

Comparing Different Methodologies Used in Wayfinding Research in Library Facilities

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Abstract: People need to navigate library spaces to access and use library services and resources. People navigate facilities by wayfinding: figuring out where they are and how to get to what they need. The most commonly used methods to research wayfinding in libraries are interviews, task completion, and observation. Each method has strengths and weaknesses, so understanding which methods are most effective for different research purposes is crucial to future research in this area. There does not appear to be a relationship between method chosen and library type, but there is indication that some methods are preferred for different research goals and that multiple methods are preferred over single methods. All methods appear to be efficacious for answering research questions, but multiple method studies appear to be more efficacious than single method studies.

Keywords: wayfinding, library facilities, facility evaluation, user assessment, research methods

1. Introduction

A patron walks into a library. What do they need? Where can they find it? How can they get from the entrance of the library to the point of service where they can ask for help? Or to the computer lab? Or to the book stacks? And how do they figure out how to get from point A to point B? These are the questions a patron faces when wayfinding in a library.

The first question when wayfinding is: where am I? Answering this is how a person orients themselves in a space. The second question is: how do I get from here to wherever I am trying to go? Answering this is how a person navigates within the space. Together, orienting and navigating comprise human wayfinding behavior.



For researchers, the questions are different. There are questions of what a person does when they are wayfinding; for example: what are the behaviors they exhibit, and what are they thinking as they undertake these behaviors? There are questions of how to help a person orient and navigate in library spaces; for example: where do we place signs, how many, and what should they say and look like? Underlying all of these questions is the methodological one: what is the most efficacious method for answering my research questions about library patron wayfinding? That is the question that this paper seeks to answer by reviewing the literature of library wayfinding research.

2. Literature Review

Wayfinding contributes to the user experience. “A good user experience is one where the customer is able to do what he or she sets out to do in an efficient manner and is satisfied with the outcome” (Datig, 2015, p. 235). Therefore, it makes sense that the library wayfinding system (e.g., maps, signs, architectural cues) needs to facilitate an efficient wayfinding process for the user that returns a satisfactory result. That means finding the location the user seeks. But, as UX designers know, there is no one-size-fits-all approach to designing an experience that meets the efficiency and satisfaction criteria for all users. In the area of wayfinding, researchers need to understand the wayfinding needs and behaviors of a wide variety of users and plan wayfinding interventions to meet those varied needs.

A variety of research methods have been used to study the user experience in libraries, including ethnographic studies (Klare and Hobbs, 2010) and observational studies (Given and Leckie, 2003). Ethnography is a method that helps a researcher to see what the users sees, understand what the user does in a situation, and how they feel about that situation (Datig, 2015). This type of research often relies on interviews and observation. Other methods used in user experience research are journaling about behaviors or interactions with services (Gabridge et al., 2008) and focus groups to ascertain users’ expectations and experiences (Marquez et al., 2015). Usability studies that use task completion methods are common for evaluating prototypes (Hahn and Morales, 2011; Lin et al., 2013).

A prior review of wayfinding research in LIS looked at what was being published in LIS journals about wayfinding, how much of that was about library wayfinding and in which library types, and how many of the library wayfinding papers were actually research (Mandel, 2017). Mandel concluded there is minimal research being done on wayfinding in libraries, especially in public, school, and special libraries, and that there is a need for empirical research on wayfinding in all library types. What Mandel did not look at was which methods were used and how effective those methods were in relation to the research questions and objectives.

Reviews of the use of research methods are plentiful in the LIS literature. This is likely because “knowledge of methods used in a particular discipline is invaluable for researchers who want to choose among appropriate methods in the conduct of reliable and valid research” (Ullah and Ameen, 2018, p. 53). There are reviews of methods used in studying access services (Long, 2014), cloud computing (Senyo et al., 2018), human-computer interaction (Lopatovska and Arapakis, 2011), and informetrics (Bar-Ilan and Peritz, 2002), among many others. There are papers that review the efficacy of different categories of methods, such as qualitative methods (Shenton and Hay-Gibson, 2009) and mixed methods (Granikov et al., 2020), as well as papers that review all use of methods in LIS (Chu, 2015; Ullah and Ameen, 2018). Chu argued their study should be viewed as “a first step in what will be a further effort to help LIS researchers gain a better understanding of research methods and subsequently to make more informed decisions about research method selection and implementation” (2015, p. 40). This paper is another such step, but this time focused specifically on usage of methods in library wayfinding research, and the efficacy of those methods for answering research questions.

3. Methodology

This literature review was conducted to investigate three research questions:

1. Which methods are used to research wayfinding in libraries?
2. What are the relationships between method(s) chosen, library type, and research purpose?
3. What is the efficacy of the method(s) chosen for answering the stated research questions?

To answer these questions, the researcher undertook a literature review modeled on prior reviews (Bishop and Mandel, 2010; Julien, 1996; Julien and Duggan, 2000; Julien et al., 2011; Mandel, 2017).

The researcher searched the Library, Information Science and Technology Abstracts with Full Text (LISTA) database looking for articles reporting research about wayfinding in libraries. The researcher’s library only has LISTA and Library Literature and Information Science Retrospective (LLIS Retrospective) as specific LIS databases. LLIS Retrospective was not used because it indexes only up to 1983. The search parameters were TX=wayfind* in order to return all articles that included the terms wayfind, wayfinder, wayfinding, and any other variants within the full text of the articles (n=405).

3.1 Narrowing the Results

The search results were limited first to academic journals (n=183) and then to peer reviewed items (n=177). These were sorted by DOCTYPE to remove bibliography, editorial, opinion, and establishment review (n=172). The researcher then reviewed the item abstracts and removed items that were abstracts or reviews of other studies, columns, and research articles that were not about libraries or wayfinding (n=74). Any items that were unclear at this

point were left in the dataset to review the full text of the items, including five with no abstracts. These five items were journal introductions, article reviews, and a research paper that turned out not to be about wayfinding, so all five were removed from the dataset (n=69).

Subject terms were reviewed to identify items that did not list wayfinding or signage as subjects or keywords and did not use these terms in the abstract. The full text of these items was reviewed to remove all items where wayfinding appeared only in citations or author biographies and not in the full text of the article, where wayfinding was mentioned once in the article but was not the focus, that were not about libraries, that used a different meaning or definition of wayfinding (e.g., one article about cataloging), or that were reviews (n=48). Six of these remaining items were in other languages (Czech, Hungarian, German, Portuguese, Spanish, and Slovenian) with no translation available, so the researcher removed them from the dataset, leaving 42 items for content analysis.

3.2 Content Analysis

No existing codebook was available to use, so the codebook was developed iteratively as the researcher analyzed the content of the articles in the dataset. Content analysis began with ascertaining whether the item was reporting research (Y/N). This code resulted in the further removal of eight items that were not research (n=34). The next step was determining the library type. An additional eight items were removed at this stage because they were not reporting research in libraries at all (n=26).

These 26 research articles were coded for whether they had research questions (RQs), the research purpose, methods used, and whether the RQs were answered. Some articles did not report RQs specifically, but had research objectives or hypotheses, and these were coded as Y for having RQs. Research purpose was coded as descriptive, evaluation, explanatory, or exploratory. This was based on authors' explicitly stated purpose for articles or interpreted by the researcher for articles where it was not stated. Methods used were coded based on terminology used in the articles; many articles reported multiple method research, so the total number of methods used per study was also noted. Whether or not RQs were answered was coded Y, N, or n/a with as generous an interpretation of Y as possible and n/a used for articles that did not specify RQs. Articles were also coded based on the underlying research goals; this developed into four categories of app development, understanding how people wayfind in libraries, evaluating facilities/signage, and the combination goal of understanding how people wayfind in libraries *and* evaluating facilities/signage.

4. Findings

Over three-quarters of the research had RQs in some form (n=20; 76.9%). All but one of the public library studies had RQs (n=5; 83.3%), and 72.2% of the academic library studies had RQs (n=13). The school library study did not have

RQs. Of the 20 articles with RQs, the majority answered all of their RQs (n=17; 85.0%), and two answered some of their RQs (10.0%). One of these answered one of the article's two RQs and the other answered two of the article's three RQs. Only one article did not answer any RQs (5.0%); this article was written while the research was still in the analysis phase and reported emergent themes.

The wayfinding research conducted in libraries was primarily for evaluation (n=11; 42.3%) or exploratory (n=11; 42.3%) purposes. An additional study was for evaluation *and* exploratory purposes (3.8%). Only three studies were for explanatory purposes (11.5%), and no studies were for descriptive purposes. Research goals were pretty evenly divided between evaluating facility/signage (n=9; 34.6%) and understanding how people wayfind in libraries (n=10; 38.5%), with an additional two articles reporting research with both of these goals (7.7%). An emerging area of library wayfinding research is app development (n=5; 19.2%). See Table 1 for a list of studies categorized by research goal.

Research Goal	Articles
app development	Dent, V., et al. (2018). Wayfinding serendipity: The BKFNDr mobile app. <i>Code4Lib Journal</i> , 42, 9. https://journal.code4lib.org
	Hahn, J., & Morales, A. (2011). Rapid prototyping a collections-based mobile wayfinding application. <i>Journal of Academic Librarianship</i> , 37(5), 416-422. doi:10.1016/j.acalib.2011.06.001
	Hahn, J., & Ryckman, N. (2012). Modular mobile application design. <i>Code4Lib Journal</i> , 18, 1. https://journal.code4lib.org
	Lin, W., Yueh, H.-P., Wu., H.-Y., & Fu, L.-C. (2013). Developing a service robot for a children's library: A design-based research approach. <i>Journal of the Association for Information Science and Technology</i> , 65(2), 290-301. doi:10.1002/asi.2297
	Orphanides, A. K. (2011). Lessons in public touchscreen development. <i>Code4Lib Journal</i> , 15, 1. https://journal.code4lib.org
evaluating facility/signage	Bedi, S., & Webb, J. (2017). Through the students' lens: Photographic methods for research in library spaces. <i>Evidence Based Library & Information Practice</i> , 12(2), 15-35. doi:10.18438/B8FH33
	Gardner, H. (2018). A user-centric approach to wayfinding signage. <i>Public Services Quarterly</i> , 14(4), 373-385. doi:10.1080/15228959.2018.1522988
	Johnston, M. P., & Mandel, L. H. (2014). Are we leaving them lost in the woods with no breadcrumbs to follow?

Assessing signage systems in school libraries. *School Libraries Worldwide*, 20(2), 38-53.

Mandel, L. H., & Johnston, M. P. (2019). Evaluating library signage: A systematic method for conducting a library signage inventory. *Journal of Librarianship & Information Science*, 51(1), 150-161. doi:10.1177/0961000616681837

Marquez, J. J., Downey, A., & Clement, R. (2015). Walking a mile in the user's shoes: Customer journey mapping as a method to understanding the user experience. *Internet Reference Services Quarterly*, 20(3/4), 135-150. doi:10.1080/10875301.2015.1107000

Pionke, J. J. (2017). Toward holistic accessibility: Narratives from functionally diverse patrons. *Reference & User Services Quarterly*, 57(1), 48-56. doi:10.5860/rusq.57.1.6442

Polger, M. A., & Stempler, A. F. (2014). Out with the old, in with the new: Best practices for replacing library signage. *Public Services Quarterly*, 10(2), 67-95. doi:10.1080/15228959.2014.904210

Schoonover, D., & Kinsley, K. M. (2014). Stories from the stacks: Students lost in the labyrinth. *Journal of Access Services*, 11(3), 175-188. doi:10.1080/15367967.2014.914426

Stempler, A. F., & Polger, M. A. (2013). Do you see the signs? Evaluating language, branding, and design in a library signage audit. *Public Services Quarterly*, 9(2), 121-135. doi:10.1080/15228959.2013.785881

**understanding
how people
wayfind in
libraries**

Bishop, B. W. (2012). Analysis of reference transactions to inform library applications (apps). *Library & Information Science Research*, 34(4), 265-270. doi:10.1016/j.lisr.2012.06.001

Everhart, N., & Escobar, K. L. (2018). Conceptualizing the information seeking of college students on the autism spectrum through participant viewpoint ethnography. *Library & Information Science Research*, 40(3/4), 269-276. doi:10.1016/j.lisr.2018.09.009

Hahn, J., & Zitron, L. (2011). How first-year students navigate the stacks: Implications for improving wayfinding. *Reference & User Services Quarterly*, 51(1), 28-35. doi:10.5860/rusq.51n1.28

Kinsley, K. M., Schoonover, D., & Spitler, J. (2016). GoPro as an ethnographic tool: A wayfinding study in an academic library. *Journal of Access Services*, 13(1), 7-23. doi:10.1080/15367967.2016.1154465

<p>understanding how people wayfind in libraries and evaluating facility/signage</p>	<p>Luo, J. (2018). Habitual wayfinding in academic libraries: Evidence from a liberal arts college. <i>Library & Information Science Research</i>, 40(3/4), 285-295. doi:10.1016/j.lisr.2018.09.011</p>
	<p>Mandel, L. H. (2010). Toward an understanding of library patron wayfinding: Observing patrons' entry routes in a public library <i>Library & Information Science Research</i>, 32(2), 116-130. doi:10.1016/j.lisr.2009.12.004</p>
	<p>Mandel, L. H. (2018). Understanding and describing users' wayfinding behavior in public library facilities. <i>Journal of Librarianship & Information Science</i>, 50(1), 23-33. doi:10.1177/0961000616635243</p>
	<p>Mandel, L. H., & LeMeur, K. A. (2018). User wayfinding strategies in public library facilities. <i>Library & Information Science Research</i>, 40(1), 38-43. doi:10.1016/j.lisr.2018.04.001</p>
	<p>Mucz, D., & Gareau-Brennan, C. (2019). Evaluating customer experience through customer journey mapping and service blueprinting at Edmonton Public Library: An exploratory. <i>Partnership: The Canadian Journal of Library & Information Practice & Research</i>, 14(1), 1-28. doi:10.21083/partnership.v14i1.4743</p>
	<p>Zaugg, H., et al. (2016). Comparing library wayfinding among novices and experts. <i>Performance Measurement & Metrics</i>, 17(1), 70-82. doi:10.1108/PMM-12-2015-0041</p>
	<p>Li, R., & Klippel, A. (2012). Wayfinding in libraries: Can problems be predicted? <i>Journal of Map & Geography Libraries</i>, 8(1), 21-38. doi:10.1080/15420353.2011.622456</p>
	<p>Mandel, L. H. (2013). Finding their way: How public library users wayfind. <i>Library & Information Science Research</i>, 35(4), 264-271. doi:10.1016/j.lisr.2013.04.003</p>

Table 1: Library Wayfinding Research, by Research Goal

All of the articles with the goal of understanding how people wayfind in libraries articulated RQs in some form, and all but one answered them completely. That study answered two of its three RQs. Two of the five articles on app development did not identify RQs (40.0%). Research on evaluating facility/signage had the highest percentage of not articulating RQs (n=4; 44.4%). Also, one of the articles on evaluating facility/signage only partially answered the RQs (one out of two) and another of the articles on evaluating facility/signage did not answer the RQs at all. All four of the articles on evaluating facility/signage that did not identify RQs were research conducted in

academic libraries, as was the article that did not answer its RQs. The article that partially answered the RQs was the one conducted in public, school, and academic libraries.

The most commonly used method was interviews (n=11), followed by task completion (n=9) and observation (n=7) [Table 2]. One of the studies using task completion was task completion with a photo survey and seven were task completion with think aloud protocol. All of the studies using task completion also included some form of observation during the task completion, whether researcher notes, audio and video recordings, or a combination of notes and recording. None of the studies categorized as using “task completion” used the term “experiment,” but the two experiments used task completion with think aloud protocol. If the two experiments were counted in the task completion method, then that method would have been used equivalently to interviews.

Method	n	% of use in a single method study	% of use in a multiple method study
content analysis	4	25.0%	75.0%
experiment	2	50.0%	50.0%
expert review	1	0.0%	100.0%
focus groups	4	25.0%	50.0%
interviews	1	9.1%	90.9%
	1		
log analysis	1	100.0%	0.0%
observation	7	28.6%	71.4%
signage inventory	5	40.0%	60.0%
site visits	1	0.0%	100.0%
space syntax analysis	1	0.0%	100.0%
surveys	6	0.0%	100.0%
task completion	9	22.2%	77.8%

Table 2: Methods Used in Library Wayfinding Research

More studies used multiple methods (n=15; 57.7%) than a single method (n=11; 42.3%). For studies that utilized only one method, observation, task completion, and signage inventory were each used as a standalone method twice, while interviews, experiment, focus group, content analysis, and log analysis were each used as a standalone method once.

Expert review, site visits, and space syntax analysis were each used only once, and as part of multiple method studies [Table 2]. Surveys were used six times, always as part of a multiple method study. Experiment was the only method

used equally in multiple and single method studies. Content analysis, focus groups, interviews, observation, signage inventory, and task completion were all used more frequently in multiple method than single method studies.

Multiple methods were used more than a single method for all research goals except understanding how people wayfind in libraries [Figure 1]. For that goal, single and multiple methods were used equally. Multiple methods were also used more than a single method for research in academic and public libraries [Figure 2].

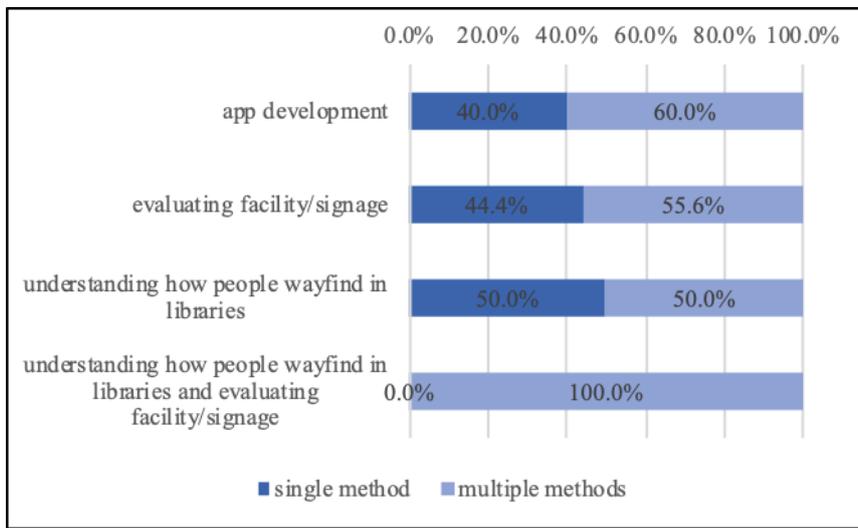


Figure 1: Use of Single and Multiple Methods by Research Goal

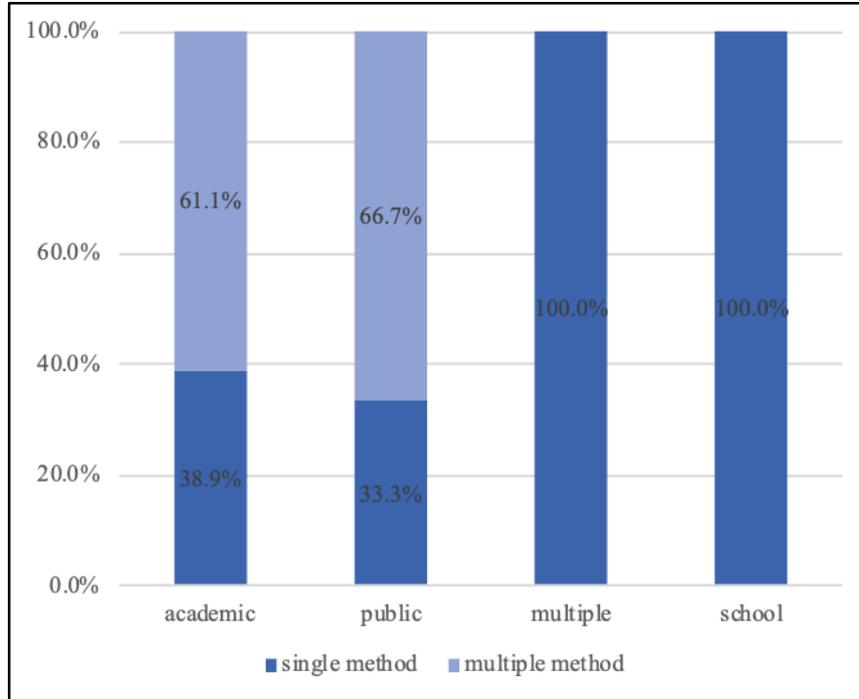


Figure 2: Use of Single and Multiple Methods by Library Type

The methods used varied for each research goal and by library type. The single methods used in app development were log analysis and task completion. The single methods used for evaluating facility/signage were signage inventory, interviews, and focus groups. The single methods used in understanding how people wayfind in libraries were task completion, observation, experiment, and content analysis.

All three multiple method app development studies combined interviews and observation. Two of these added in task completion as well. Of the multiple method studies on evaluating facility/signage, two combined surveys and signage inventory, one combined surveys and content analysis, one combined interviews and task completion, and one combined five different methods: content analysis, site visits, focus groups, interviews, and surveys. Four of the multiple method studies on understanding how people wayfind in libraries combined interviews with another method or methods: interviews + document analysis, focus groups, and task completion (n=1); interviews + observation (n=1); and interviews + task completion (n=2). The remaining multiple method study on understanding how people wayfind in libraries combined surveys and task completion.

Whether used alone or in combination with other methods, both task completion and observation were used in studies with the goals of app development and understanding how people wayfind in libraries [Figure 3]. Observation was not used in any studies evaluating facility/signage, and task completion was only used in one study evaluating facility/signage. Task completion was used predominantly for understanding how people wayfind in libraries (n=6). Interviews were used for all three research goals, although most heavily for understanding how people wayfind in libraries (n=4). App development was the only research goal with an equitable breakdown of use of the top three methods: interviews, task completion, and observation were each used in three studies with the goal of app development.

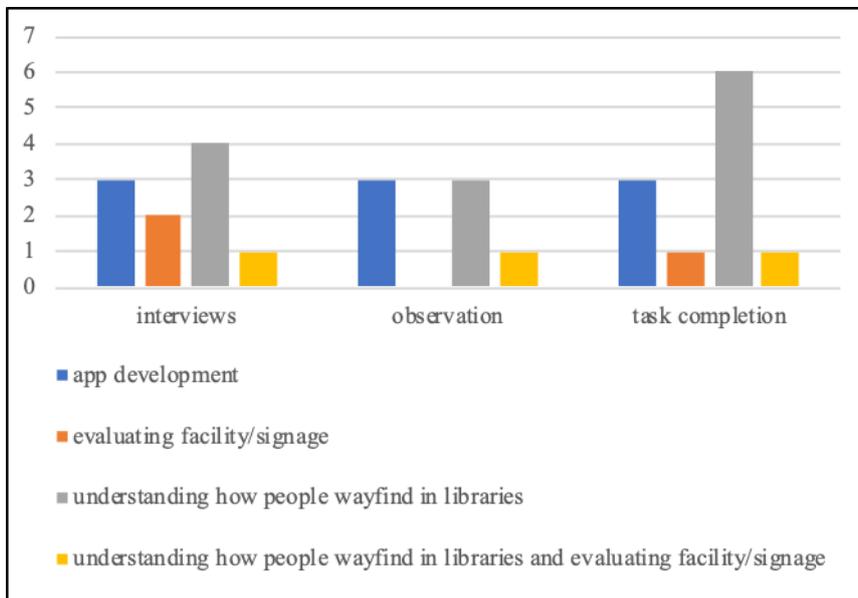


Figure 3: Use of Top Three Methods by Research Goal

5. Discussion

5.1 Library Wayfinding Research in the Context of LIS Research

In considering library wayfinding research in the context of all LIS research, there are a few clear areas where library wayfinding research differs. A key difference is in the purpose of the research. Ullah and Ameen (2018) found 50% of LIS research was descriptive research and only 5% was explanatory, 8% was exploratory, and 7% was evaluation. In contrast, *none* of the wayfinding studies indicated they were descriptive research, but over 80% were either evaluation or exploratory research. Wayfinding research is clearly focused on usability of a facility or app, and the user experience. These foci suggest evaluation of facilities and exploration of user behaviors rather than description.

There are also differences in the methods used. Where Chu (2015) found decreasing usage of multiple methods when comparing papers published 2001-2002 and 2009-2010, this literature review found heavier reliance on multiple methods in library wayfinding research. This might be related to the research topic, but another decade has now passed since 2010, and Chu only looked at three journals, so it is possible that multiple methods are on the rise in LIS as well as in library wayfinding research.

Library wayfinding research also uses different methods as compared to LIS research overall. Both Chu (2016) and Ullah and Ameen (2018) found the top three methods used in LIS research were survey, theoretical analysis, and content analysis. This study found the top three methods used in library wayfinding research to be interviews, task completion, and observation. While surveys and content analysis were found to be used in library wayfinding research, they were used less frequently than in LIS overall, and theoretical analysis was not used in any of the studies analyzed here. Surveys and content analysis seem to be supplemental methods in library wayfinding research. There is a lack of theoretical development in library wayfinding research (Mandel, 2017), so it would not be possible to do much research in this area using theoretical analysis.

5.2 Use of Single vs. Multiple Methods

Although the sample is too small to run correlation statistics, it does not appear that there is any relationship between research goal and methods used. All three research goals were investigated using both single method and multiple method studies, and the methods that were employed varied widely across the studies. There also does not appear to be a relationship between library type and methods used. Multiple methods were preferred over single method studies in public and academic libraries, but again the methods varied widely across the wayfinding research in all library types.

Two of the three studies that were unable to answer all of the RQs relied on a single method: content analysis (Bishop, 2012) and signage inventory (Mandel and Johnston, 2019). One might infer from this that multiple method studies are more efficacious for studying wayfinding in libraries. However, the one study that did not answer any RQs did employ multiple methods (Bedi and Webb, 2017), and most single method studies answered their RQs. Whether or not multiple methods are more efficacious for answering RQs about library wayfinding, multiple methods are employed more frequently than single methods in library user wayfinding research, indicating a preference among library wayfinding researchers to use multiple methods for this topic area. In fact, after conducting an experiment using task completion and document analysis, Li and Klippel (2012) concluded that “For revealing and predicting wayfinding problems that exist in libraries, it is beneficial to combine methods

that address both the quantitative assessment of physical environments and allow for evaluating individual behaviors” (p. 36).

5.3 Efficacy of the Top Three Methods for Library Wayfinding Research

Interviews were used frequently in combination with other methods. The question arises: are interviews not useful for researching wayfinding when that is the only method used? The study that employed photo-elicitation interviews is the only one that didn't answer its RQs (Bedi and Webb, 2017), giving more support to that idea. However, interviews have many positives. For example, in the photo-elicitation interviews, participants were able to drive the interviews and co-construct knowledge, and the use of visual references facilitated discussion (Bedi and Webb, 2017). Interviews alone were sufficient to answer the RQs and present a rich report of participants' perceptions of a library facility's accessibility in one study (Pionke, 2017).

Observation was used both as a standalone method and in combination with other methods. As a standalone method, authors noted limitations. For example, by relying on observation alone, Luo (2018) had to guess at the end of users' observed routes when they ended beyond the observer's sightline. Also, observation cannot address any *why* questions about user wayfinding (Mandel, 2010). When used in combination with other methods, observation can add details, such as researchers observing people use signs during task completion that they do not mention in debriefing interviews (Hahn and Zitron, 2011).

Task completion was the only method used frequently both as a single method and as part of a multiple method study. This may indicate a high efficacy of task completion since it can be used both alone and in combination. In fact, when experiment with task completion is added to the task completion method, that method ties for interviews as most commonly employed. Even in a study with a small sample (n=2), the use of task completion resulted in a plethora of data for analysis (Everhart and Escobar, 2018). Task completion was also purposely used by Kinsley et al. (2016) because their previous study using surveys and content analysis (Schoonover and Kinsley, 2014) didn't give real-time wayfinding data, decision and fail points, or student thoughts as they were wayfinding. Johnston and Mandel (2014) and Mandel (2013) also reported planning to employ task completion methods in follow-up to their studies to add to the knowledgebase.

5.4 Use of Different Methods for Different Research Goals

There does seem to be a difference in which methods are preferred for different research goal. Mandel (2013, 2018) reported that neither observation nor interviews were efficacious methods for ascertaining library patrons' use of cognitive wayfinding strategies because the strategies were neither observable behaviors nor recalled by patrons in interviews. In one paper, Mandel (2013) ended up recommending task completion with think aloud protocol as a method that would be more likely to be efficacious in ascertaining patron use of

cognitive wayfinding strategies since it would not be reliant on patrons' recall of past wayfinding activities (like interviews). In contrast to Mandel (2013, 2018), Hahn and Ryckman (2012) noted that interviews and observation were effective methods for their evaluation study involving rapid prototyping of a mobile wayfinding app.

A wider variety of methods were used for evaluating facility/signage and understanding how people wayfind in libraries (seven different methods each) than for app development (five different methods). Some methods were used only for one research goal: log analysis for app development (Orphanides, 2011), site visits for evaluating facility/signage to compare other library facilities to the research site (Gardner, 2018), and expert review (Mandel, 2013) and space syntax analysis (Li and Klippel, 2012) for the combination goal of understanding how people wayfind in libraries and evaluating facility/signage. Understanding how people wayfind in libraries was the only research goal that did not utilize a unique method.

App development research primarily used the same three methods as library wayfinding research overall, with two additions: log analysis and surveys. Task completion was used for researching wayfinding app development both as a standalone method (Dent et al., 2018), and in multiple method studies where it was combined with interviews and observation (Hahn and Morales, 2011), and with interviews, surveys, and observation (Lin et al., 2014). In all three cases, task completion was used to field test a prototype of an app.

Different methods were used more frequently for evaluating facility/signage than for library wayfinding research overall. Observation was not used at all, and signage inventory and surveys were used more than interviews or task completion. It is quite logical that signage inventory would be a preferred method for evaluating facility/signage and not the other research goals since that method is designed specifically for this research goal. Surveys were used to ascertain patrons' experience with the facility (Gardner, 2018), how they wayfind in a facility (Schoonover and Kinsley, 2014), and their preferences for library signage (Polger and Stempler, 2014; Stempler and Polger, 2013). These are all *why* questions that could not be investigated using observation or task completion. While they could be investigated using interviews, these researchers sought larger samples via surveys than they could have attained through interviews.

Studies with the goal of understanding how people wayfind in libraries used the same three methods most frequently as in library wayfinding research overall. This goal and the combination goal of understanding how people wayfind in libraries and evaluating library/signage were the only two goals to utilize experiments. Both studies that utilized the experiment method were testing user cognitive activities while wayfinding (Li and Klippel, 2012; Mandel and LeMeur, 2018). The difference between studies that used task completion

without calling it an experiment and these two studies seems to be the goal of measuring unobservable cognitive activities while people are wayfinding versus testing the effectiveness of a wayfinding tool like an app (Dent et al., 2018; Hahn and Morales, 2011; Lin et al., 2014), measuring observable behaviors like speed and efficiency of wayfinding (Zaugg et al., 2016), determining which wayfinding cues patrons use (Bedi and Webb, 2017; Everhart and Escobar, 2018; Hahn and Zitron, 2011; Zaugg et al., 2016), or identifying where people get stuck in wayfinding decision-making (Hahn and Zitron, 2011; Kinsley et al., 2016; Mucz and Gareau-Brennan, 2019).

6. Conclusion

A review of the LIS literature on library wayfinding is a useful mechanism for determining which methods are being used in library wayfinding research, as well as the efficacy of those methods for answering research questions. Library wayfinding research uses a wide variety of methods. Nearly all studies reviewed in this paper were able to answer their research questions, indicating that the variety of methods in use are all efficacious for studying the topic. There does appear to be increased efficacy for certain methods when used in combination with other methods, particularly interviews. Task completion is an especially efficacious method for research with the goal of understanding how people wayfind in libraries. Observation and interviews seem more equally efficacious across the three research goals of app development, evaluating facility/signage, and understanding how people wayfind in libraries. Use of multiple methods is preferred over use of single methods across all three research goals. Any research that seeks to understand human behavior is complex, and it is logical that complex research calls for multiple methods to evaluate, explore, and explain the different facets of human behavior.

References

- Bar-Ilan, J., & Peritz, B. C. (2002). Informetric theories and methods for exploring the internet: An analytical survey of recent research literature. *Library Trends*, 50(3), 371-392. <https://www.press.jhu.edu/journals/library-trends>
- Bedi, S., & Webb, J. (2017). Through the students' lens: Photographic methods for research in library spaces. *Evidence Based Library & Information Practice*, 12(2), 15-35. doi:10.18438/B8FH33
- Bishop, B. W. (2012). Analysis of reference transactions to inform library applications (apps). *Library & Information Science Research*, 34(4), 265-270. doi:10.1016/j.lisr.2012.06.001
- Bishop, B. W., & Mandel, L. H. (2010). Utilizing geographic information systems (GIS) in library research. *Library Hi Tech*, 28(4), 536-547. <http://dx.doi.org/10.1108/07378831011096213>
- Chu, H. (2015). Research methods in library and information science: A content analysis. *Library and Information Science Research*, 37(1), 36-41. <https://doi.org/10.1016/j.lisr.2014.09.003>
- Datig, I. (2015). Walking in your users' shoes: An introduction to user experience research as a tool for developing user-centered libraries. *College & Undergraduate Libraries*, 22(3/4), 234-246. doi:10.1080/10691316.2015.1060143

- Dent, V., et al. (2018). Wayfinding serendipity: The BKFNDr mobile app. *Code4Lib Journal*, 42, 9. <https://journal.code4lib.org>
- Everhart, N., & Escobar, K. L. (2018). Conceptualizing the information seeking of college students on the autism spectrum through participant viewpoint ethnography. *Library & Information Science Research*, 40(3/4), 269-276. doi:10.1016/j.lisr.2018.09.009
- Gabridge, T., Gaskell, M., & Stout, A. (2008). Information seeking through students' eyes: The MIT photo diary study. *College & Research Libraries*, 69(6), 510-522. <https://doi-org.uri.idm.oclc.org/10.5860/crl.69.6.510>
- Given, L. M., & Leckie, G. J. (2003). 'Sweeping' the library: Mapping the social activity space of the public library. *Library & Information Science Research*, 25(4), 365-385. [https://doi.org/10.1016/S0740-8188\(03\)00049-5](https://doi.org/10.1016/S0740-8188(03)00049-5)
- Gardner, H. (2018). A user-centric approach to wayfinding signage. *Public Services Quarterly*, 14(4), 373-385. doi:10.1080/15228959.2018.1522988
- Granikov, V., Hong, Q. N., Crist, E., & Pluye, P. (2020). Mixed methods research in library and information science: A methodological review. *Library & Information Science Research*, 42(1), 1-10. <https://doi.org/10.1016/j.lisr.2020.101003>
- Hahn, J., & Morales, A. (2011). Rapid prototyping a collections-based mobile wayfinding application. *Journal of Academic Librarianship*, 37(5), 416-422. doi:10.1016/j.acalib.2011.06.001
- Hahn, J., & Ryckman, N. (2012). Modular mobile application design. *Code4Lib Journal*, 18, 1. <https://journal.code4lib.org>
- Hahn, J., & Zitron, L. (2011). How first-year students navigate the stacks: Implications for improving wayfinding. *Reference & User Services Quarterly*, 51(1), 28-35. doi:10.5860/rusq.51n1.28
- Johnston, M. P., & Mandel, L. H. (2014). Are we leaving them lost in the woods with no breadcrumbs to follow? Assessing signage systems in school libraries. *School Libraries Worldwide*, 20(2), 38-53.
- Julien, H. (1996). A content analysis of the recent information needs and uses literature. *Library and Information Science Research*, 18(1), 53-65. [http://dx.doi.org/10.1016/S0740-8188\(96\)90030-4](http://dx.doi.org/10.1016/S0740-8188(96)90030-4)
- Julien, H., & Duggan, L. J. (2000). A longitudinal analysis of the information needs and uses literature. *Library and Information Science Research*, 22(3), 291-309. [http://dx.doi.org/10.1016/S0740-8188\(99\)00057-2](http://dx.doi.org/10.1016/S0740-8188(99)00057-2)
- Julien, H., Pecoskie, J. L., & Reed, K. (2011). Trends in information behavior research, 1999-2008: A content analysis. *Library and Information Science Research*, 33(1), 19-24. <http://dx.doi.org/10.1016/j.lisr.2010.07.014>
- Kinsley, K. M., Schoonover, D., & Spitzer, J. (2016). GoPro as an ethnographic tool: A wayfinding study in an academic library. *Journal of Access Services*, 13(1), 7-23. doi:10.1080/15367967.2016.1154465
- Klare, D., & Hobbs, K. (2010). Digital ethnography: Library web page redesign among digital natives. *Journal of Electronic Resources Librarianship*, 23(2), 97-110. <https://doi.org/10.1080/1941126X.2011.576946>
- Li, R., & Klippel, A. (2012). Wayfinding in libraries: Can problems be predicted? *Journal of Map & Geography Libraries*, 8(1), 21-38. doi:10.1080/15420353.2011.622456
- Lin, W., Yueh, H.-P., Wu, H.-Y., & Fu, L.-C. (2013). Developing a service robot for a children's library: A design-based research approach. *Journal of the Association for Information Science and Technology*, 65(2), 290-301. doi:10.1002/asi.22975
- Long, D. (2014). Assessment and evaluation methods for access services. *Journal of Access Services*, 11(3), 206-217. doi:10.1080/15367967.2014.914422

- Lopatovska, I., & Arapakis, I. (2011). Theories, methods and current research on emotions in library and information science, information retrieval and human-computer interaction. *Information Processing & Management*, 47(4), 575-592. doi:10.1016/j.ipm.2010.09.001
- Luo, J. (2018). Habitual wayfinding in academic libraries: Evidence from a liberal arts college. *Library & Information Science Research*, 40(3/4), 285-295. doi:10.1016/j.lisr.2018.09.011
- Mandel, L. H. (2010). Toward an understanding of library patron wayfinding: Observing patrons' entry routes in a public library *Library & Information Science Research*, 32(2), 116-130. doi:10.1016/j.lisr.2009.12.004
- Mandel, L. H. (2013). Finding their way: How public library users wayfind. *Library & Information Science Research*, 35(4), 264-271. doi:10.1016/j.lisr.2013.04.003
- Mandel, L. H. (2017). Wayfinding research in library and information studies: State of the field. *Evidence Based Library and Information Practice*, 12(2), 133-148. <https://doi.org/10.18438/B8395P>
- Mandel, L. H. (2018). Understanding and describing users' wayfinding behavior in public library facilities. *Journal of Librarianship & Information Science*, 50(1), 23-33. doi:10.1177/0961000616635243
- Mandel, L. H., & Johnston, M. P. (2019). Evaluating library signage: A systematic method for conducting a library signage inventory. *Journal of Librarianship & Information Science*, 51(1), 150-161. doi:10.1177/0961000616681837
- Mandel, L. H., & LeMeur, K. A. (2018). User wayfinding strategies in public library facilities. *Library & Information Science Research*, 40(1), 38-43. doi:10.1016/j.lisr.2018.04.001
- Marquez, J. J., Downey, A., & Clement, R. (2015). Walking a mile in the user's shoes: Customer journey mapping as a method to understanding the user experience. *Internet Reference Services Quarterly*, 20(3/4), 135-150. doi:10.1080/10875301.2015.1107000
- Mucz, D., & Gareau-Brennan, C. (2019). Evaluating customer experience through customer journey mapping and service blueprinting at Edmonton Public Library: An exploratory. *Partnership: The Canadian Journal of Library & Information Practice & Research*, 14(1), 1-28. doi:10.21083/partnership.v14i1.4743
- Orphanides, A. K. (2011). Lessons in public touchscreen development. *Code4Lib Journal*, 15, 1. <https://journal.code4lib.org>
- Pionke, J. J. (2017). Toward holistic accessibility: Narratives from functionally diverse patrons. *Reference & User Services Quarterly*, 57(1), 48-56. doi:10.5860/rusq.57.1.6442
- Polger, M. A., & Stempler, A. F. (2014). Out with the old, in with the new: Best practices for replacing library signage. *Public Services Quarterly*, 10(2), 67-95. doi:10.1080/15228959.2014.904210
- Schoonover, D., & Kinsley, K. M. (2014). Stories from the stacks: Students lost in the labyrinth. *Journal of Access Services*, 11(3), 175-188. doi:10.1080/15367967.2014.914426
- Senyo, P. K., Addae, E., & Boateng, R. (2018). Cloud computing research: A review of research themes, frameworks, methods and future research directions. *International Journal of Information Management*, 38(1), 128-139. doi:10.1016/j.ijinfomgt.2017.07.007
- Shenton, A. K., & Hay-Gibson, N. V. (2009). Dilemmas and further debates in qualitative method. *Education for Information*, 27(1), 21-37. doi:10.3233/EFI-2009-0870.

- Stempler, A. F., & Polger, M. A. (2013). Do you see the signs? Evaluating language, branding, and design in a library signage audit. *Public Services Quarterly*, 9(2), 121-135. doi:10.1080/15228959.2013.785881
- Ullah, A., & Ameen, K. (2018). Account of methodologies and methods applied in LIS research: A systematic review. *Library & Information Science Research*, 40(1), 53-60. <https://doi.org/10.1016/j.lisr.2018.03.002>
- Zaugg, H., et al. (2016). Comparing library wayfinding among novices and experts. *Performance Measurement & Metrics*, 17(1), 70-82. doi:10.1108/PMM-12-2015-0041