

# Spatial Mapping: Connections between Virtual and Physical Navigation

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*Abstract.* Using Lynch's (1960) treatise *The Image of the City* as a model, user navigation of e-retailing web sites was analyzed using defined categories: paths, districts, edges, nodes, and landmarks. Results from this study suggest that elements in the urban landscape and their use by individuals for way finding and legibility may be similar to those necessary for navigating the World Wide Web.

*Keywords.* Spatial mapping; way finding; e-retailing; built environment; world wide web.

## Introduction

Of interest to individuals creating environments in physical space is the way in which users navigate through cyberspace and whether paradigms exist between virtual navigation, physical circulation, and cognitive mapping. Discovery of a relationship may stimulate a new dialogue about visual legibility and navigational structure for both built and virtual landscapes.

## Literature

Three decades of retail and marketing research identifies the relationship between facility-based environmental cues, or atmospherics, and consumer behavior. Berman and Evans (1995) categorize atmospheric stimuli into five groups of elements. Way finding factors appear within the "layout and design variable" unit. Examples in this category include space allocation, placement of merchandise, grouping of merchandise, department locations, traffic flow, waiting cues, furniture, racks and cases, and dead areas (Turley & Millman 2000).

Layout variables noted above parallel earlier

work by Kevin Lynch in his search for imagability and legibility in the urban landscape. In his treatise, *The Image of the City*, Lynch (1960) cites continuous elements as important features for image making. His research points to five categories of elements that provide structure and identity to cognitive images: paths, edges, districts, nodes, and landmarks. In a retail setting, corridors are paths; they expedite movement. Demarcation that exists between the sales floor and stock room is an edge; it serves as a boundary. Store departments are districts; they have a distinct identity. Point-of-purchase is a node; it is an intersection with great activity. Escalators are landmarks; they are easily seen and serve as points of reference.

Way finding is not always easy nor does it invariably terminate with success. Hospitals, government buildings, and educational facilities are notorious examples of confusing and illegible interior landscapes. The way finding strategy a person adopts depends on the type of spatial information available. Orienting systems may include cardinal points, anchor point references, or one's personal universe, but all commence by means of spatial information.

Spatial information identifies distance, direc-

tion, time, and descriptive attributes. It may be newly retrieved from the environment, stored in the mind for period of time, gained from information provided by others, or imagined. The aggregate product of spatial information is identified as spatial knowledge. Researchers partition spatial knowledge into three levels: landmark knowledge, route knowledge, and configuration knowledge (Burnett, Smith & May, 2001).

Epstein (1997) distills much of the way finding theories and literature into two classes: facilitators and obstructers. Facilitators may be environmental cues that support way finding, such as spatial knowledge, or conceivably may be other factors such as individual motivation, experience, and differences in ability. Way finders tend to be unaware of facilitators that aid in locating the designated destination; however many can identify elements that obstruct or confuse their travel navigation. Obstructers may be ambiguous signage, monotonous corridors, or overly stimulated environments that lead to erroneous cognitive maps.

## Methodology

The method chosen for this case study parallels that proposed by Lynch (1960) in his treatise *The Image of the City*. Similar to Lynch, the goal of this project was to investigate the idea of structure and imagability in the environment. While Lynch centered on the physical city, this project concentrated on the World Wide Web. Both studies focused on place-oriented environments in grand scale—the urban landscape and the virtual landscape. Both used field reconnaissance as an instrument for data collection. For over forty years Lynch's supposition has been tested and proved by others to be reliable in its method and findings (see Norburg-Schulz, 1971; Pocock and Hudson, 1978).

Lynch states that “[a]s in any small pilot study, the purpose was to develop ideas and methods,

rather than to prove final facts in a final and determinate way”, (Lynch, p. 14). The same can be said for this study. The sample size was small—sixteen students in a junior-level interior design studio in the United States. The majority of e-retailing sites accessed were based in North America; two were European. Students worked in groups observing and recording behaviors of their teammates as each navigated through separate e-retailing sites. Behaviors were analyzed by each student with findings documented in a three-dimensional navigation model and supportive narrative assessment (Figure 1).



Figure 1. Three-dimensional models of e-retail web site analysis.

To fulfill the studio component of the course, students utilized their navigational and way finding knowledge of a particular e-retailing web site in the design of its physical retail establishment. Relying on the web site analysis from the first phase, students began to explore schematic ideas for an offline archetype of the online store. Designs were digitally constructed using AutoCAD 2000 and 3DS VIZ software. Final solutions were presented to a jury of student peers and faculty.

## Results

Findings from web site analysis identified the five categories of elements reported by Lynch (1960) in *The Image of the City*. Students documented paths, districts, nodes, edges and landmarks in a total of fourteen e-retailing sites. Way finding errors, facilitators, and obstructers were

also noted.

**Districts.** Large categories depict the district. Individual websites form districts inside the World Wide Web. Entry inside the online district is easily recognized by common features such as graphics and layout. Lynch (1960) notes that the milieu of districts can be thematic and this was true for online retailing sites. The site [www.puma.com](http://www.puma.com), for example, has seven districts: pumarunning, pumafootball, pumaville, pumawomen, pumabaseball, pumamotorsport, and pumacricquet. Some of Puma's districts are bilingual, others are geographically defined. Merchandise offered for sale is specific to each of Puma's districts.

**Paths.** As channels of movement, paths were the most common element found in online sites. Virtual paths were akin to those in the urban landscape: they were identifiable, continuous, and directional. Lynch (1960) identified gradients as cumulative changes that distinguish direction. Students classified online examples as "dead end" when the path terminated at a destination and one had to retrace through use of the back button, or "u-turn" when the path motion did not end but looped to continue in the opposite direction.

Path configuration was identified as either linear, radial, networked, meandering or a composite (Ching 1996). Relationships between paths and spaces were also observed. Examples of paths that passed-through space or passed-by space were noted as was the scale and hierarchy of the path (Ching 1996). Path recognition was strongest when linked with an origin and destination point.

**Edges.** Linear boundaries, breaks in continuity, and barriers illustrate the edge. Edges define inside from outside, beginning from end. The most identifiable online edge is the requirement of a plug-in, such as Micromedia Flash. Without the required plug-in, the site is like a gated community, impenetrable without permission. Log-ins, memberships, and registration requirements

function as physical boundaries, monitoring entry and exit. Dead-end conditions also serve as edges, interrupting continuity of motion. Language is an online edge. While not excluded from entry, non-English e-retailing sites became boundaries to student participants. In multilingual web sites each language is a district, the edge serving to reinforce the identity of each individual area.

**Portals are edges.** Embedded links define the end of one web site and the beginning of another. Hot-links can be barriers when they are inoperable or fail; they are barriers when directional, blocking re-entry to the previous site or district. Some links produce a separate window that floats above the web site. These are akin to what Lynch terms "overhead edges" that in the physical world are recognized as elevated railways and bridges.

**Nodes.** Strategic points of entry characterize the node. It is here that interaction between person and computer occurs. In e-retailing sites the shopping cart is a node, a junction of special prominence. Check-out is a consumer goal, a destination point in the shopping experience. At this intersection consumer attention is heightened as is clarity of action. At online auction sites PayPal® and Bidpoint become nodes in the retail landscape.

**Landmarks.** A unique, external point of reference serves as a landmark. In the physical environment this may be a tower or dome, a sign or storefront. Most prominent in e-retailing environments is the company's logo. It is generally visible from many locations, no matter where one navigates throughout the site. Similar to physical landmarks, e-retailing logos contrast with their online surroundings in shape, scale, color and clarity. They are easily singled out from other visual elements in the landscape.

More localized in scale, navigational icons, buttons and bars also serve as landmarks. In assessing [www.bensherman.com](http://www.bensherman.com), one student

characterized the framing border as a landmark noting that it served as a stable anchor in a complex site. Landmarks that occur at intersections or decision points along a path enhance their prominence in the environment. A sequential series of landmarks aid consumers, first by triggering action cues and then to reassure and confirm that past decisions were accurate. In the [www.don-nakaran.com](http://www.don-nakaran.com) website, a student noted that changes in color occurred when actions were taken as a method to encourage consumers that site tools were used correctly. Navigational buttons and icons may be ordered by hierarchy of placement or hierarchy of size (Ching 1996).

Shifting Images. In addition to the five primary categories noted above, Lynch (1960) also identified three additional incidences: element interrelations, image quality, and shifting images. Images that differ in scale, viewpoint, time of day, season and/or weather conditions are classified as shifting images. For instance, images of Central Park appear differently in summer than in winter, at noon versus after dusk, and when viewed from a car, a horse drawn carriage, or on foot. While external conditions such as changes in weather and time of day are absent in e-retailing sites, alterations do occur. Most notable is how frequently web sites are modified and transformed, how they evolve and then expire. Whether offline or online, retailing is constantly in flux given new product, seasonal merchandise, etc. Constant change leaves little opportunity for the retention of path traces and other cognitive mapping cues.

## Discussion

This study was the first comparative analysis of web sites using a methodology authored for the physical-built environment. With this project begins the discussion of how designers might assess web site layout and improve upon the imagability and navigational structure of the virtu-

al landscape.

Lynch's (1960) theoretical framework was chosen due to similar environmental scales and data collection procedures. His analytical model was found to operate not only in physical space but was also applicable to the virtual environment. Results from this study suggest that elements in the urban landscape and their use by individuals for way finding and legibility may be similar to those necessary for navigating the World Wide Web. In concept, this study advances current theory and practice used to design and develop online retailing sites.

One of the strengths of this analytical method is the ability to gain a holistic view of a proposed or existing web site. Unlike many GUI (Graphic User Interface) research practices that isolate small components of site display, such as color recognition or font clarity, Lynch's model provides a framework and structure applicable at both the macro and micro levels. When is the navigational path too long? Are there too many competing landmarks? Where are barriers that might discourage consumer use? Is each district well defined? How might activity nodes become more legible?

While much of the focus and discussion in this paper is directed toward web analysis and design, knowledge gained from this study strengthened students' ideas for their retail design project in studio. Students' design solutions for an offline retail store possessed greater attention to path development and more legible landmarks than in previous years when online navigational analysis was not a studio component. In addition, many of the final offline design solutions proved to be more interactive and experiential than past studio output.

The blurring between online and offline, physical and virtual is another significant outcome from this project. As retailers and interior designers see online and offline sites as similar entities

with common goals and complementary design requirements, both venues merge into a single unified concept and solution. According to Lynch, “[t]he final objective of such a plan is not the physical shape itself, but the quality of an image in the mind” (Lynch, p. 117).

### Summary

This researcher acknowledges the limitations of this study. The sample was small and homogeneous. Student participation was a studio requirement. Unlike Lynch, no in-depth interview of the general public was conducted. As an initial pilot study, however, the project met its objective. The investigation examined and documented parallels that exist between offline and online navigational structures and environmental legibility. Consequently, improved knowledge of online way finding behaviors heightened students’ awareness of circulation and navigational requirements, which in turn enhanced their physical retail design solutions. Understanding of the physical/offline environment and the World Wide Web were both enriched by this study.

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