Human Orientation and Wayfinding in Airport Passenger Terminals

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Passengers and visitors to major U.S airport terminals frequently complain that they have problems finding their way through the vast and complex structures. Such problems are related to the extent to which it is possible to reach various destinations within reasonable limits of time and effort, which is an important aspect of a terminal building's environmental quality. This paper provides an evaluation of current airport terminal wayfinding systems, focusing specifically on visual information elements, such as signs, maps, and directions. A multiple-method strategy of respondent self-reporting and behavior tracing was used to draw a composite picture of passenger wayfinding information needs and to identify particular problems that lead to poor spatial orientation or wayfinding performance. Significant problems were reported and observed with respect to the design of you-are-here maps and, to a lesser extent, corridor directional signs. These problems are addressed in the context of a theoretical framework for understanding how humans acquire and represent navigational information. This framework, in turn, is used both to evaluate existing terminal designs and to suggest specific guidelines for effective redesign.

Passengers and visitors to major U.S. airports frequently encounter problems of spatial orientation and wayfinding. This may be caused, in part, by the rapid growth of air travel in the last decade and resistance to the construction of new major airports, both of which have greatly contributed to the overcrowding of airport terminals (*1*). Furthermore, the vast structure of the passenger terminal creates a complexity that most airport planners and architects are not equipped to simplify; that is, they lack a formal, theoretical framework for understanding human spatial cognition and for relating its implications to the design of the terminal or its wayfinding system (e.g., signs, maps, directions).

The present research addresses the problem of passenger wayfinding using a multiple-method strategy of respondent self-reporting and behavior tracing both to draw a composite picture of passengers' wayfinding information needs and to identify particular problems that lead to poor wayfinding performance. A psychological, or information-processing, model of how humans acquire and represent spatial and navigational information is then proposed to identify potential design shortcomings of present wayfinding systems and to suggest pragmatic, feasible design guidelines for effective redesign.

PASSENGER ORIENTATION AND WAYFINDING

> The very word "lost" in our language means more than simple geographical uncertainty; it carries overtones of utter disaster (*2*).

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The term *wayfinding* describes a person's abilities to reach spatial destinations and refers to one's static relation to space as well as the dynamics involved in his or her purposeful mobility (*3*). Accordingly, two variations of lostness may occur; lostness in orientation—knowing where you are, but not where you are going—and lostness in location—knowing where you are going, but not where you are. Simply stated, the combined effects of both variations represent the degree to which a person deviates from the most direct route to a desired location (*4*).

The susceptibility to problems of spatial orientation and wayfinding reflects the extent to which it is possible for passengers to reach various destinations within reasonable limits of time and effort, which is an important aspect of a terminal building's environmental quality (*5*). Indeed, the longer the time that passengers spend waiting, walking, or trying to find a particular facility, the lower the perceived level of service (*6*, *7*). Moreover, poor spatial orientation often causes considerable annoyance and psychological stress (*8*).

As the burden of airport finance shifts from federal government to local government, airport operators will become, or want to become, more competitive in attracting travelers through their terminals. Logically, a common way to attract travelers is to upgrade the level of service at a terminal by increasing or improving the services and facilities that are offered (e.g., shops, restaurants, and business services). Yet, overriding these aspects of terminal design, providing another "level" of service, is the appropriate location of facilities in the terminal area and their quick identification by the passenger (*9*). Indeed, this aspect of the terminal design may also have a major impact on capital and operating costs, because passengers can only spend money at facilities they can locate.

INFLUENCE OF PHYSICAL ENVIRONMENT

> Environments . . . do not really function properly unless users are able to find their way around (*5*).

A total wayfinding system comprises many elements (*10*), but wayfinding ability is most affected by the influence of the physical environment (*11*). Therefore, in order to forecast wayfinding problems, physical variables that are likely to affect the ease with which spatial orientation and wayfinding are accomplished must be specified (*5*). Garling et al. (*5*) have proposed three such variables: the degree of differentiation, the degree of visual access, and the complexity of spatial layout.

The degree of differentiation refers to the degree to which different related parts of the environment look the same and unrelated parts are distinguishable. A high degree of differentiation should enhance spatial orientation and wayfinding by making parts of the environment more easily recognizable.

The degree of visual access refers to the extent to which different parts of the environment are visible from many vantage points. High visual access will increase both the recognition and localization of distant destinations, thereby improving spatial orientation and wayfinding (*12*). Seidel (*11*) reports some evidence that passengers arriving at a gate with direct visual access to the baggage claim area have an easier wayfinding experience.

The complexity of the spatial layout will also affect spatial orientation and wayfinding (*13*). The spatial layouts of environments such as the airport passenger terminal are naturally complex because of their sheer size and the large number of possible destinations and routes.

Much research has approached the issue of passenger orientation and wayfinding under the assumption that its efficiency is a factor of space and time constraints (*7*). In other words, it is assumed that the more space passengers have, and the less distance they need to walk, the greater the ease of mobility. There is growing reason to believe, however, that these parameters fall short of explaining passengers' abilities and attitudes toward circulation in the terminal. In fact, a survey of 30,000 passengers conducted by Condom (*15*) found that availability of space is not a variable of fundamental importance.

More recently, Martel and Seneviratne (*1*) have suggested that several variables besides availability of space and waiting time should be considered when passenger terminal performance is evaluated in terms of passenger wayfinding needs. In their study, 53 percent of the respondents to a personal interview survey perceived information as the most significant variable affecting their ability to circulate in the terminal effectively, whereas 38 percent chose walking distance as the most critical variable. Fewer than 10 percent of the respondents, though, chose space availability and level changes as most important. In a study of passenger information needs in subway systems, Beck (*16*) also notes the critical role that guidance information plays in facilitating the efficient movement of passengers through transit facilities.

IMPORTANCE OF INFORMATION

Of course, improvements in the three physical characteristics may be achieved by varying the size, form, or architectural style of the passenger terminal environment (*13*). But perhaps the most logical and feasible alternative under the present circumstances would be to increase efficiency through better management of existing facilities and resources for aiding passenger orientation and wayfinding (Seneviratne and Martel, unpublished data). Thus, the focus shifts from physical form to information. Guidance information sources, in the form of signs and maps, must then also be taken into account, especially when one attempts to predict the wayfinding difficulties that newcomers will have in any specific environment (*5*, *14*).

Information, however, is a rather broad term, and thus could reflect any number of guidance sources (*1*). For example, one can minimize walking distance and level changes if the appropriate information is available to direct the passenger to the correct destination (*1*). It is seemingly important, then, to define and categorize the various types of information available to passengers. Here, two general forms of guidance information are discussed: visual guidance signs and verbal route directions.

Visual Guidance Information Sources

The visual guidance system can be broken down into two main components: corridor guidance signs and airport map displays.

Corridor Guidance Signs

Corridor guidance signs usually take the form of directional arrows. One problem with these signs, however, is that they are trying to portray three-dimensional information on a two-dimensional or flat surface. This often causes ambiguity as to whether a sign is pointing up or straight ahead, leaving the passenger guessing as to the terminal layout ahead.

Airport Maps

Airport maps are publicly displayed pictorial or schematic layouts of the terminal and may be stationary or portable. Stationary maps, often in the form of the you-are-here design shown in Figure 1, are placed in large display cases so that passengers and visitors can view them easily. Portable maps, so called because passengers can carry them as they navigate through the terminal, are available in most airline magazines or at the airport information and customer-service booths.

Verbal Directions

Many passengers, either confused by the visual guidance information or simply lacking the time needed to interpret their relative location accurately from a map, consult airport personnel for directions to their desired designations. In most large airports, information booths or customer-service centers are operated by both airport managers and airlines. In addition, customer-service representatives are placed throughout the terminals, and often at arriving gates, in an effort to assist passengers.

EXPERIMENTAL EVALUATION OF AIRPORT WAYFINDING SYSTEM

Clearly, the design of any terminal should not proceed without knowledge of the mix of passenger traffic envisaged, because this knowledge can be used by airport owners to tailor the design of the terminal to the needs of the passengers (*17*). Moreover, any effort aimed at improving the quality of the wayfinding systems in passenger terminal buildings should be based on an understanding of the critical factors that underlie

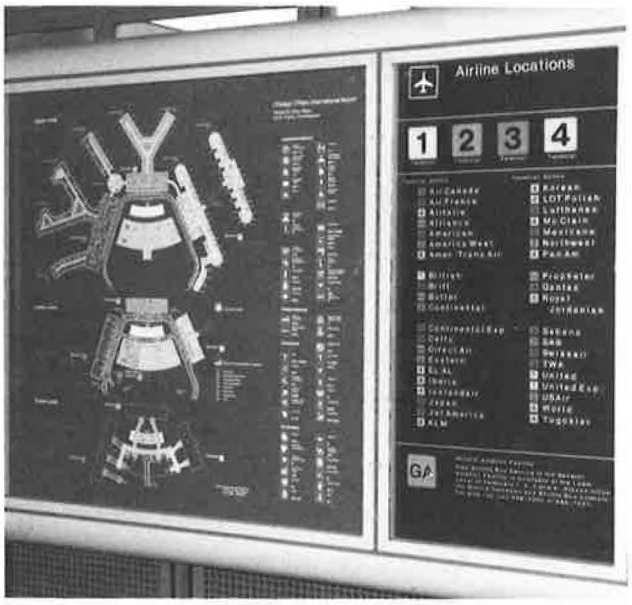

FIGURE 1 Typical you-are-here map display.

passenger performance and satisfaction. Accordingly, in the present study an evaluation was undertaken to (a) identify which guidance information sources are most important to passengers while they are navigating the terminal and which are perceived as needing the most improvement in their design or implementation; (b) determine the passengers' ability to use these sources; and (c) provide feasible guidelines for the optimal design of guidance information.

The experimental data were collected in three stages through:

1. an analysis of requested information at airport information booths;
2. a personal interview survey, which was used to determine passenger attitudes toward the importance of various types of directional information and the need for improvements in their design; and
3. interviews with, and observations of, "lost" passengers as they consulted a you-are-here map display.

All data were collected at Chicago's O'Hare International Airport, Terminals 1 and 2, over a three-month period, April through June 1990.

Experiment 1: Verbal Guidance Analysis

An analysis of the nature of information requested at the information booths located in Chicago's O'Hare International Airport was conducted on data obtained for 1989, using the SAS statistical package. These booths are intended to provide more in-depth information than that offered by the visual information systems (*18*). Figure 2 shows the relative proportions and the nature of the information requested during 1989 from the four information booths located in the airport. As shown, of the 1,046,957 persons who requested information during this year-long period, the majority (74 percent) asked questions involving directions to various terminal facilities ($p < .05$). Not surprisingly, a smaller but significant

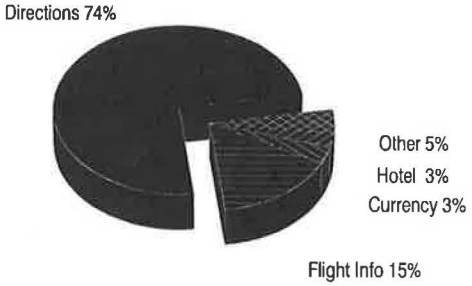

FIGURE 2 Analysis of passenger requests at O'Hare International Airport information booths.

proportion (15 percent) requested information pertaining to the scheduled arrival or departure of various flights ($p < .05$). In addition, a survey of 10 airport and airline customer-service representatives revealed that more than 90 percent of their requests are for directional information.

Given that few of these passengers missed their flights, these findings suggest that information booths, and the verbal route directions they provide, are an important navigational aid to many passengers. Of course, it is difficult to tell whether this finding demonstrates that the terminal architecture and the visual guidance system are not adequately designed to address the information needs of passengers navigating the terminal. It may, instead, merely demonstrate that passengers do not devote time to the study of maps and signs, and opt instead to ask for verbal route directions. In either case, though, one can argue that a more efficient visual guidance system would not only assist those passengers who rely on maps and signs but also alleviate the need for passengers to consult the information booths. Indeed, such an improvement would potentially provide a substantial cost reduction for airport operators and airline owners, who carry the burden of providing customer-service representatives at information booths and throughout the airport terminals.

Experiment 2: Personal Survey

Various terminal passengers were administered a personal survey that consisted of three parts. The survey sought to obtain

1. Demographic information (age, sex, nationality, residence) and information relating to the purpose of the trip (business or leisure);
2. Information on the frequency of travel from O'Hare (infrequent or frequent), the mode of arrival at the airport (local or transfer), and the time of departure; and
3. Passengers' ratings of the relative importance of four directional information aids (corridor signs, airport or magazine carry maps, you-are-here map displays, and verbal directions) and of the need for any corresponding improvements.

The personal survey was completed by 118 passengers in various segments of the terminals.

Procedure

After providing demographic and type-of-travel information, participants were instructed to rank order (1 to 4) the variables

by their relative importance for use in navigating the airport, with a rank of 1 signifying the variable as the most important. Subjects were also asked to rank order (1 to 4) the variables by the need for improvement in their design or implementation, with a rank of 1 now signifying a variable as needing the most improvement.

Results

The passenger responses to the survey were coded and analyzed using the SAS package. The variables sex, age, nationality, and trip purpose were not included in the analysis, which focused primarily on the frequency of travel out of, and, hence, familiarity with, the airport. Of the 118 respondents, 56 (47 percent) identified themselves as infrequent passengers and 62 (53 percent) identified themselves as frequent passengers. An analysis of variance (ANOVA) procedure was performed to determine the significance of the difference between the mean ranks of the variables.

Figure 3 plots the percentage of passengers, by frequency of travel through O'Hare, who chose each of the four variables as the most important. It is apparent from these data that the majority of infrequent travelers perceived either the corridor signs or the you-are-here maps as the most important guidance-information sources but that frequent travelers chose only the corridor signs as most important. This suggests that with increasing exposure to the airport, passengers rely more on the corridor signs and less on the you-are-here maps. An ANOVA performed on the mean ranking showed these trends to be significant ($p < .05$).

Figure 4 plots the percentage of passengers, by frequency of travel through O'Hare, who chose each of the four variables as needing the most improvement. The results suggest that the you-are-here maps provide the most significant source of confusion for infrequent passengers, and hence are most in need of improvement ($p < .05$). Corridor signs and verbal directions are also noted, although to a lesser degree, as in need of improvement. Frequent passengers rate the corridor signs as most in need of improvement ($p < .05$). The you-are-here maps and verbal directions are also noted, although to a lesser degree, as in need of improvement.

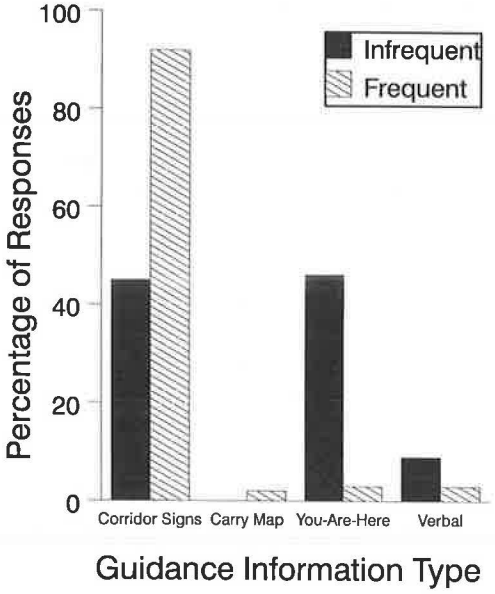

FIGURE 3 Effect of airport exposure (frequency) on passengers' perception of the most important directional information sources.

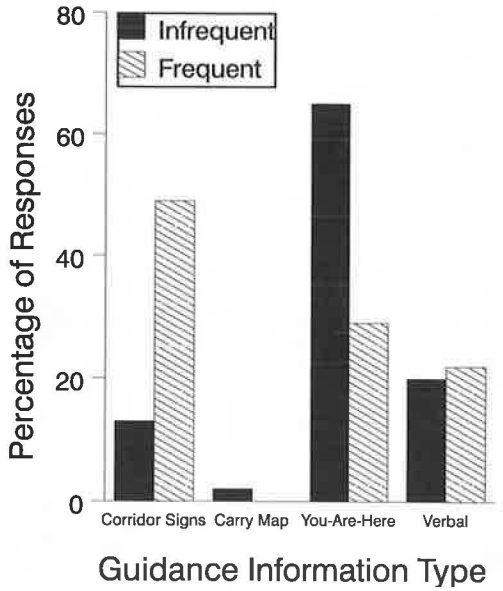

FIGURE 4 Effect of airport exposure (frequency) on passengers' perception of the directional information sources most in need of improvement.

Discussion

A comparison of Figures 3 and 4 provides a rather informative and consistent picture. Those passengers unfamiliar with the airport rated both corridor signs and you-are-here maps as important sources of guidance information, but also suggested that these sources, in addition to the verbal directions provided by the airport personnel, are in need of substantial improvement. Those passengers more familiar with the airport rated only the corridor signs as important sources of guidance information, yet they cited the same set of information sources (i.e., corridor signs, you-are-here maps, and verbal directions) as in need of improvement. Perhaps this latter finding reflects the business travelers' previous experiences with you-are-here maps and verbal directions at a time when they were less familiar with the airport layout.

Experiment 3: Passenger Performance with the You-Are-Here Map Display

The results of Experiment 2 suggest that newcomers rely extensively on you-are-here maps, yet they also suggest that such passengers, along with more experienced ones, believe that you-are-here maps are most in need of improvement. Previous research, however, has shown that subjective ratings sometimes differ from objective performance (*19*). The objective of Experiment 3, therefore, was to determine what

proportion of those passengers trying to use the you-are-here maps could do so effectively.

To meet this objective, a final set of data was collected as passengers viewed one of the airport's you-are-here map displays (see Figure 1). These maps represent a static view of the airport layout, with Terminal 2 always located at the top of the map display. More than 90 of these displays are located through O'Hare International Airport.

Over a 3-hr period, data were collected from all of those passengers (n = 19) who consulted the you-are-here map. Respondents were categorized in one of two ways:

1. Successful, if they were able to determine the appropriate heading and direction to the desired facility, or
2. Unsuccessful, if they could not.

All 19 passengers identified themselves as being unfamiliar (i.e., newcomers) with O'Hare Airport.

Results

Figure 5 plots the passengers' ability to determine the proper navigational course successfully, as well as to identify the specific terminal facility in question. Clearly, the results are discouraging, because only 2 of the 19 passengers were able to determine the correct course of action from their study of the you-are-here map display. In fact, many of the passengers had trouble just determining where they were located on the map in relation to the terminal. Frequent comments included, "I'm not even sure where I am on this map" and "Now that I know where it is, how do I get there?"

Discussion

The results of Experiment 3 suggest that the majority of passengers who attempted to use the you-are-here maps could not do so. Thus, the passengers' subjective rating of the poor design quality of these maps corresponded rather well with their inability to use them effectively. It should be noted, however, that although suggestive, the reliability of these findings is limited because of the small sample size obtained.

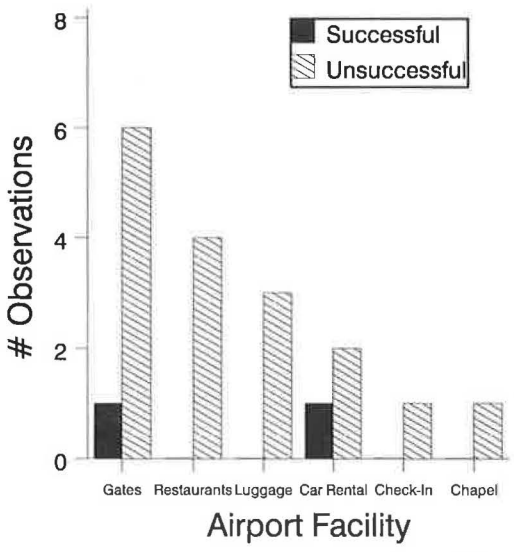

FIGURE 5 Analysis of passenger performance with you-are-here maps.

THEORY AND GUIDELINES

Collectively, the experimental results obtained suggest that an overwhelming majority of passengers perceive the corridor directional signs and the you-are-here map displays to be the most important sources of directional information; yet, at the same time, they note substantial flaws in their design or implementation. Furthermore, the results show that inexperienced passengers, unfamiliar with the airport terminal, rely less on the corridor signs and more on the you-are-here maps than do experienced passengers.

These results are consistent with those of Martel and Seneviratne (*1*), who found that for efficient circulation in the airport terminal, business travelers perceive walking distance (i.e., time) as the most important variable, whereas leisure travelers feel that information (for guidance) is the most important variable. The authors conclude that "these differences seem to reflect the variance in the value of time for the two groups, as well as the variance in familiarity with the airport" (*1*).

Clearly, the efficient movement of passengers through transit facilities should be the primary concern of terminal planners (*16*). That is, the internal guidance-information system of the passenger terminal should be simple to follow and easy to negotiate. But this rather intuitive human factors aspect of design does not seem to have been given proper consideration in the preparation of most passenger terminals (*9*), including the one evaluated here.

Why is the design process seemingly devoid of human factors? Perhaps bringing in another group of experts would undermine the architects' autonomy (*20*). A more likely reason, however, is the planners' and architects' concerted lack of understanding of the way humans acquire and represent navigational information and the optimal formats for presenting this information. For without this knowledge, planners and architects have only their common sense to assist them with the difficult task of minimizing passenger disorientation and confusion while they circulate in the airport terminal.

Theoretical Approach to Design of Guidance Information Systems

Although it is undoubtedly important to highlight systematic problems experienced by passengers as they attempt to navigate the terminal, it is equally important to illustrate how these problems may be overcome through redesign. Such an endeavor naturally falls within a human factors approach, whereby the information needs of the passengers are assessed and subsequently serve as the basis for proposed designs. A good theory, relating these factors, can be used to identify the consequences of proposed designs early in the design process, when various alternatives are still being generated.

Thorndyke (*21*) proposed that, as people become increasingly familiar with a geographical environment, the nature of

their knowledge of that environment undergoes qualitative as well as quantitative changes (*22*). The qualitative changes are characterized by a progression through three levels of knowledge.

Initially the representation is characterized by landmark knowledge. Here, orientation is guided exclusively by highly salient visual landmarks (e.g., statues, buildings, restaurants) that provide little more than a crude representation of the environment.

One soon progresses from landmark knowledge to route knowledge (i.e., one acquires the ability to navigate between points). This understanding is expressed from an ego-centered frame of reference whereby landmarks or other visual features seen while navigating the environment generate the decision to turn left or right or continue straight ahead at a given intersection (*22*).

Sufficient navigational experience eventually provides one with survey knowledge. Here, the knowledge resides in the form of an internalized "cognitive map" (*23*), which is analogous to the true physical map of the environment. This representation is expressed from a world-centered frame of reference, so one navigates with a top-down perspective of the layout of the environment. Hence, at this level one is able to describe the relative location of two landmarks even though one may never have traveled a route that connects them.

Thus, beyond describing two phases of navigational learning, route and survey knowledge forms may be contrasted in their "canonical" or preferred frame of reference. During early acquisition, one navigates using route knowledge from an ego-centered frame of reference, and thus one's representation of the environment corresponds directly to what one sees as he or she follows a route. With survey knowledge, on the other hand, one navigates from a world-centered frame of reference, and thus the internal map is independent of the particular view one has of the environment.

As Thorndyke (*21*) has proposed, a logical consequence of this difference is that possession of route knowledge is optimal for judgments made from one's own frame of reference. These would include such tasks as pointing to a given part of the airport that is not visible (orientation) or judging the actual walking distance that must be traveled between two points and actually navigating that route. For example, the instruction "turn right" (a command based on route knowledge) will lead to different actions, depending upon whether one is facing north or south. In contrast, "turn westward" (a command based on survey knowledge) will lead to the same ultimate action, independent of the initial orientation.

The progression from route to survey knowledge with training suggests that the internal model slowly progresses from an ego-centered, context-dependent representation to a world-centered, context-free representation. Evidence for this progression is provided by the observation that experts in map reading tend to orient maps in a "north-up" or fixed direction, whereas novices tend to rotate the map in the direction ("track-up") they are heading (*24*).

Design Guidelines

Maps

Several experiments have shown that the mental representation of a paper map is analogous to the physical map itself (*25*, *26*), and as previously discussed, that inexperienced travelers navigate according to their own frame of reference (i.e., "up" in the direction they are heading). However, if the environment is not aligned with the map, the traveler must then perform some time-consuming and error-prone mental operation (i.e., mental rotation) to bring the map and the environment into correspondence. An optimal map design, therefore, would consider the orientation of the passenger as he or she views the display, and would provide a map whose orientation (i.e., frame of reference) is congruent with the passenger's current orientation in the terminal.

The implication of the previous discussion is that newcomers would benefit when the map was aligned in the same direction they were heading (i.e., track-up), whereas experienced passengers would prefer fixed maps. Clearly, however, this guideline stands in contrast to the airport map display evaluated in this study. As shown in Figure 1, a fixed-map orientation was used, with Terminal 2 always at the top of the map. It is therefore not surprising that passengers had difficulty locating their relative position on the map and ascertaining the appropriate navigational route to the terminal, facility, or gate in question. Moreover, because the data suggest that only inexperienced travelers rely extensively on you-are-here map displays, these travelers should be provided with the map format that is most compatible for them. Track-up maps not only would improve their orientation and wayfinding but also would facilitate their progression from route knowledge to survey knowledge as they became more familiar with the terminal environment.

In a detailed account of map-design issues, Levine (*26*) suggests the following additional guidelines:

- The map should be placed in some asymmetric location, preferably close to some prominent landmark, to facilitate the observer's locating himself or herself on the map. The map orientation could be indicated symbolically as aligned properly with respect to the environment by means of a horizontal line at its appropriate location on the map, and the observer in front of the map symbolized with an upward-pointing you-are-here symbol.
- Facilities and services (restaurants, restrooms, information booths, etc.) should be indicated on the map either by visual shape or by some type of symbol. A written description would be less salient and more difficult for foreign travelers to understand.
- Color should not be used in way that would contradict normal stereotypes or meanings with which certain colors are known to be associated (e.g., red—emergency/help; blue—sky/up).

Corridor Directional Signs

The previous discussion on map design shows that it is essential that signing be designed carefully and that careful consideration be given to guidelines that oppose each other. On the one hand, the passenger must be given sufficient signage to find the facility or the direction sought. On the other, there must not be such a proliferation of signs that there is confusion.

More specifically, Beck (*16*) suggests three guidelines for the design of directional signs in transit terminals.

Directional Association. Directional information should be placed in a way that will be easily and unambiguously associated with the pathway choice the user must make. Thus, designers must be aware of both where signs are located and the location from which they can be seen.

Message Content. The message content of a directional sign should be in a form that is easily understood and useful to the user. Designers must ensure that only relevant information is displayed and that combinations of displays are avoided, when possible. Combinations of displays introduce the possibility that display elements will interact in ways not intended for the task by the system designer. As an example, the display shown in Figure 6 was found in a U.S. airport and reported by Kantowitz et al. (*27*). One can see how a passenger might be confused about the correct association of gate numbers to directional arrows. For this example, the difficulty is easily solved by the introduction of an appropriate line (either vertical or horizontal, depending on whether gates 1 to 5 are to the left or the right) between the display elements (*27*).

Redundancy. Because of the built-in limitations in human short-term memory, a certain amount of redundancy of information is necessary. This may be in the form of a visual icon or symbol complementing a written description or confirmation signs that let the passenger know that he or she has chosen the correct path.

Terminal Architecture

Finally, although not the focus of the present paper, it is acknowledged that planning an airport terminal in such a manner that its internal layout minimizes possible disorientation significantly contributes to passenger satisfaction (*9*, *28*). Moreover, passengers will not be likely to be able to use the terminal's facilities and appreciate its architectural features if they cannot easily navigate it. Hence, the architectural design of passenger terminals should, ideally, be structured so that the recognition and localization of its inner facilities are continually apparent to its users.

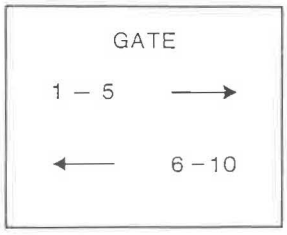

FIGURE 6 In which direction should one turn to reach Gate 4? (*27*)

CONCLUSION

This research has attempted to determine the significant sources of information that passengers use while orienting themselves to various facilities within and between airport terminals, how successful those sources are, and what design qualities facilitate or inhibit the passenger's wayfinding abilities. Perhaps not surprisingly, the current results suggest the need for vast improvements in the design and implementation of guidance information in airport passenger terminals. Specifically, it was found that inexperienced passengers rely more on airport maps than do experienced passengers, yet they both find these same maps difficult to interpret or use for navigation.

A theoretical review of human navigation and spatial cognition indicated that people unfamiliar with an environment navigate from an ego-centered (i.e., self) reference. By providing geographical information congruent with this vantage, wayfinding performance can be improved substantially. An evaluation of the you-are-here maps at O'Hare International Airport indicates that all of these maps show an identical, fixed (Terminal 2-up) orientation, regardless of their placement in the terminal. Previous research has revealed severe wayfinding decrements for misaligned maps (*26*, *29*), thus explaining the wayfinding problems observed by inexperienced passengers in the present study. It is, therefore, imperative that you-are-here maps, such as those studied here, are designed with previous knowledge of their location within the environment. To carry out this process in the reverse—first designing the map and then looking for its ideal placement—would leave the ultimate alignment of the map to chance (*29*).

Time spent in a passenger terminal is an increasingly important component of the overall travel experience for the passenger. This time, however, is often spent in a state of anxiety, confusion, and disorientation because of the complex architecture and dysfunctional guidance-information systems inherent in many airport passenger terminals. It is therefore important that terminal planners and designers make every possible effort to enact a total guidance system, including architect, signs, maps, and personnel, that facilitates rather than impedes the passengers' orientation process. Furthermore, the design of the system should ensure that these elements are mutually reinforcing (*10*).

Navigating an unfamiliar environment is a formidable task for many. Improving the visual wayfinding system by providing signage at choice points and placing you-are-here maps so that they are aligned congruent with one's forward view would significantly improve the wayfinding abilities of passengers unfamiliar with the airport terminal.

In conclusion, this paper has attempted to bridge the gap between theoretical and applied issues of human orientation and wayfinding in airport terminals. In doing so, these findings attempt to illustrate why the terminal-design process in general, and the design of terminal guidance-information displays in particular, should be guided by the needs of passengers and should therefore reflect an awareness of their attitudes and behavior. For information to be of use to architects, social scientists must have useful and relevant knowledge to contribute a form that is meaningful and timely for designers. It is hoped that the present research shows that many applied-design problems can be answered, or at least guided, through

the process of generalizing and applying results of theoretically based research.

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