in that local region. Though many GIS' scientists suggested the computational method to extract landmarks with automated procedures (Raubal and Winter, 2002; Nothegger *et al.*, 2004; Tezuka and Tanaka, 2005), the traditional behavioral geographers had a different viewpoint to the meaningful landmarks for regional community.

Downs and Stea (1977) indicated that the urban movement was the process to solve spatial problems. They thought that the cognitive maps of a city were developed in the middle of the spatial experiences such as seeking to solve their spatial problems. Golledge (1999) argued that cognitive maps are the basis of wayfinding and defined it as the internal representation of perceived environmental features or objects. Couclelis *et al.* (1987) discussed that landmarks usually act as anchor points for organizing other spatial information into a layout. Anchor points are used as a centroid for spatially partitioning regions. Because of its dominance, it acts as an organizing feature that represents the nearby features and as a reference; it is the centered location of the clustered places. In summary, landmarks are noticed and remembered, because of dominance of visible form. However, the socio-cultural significance is another important factor for regional community. When we are in trip, a short description that includes a critical landmark is more effective than a precise route direction. To the community members who share a social network, they have similar anchors of landmarks because of their similar social and cultural living style and these are frequently used as a reference point to indicate the nearby geographical features as a reference.

MATERIALS AND METHODS

As the main analytical tool, the traditional survey analysis focuses on the data set that is attributed to a specific phenomenon and the quantifiable variable is applied, using statistical analysis on the tabularized format. However, it has the limitation that the relationship or solidarity of collective data cannot be identified.

Case study: Muar town, Malaysia

▪ History and background

The origins of the name of Muar according to records of the past Named after Sungai. Muar Derived from the Malay word Sunda 'Estuary' which means river estuary is open or meneluk area. Derived from the Hindu word 'Muaru' which means the three bars of streams. Derived from the word Sikh 'Murthuaa' meaning wind. Derived from the Malay word 'Sick' which means tired because the coast is flat and has

been dreary hills that crosses navigators named a large state in southern India in ancient times called 'Munu' (Three) 'ar' (river) or "Munar 'which means' Three Rivers State' by the gold seekers from India . Derived from the Hindi word 'Mucar' or 'Mocar' which means wind or meander.

▪ Muar Geography

Muar district formerly covers 2346.12 km², with a population of 328,695 (2000). The town of Muar is located at 2°32'N 102°34'E / 2.05°N 102.567°E / 2.05; 102.567, at the mouth of the Muar River (Fig. 1). The town is about 150 km (93 miles) southeast of Malaysia's capital Kuala Lumpur, and about the same distance (179 km) northwest of Singapore. It is 45 km south of Malacca Town. It is also 50 km north of Batu Pahat. The whole Muar district (North and South) is roughly the size of two and a half Singapore.

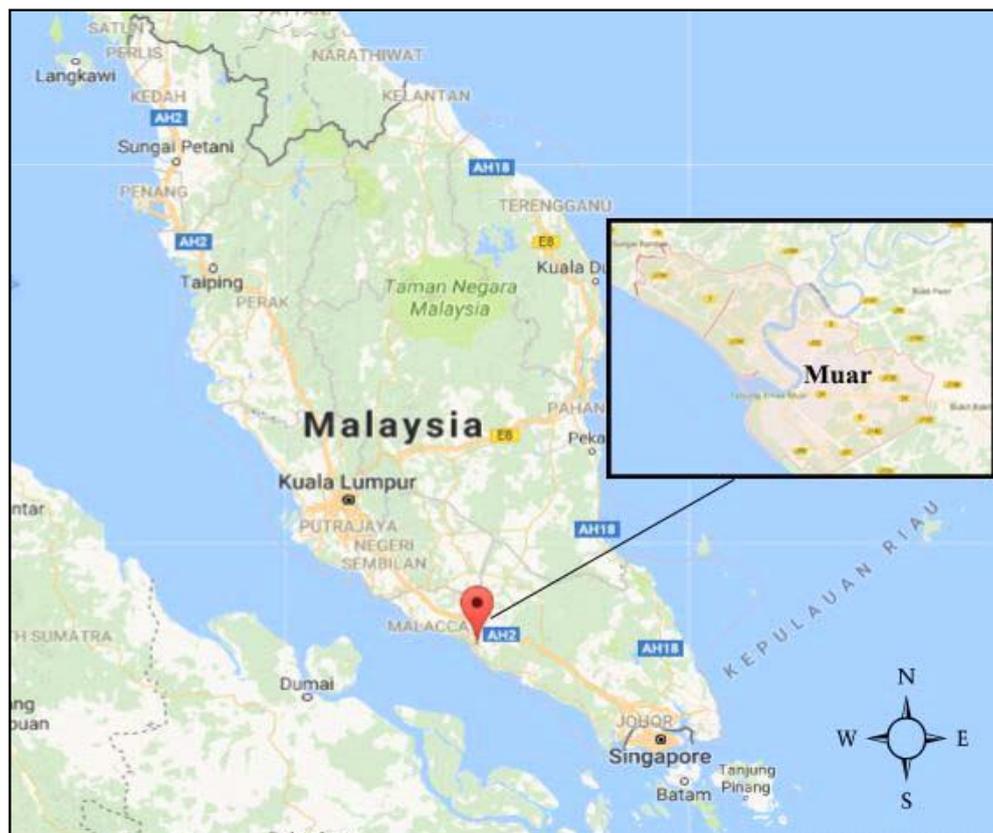


Fig. 1: Muar town

Muar culture

Muak: Means “bored” or “tired” in paddling the boat travelling along the river which is large and curvy by the peoples in the early days. The peoples started calling the river and place Muar deriving from the word Muak after a long time since then. Muar: Muar name is said to be the summary for this old Malay word Muara meaning “the wide open estuary”. In terms of providing more visual understanding about Muar Town [Figs. 1 to 3](#) is highlighted as distinctiveness characteristic of the town.

▪ *Ghazal music*

Muar is famous for its ‘Ghazal’ music, which originated from Persia, and ‘Kuda Kepan’, a traditional dance where dancers sit astride mock horses according to the beat and rhythm of a percussion ensemble.

▪ *Landscape*

Muar: Tucked away on the western coast of the State of Johor, Malaysia lies a small town called Muar

Comprising little more than a few dusty streets with crumbling colonial shop houses, Muar may one day be a Mecca for local bird enthusiasts. For if you follow the one-kilometer road that leads down to the fishing village, and walk to the end of the wooden jetty, there is a high chance that you will be able to see one of the rarest storks in the world, the Lesser Adjutant *Leptoptilos javanicus*.

▪ *Birdlife*

The main attraction of Muar, especially during the October-March migration season, is the birdlife. Though there is a regular traffic of fishing boats winding its way through the muddy channels, and though there are local people going about their business near the jetty the bird fauna seems unperturbed. The most noticeable of the birds are the Lesser Adjutants, by sheer virtue of their size. Standing at 120 cm tall, with a white body and dark grey wings this species is unmistakable. Comically, its head is virtually bald, apart from a sparse covering of fine hair-like feathers.



Fig. 2: Birdlife in Muar Town River and the profile of the town of Muar (Bandar Maharani)

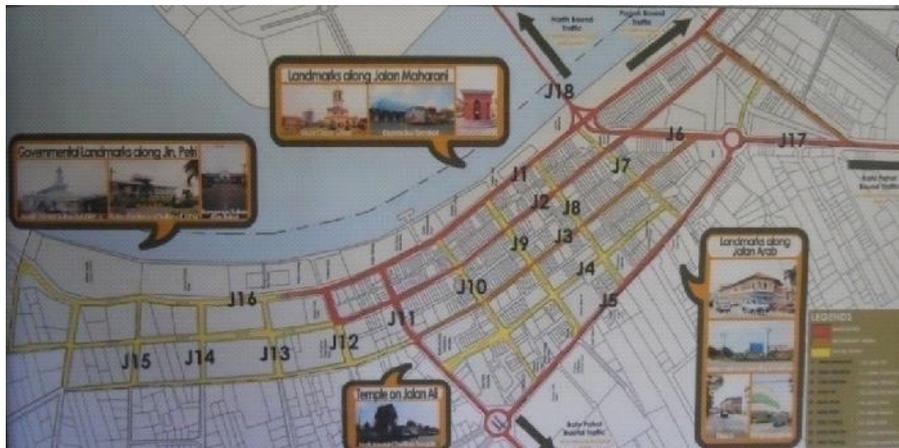


Fig. 3: Overall map indicating the roads, place-markers, and ingress/egress of the Muar town

RESULTS AND DISCUSSION

As the object of the spatial familiarity study, Muar town was selected. Subjects consisted of 40 respondents. A survey instrument was created to ascertain which elements in Muar town are regarded as best known to MUAR community. To explain how MUAR residents conceptualize the Muar Town, the survey examines the mental images of geographic places. In addition, the quantifiable works of researches and the qualitative interviews were adopted to explore the symbolic value of study area. Data collection occurred with the fill-out survey forms.

The survey questions were sub-divided into two parts that were composed of the socio-demographic information and the spatial familiarity of locations. The socio-demographic background was composed of the variable that might affect the spatial familiarity, such as sex, age, and work statues. Systematic field observation was carried out to gather evidence on the form and pattern of activities of the orientation. The respondents are varied in their social, cultural and functional characteristics. Hence, they are clustered according to their roles;

▪ Gender

Based on cross tabulation, the following graph (Fig. 4) is produced. As it literature, the respondents were mostly women rather than men.

▪ Age

Based on cross tabulation, the following graph

(Fig. 5) illustrate the respondents' distribution according to different age categories which can entire the results.

▪ Work status

Based on cross tabulation, the following graph (Fig. 6) is illustrated. As it shows, the least number of respondents were either secretary or writer.

▪ Preparing Data For Further Analysis

Gathered data are needed to be categorized due to the aim of the research. Therefore, the researcher assigned following methods to the study.

▪ Data categorization and discussion

Based on the aim of the study, which is to identify the contribution of notable places in Muar town in

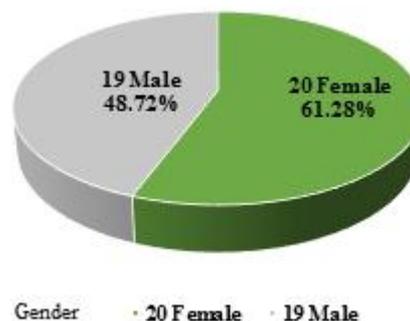


Fig. 4: Male and female categorizes

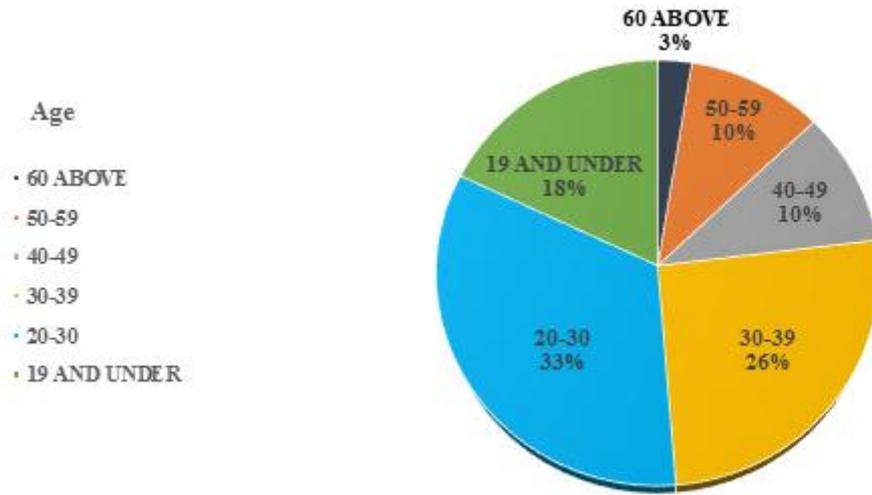


Fig. 5: Different age categorizes

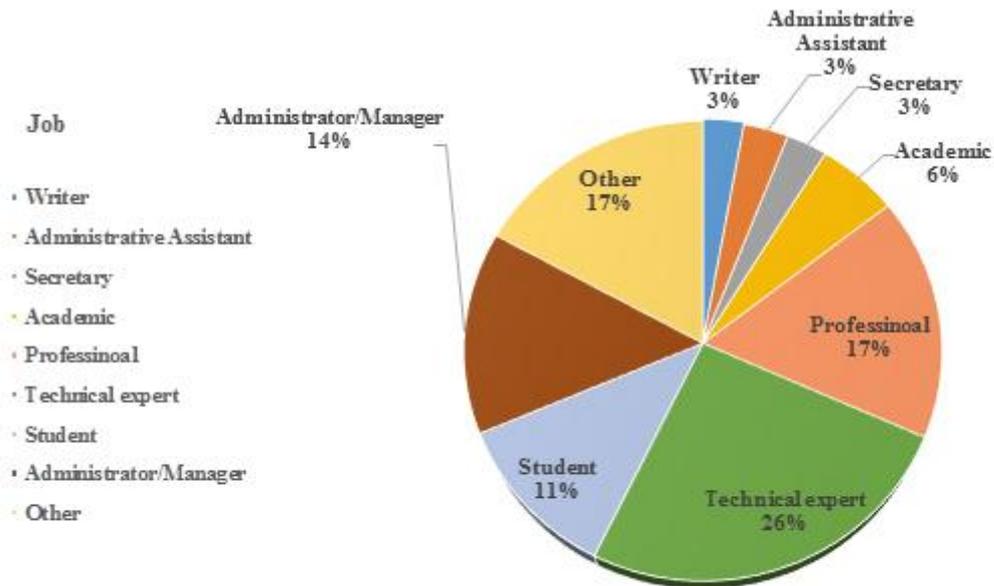


Fig. 6: Work status category

Table 1 shows, response to some the fundamental questions about wayfinding. Results show that most of the people in Muar town (43.59%, 42.11% and 41.03%) acknowledged that the orientation in the city is very important for them and also most of them mentioned that wayfinding in Muar town is easy for them. According to all information in this section it can be concluded that the people' knowledge about wayfinding is good. On the other hand, although Jalan Sulaiman is not as crowded as Jalan Maharani (according to people' feeling or their cognitive map) it is working as a good landmark for the town. Other sections focused on the elements of the street which work as landmarks.

The aim was to find the reason for choosing Jalan Sulaiman and its components, which made this place more memorable in people's mind. Other questions were prepared for this purpose in the next sections.

According to Evans et al. (1982), using particular features in designing landmarks such as distinctive facades can support navigation. They also highlighted that the function of buildings such as unique buildings, their socio-culture significance and their surrounding patterns such as unique smells or unique sounds also affect their familiarity, it was tried to add some follower questions to section 2 to earn more information about

notable places and to find the landmarks there. On the other hand according to the main purpose of the research which is evaluating the wayfinding' condition in Muar town, people were asked to mention the parts of the streets of Muar town which are more familiar for them. The results shown in Table 2 explain why Jalan Sulaiman has been chosen by people as a good landmark.

Table 2 indicates that people do not have the specific idea about the mentioned components in Jalan Arab, Jalan Meriam, Jalan Sisi, Jalan Maharani, Jalan Petri and Jalan Bakri. According to the accessibility map of Muar town, which indicates Jalan Maharani as the main street connecting the town to other cities and the active population in this street, people, were expected to choose this street as a landmark. Thus, the first result is although Jalan Maharani has the potential to be as a landmark it does not work well. The other result which has taken from Table 2 is that; according to section one - result shown Jalan Sulaiman is the popular street for people- it is obvious that the elements which help to improve the orientation in Jalan Sulaiman and make it more memorable for people, is the Facades of the buildings in this street. Although people did not mention Jalan Bentayan, Jalan Othman, Jalan Sayang and Jalan Abdullah as a landmark, they mentioned

Table 1: Degree of orientation in Muar town

Orientation items	Strongly disagree	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	I have a special feeling about Jalan Arab	2.56	15.38	56.41	20.51	5.13
2	I have a special feeling about Jalan Mariam		10.26	51.28	33.33	5.13
3	I have a special feeling about Jalan Abdullah	5.13	12.82	53.85	20.51	7.69
4	I have a special feeling about Jalan Sayang	2.56	10.26	51.28	30.77	5.13
5	I have a special feeling about Jalan Sisi	2.56	12.82	58.97	10.26	15.38
6	I have a special feeling about Jalan Othman	2.56	7.69	58.97	25.64	5.13
7	I have a special feeling about Jalan Maharani	-	15.38	53.85	25.64	5.134
8	I have a special feeling about Jalan Petri	-	21.05	47.37	26.32	5.36
9	I have a special feeling about Jalan Sulaiman	-	5.13	41.03	43.59	10.26
10	I have a special feeling about Jalan Bakri	7.69	7.69	46.15	25.64	10.26
11	I have a special feeling about Jalan Bentayan	2.56	12.82	41.03	28.21	15.38
12	The orientation in the town is very important for me	2.56	7.69	28.21	43.59	17.95
13	If you know where you are, you feel comfortable and when you feel you lost you feel uncomfortable	7.89	5.26	21.05	42.11	23.68
14	The way finding in Muar is easy for you	7.69	5.13	17.95	41.03	25.64

some components such as facades and unique smells that indicated these streets have the potential to work as landmarks. The probable reason that people did not mention these streets is that they do not work very well and they need to be improved. Therefore, there is just one street working as a landmark in Muar town and the other streets such as Jalan Bentayan, Jalan Othman, Jalan Sayang and Jalan Abdullah have the quality to work as landmarks.

All the landmarks ease the wayfinding process for people to reach them to their destination. Allen (1999) mentioned that people respond in various ways depending upon whether they are wayfinding. In

addition, general knowledge of buildings, in the form of schemas, helps people to orient themselves in unfamiliar settings, some other elements which are assumed to work as a landmark are investigated. For this purpose, people’s ideas about some places or elements, which define as landmarks were asked. So there is a need to categorize some popular elements such as riverfront of Muar town or clock tower and so on, to know whether these places can act as landmarks or no? Thus, other section in the questionnaire for people to choose eight elements between mentioned places from most to least were prepared. Results are shown in Table 3.

Table 2: Degree of orientation between streets’ components in Muar town

		Mean value (%)				
	Components	Facades	Unique smell	Unique sound	Unique buildings	Other
1	Jalan Arab	21.88	28.12	21.88	25.00	3.12
2	Jalan Mariam	30.00	16.67	23.33	20.00	10
3	Jalan Abdullah	40.00	20.00	16.67	16.67	6.67
4	Jalan Sayang	23.33	40.00	13.33	23.33	-
5	Jalan Sisi	22.58	28.81	19.35	19.35	12.90
6	Jalan Othman	40.00	23.33	13.33	10	13.33
7	Jalan Maharani	36.36	15.15	9.09	33.33	6.06
8	Jalan Petri	41.18	20.59	-	29.41	8.82
9	Jalan Sulaiman	35.48	6.45	22.58	22.58	12.9
10	Jalan Bakri	39.29	32.14	10.71	10.71	7.14
11	Jalan Bentayan	23.33	50.00	10.00	10.00	6.67

Table 3: Degree of orientation between notable places in Muar town

	First choice	Second choice	Third choice	Forth choice	Fifth choice	Sixth choice	Seventh choice	Eighth choice
River front	58.91%							
Clock tower		41.03%						
Sultan Ismail Bridge			15.38%					
Market at Bentayan				30.35%				
Wetex mall					30.77%			
Bus station terminal						28.42%		
Market at Jalan Arab							20.5%	
Bentayan food count								12.98%

The results from [Table 3](#) indicate that the river front play a critical role in wayfinding in this place and also according to the observation in the city the clock tower can act as a strong landmark for the entrance of the heritage part of city. According to people' ideas about the clock tower, it seems that the functional role of this element is suitable and it can be a good reason for improving the quality of navigation in the city. The other result from [Table 3](#) proves that Jalan Sulaiman which acts as a landmark as shown in previous section helps Muar town to be more memorable for people. And also the last results of [Table 3](#) indicate that it is important for concerning Jalan Abdullah and Jalan Bentayan as a good potential to improve and work as a landmark.

After analyzing the chosen places as a landmark. Meanwhile, different people may also use different landmarks in the same environment, there is a need to find out other elements which may be forgotten to be analyzed. For this aim, the last section of the questionnaire was prepared. Respondents were asked to write down the five best places as the most representative of the Muar Town. To measure and quantify the geographical familiarity of the Muar Town, the 40 locations that were previously selected by the pilot study. The pilot study was conducted with a group of individuals who have long-term knowledge of Muar Town. Place names were tersely worded, giving either the title of a landmark such as Wetex Mall or a brief description of place.

To measure the familiarity, the question with the scaled degree was generally used to choose the ranked places from the most to the list, which was given at survey questionnaire. For the convenience of statistics, the previous studies usually gave 0-5 as a measure of familiarity. Instead, this study used five familiar indexes, following Gale's four dimensions of familiarity ([Golledge, 1999](#)). He categorized four dimensions of spatial familiarity into four kinds; spatial, visual, naming and interaction. The first is the sense of spatial knowledge or knowing where a place is. The second is the ability to recognize a place when shown an image of it. The third is a process of labeling. The fourth is the interaction of frequency and overall, interaction proved to be distinctive. These five indexes were used to measure the spatial familiarity of the places. For the statistical analysis, 1-5 scale was applied and the survey results were converted to matrices. As a weighted matrix, each place had 1-5 degree by

subjects. Subjects were instructed to give these a score according to the familiar index. With the weighted matrix, the familiarity is scaled from 1 (low level) to 5 (high level) and the average of spatial familiarity of each place was calculated. The average value of each place was used for descriptive statistics of each group. The descriptive statistics and t-test were applied as the analysis methods.

CONCLUSION

The first analysis dealt with participant's performance on the spatial familiarity of places and spatial acknowledgement of Muar town. The average familiarity of total participants was 3.61. [Fig. 7](#) demonstrates the average of familiarity of landmarks in accordance with demographic profiles. At the first, males performed better than females. Male group was 3.76, while female were 3.34. The average age 20-30 was more familiar with the chosen urban environment than the age 19 and under. Regarding job's categories, while the administrator managers were lower than the other each group, respondents who are students was similar to the other jobs title. There was no difference in whether an administrative assistants or technical exports. In addition, T-test was applied for the further study of the relationship between current knowledge and participant characteristics.

The t-test was conducted to study and compare the relationships between the groups of subject's compositions. The mean of familiar index were calculated for each list of landmarks. These statistics were then broken down and displayed by participant profile. T-test was considered significant, if the p-value was within the 0.05 confidence interval. The participant profile consisted of three sections, regarding the participant's gender, age and jobs. The result for these relationships was interpreted to indicate whether there was a significant difference of ability between participants in each category. The mean of familiar index in Muar town was represented high as a whole. The mean for all respondents corresponds to the response of "I know where it is". According to [Fig. 7](#) the mean of familiar index was highest in age 30-39 (3.98), students, male (3.76) and age 20-30 (3.75).

As shown in [Fig. 7](#), sex, age and job's categories have a significant difference with the degree of spatial familiarity. In summary, the males and respondents with the age of 20-30 and 30-39 categories and students show the high degree of familiarity with the urban

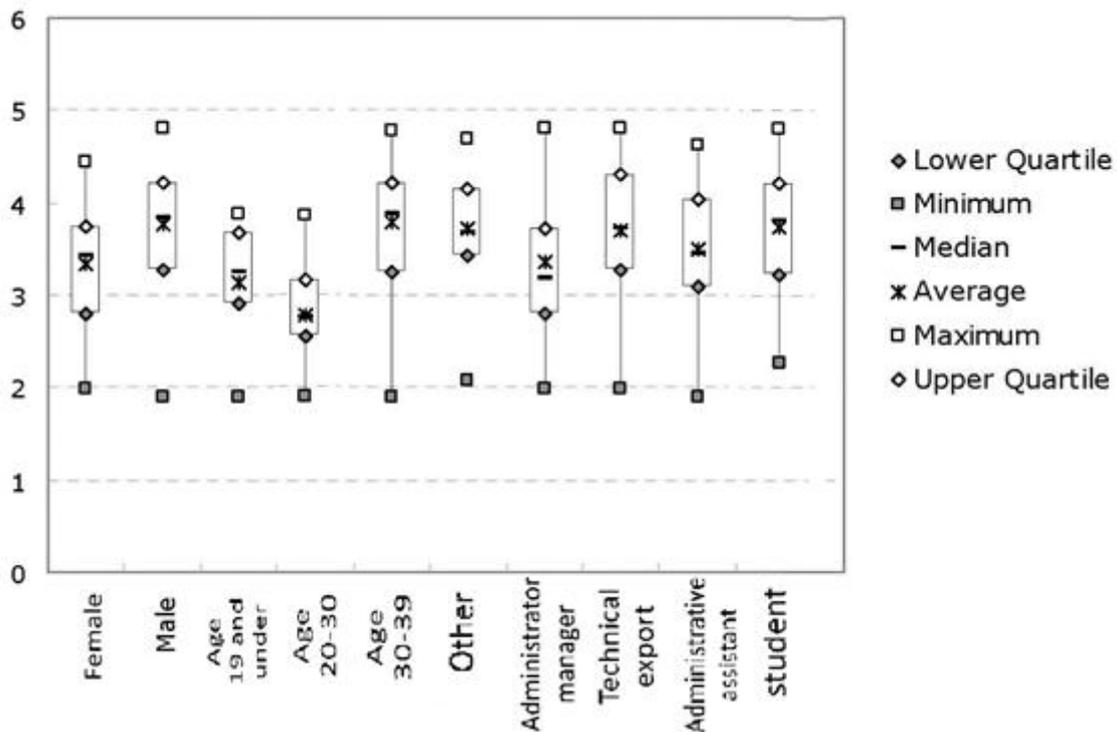


Fig. 7: Spatial familiar index according to participant

environment. In this study, the best-known places were collected for each different group and the list of places was used for the next experiment. The most of the answered places were composed of the frequently visiting places such as shopping mall, restaurant, and road names.

Due to understand the current familiarity of people in Muar town as the research case study following section is provided in terms of specifying the known landmarks in each section of the town;

Wayfinding condition in Muar town

▪ Jalan Bakri (Bakri street)

There are two defined landmarks (clock tower and hotel D'99) in the *Bakri Street*. The analysis has shown 39.29% of respondents were familiar with facades and 32.14% of them had feeling about unique smell. However, the amount of people's familiarities to unique buildings such as: landmarks are around 10.71% which imply people are not able to distinguish these elements there. On the other hand, the result indicates the special feeling about Jalan Bakri was around 25.64% which

means there is a lack of sense of place in this street. Hence in accordance with the research and guidelines, some problems seem to have lack of distinctiveness in hotel D'99 and also there is no visual connection between these elements there.

▪ Jalan Bentayan (Bentayan street)

There are three clarified landmarks (Bulatan Bakry, Shell Gas Station and ENO bank) in Bentayan street. The result has shown 23.33% of respondents were familiar with facades and 50% of them had feeling about unique smell. However, the amount of people's familiarities to unique buildings such as: landmarks are around 10% which imply people are not able to distinguish these elements as a landmark there. Besides, the other analysis signifies the special feeling about Bentayan street was around 28.21% which means there is a lack of sense of place in this street. Based on the research and guidelines, although this place has several landmarks, they don't work as well and also it seems that these landmarks have encountered with some problems such as lack of visual connection and

in some cases there is an absence of distinctiveness (e.g. EON bank).

▪ *Jalan Maharani (Maharani street)*

There are five determined landmarks (Trader's hotel, Bus Station, Majlis Perbandarn Muar, Laman Maharani and Clock Tower) in Maharani street. Also all the information about this street portend that it has a critical role for whole of the city because it connects the town to other towns and it seems to be one of the main streets for the town. The result has shown 36.36% of respondents were familiar with facades. However, the amount of people's familiarities to unique buildings such as: landmarks are around 33.33% which is the most of the percentage of familiarity between all the streets; imply people are able to distinguish these elements as a landmark there. Besides, the other analysis indicates the special feeling about Maharani street was around 25.64% which means there is a lack of sense of place in this street. Finally, although this place has several landmarks and each of these landmarks is distinctive, they are encountered with some problems such as lack of visual connection.

▪ *Jalan Petri (Petri street)*

There are three defined landmarks (Sultan Abobakr Place, High Court of Muar, and Retreat Place) in Petri street. The result has shown 35.48% of respondents were familiar with facades. However, the amount of people's familiarities to unique buildings such as landmarks are around 22.58% which hints that people are not able to distinguish these elements as landmarks. Besides, the other analysis indicates the special feeling about Petri Street was around 26.32%, which means there is a lack of sense of place in this street. Finally, although this place has several landmarks and each of these landmarks is distinctive (e.g. High Court of Muar), they encountered with some problems such as lack of visual connection.

▪ *Jalan Sulaiman (Sulaiman street)*

There are two determined landmarks (Wetex and Caltex Station) in Sulaiman street and also all the information about this street portend that it has a critical role for whole of the city after Maharani Street because it seems to be the second main street for the town. The result has shown 41.18% of respondents were familiar with facades. However, the amount of people's familiarities to landmarks are around 29.41% which is

in the second level of familiarity between all the streets; imply people are able to distinguish these elements as a landmark there. Besides, the other analysis indicates the special feeling about Sulaiman Street was around 43.59% which is the highest percentage of people's familiarity between all streets. It means there is a sense of place for respondents there. The reason rely on the street which is occupied by the commercial places, specially Wetex mall, that is a good motivation for people for gathering and memorizing the street and its components. Finally, although this place does not have several landmarks, they are distinctive and there is a visual connection in the feature of each landmark. On the other hand, because of the strong sense of place for people, this street can work as a strong landmark for whole of the town. As result the wayfinding' condition in this street is good.

▪ *Jalan Arab (Arab Street)*

There are four defined landmarks (Wetex Parade, Komplek, Lagenda and SJKC Chonghwa 2A) in Arab Street. The result has shown 21.88% of respondents were familiar with facades. However, the amount of people's familiarities to landmarks are around 25% which imply people are a little able to distinguish this element there. The reason is that this street contains several landmarks inside. Besides, the other analysis indicates the special feeling about Arab Street was around 20.51%, which means there is a lack of sense of place in this street. Hence, some problems seem to have lack of visual connection between these elements there.

▪ *Jalan Meriam (Meriam Street)*

There is no clarified landmark except some restaurants in Meriam Street. The result has shown 30% of respondents were familiar with facades and around 16.67% of respondents felt unique smell there. However, the amount of people's familiarities to landmarks are around 20% which hints that people are not able to distinguish these elements as a landmark there. Besides, the other analysis indicates the special feeling about Meriam Street was around 33.33%, which means there is a sense of place for respondents there. In addition, although there is no place which concern as a landmark in this street, people have feeling about it. This street is popular as a Hunger Street. On the other hand, it has clarified that the food and the related places such as restaurants are wary famous for Malaysian. As a result, although this street can work

as a landmark for the town, but the condition of wayfinding is weak.

▪ *Jalan Abdullah (Abdullah Street)*

There are one defined landmark (Maharani KTV) in Abdullah Street. The result has shown 40% of respondents were familiar with facades. However, the amount of people's familiarities to landmarks are around 16.67% which imply people are not able to distinguish this element there. Besides, the other analysis indicates the special feeling about Abdullah Street was around 20.51%, which means there is a lack of sense of place there. Hence, some problems seem to have lack of distinctiveness in Maharani KTV.

▪ *Jalan Sayang (Sayang Street)*

There are two determined landmarks (Public Mutual Bank and SJKC Chonghwa from Arab Street) in Sayang Street. The result has shown 23.33% of respondents were familiar with facades. However, the amount of people's familiarities to landmarks are around 23.33% which imply people are not able to distinguish this element there. Besides, the other analysis indicates the special feeling about Sayang Street was around 30.77%, which means there is a sense of place for respondents there. In addition, although the landmarks does not work as well, people have feeling about this street. Meanwhile, the SJKC chonghwa 2A located there and it has clarified that the entire road consists of old shop houses dated back from 1900' which means this street is one of the historical place for the town. Thus, the reason for people to have a sense of place is the old shop houses and the SJKC Cunghwa 2A relating to food there. As a result, although this street can work as a landmark for the town but the condition of wayfinding is weak.

▪ *Jalan Sisi (Sisi Street)*

There are four defined landmarks (Hotel Kingdom, Vista of MPM and Bank Islam and Pasaraya Fresco) in Sisi Street. The result has shown 22.58% of respondents were familiar with facades. However, the amount of people's familiarities to landmarks are around 19.35% which imply people are not able to distinguish this element there. Besides, the other analysis indicates the special feeling about Sisi Street was around 10.26%, which means there is a lack of sense of place there. Hence, some problems seem to have lack of distinctiveness in the landmarks and also there is no

visual connection between these elements there.

▪ *Jalan Othman (Othman Street)*

There are two known landmarks such as Traffic Office and Vista of Muar trader Hotel in Othman Street. The result has shown 40% of respondents were familiar with facades. However, the amount of people's familiarities to landmarks are around 10% which imply people are not able to distinguish this element there. Besides, the other analysis indicates the special feeling about Othman Street was around 25.64%, which means there is a lack of sense of place in this street. Hence, some problems seem to have lack of distinctiveness in the landmarks and also there is no visual connection between these elements there.

According to the all information above, the efficiency of wayfinding in Bakri Street, Bentayan Street, Petri Street, Abdullah Street, Sisi Street and Othman Street is insufficient. Thus, there is a necessity of improvement of landmark's condition and in some cases, it is necessary to impute some landmarks.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this manuscript.

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