AIRPORT ROAD ACCESS DESIGN SOLUTIONS: A CONCEPTUAL STUDY OF WAYFINDING SYSTEMS

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ABSTRACT

The growth of the airport in the world will have a significant impact on future road access design. Pressure by drivers for simplifying of airport wayfinding has led to the inclusion of basic road access design so as to reduce the cost. An effective of wayfinding is directly linked to the reduction in drivers' travelling cost and number of road accidents. Drivers prefer an effective airport wayfinding system in airport areas to navigate easily. This has raised an aim to investigate ways in which airport road access design can be improved, through a conceptual study of both wayfinding design and signage information systems. It leads to the exploration of the new field of the study in order to propose appropriate guidelines and solutions on airport navigation with an emphasis on simplifying the wayfinding provision design in a future.

Keywords: Wayfinding; Signage design; Driver behaviour; Navigation system

1 INTRODUCTION

Wayfinding is an important activity that people do throughout their entire lives as they navigate from one place to another. Lynch (1960) stated that the wayfinding is the progressive process which used by people to arrive at the destination successfully. Charpman and Grant (2002) stated that wayfinding helps people to identify their location, next destination, and to choose the best route to the intended destination. Montello and Sas (2006) agreed that wayfinding occurs when people need to travel from one place to another on the intended route and direction without having accidents or getting delayed and reach the destination successfully. It is also important to distinguish the

destination upon arrival and reversing the process to find the way back. In this paper, drivers' wayfinding is defined as a process in which people make a decision (choose) to navigate using information support systems (clues) such as maps, lighting, sight lines, and signage, and arrive at the destination (results) successfully.

The lack of wayfinding provision in airport areas has discouraged the interests of drivers and much effort has not been directed towards understanding the concepts and its practicality (Darken and Sibert, 1996; Burns, 1998; Montello and Sas, 2006). An ineffective number of signage has been constructed around airport areas which distracts the wayfinding. Harding (2012) stated that many airports have not established the concept of 'simple', functional and less is more' on airport navigation system. Therefore, the airport has less attractive and competitive than neighbourhood airports [Airport Cooperative Research Program (ACRP), 2011; Alhussein, 2011]. In many cases, drivers experience most difficulties to understand a complete wayfinding process which stimulates a distraction while driving (Bhise et al., 1973; May et al., 2005). The distraction from inadequacy of signage (i.e. too much advertising signage) in airport road access areas could increase confusion of drivers and road accident (Mitchell, 2010; Wener et al., 1983).

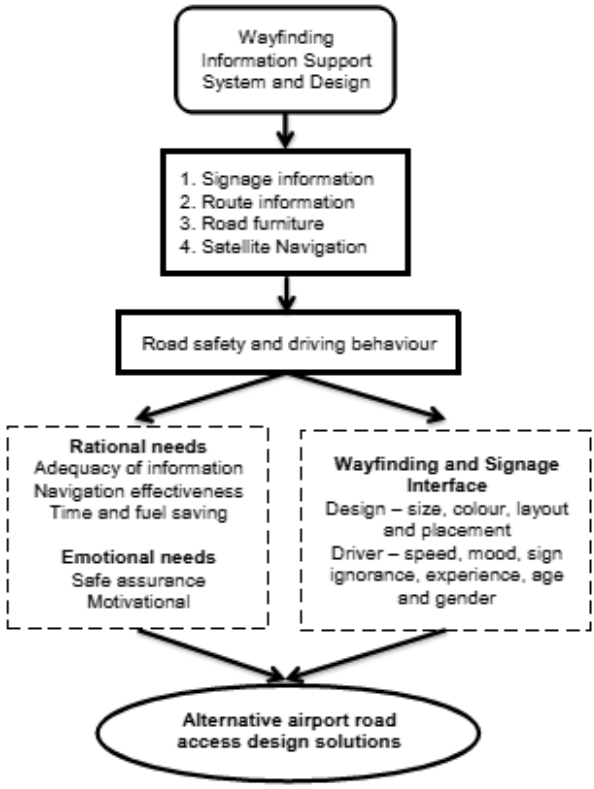
From the literature search, it was realised that the cost of airport facilities (including wayfinding) regularly appeared in airport studies as a benchmark for measuring industry performance (Graham, 2003; Corlett et al., 1972). The lessons learnt from the literature search were quite surprising and the need to fill a knowledge gap (examining the effects on the wayfinding and road safety) appeared to be necessary (Carsten and Tate, 2005; O'neill, 1991). As a remedy to counter this problem, efforts to investigate the effect between wayfinding, road safety and drivers' expectation are crucial.

2 SETTING OF THE SCENE

Wayfinding is a natural skill which drivers used common-sense knowledge of geographic space. Drivers need adequate information to continue their travelling. A good signage aids drivers' navigate easily (Butler et al, 1993).

Figure 1 shows the conceptual framework as the result of a literature review of wayfinding provision.

Figure 1: Drivers' wayfinding process (Author, 2014)



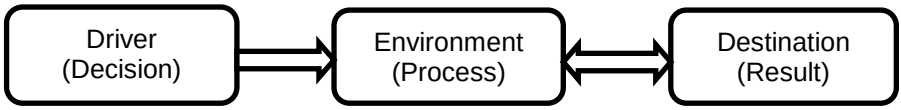
2.1 Wayfinding and Signage Information System

A straightforward design has been adopted in the structure of wayfinding design. Simplifying wayfinding provision will eliminate the effort in delivering an aesthetic value of signage as the aim is to reduce investment cost. Signage provides a directional guidance, reassure drivers about intended location, sites of local services, speed limit and warn of upcoming changes or hazards. Findlay and Southwell (2004) stated that wayfinding is involved a variety of driver's strategies and sources of information afforded by the landscape of which signs are a key component, often supplemented by paper maps and word of mouth. Signage information of wayfinding represents a form of social control to limit people movements and behaviour

(Dann, 2003, cited in Findlay and Southwell, 2004). According to Transport Scotland (2013), the wayfinding principles are suggested as below:

a. Fewest possible signs of the smallest adequate size in the clearest and simplest form.
b. Clarity of the signs information, fonts, backdrops and colours.
c. Increasing the number of signs can cause more vagueness and confusion without solving the problem.

Figure 2: Drivers' wayfinding process (Author, 2014)



Wayfinding is useful for making a quick decision due to complex road access design. Figure 2 shows drivers' wayfinding process.

i. Driver (Route decision)
   Complete information concerning decision alternative ways of road access is available and feasible to drivers.

ii. Environment (process)
   Drivers use alternative surrounding objects (i.e. wayfinding, signs and landmark) and processes into valuable information. At this point, drivers develop alternative shorter distance in which presentation of right information is crucial.

iii. Destination (Result)

   Drivers eliminates an excess in travelling based on amount of information received which includes the financial cost (i.e. fuel costs and tolls) and the opportunity cost (i.e. time spent travelling) on their journey.

Drivers use two immediate elements of wayfinding; choices and clues. Choices are related to instance decision points in wayfinding (Raubal and Egenhofer, 1998). Decision points (also refer as choice points) are the points where drivers need to make a quick decision using available information (i.e. exit from highway and split between roads leading to terminal and parking). The choices give opportunity to drivers to decide two or more alternative way

on road access. Driver tends to use a clue to make estimation on road architecture. Clues include any signs and physical architecture along the road. Mitchell (2010) agreed signage should be specific, designed and placed in accordance with national standard in which advantages to drivers in terms of locate, read and understand them within a timeframe. According to ACRP (2011), the signage needs to be conspicuous, legible, brief, understandable, and located a sufficient distance from the choice point to allow enough time to detect, read and make a decision. Table 1 explains the signage information indicator components.

Table 1: Signage information indicator (Source: Transport Scotland, 2013)

Indicator	Issues
Traffic direction	The flexibility of signage indicates a number and size in certain circumstances on road access design.
Safety	Too much signage discourages drivers' complacency which contributes to accident risk. A detailed evaluation to ensure that only minimum wayfinding provision has been proposed.
Adequacy of information	Pressures by business, road users and tourism agencies for information signs alongside roads allocation. The effectiveness of existing signs, or related signage information is necessary.

2.2 Impact of Navigation System

Navigation is defined as an integrated system which involves traditional and modern wayfinding elements. These elements turn to effective wayfinding if up-to-date information is loaded sufficiently. The navigation system (i.e. satellite navigation) conveys route guidance to the driver using both visual and audio display, respectively. The research found that the recorded navigation directions produced shortest routes (in terms of distance and time), and resulted in the fewest navigational errors. Parkes (1993) stated

that the vocal directions (i.e. left, right, straight on) may be more demanding than pictorial symbolic information (i.e. arrows) as to be interpreted in a particular context. Parkes argued that vocal directions are superior. The effect of visual and auditory modality received most attention in previous research due to its relative contribution to normal safe driving behaviour.

In order to increase road safety, the adaption of both traditional (i.e. paper maps) and an electronic navigation system has been recommended. Streeter et al. (1985) agreed that several traditional navigation methods (i.e. paper maps, recorded vocal directions, customized route maps and a combination of the latter two) aids drivers' in their journey. Burnett (2000) stated that the electronic navigation system display position affected the frequency of glances to the display and number of navigational errors, such that a low position resulted in less glances and more navigational errors. Bhise and Rockwell (1973) supported that the duration of glances towards road traffic signs were almost twice as long in low density traffic as in high density traffic.

Satellite Navigation system (Sat Nav) has changed the traditional wayfinding processes in which real-time of wayfinding navigation can be introduced. Sat Nav user tends to drive slowly and in some circumstances they probably stop driving completely, particularly when approaching junctions. Although this may appear to be safety behavioural adaptation, speed reductions occurred without consideration of traffic regulations has been notified. Driving in an unfamiliar area engaged in 50% fewer cases of unsuitable driving behaviour than those using conventional navigation methods [Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek (TNO), 2007]. TNO agreed that drivers faced unfamiliar areas; journey distances and durations were shorter for those using electronic navigation systems than those using conventional navigation methods. In many cases, drivers have difficulties to follow the Sat Nav system due to fewer obstacle (i.e. too concentrate on signage and focus on road) which caused to stress, delay and potentially unsafe road behaviour such as late lane changes or attempting to read paper or screen maps while driving (May, Ross and Bayer, 2005).

3 CONCLUSIONS

The research provides worthwhile concepts for the design of efficient

wayfinding provision. The results contribute to the following areas:

1. Better understanding and improvement of airport wayfinding information support systems for airport road access design solutions.

2. Integration of traditional (i.e. signage and paper map) and modern (i.e. Sat. Nav) wayfinding to enhance the interaction on sign information.

The research will be beneficial to develop an adequate wayfinding provision in which able to increase a quality of drivers' navigation in airport areas. The research contributes for a safe navigational system to be adopted by parties involved (i.e. drivers, airport authorities and road planners). Furthermore, there are two areas that can benefits to the society. A better linkage and transportation of wayfinding information system connects parts of transit systems to each other, one design to another, and activities and places (i.e. signage). Secondly, the road access to the airport can be improved as it will complete a wayfinding information process to the destination successfully.

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