

THESIS

EXAMINING KNOWLEDGE TRANSFER BETWEEN DESIGN RESEARCH AND HEALTHCARE  
DESIGN PRACTICES: AN INTERPRETIVE COMPARATIVE CASE STUDY

Submitted by

Alyssa Iedema

Department of Design and Merchandising

In partial fulfillment of the requirements

For the Degree of Master of Science

Colorado State University

Fort Collins, Colorado

Spring 2023

Master's Committee:

Advisor: Laura Malinin

Co-Advisor: Jain Kwon

Daniel Graham

Copyright by Alyssa Iedema 2023

All Rights Reserved

## ABSTRACT

### EXAMINING KNOWLEDGE TRANSFER BETWEEN DESIGN RESEARCH AND HEALTHCARE DESIGN PRACTICES: AN INTERPRETIVE COMPARATIVE CASE STUDY

The utilization of research to inform design decisions has been a rising topic of discussion. There is a gap between design research, how it is communicated and its accessibility, and the design industry, the ones responsible for designing and building the environments people inhabit (Huber, 2017). There have been few studies investigating how interior design practitioners are acquiring and applying research to inform their design decisions (e.g., Dickson and White, 1993; Huber, 2016b; 2017). Architecture and design firms have started to invest in developing in-house research labs in attempt to bridge the gap (Donofrio, 2013; Huber, 2016a). The purpose of this comparative case study is to explore how architecture and design firms in the United States are engaging with design research throughout the design process, including if and how engagement differs between firms with in-house research labs and those without. A total of 8 firms were studied (4 of these had in-house research labs). A content analysis of each firm's website was conducted to understand how they are describing their engagement with research to find essential themes across cases. Ten individuals, consisting of interior design practitioners and design researchers, were then interviewed to gain an understanding of research utilization from their perspective. Findings suggest that eight themes in which research is involved in the design process: 1) motivation for research 2) definition of research 3) organization of research 4) identifying knowledge 5) selecting knowledge 6) adapting knowledge 7) implementing knowledge 8) disseminating knowledge. Findings also suggest that there is an inconsistent communication and expectation of research across all firms.

## ACKNOWLEDGMENTS

This research is supported by my committee members Dr. Jain Kwon and Dr. Daniel Graham. A special acknowledgement goes to Dr. Laura Malinin for her continuous support, patience, and knowledge in helping me make this research possible. Thank you all for your efforts and support in this journey.

## AUTHOR BIOGRAPHY

Alyssa Iedema is a graduate student at Colorado State University in the Department of Design and Merchandising specializing in Interior Design. After earning her Bachelor of Fine Arts in Interior Design at South Dakota State University, she became interested in understanding how design research can be used to inform why and how we design the built environment. This thesis is her first steps in attempting to increase the utilization of design research in the design industry.

## DEDICATION

I would like to dedicate this thesis to my parents for their continuous love and support. Thank you for giving me the drive and discipline to accomplish my goals.

## TABLE OF CONTENTS

ABSTRACT .....	ii
ACKNOWLEDGMENTS.....	iii
AUTHOR BIOGRAPHY .....	iv
DEDICATION .....	v
DEFINITION OF TERMS.....	viii
INTRODUCTION.....	1
LITERATURE REVIEW.....	2
Research Production and Application.....	2
Bridging the Gap.....	3
Research Informed Design.....	3
Evidence Based Design.....	4
THEORETICAL FRAMEWORK .....	7
RESEARCH QUESTIONS.....	9
METHODOLOGY .....	9
Case Selection.....	10
Data Collection .....	11
Participant Selection and Recruitment.....	12
Data Analysis .....	13
Research Quality .....	13
FINDINGS .....	15
Part One: Firm Website Content Analysis.....	15
Part Two: Informant Interviews.....	16
LIMITATIONS AND CONCLUSIONS .....	25
FUTURE RESEARCH .....	27

REFERENCES..... 28

APPENDIX A: INTERVIEW QUESTIONNAIRE..... 32

APPENDIX B: IRB APPROVAL FORM ..... 33

## DEFINITION OF TERMS

**Best Practice:** “Procedure that has been shown by research and experience to produce optimal results and that is established or proposed as a standard suitable for widespread adoption” (Merriam-Webster, n.d.)

**Design Research:** “...a systematic inquiry whose goal is knowledge of, or in, the embodiment of configuration, composition, structure, purpose, value, and meaning in man-made things and systems” (Bayazit, 2004, p. 16; Jacques & Powell, 1981).

**Evidence:** “...many forms of knowledge including tacit expert opinion or personal experience” (Peavey and Vander Wyst, 2017, p. 144).

**Evidence Based Design (EBD):** “...the process of making decisions about the creation of an environmental design by critically and appropriately integrating the sum of credible evidence, practitioner design expertise, client and population needs, and preferences and resources, in the context of the project in order to achieve project objectives” (Peavey and Vander Wyst, 2017, p. 150).

**Explicit Knowledge:** based on academic research findings and often comes to fruition in words or numbers. It is broad in that it speaks to the larger design problem at hand (Rhoads, 2010).

**In House Research:** architecture firms that have a dedicated research lab in the headquarters of the firm. The headquarters research lab is in contact with the research arm of each office and typically has a database they use to communicate their findings to the other firm locations.

**Primary Research:** Research conducted by the researcher for a specific problem and adds new knowledge to the existing body of knowledge (Driscoll, 2011; Hox & Boeije, 2005)

**Research:** “...a form of explicit knowledge gained through observation and measurement and created through a deductive or inductive process...” (Peavey and Vander Wyst, 2017, p. 144).

**Research Arm:** the architecture firm has a research lab within the office. The research lab communicates with the in-house design researchers when acquiring and applying knowledge to projects.

**Research Informed Design (RID):** “...the process of applying credible research in integration with project-, client-, or population-specific empirical inquiry to inform the creation of environmental design and achieve project objectives” (Peavey and Vander Wyst, 2017, p. 150).

**Research Team:** a team of individuals, often developed through a bottom-up approach, that is interested in applying research to design projects. The research team often uses external, secondary resources to inform their design decisions.

**Secondary Research:** Research that has already been published and was created by others (Driscoll, 2011; Hox & Boeije, 2005)

**Tacit Knowledge:** is developed through working with clients, working on various projects, and years spent in the industry, and because of that it is often personalized to the client and project (Huber, 2016; Martin, 2014; Rhoads, 2010)

## **Introduction**

The concept of design research has been around for decades; however, the application and interpretation of design research continues to be brought into question. In 1980, Bruce Archer, a Professor of Design Research at the Royal College of Art, shared his definition of design research at the Design Research Society Conference. He claimed that design research is "...a systematic inquiry whose goal is knowledge of, or in, the embodiment of configuration, composition, structure, purpose, value, and meaning in man-made things and systems" (Bayazit, 2004, p. 16; Jacques & Powell, 1981). Initially, design research intended to make design a science (Cross et al., 1981; Cross, 2006 [1982]; Cross, 2012; Simon, 1996 [1968]). Scholars later challenged that viewpoint, arguing that because the design process is not linear and design problems are often ill-defined, they cannot fit into a systematic approach. Cross et al. (1981) describes the role of research in design as being two-fold, using both explicit knowledge and tacit knowledge to inform design decisions. Cross argues that explicit knowledge ensures the quality of design solutions, and tacit knowledge of the interior designer develops creative design solutions. Unfortunately, there has been a long history of a disconnect from design research production to its application. Until recently, academia was responsible for conducting design research; however, the academic design researchers' language rarely aligns with the interior design practitioners' language (Anåker et al., 2017; Bik & Bouwens, 2018; Huber, 2016a; 2016b; 2017; 2021; Rhoads, 2010; Seidel, 1985; Sommer, 1997; Wild et al., 2010). In practice, the design process often consists of visuals such as 3D modeling, sketching, presentations, and diagramming, whereas design research is communicated through publications that are broad, extensive, and often conceptual (Backer, 1991; 1993; Ching, 2009; Criado-Perez et al., 2020; Huber, 2016a; 2021; Lawson, 2005). Knowledge about our environment is not reaching those responsible for designing our environment, and this gap in communication hinders the growth of the field of interior design (Huber, 2017).

## **Literature Review**

### ***Research Production and Application***

Peavey and Vander Wyst (2017) offered an overarching definition of research: "...a form of explicit knowledge gained through observation and measurement and created through a deductive or inductive process..." (p. 144). However, the definition of research has been interpreted differently by design researchers in academia and interior design practitioners. Academia refers to research as "knowledge generation," and industry refers to research as "collecting existing information" (Dickinson et al., 2009; Huber, 2016b; 2021; Martin, 2014; Stichler, 2016). This leads to discrepancies in how academia and the design industry conduct research. Design research in the academic setting is creating new knowledge through experiments and meta-analysis of existing knowledge to identify themes and gaps. Academia design researchers work through a rigorous process with Institutional Review Board (IRB) approvals, peer review processes, and extensive access to funding for resources (Dickinson et al., 2009; Grady, 2015; Huber, 2021). Researchers then often publish their work in subscription-based journals. Research in practice is more focused on collecting information to understand a specific design problem. Interior design practitioners are bound by timelines and may resort to accessible knowledge over quality knowledge (Huber, 2016a; Huber, 2016b). In a survey, Dickson and White (1993) found that under half of the respondents did not reference peer-reviewed journal articles. In addition, Huber (2016b) conducted a survey and found that only 12% of interior designers reference journal articles when researching a design problem. Participants claimed this is because they are unaware of the relevant journals and find the articles extensive and impractical. Instead, they refer to non-peer-reviewed sources such as magazines, blog posts, and other internet-based resources. As interior designers acquire knowledge, they work through an iterative user testing process; the end users' feedback is often a vital part of this process. Once the interior design practitioner implements the design solution, they seldom disseminate the knowledge outside the design firm. Design research should be a circular communication process between academia and practice where academia informs action and design outcomes inform topics (Huber, 2017). Even

though the interior design field is progressing, and the demands of clients are increasing, it is unclear if interior designers' engagement with scientific knowledge has changed (Huber, 2016a).

### ***Bridging the Gap***

To balance explicit and tacit knowledge and bridge the communication gap between academia and practice, conceptual frameworks were developed to guide interior design practitioners in acquiring and applying knowledge to design problems: Research Informed Design (RID) and Evidence-Based Design (EBD). Because there are many model variations of the RID process and the EBD process, for this study, Figure 1 is a synthesis of two different models to develop a comprehensive RID model, and Figure 2 is a synthesis of two different models to develop a comprehensive EBD model. In the RID process model for this study, the gathering of knowledge, evaluate and select, and prototype and test steps were derived from Tomasi and Weeks' (2006) model as they emphasized the allotted resources, prototyping, user testing, and user feedback that characterize the RID process. Peavey and Vander Wyst's (2017) model guided the organization of how an interior designer would move through the steps. In this study's EBD process model, the gathering of knowledge and interpret and translate steps were derived from The Center for Health Design's (2021) model. The design development and hypothesis steps were the same in both models. The implement and monitor step in the model for this study is a combination of both models. For clarity, the pre- and post-data collection steps were derived from Peavey and Vander Wyst's (2017).

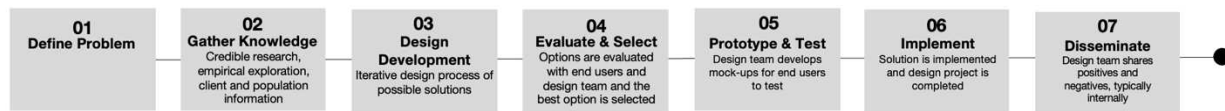
Despite their differences, RID and EBD are often used interchangeably in literature and practice.

However, this distinction may influence how one defines and conducts design research (Peavey & Vander Wyst, 2017; Stichler, 2013).

### ***Research Informed Design***

The field of education developed the RID model as an approach to limit the trial-and-error process and add confidence to one's decision-making processes (Burghardt & Hacker, 2014; Peavey & Vander Wyst, 2017). Research informed practices in the field of education prompted students to conduct secondary research, such as literature reviews, and primary research, such as interviews and observations (Driscoll,

2011; Hox & Boeije, 2005). The RID process uses "credible research, empirical exploration, and client and population information" to best inform decision-making (Peavey & Vander Wyst, 2017, p.150). RID emphasizes prototyping, user testing, and the end user's feedback before implementing the solution (Figure 1). RID focuses on finding the best available knowledge during the design process to inform design solutions and achieve the project goals. Because of this, the RID process typically ends when the project ends (Burghardt & Hacker, 2014; Peavey & Vander Wyst, 2017; Stichler, 2016).

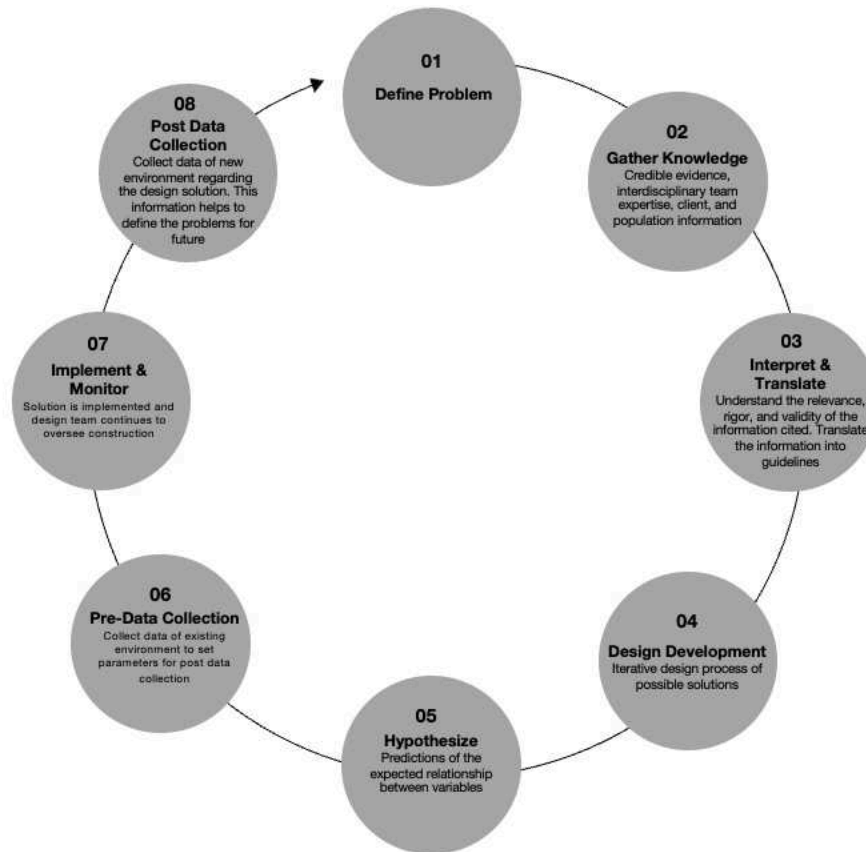


**Figure 1**  
*Research Informed Design Model*

Adapted from "Evidence-based design and research-informed design: What's the difference? Conceptual definitions and comparative analysis" by E. Peavey and K. B. Vander Wyst, 2017, *HERD: Health Environments Research & Design Journal*, 10(5), 143-156 and "Informed design as a practical problem-solving approach" by C. Tomasi and M. Weeks, 2006, *2006 Annual Conference & Exposition*, 11-761.

### ***Evidence Based Design***

Evidence-based medicine came to fruition in the late 20th century as Archie Cochrane pushed for a more systematic, reliable, and collaborative approach to decision-making in healthcare fields (Cochrane, 1972; Peavey & Vander Wyst, 2017; Sackett et al., 1996). This push for the best available evidence to inform decisions made its way into varying health-related fields, including the design of healthcare facilities (Peavey & Vander Wyst, 2017; Ulrich, 1984; Ulrich et al., 2008; Ulrich et al., 2010 Zborowsky & Bunker-Hellmich, 2010). EBD has many definitions, but for this study, EBD is "the process of making decisions about the creation of an environmental design by critically and appropriately integrate the sum of credible evidence, practitioner design expertise, client and population needs, and preferences and resources...." (Peavey & Vander Wyst, 2017, p. 150). Unlike RID, EBD focuses on finding the best available knowledge during the design process and creating new knowledge to inform future projects after the project is complete (Peavey & Vander Wyst, 2017).



**Figure 2**

*Evidence-Based Design Model*

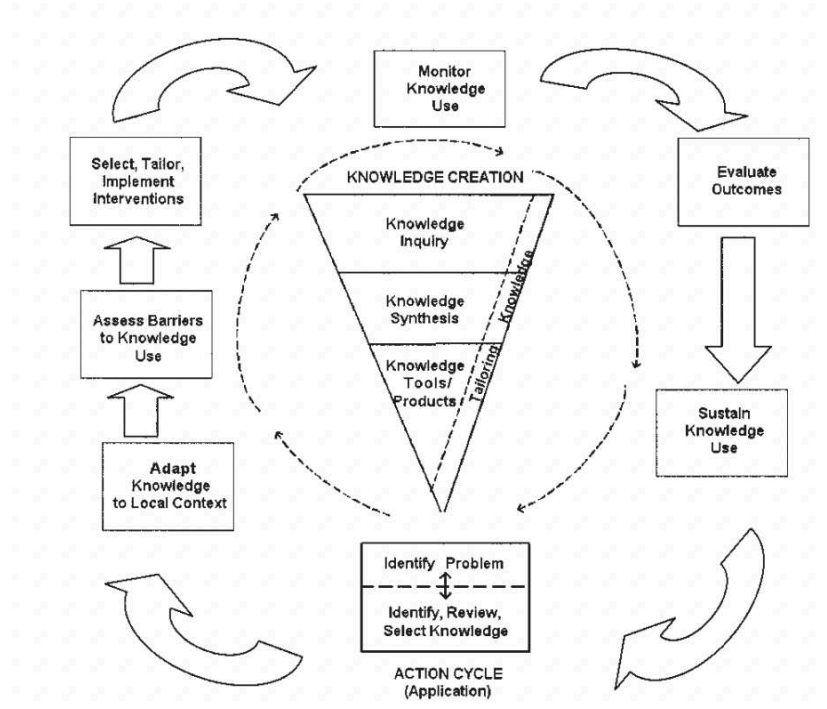
Adapted from “Evidence-based design and research-informed design: What’s the difference? Conceptual definitions and comparative analysis” by E. Peavey and K. B. Vander Wyst, 2017, *HERD: Health Environments Research & Design Journal*, 10(5), 143-156 and “About EBD” by The Center for Health Design, 2021, <https://www.healthdesign.org/certification-outreach/edac/about-ebd>

Even though both conceptual frameworks intend to guide ways of acquiring and applying knowledge to design problems, neither process analyzes the translation of knowledge into tangible design solutions. Furthermore, there are limited studies investigating how interior designers work through these frameworks, what resources they are using to inform design decisions, and understand the application of research in the design process from their perspective (Huber, 2016a; 2017). As the demand for scientific knowledge to inform design solutions continues to grow, many large and midsize architecture and design firms are developing in-house research labs rather than solely relying on outside resources (Donofrio, 2013; Huber, 2016a). It depends on the firm in how it organizes its research lab and conducts research; however, it is assumed to be a combination of academic and industry research processes in that they may

create new knowledge and refer to external resources (Huber, 2016a). There is still a concern about the translation of knowledge due to the different methods of communication. For efficient and effective translation of knowledge, there is a need to emphasize communication between knowledge creators and users (Huber, 2017; Zeisel, 1984). This communication gap, again, hinders the growth and validity of the field of interior design.

## Theoretical Framework

The Knowledge-to-Action (KTA) framework, developed by Graham et al. (2006), guided the data collection and analysis for this study (Figure 3). Graham et al. (2006) designed KTA to become a feedback loop between knowledge creators and users. Knowledge creators should use the feedback from the knowledge users to tailor future study topics and how they frame, communicate, and disseminate future research. KTA was initially developed to be used in the medical field but has recently been brought into Environmental Health Sciences (Pettibone et al., 2018; Sudsawad, 2007). It can complement EBD and RID frameworks, which provide little detail on the transfer of knowledge from creators to users nor how users might inform knowledge creation. The KTA aims to make knowledge translation more tangible by emphasizing the two main processes: knowledge creation and action on the knowledge.



**Figure 3**  
*Knowledge-to-Action Framework*

From Graham, I. D., Logan, J., Harrison, M. B., Straus, S. E., Tetroe, J., Caswell, W., & Robinson, N. (2006). Lost in knowledge translation: time for a map? *Journal of Continuing Education in the Health Professions*, 26(1), p.19. Reprinted with permission from John Wiley and Sons.

The knowledge creation funnel includes three types of knowledge: (1) knowledge inquiry, (2) knowledge synthesis, and (3) knowledge tools/products (Graham et al., 2006; Sudsawad, 2007). Knowledge creators

use new and existing knowledge related to a specific topic and translate the knowledge into meaningful information for knowledge users. For example, knowledge inquiry is the new and raw knowledge a researcher gathers from primary research. Knowledge synthesis is the process of using already published knowledge to find common themes or gaps in the knowledge. Knowledge tools and products present knowledge in a way that can be used in a tangible way (Graham et al., 2006). The third step of knowledge tools and products is where we see a disconnect from research to application (Bik & Bouwens, 2018; Criado-Perez et al., 2020; Graham et al., 2006; Huber, 2016a; 2017; 2021; Rhoads, 2010; Sudsawad, 2007). The action cycle is the application of knowledge provided by the knowledge creation funnel. The knowledge user takes the explicit knowledge provided by the knowledge creator with the knowledge user's tacit knowledge to inform a decision. Tacit knowledge is essential in adapting and implementing the knowledge as it aids in filtering through the broad explicit knowledge provided by knowledge creators. After implementing the solution, the team monitors knowledge use, evaluates the outcomes, and sustains knowledge use. Communication becomes full circle as the application of knowledge and its outcomes are disseminated to other users, but more specifically back to the knowledge creators (Graham et al., 2006; Sudsawad, 2007). This circular communication informs knowledge creators' research topics and knowledge users' application of research (Huber, 2017). As it is crucial for design research to make its way to those responsible for applying the knowledge, KTA was used as a lens for identifying and understanding the gaps in the translation of knowledge (Huber, 2017; Rhoads, 2010).

## Research Questions

RQ 1 How do architecture and design firms in the United States engage with design research throughout the design process?

RQ 2 In what ways, if any, does engagement with design research differ between design firms with and without research units?

## Methodology

This interpretive comparative case study analyzed eight architecture and design firms that range in size and level of in-house research to understand their research resources, processes, and application. A comparative case study approach allows a comprehensive understanding of real-life circumstances and experiences and gives insight into the similarities and differences among the types of architecture firms (Yin, 2009).

Because this study is comparing architecture and design firms with and without in-house research facilities, we define, for the purpose of this paper, three primary forms of research engagement. *In-house* research refers to architecture firms with a dedicated research lab in the firm's headquarters. The headquarters research lab is in contact with the research arm of each office and typically has a database they use to communicate their findings to the other firm locations. In-house research labs focus on knowledge inquiry and synthesis for internal and external dissemination; they develop research materials (e.g., surveys) for research arms and foster programs for individuals across all offices to conduct their own research projects. *Research arm* refers to the architecture firm having research professionals within the local office. In-house research and research arms have researchers with formal research education (i.e., Ph.D. and master's degrees) and experience. Some architecture firms may have an in-house research lab and a research arm. *Research Affinity Group* refers to individuals, developed through a bottom-up approach, interested in applying research to design projects. This group includes designers or others with varying backgrounds that do not have formal research education or training. The research group refers to external, secondary resources to inform their design decisions as they do not have the education, resources, or facilities to conduct primary research at the level of in-house research labs and research

arms. Of the eight firms, four architecture firms are large multi-site (MS) firms with in-house research labs located at their headquarters and research arms in their office locations, one midsize multi-site firm with a research arm, and three architecture and design firms are single-site (SS) firms that have research teams in the office.

**Case Selection**

**Table 1**  
*Case Information*

<b>Firm</b>	<b>Research Organization</b>	<b>Firm Size (Entire Firm; Local Office)</b>	<b>Informants</b>
MSA	In-House Research Lab; Research Arm	>5,000;<100	Ava, Avery
MSB	In-House Research Lab; Research Arm	>1,000;<20	Brett, Brooke
MSC	In-House Research Lab; Research Arm	>1,000;<20	Chloe
MSD	In-House Research Lab; Research Arm	>2,000;<20	Danielle
MSE	Research Arm	<100	Ella
SSF	Research Affinity Group	<100	Frankie
SSG	Research Affinity Group	<100	Gabby
SSH	Research Affinity Group	<20	Hannah

The cases selected for this project are eight architecture and design firms, located within a central United States metro-region with a population of approximately three million, specializing in designing healthcare facilities (Table 1). Healthcare design continues to hold the leadership position in prioritizing research in design (Shepley & Danko, 2017); thus, case selection was limited to firms specializing in healthcare design. Four cases were selected because they are the four largest architecture firms in the U.S. with annual revenue over \$400 million U.S. These four are multi-site firms with centralized in-house research facilities and a local research arm (MSA, MSB, MSC, and MSD). The other four firms had typical annual revenue of approximately \$10-25 million U.S. and did not have in-house research. MSE is a multi-site firm with research arms. SSF, SSG, and SSH are single-site architecture and design firms with no in-house research facility or research arm.

### ***Data Collection***

This interpretive comparative case study was conducted in two parts: a focused content analysis of the firm's websites and informant interviews with interior design practitioners (n=7) and in-house design researchers (n=3). The focused content analysis examined the firm's websites for information related to (1) the firm's organization and how they prioritize research within the firm (i.e., certifications earned, position titles), (2) the firms' services and how they conduct and gather scientific knowledge (i.e., RID, EBD), (3) the firms design outcomes in how they integrate and use research to inform design decisions (i.e., what they research, tangible design outcomes from research), (4) the firms' resources and how the scientific research is communicated (i.e., employee degrees, affiliation with organizations, blog posts, white papers, project examples, annual reports). The semi-structured interviews were designed with open-ended questions, as they were used to understand the design process and knowledge acquisition from the informant's perspective. To begin the interview informants were asked demographic information to ensure their qualifications for this study (1) firm they are employed with, (2) position at said firm (ID, DR), (3) their education, (4) years of experience in design firms, (5) certifications (NCIDQ, EDAC), (5) industry sector experience (Table 2.) An interior designer is certified when they have passed the NCIDQ, which is "the industry's recognized indicator of proficiency in interior design principles and a designer's commitment to the profession" (Council for Interior Design Qualification, n.d., para. 1). The Evidence-Based Design Accreditation Certification (EDAC) is an indicator of a designers "...understanding of how to apply an evidence-based process to the design and construction of all settings that contribute to health, safety and wellbeing including measuring and reporting results" (The Center for Health Design, 2023, para. 1). The interview questions (Appendix A) were developed based on the construction of the KTA framework discussing how they work through the design process, when they refer to design research to inform a decision, and the process of acquiring that knowledge. The content analysis findings informed probing questions for each informant.

***Participant Selection and Recruitment***

**Table 2**  
*Informant Information*

<b>Name</b>	<b>Firm</b>	<b>Position (ID/DR)</b>	<b>Education</b>	<b>Years of exp. in design firms</b>	<b>Certifications (NCIDQ, EDAC)</b>	<b>Industry Sector Experience</b>
Ava	MSA	ID/DR	Bachelor's Degree	>20	NCIDQ	Workplace
Avery	MSA	DR	Bachelor's Degree	>10	NCIDQ	Workplace, Healthcare, Education, Civic,
Brett	MSB	DR	Bachelor's Degree; Master's Degree (2); Doctorate	<10	None	Workplace
Brooke	MSB	ID	Bachelor's Degree; Master's Degree	>5	None	Healthcare, Hospitality, Religious
Chloe	MSC	ID	Bachelor's Degree	<10	NCIDQ	Workplace, Education, Healthcare, Hospitality, Retail
Danielle	MSD	DR	Bachelor's Degree; Doctorate	>5	EDAC	Healthcare, Education, Workplace
Ella	MSE	ID	Bachelor's Degree	>20	NCIDQ	Healthcare
Frankie	SSF	ID	Bachelor's Degree	>10	EDAC	Healthcare, Hospitality, Multifamily, Higher Education
Gabby	SSG	ID	Bachelor's Degree	<10	NCIDQ, EDAC	Healthcare
Hannah	SSH	ID	Bachelor's Degree; Master's Degree	<10	NCIDQ, EDAC	Healthcare, Higher Education, Community, Government, Airport

Ten participants were recruited through intentional snowball sampling via personal networks to identify participants who could serve as informants. As described by Bygstad and Munkvold (2011), an informant is a "stakeholder that gives qualified information or opinion on a case" (p.32). As this is an interpretive comparative case study, informants play an active role in developing the narrative (Bygstad & Munkvold, 2011; Miles & Huberman, 1994). Selected for this study were six interior design practitioners (ID), three design researchers (DR), and one participant who identified as both a practitioner and researcher (Table 2). As case criteria required engagement with healthcare design, informant criteria included their location in the local office, design research engagement and awareness in practice, having earned a degree in a design-related field (e.g., Bachelor of Fine Arts in Interior Design, Master of Science in Interior Design, Ph.D. in Human Behavior and Design), and peers and colleagues inside and outside of the firm identifying them as a vital informant for this study. Informants engaging in healthcare design were preferred but optional as other industry sectors are integrating design research (e.g., workplace). When

applicable, both practitioner and design researcher were interviewed on the same case to gain an adequate understanding of the communication between the design researcher and interior designer.

### ***Data Analysis***

Data material for analysis included the firm websites and the interview transcripts. The focused content analysis resulted in quantitative results (i.e., how many cases discuss research on their website) and qualitative results (i.e., how they describe their engagement with research). Qualitative coding techniques were memos, a priori themes drawn from the KTA framework (Figure 3), and open coding to identify new themes (Miles et al., 2014). These themes identified commonalities and differences in like cases and across cases (Miles et al., 2014; Stake, 2008). Miles and Huberman's (1994) thematic analysis was used to analyze the themes further. The thematic analysis model comprises three stages: data reduction, data display, and data conclusion-drawing/ verifying (Alhojailan, 2012; Miles & Huberman, 1994). Qualitative software (NVIVO) was used for preliminary analysis and data reduction, conceptual framework development visually represented the findings, and the senior researcher reviewed the researcher's coding and themes.

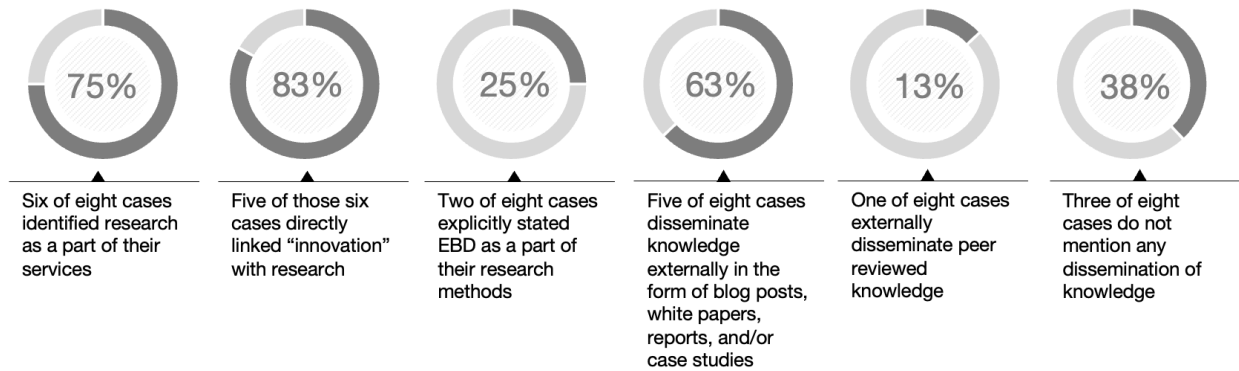
### ***Research Quality***

There has been much debate over qualitative research methods and how to assess them regarding quality (Mays & Pope, 2000; Miles et al., 2014). Validity and reliability are concepts initially used to assess the quality of quantitative research. However, they apply to qualitative research with a different approach and understanding of the research goals (Mays & Pope, 2000). Lincoln and Guba (1985) identify five concepts for ensuring quality in qualitative research: credibility, transferability, dependability, confirmability, and authenticity. Credibility refers to the accuracy of the study's findings; as accuracy in qualitative research is subjective to the participant, member checking and mixed methods, including content analysis with quantitative and qualitative results and open-ended interviews, were used to increase the credibility of this study (Lincoln & Guba 1985; Iivari, 2018). To be of value, a study must be transferrable to some extent. This study did not aim to be transferable outside the interior design field;

however, the findings from this study may lead to a revised knowledge transfer theory that other topics can adapt. Dependability ensures outcomes would remain consistent regardless of the researcher. Confirmability ensures that biases do not impact the research outcomes (Lincoln & Guba 1985, 1985). Expert review was consistent throughout the method development, data collection, and analysis to increase dependability and confirmability. Research findings align with the raw data to reduce the researcher's bias and increase the confirmability of findings (Miles et al., 2014). Authenticity refers to the research accurately communicating the informants' perspectives and representing a range of viewpoints relevant to the topic. This study included a wide range of cases in size and level of in-house research, interior design practitioner and design researcher perspectives, and member checking to increase authenticity (Bygstad & Munkvold, 2011; Lincoln & Guba, 1985; Iivari, 2018; Mays & Pope, 2000).

## Findings

### *Part One: Firm Website Content Analysis*



**Figure 4**

*Content Analysis Findings (quantitative Figure 4 and qualitative narrative)*

Many of the cases (all MS cases and SSF) discussed research on their website, but how they discussed research varied. Vague and even opposing phrases such as "data-informed" and "best possible information" was used when discussing the cases' approach to research. However, in all MS cases, research was directly linked to "innovation." Along with the inconsistent communication of research, discussion of research methods and resources was kept at a broad level. For example, a survey was conducted, but how the survey was developed, who developed the survey, how the findings were analyzed, and the participant information was unavailable. MSE and SSF explicitly stated that they use EBD as a part of their research methods; however, neither case discussed the EBD process or how they engage with it. None of the case's websites discussed RID. Across all cases, the organization of research teams was difficult to identify. All firms except SSG and SSH mention a research team, but most do not provide specific information, including composition or expertise related to educational background or training. Nor do they explain how the research team functions during the design process. All MS cases disseminate their research findings on their website. When sharing knowledge, cases describe the problem, identify the type of research method (e.g., survey, literature review), their conclusion, and the design outcome; this knowledge takes the form of blog posts, case studies, white papers, and reports.

Again, the websites do not discuss the details of the research methods and the qualifications of who is conducting the research. MSB disseminates peer-reviewed articles as they often partner with academic institutions. The dissemination of knowledge from MS cases is projected at interior design practitioners, design researchers, and clients. None of the SS cases disseminated knowledge externally via their websites.

### ***Part Two: Informant Interviews***

Seven overarching themes emerged from the thematic analysis of the interview transcripts: (1) motivation for research, (2) definition of research, (3) identifying knowledge, (4) selecting knowledge, (5) adapting knowledge, (6) implementing knowledge, (7) disseminating knowledge. The first two themes emerged through open coding. The last five themes are a priori themes from the KTA framework. Barriers and facilitators to knowledge use are discussed within the a priori themes.

**Motivation for Research.** Motivation for research is a significant theme in that it seeks to understand why firms and professionals are integrating research into their design solutions. Across all cases, engagement with research stemmed from personal values, client requests, and new territories. All MS informants, except Ella, also stated that engagement stemmed from their respective firm's values. Informants felt that research was essential in making design decisions (Brett, Brooke, Chloe, Gabby, Hannah) but that research was lacking in the industry (Brooke, Gabby, Hannah). When working with healthcare clients, informants discussed experiencing a push for research integration; "For healthcare, it's expected that you are a researcher, and you are the expert in your field" (Frankie). Informants also mentioned that when tasked with an unfamiliar practice area, they are more likely to lean on research (Ella, Hannah, Danielle, Frankie). MS informants (Ava, Avery, Brett, Brooke, Chloe, Danielle) described their firm's values as playing a significant role in research engagement; "...within our mission and our values...as a firm, that's one of our differentiators is having people who are ... focused on constantly researching, constantly surveying, constantly analyzing what our clients are doing and what other firms are doing..." (Chloe) "I think from a firm standpoint, what we're trying to do is just make sure that contractually we include things like a vision session and or a survey just on every project. We really feel

like those are completely necessary" (Ava). All MS informants, except Ella, also described the collaboration with design researchers at the beginning of projects, whereas others (e.g., Hannah, Gabby, Frankie) sought out knowledge when needed.

**Definitions of Research.** The definition of research is an essential theme as it reveals the various ways informants defined research. The definition of research was inconsistent across all cases. Avery defined research as a rigorous process using primary and peer-reviewed secondary research. Other MS informants (e.g., Brett, Chloe, Danielle) defined research in a much broader sense; "Research is any information that we gather to inform our design decisions..." (Danielle). SS informants Hannah and Frankie defined research as best practices. These diverse definitions of research is defined led to a variation in research methods; "We love to kick off every project with a visioning session...red dot green dot exercise. So...we pin up...all these boards with images of like reception areas...open workplace and closed workplace, meeting rooms, collaboration styles...everybody goes up and puts red dots on things that they hate [and] green dots on things that they love" (Chloe). "Sometimes I see visioning sessions that are just what I call a look and feel exercise. It's pictures on a wall and you put red or green dots on what you like or don't like and boom visioning session... you know, that's, that's not research" (Avery). Both cases claim to engage in primary research (i.e., visioning sessions). However, their research definitions influence their research methods, making it unclear what constitutes research in the design industry.

When asked to define and compare Research Informed Design and Evidence-Based Design, the two frameworks developed to aid in acquiring and applying research to design solutions, findings suggest an unclear understanding of RID and EBD across cases. Informants described EBD as being too strict and limited to healthcare design (Brett, Danielle), and informants described RID as broad but more relatable.

And I think [EBD] has a lot of limitations because it emphasizes a healthcare practice, even though we know that evidence needs to be used in other practice areas, and it also ...over emphasizes quantitative data and peer-reviewed data. So actually, we tend not to use evidence-based design at [MSD] and we...use research informed design...because it

is a much broader way of understanding evidence and a much broader way of understanding the practice areas that need to be informed by research. (Danielle)

Others felt they were the same thing; "I mean, I guess in my mind they mean the same thing" (Gabby).

**Identifying Problem.** Identifying the problem refers to the types of problems informants felt needed research and when research support was introduced. As all MS informants, except Ella, described firm values as a motivation for research integration, research was more likely to be integrated at the beginning of the design process; "I think from a firm standpoint, what we're trying to do is just make sure that contractually we include things like a vision session and or a survey just on every project" (Ava). SS informants Frankie, Hannah, Gabby, and MSE informant Ella described engaging with design research when they had a specific question. Their engagement was more sporadic and less direct unless the interior design practitioner sought out support; "I didn't really engage with [design researcher] that much..." (Frankie). SS informants that stated personal values as a motivation for engaging with design research (e.g., Gabby) were more likely to seek out knowledge earlier in the design process.

**Selecting Knowledge.** Selecting knowledge refers to what types of resources informants use. Across all cases, knowledge is selected based on accessibility, their definition of research, and motivation for research. Gabby mentioned that having research behind design solutions was important to her, and when asked which resources she used, she attempted to find valid, credible studies from journals and knowledge repositories; "Research connections and ... I tried to get some things from the HERD journal. I think the Center for Health Design was definitely the easiest resource to use" (Gabby). Danielle defined research as "any information that we gather to inform our design decisions..." when asked how she selects knowledge and what resources she uses, her response aligns with her definition.

[E]vidence comes from the literature, for sure. That's usually the first place I'm going to look... I actually really...like the knowledge repository from the Center for Health Design...so literature, peer-reviewed journal literature for sure, but then also...Blog post, white papers...we have a research journal at our firm as well and some internal research collateral at our firm, but we also look at external benchmarks. (Danielle)

Avery defined research as a rigorous process of primary research and peer-reviewed secondary research. Her resources align with her definition; "...surveys, interviews, focus groups, user research... university papers" (Avery). Informants also mentioned several barriers that come with selecting knowledge. There are many resources for design research, but the options feel overwhelming.

So there's a lot of obstacles for someone having easy entry into understanding where to go for resources. As a designer, that's like a huge problem for my perspective. Because they have to, like, be comfortable enough going around to different sources and kind of taking pieces that they can understand from all those, which is really hard to do... I'd say it's horrible. [I] t's like this patchwork of going to conferences, reading all these different journals, which no one's gonna do as a designer...I realize this is a huge gap. (Brett)

Informants across cases struggle to access journal articles due to a lack of funding (Gabby, Danielle). Lastly, informants described the struggle of balancing project timelines and budgets and the time it takes to find adequate knowledge; "I think if I was primarily in practice and doing project work, that would be really challenging, and I would not take the time to go through and read a peer-reviewed article...I absolutely would not" (Danielle) "[A]nd again, just spending the time... reading through everything because we have to follow billable hours for specific projects....I had to limit my time" (Gabby) Because of these barriers informants across cases refer to knowledge that is most accessible to them; "I think what's...at our fingertips is what we're gonna reach for" (Hannah) "We're just gonna use what someone you know has done last time or lean on someone..." (Brett)

**Adapting Knowledge.** Adapting knowledge refers to translating knowledge to fit a specific project. Design researchers and interior design practitioners across cases (e.g., Avery, Brett, Danielle, Ella, Frankie, Hannah) expressed many barriers to adapting knowledge, specifically the communication of research, stating that it includes too much detail, is misleading and confusing; "A lot of design research...is so abstract that you have to make a bunch of leaps... you have to translate that pretty far to do something new with it, right?" (Brett). Interior design practitioners (e.g., Ella, Frankie, Hannah,

Brooke) state that having a design researcher for support when trying to understand and adapt knowledge made the process more seamless.

When we look for research, we talk to [design researcher] she has lots of research and information...she helps find articles and filter information to give to interior designer.

She understands that interior designers have certain level of expertise, and she understands the research...she translates the information for us to understand ... (Ella)

With MS cases' motivation for research in their firms' values, MS interior design practitioners had greater access to design researchers throughout the design process. Design researchers (Avery, Brett, Danielle) also expressed concern about helpfully communicating knowledge without over-generalizing it.

Other barriers translating research into practice [are] making sure that our project team and I [are] communicating in a way that emphasizes the limitations of research. I can't just say there were three studies done that showed decentralized nursing stations are good for satisfaction and good for visibility and leave it at that. You have to explain the challenges, validity, reliability, and generalizability. (Danielle)

**Implementing Knowledge.** Implementing knowledge refers to the process of design research becoming tangible design solutions. There were shared barriers in this process phase across all cases. Informants across cases (e.g., Avery, Brett, Gabby) described communication within the design team as being essential in ensuring the informed solution is implemented; "But I think the really important thing...is really making sure your team, knows [what] we're doing...especially when you get down into constructing things, cause a lot of things will just get thrown aside if people aren't aware..." (Gabby) Informants across cases also expressed the need for having a design researcher for support and ensuring the knowledge is being implemented properly. Again, MS interior design practitioners and design teams had greater access to design researchers throughout the design process.

**Dissemination of Knowledge.** Dissemination of knowledge refers to how cases share the knowledge they gained, whether internally with the firm or externally with the architecture and interior design field. All cases described their process for disseminating knowledge internally. SS informants do not disseminate

their knowledge externally as they are not conducting any new knowledge but are rather collecting existing knowledge. Across all MS cases disseminating knowledge internally and externally was a priority. Internally this knowledge sharing looks like webinars; "So [MSA] does their best to make sure everyone's aware.... So every time there's new research that comes out, at a bare minimum, everyone's invited to like a hour long webinar to learn about it..." (Ava), written documents; "...design guideline document... It's just internal, so it goes to our...project team as part of the pursuit and they used it to inform their interviews" (Danielle), presentation; "a monthly research presentation, which is essentially just like what the firm has been doing you know month to month in terms of research" (Brooke) and lunch and learns; "...sometimes we'll put together lunch and learns for our own internal team to talk about. Hey, this is who we engaged on this project. It was a really big success, or this was a lesson learned. So that's how we share the knowledge across project teams as well" (Chloe). In alignment with their firm's motivations to engage with research, all MS cases also disseminate their knowledge externally for clients and others in the industry; "We don't [just] keep it internal; we post it to our website and allow everyone to have access to it. So we wanna make sure our clients are seeing what we're doing because it's something we've invested a lot of time and money into and feel very proud of" (Ava) "... we're not just designers, we are creating solutions to problems...that our clients have and we are helping them evolve and understand what other people that have similar job functions are doing" (Chloe). All MS cases felt passionate about disseminating knowledge internally and externally as it was their contribution to growing the industry.

## **Discussion**

This interpretive comparative case study aimed to understand how architecture and design firms engage with design research. The KTA was a lens for understanding the translation of knowledge between design researchers and interior design practitioners and identifying weaknesses in the process. Findings from this study revealed that identifying the problem, selecting, adapting, implementing, and disseminating knowledge were the areas in the KTA framework in which design research is prominent in the industry. The KTA framework identifies a collaboration between the design researcher and interior design practitioner with the final step of the knowledge creation funnel, knowledge tools and products, and the first step of applying the knowledge cycle, identifying the problem. Despite the integration of research units in architecture and design firms all informants felt a disconnect in the transfer of knowledge process. Informants with access to design researchers felt integrating research was more manageable, but other barriers (i.e., budget, timeline, accessibility, applicability) interfered. On the other hand, design researchers expressed concern about communicating such knowledge concisely and accurately.

This study also revealed common themes across all cases that impacted how they worked through integrating research into the design process. The informant interviews gave insight into the motivations for engaging in design research, the definition of design research, and how research organizations impact research utilization in practice. Across all cases, engagement with research stemmed from personal values, client requests, and unfamiliar topics, with all the MS cases also stating engagement stemmed from their respective firm's values. These results align with findings in prior research; there is a desire for research in practice (Dickson & White, 1993; Huber, 2017). When design problems were identified was impacted by informants' motivations for engaging with design research. For example, if the motivation is firm values or client requests, the research process is more likely to start at the beginning of the design process. If the motivation is personal values or new territory, research is more likely to be sought out when a problem arises throughout the design process. Informants' motivations for research also impacted what types of resources they used. MS informants with firm values being a motivation for research also

mentioned primary research, such as interviews, surveys, and visioning sessions, and peer-reviewed secondary research, such as journal articles, as their resources. Informants that mentioned personal values as their motivation mentioned using resources available to them (i.e., design researcher, research affinity group, journal articles, white papers, and knowledge repositories). Lastly, motivations also impacted the external dissemination of knowledge. All MS cases, whose informants identified firm values as a motivator, disseminate their knowledge externally. They felt that sharing their knowledge contributed to the industry's growth.

Though all MS informants, except Ella, noted that they engage with design research because of their firm's values, their definitions of design research varied. The content analysis revealed cases discussing research at large; however, most of the cases directly linked "innovation" with research, which alludes to the idea that research in practice means developing new knowledge for those with the capacity, and new design solutions. In the informant interviews, their definitions ranged from primary research and peer-reviewed journal articles to any information that may inform a solution to best practice. The responses varied across cases when asked to define and compare RID and EBD. Some informants (Brett, Danielle) stated that they felt EBD was too strict and RID aligned more with what they do in practice, but their definition of RID did not align with the definition in the literature. Two of the cases mentioned using EBD on their website, but those informants did not discuss using EBD in their practice. How informants defined research impacted the research methods, specifically Avery and Chloe, and their selection of resources for collecting research. Informants with a stricter definition of research (i.e., primary research and peer-reviewed secondary research) were likelier only to use findings from research they had conducted and journal articles. Those with a broader definition of research (i.e., guardrail) were likelier to use a wide range of resources.

A consistent factor that all cases discussed were the barriers they encountered. When selecting knowledge, short timelines, limited budgets, limited access to resources (i.e., journal articles, design

researchers), and the ability to understand and comprehend resources (i.e., journal articles) were barriers often encountered across all cases and informants. When adapting knowledge to the project at hand, the ability to understand and comprehend resources was an issue. Informants across all cases, design researchers and interior design practitioners mentioned that knowledge from journal articles required "leaps" to make it applicable. Design research informants stated they felt more equipped to translate the knowledge into actionable steps, but they still felt a disconnect. Knowledge about material health and application was much more adaptable. Budget cuts and lack of communication within the design team became barriers when implementing knowledge in the project. The primary facilitator of knowledge integration was the support of a design researcher. In all MS cases, the role of the design researcher is integral to selecting, adapting, and implementing research as they offer support to the interior designer. In the SS cases, the interior design practitioner is alone in this process. Across all cases, informants emphasized the desire for a design researcher to help translate and implement knowledge.

## **Limitations and Conclusions**

This study was limited to a central United States metro-region with a population of approximately three million and may not represent the larger U.S. population. This study focused on eight firms, four architecture firms are large multi-site (MS) firms with in-house research labs located at their headquarters and research arms in their office locations, one midsize multi-site firm with a research arm, and three architecture and design firms are single-site (SS) firms that have research teams in office resulting in a sample size of ten informants. Of the ten informants, six were interior design practitioners (ID), three were design researchers (DR), and one participant identified as both a practitioner and researcher. Ten is a small number of informants in relation to the hundreds of design firms in the U.S. and may not capture the range of experiences or education. The intent was to interview both an interior design practitioner and design researcher from all MS cases which would have resulted in thirteen informants. In MSC and MSE a design researcher was unavailable for interview and in MSD an interior design practitioner was unavailable for interview.

The findings from this study revealed inconsistent communication and expectations of research in practice across cases. All MS cases noted their motivation for engagement with research stemmed from their firms' values, yet their definitions and approaches to research were opposing. For example, Avery defined research as "...a journal...an academic paper. It is applying surveys, interviews, focus groups, user research to help shape a principle or a direction for a client...", whereas Danielle defined research as being "any information that we gather to inform our design decisions..." The varying research definitions also led to various types of resources used across cases. Some informants identified white papers, blog posts, and the like as insufficient knowledge sources, and others deemed them sufficient. Cases with in-house research labs and research arms had greater access to educated and experienced design researchers to help guide the process of integrating research. Comparing the cases also revealed some commonalities; motivations for research stemmed from personal values, client requests, and new territory, and barriers such as budget, timeline, access to resources, and the ability to understand and utilize academic design

research were experienced across cases. The KTA framework offered insight into the communication between the knowledge creator (design researcher) and the knowledge user (interior design practitioner). The findings from this study align with the literature; the knowledge tools and products produced by knowledge creators have limited access (i.e., journal articles) and often do not speak the same language as knowledge users (Bik & Bouwens, 2018; Criado-Perez et al., 2020; Graham et al., 2006; Huber, 2016a; 2017; 2021; Rhoads, 2010; Sudsawad, 2007). However, the physical collaboration of the knowledge creator (design researcher) and knowledge user (interior design practitioner), as seen with in-house research labs and research arms, helps to minimize the gap. This study revealed that with the recent integration of design research in practice, and more specifically, in-house research facilities in firms, there needs to be a common dialogue for discussing research in the industry. Moreover, there needs to be an effective process for integrating research in design outside of having a design researcher and interior design practitioner on the project team.

## **Future Research**

This study included six interior design practitioners (ID), three design researchers (DR), and one participant who identified as both a practitioner and researcher as informants; future research should investigate the design researcher's knowledge inquiry and synthesis process. It still needs to be determined how an industry design researcher's scope and processes differ from an academic design researcher's scope and processes. As this study focused on the translation of knowledge between design researchers and interior design practitioners in healthcare firms, future research should investigate the translation of knowledge in an academic and industry partnership. Firms such as MSB partner with academia to conduct and implement design research. Understanding the collaboration process may also inform the translation of knowledge in practice. More research is needed to fully understand the process and experiences of interior design practitioners when gathering and applying research (Huber, 2017). Findings from this study may be used to inform survey questions and scale this research topic. This study revealed the inconsistent communication of research in practice, more qualitative and mixed method research is needed to understand how research is defined in practice, what constitutes research, and definitions and motivations for research are developed in practice. Lastly, this study focused on one creative profession, the transfer of knowledge processes in other creative professions may also offer insight into how to communicate between experts effectively and efficiently.

## REFERENCES

- Alhojailan, M. I. (2012). Thematic analysis: A critical review of its process and evaluation. *West East Journal of Social Sciences*, 1(1), 39-47.
- Anåker, A., Heylighen, A., Nordin, S., & Elf, M. (2017). Design quality in the context of healthcare environments: A scoping review. *HERD: Health Environments Research & Design Journal*, 10(4), 136-150. <https://doi.org/10.1177/1937586716679404>
- Backer, T. E. (1991). Knowledge utilization: The third wave. *Knowledge*, 12(3), 225-240. <https://doi.org/10.1177/107554709101200303>
- Backer, T. E. (1993). Information alchemy: Transforming information through knowledge utilization. *Journal of the American Society for Information Science*, 44(4), 217-221. [https://doi.org/10.1002/\(SICI\)1097-4571\(199305\)44:4<217::AID-ASI9>3.0.CO;2-D](https://doi.org/10.1002/(SICI)1097-4571(199305)44:4<217::AID-ASI9>3.0.CO;2-D)
- Bayazit, N. (2004). Investigating design: A review of forty years of design research. *Design Issues*, 20(1), 16-29. <http://www.jstor.org/stable/1511952>
- Bik, O., & Bouwens, J. (2018). Bridging the knowledge gap between academia and practice: how research can help develop the auditing profession (vice versa). *Maandblad voor Accountancy en Bedrijfseconomie*, 92(7/8), 221-228. <https://doi.org/10.5117/mab.92.30360>
- Burghardt, M. D., & Hacker, M. (2014). Informed design: A contemporary approach to design pedagogy. In *International Geoscience and Remote Sensing Symposium* (Vol. 1, pp. 1-5).
- Bygstad, B., & Munkvold, B. E. (2011). Exploring the role of informants in interpretive case study research in IS. *Journal of Information Technology*, 26(1), 32-45.
- Ching, F. (2009). *Architectural graphics*. John Wiley & Sons.
- Cochrane, A. (1972). *Effectiveness and efficiency: Random reflections on health services*. London, England: Nuffield Provincial Hospitals Trust. <http://hdl.handle.net/10822/764041>
- Council for Interior Design Qualification. (n.d.). *NCIDQ exam: Interior Design Certification: NCIDQ certificate*. cidq. Council for Interior Design Qualification. Retrieved March 3, 2023, from <https://www.cidq.org/#:~:text=NCIDQ%20Certification%20is%20the%20industry's,%E2%80%8B>
- Criado-Perez, C., Collins, C. G., Jackson, C. J., Oldfield, P., Pollard, B., & Sanders, K. (2020). Beyond an 'informed opinion': Evidence-based practice in the built environment. *Architectural Engineering and Design Management*, 16(1), 23-40. <https://doi.org/10.1080/17452007.2019.1617670>
- Cross, N., Naughton, J., & Walker, D. (1981). Design method and scientific method. *Design studies*, 2(4), 195-201. [https://doi.org/10.1016/0142-694X\(81\)90050-8](https://doi.org/10.1016/0142-694X(81)90050-8)
- Cross, N. (1982). Designerly ways of knowing. *Design studies*, 3(4), 221-227. [https://doi.org/10.1016/0142-694X\(82\)90040-0](https://doi.org/10.1016/0142-694X(82)90040-0)

- Cross, N. (2012). From a design science to a design discipline: Understanding designerly ways of knowing and thinking. In *Design research now* (pp. 41-54). [https://doi.org/10.1007/978-3-7643-8472-2\\_3](https://doi.org/10.1007/978-3-7643-8472-2_3)
- Dickson, A. W., & White, A. C. (1993). Are we speaking the same language? Practitioners' perceptions of research and the state of the profession. *Journal of Interior Design*, 19(1), 3-10. <https://doi.org/10.1111/j.1939-1668.1993.tb00146.x>
- Dickinson, J. I., Anthony, L., & Marsden, J. P. (2009). Faculty perceptions regarding research: Are we on the right track? *Journal of Interior Design*, 35(1), 1-14. <https://doi.org/10.1111/j.1939-1668.2009.01024.x>
- Donofrio, M. (2013). Building knowledge: A framework for a translational research culture in architecture. In *ARCC Conference Repository*. <https://doi.org/10.17831/rep:arcc%25y106>
- Driscoll, D. L. (2011). Introduction to primary research: Observations, surveys, and interviews. *Writing spaces: Readings on writing*, 2, 153-174.
- Grady, C. (2015). Institutional review boards: Purpose and challenges. *Chest*, 148(5), 1148-1155. <https://doi.org/10.1378/chest.15-0706>
- Graham, I. D., Logan, J., Harrison, M. B., Straus, S. E., Tetroe, J., Caswell, W., & Robinson, N. (2006). Lost in knowledge translation: Time for a map?. *Journal of Continuing Education in the Health Professions*, 26(1), 13-24. <https://doi.org/10.1002/chp.47>
- Hox, J. J., & Boeije, H. R. (2005). Data collection, primary versus secondary.
- Huber, A. (2016a). Is seeing intriguing? Practitioner perceptions of research documents. *Journal of Interior Design*, 41(1), 13-32. <https://doi.org/10.1111/joid.12067>
- Huber, A. (2016b). Research utilization in the design decision making process. *ArchNet-IJAR: International Journal of Architectural Research*, 10(1), 4.
- Huber, A. (2017). Design research: Off the rails or on the right track?. *Design Management Journal*, 12(1), 40-55.
- Huber, A. M. (2021). Exploring Informed-Design Services During the Project-Defining Phases in Commercial Interior Design. *Journal of Interior Design*, 46(2), 11-33. <https://doi.org/10.1111/joid.12191>
- Iivari, N. (2018). Using member checking in interpretive research practice: A hermeneutic analysis of informants' interpretation of their organizational realities. *Information Technology & People*, 31(1), 111-133.
- Jacques, R., and Powell, J. (eds.) (1981) *Proceedings of the Design Research Society International Conference, 1980: Design: Science: Method*, Guildford, IPC Business Press Limited. <https://dl.designresearchsociety.org/conference-volumes/4>
- Lawson, B. (2005). *How designer's think: The design process demystified (4th ed.)*. Routledge. <https://doi.org/10.4324/9780080454979>

- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. sage.
- Martin, C. S. (2014). Implementation of evidence based design (EBD) by non-healthcare design practitioners. *International Journal of Architectural Research*, 8(3), 166–180.  
<http://archnet.org/system/publications/contents/9999/original/DTP102384.pdf?1418680285>
- Mays, N., & Pope, C. (2000). Assessing quality in qualitative research. *Bmj*, 320(7226), 50-52.
- Merriam-Webster. (n.d.). *Best practice definition & meaning*. Merriam-Webster. Retrieved February 16, 2023, from <https://www.merriam-webster.com/dictionary/best%20practice>
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Sage publications.
- Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative data analysis: A sourcebook* (3<sup>rd</sup> ed.). Beverly Hills, CA: Sage publications.
- Neuendorf, K. A. (2018). Content analysis and thematic analysis. In *Advanced research methods for applied psychology* (pp. 211-223). Routledge.
- Peavey, E., & Vander Wyst, K. B. (2017). Evidence-based design and research-informed design: What's the difference? Conceptual definitions and comparative analysis. *HERD: Health Environments Research & Design Journal*, 10(5), 143-156. <https://doi.org/10.1177/1937586717697683>
- Pettibone, K. G., Balshaw, D. M., Dilworth, C., Drew, C. H., Hall, J. E., Heacock, M., Latoni, A., McAllister, K., O'Fallon, L., Thompson, C., Walker, N., Wolfe, M., Wright, D., & Collman, G. W. (2018). Expanding the concept of translational research: making a place for environmental health sciences. *Environmental Health Perspectives*, 126(7), 074501.  
<https://doi.org/10.1289/EHP3657>
- Rhoads, E. (2010). The importance of incorporating embedded knowledge into the interior design BOK. In D. Guerin & C. S. Martin (Eds.), *The state of the interior design profession* (pp. 104-110). Fairchild Books.
- Robinson, S., & Pallasmaa, J. (Eds.). (2015). *Mind in architecture: Neuroscience, embodiment, and the future of design*. Mit Press.
- Sackett, D. L., Rosenberg, W. M., Gray, J. M., Haynes, R. B., & Richardson, W. S. (1996). Evidence based medicine: what it is and what it isn't. *Bmj*, 312(7023), 71-72.  
doi: <https://doi.org/10.1136/bmj.312.7023.71>
- Seidel, A. D. (1985). What is success in E&B research utilization?. *Environment and Behavior*, 17(1), 47-70. <https://doi.org/10.1177/0013916585171004>
- Shepley, M. M., & Danko, S. (2017). Design as healing: The next generation of research-informed practice. *Journal of Interior Design*, 42(1), 5-7. <https://doi.org/10.1111/joid.12090>
- Simon, H.A. (1996 [1968]), *The sciences of the artificial*, Cambridge, The MIT Press.  
DOI : [10.7551/mitpress/12107.001.0001](https://doi.org/10.7551/mitpress/12107.001.0001)

- Stake, R. E. (2008). Qualitative case studies. In N. K. Denzin & Y. S. Lincoln (Eds.), *Strategies of qualitative inquiry* (pp. 119–149). Sage Publications, Inc.
- Stichler, J. F. (2016). Research, research-informed design, evidence-based design: What is the difference and does it matter?. *HERD: Health Environments Research & Design Journal*, 10(1), 7-12. <https://doi.org/10.1177/1937586716665031>
- Sommer, R. (1997). Utilization issues in environment-behavior research. In *Toward the integration of theory, methods, research, and utilization* (pp. 347-368). Springer, Boston, MA.
- Sudsawad, P. (2007). *Knowledge translation: introduction to models, strategies and measures*. Austin, TX: Southwest Educational Development Laboratory, National Center for the Dissemination of Disability Research. [http://www.ktdrr.org/ktlibrary/articles\\_pubs/ktmodels/](http://www.ktdrr.org/ktlibrary/articles_pubs/ktmodels/)
- The Center for Health Design. (2021, February 26). *About EBD*. Retrieved August 26, 2022. <https://www.healthdesign.org/certification-outreach/edac/about-ebd>
- The Center for Health Design. (2023, February 6). *Evidence-based design accreditation and certification (EDAC)*. The Center for Health Design. Retrieved March 3, 2023, from <https://www.healthdesign.org/certification-outreach/edac>
- Tomasi, C., & Weeks, M. (2006, June). Informed design as a practical problem solving approach. In *2006 Annual Conference & Exposition* (pp. 11-761). doi: 10.18260/1-2—55
- Ulrich, R. S. (1984). View through a window may influence recovery from surgery. *Science*, 224(4647), 420-421. DOI: [10.1126/science.6143402](https://doi.org/10.1126/science.6143402)
- Ulrich, R. S., Zimring, C., Zhu, X., DuBose, J., Seo, H. B., Choi, Y. S., Quan, X., & Joseph, A. (2008). A review of the research literature on evidence-based healthcare design. *HERD: Health Environments Research & Design Journal*, 1(3), 61-125. <https://doi.org/10.1177/193758670800100306>
- Ulrich, R. S., Berry, L. L., Quan, X., & Parish, J. T. (2010). A conceptual framework for the domain of evidence-based design. *HERD: Health Environments Research & Design Journal*, 4(1), 95-114. <https://doi.org/10.1177/193758671000400107>
- Wang, D. (2007). Diagramming design research. *Journal of Interior Design*, 33(1), 33–43. doi: 10.1111/j.1939-1668.2007.tb00420.x.
- Wild, P. J., McMahon, C., Darlington, M., & Culley, S. (2010). A diary study of information needs and document usage in the engineering domain. *Design Studies*, 31(1), 46-73. doi: 10.1016/j.destud.2009.06.002
- Yin, R. K. (2009). *Case study research: Design and methods* (Vol. 5). Sage publications.
- Zborowsky, T., & Bunker-Hellmich, L. (2010). Integrating healthcare design research into practice: Setting a new standard of practice. *HERD: Health Environments Research & Design Journal*, 4(1), 115-130. <https://doi.org/10.1177/193758671000400108>
- Zeisel, J. (1984). *Inquiry by design: Tools for environment-behaviour research*. Cambridge, United Kingdom: Cambridge University Press

## APPENDIX A: INTERVIEW QUESTIONNAIRE

Guided by theoretical framework

### **Part I- demographic information:**

1. What is your name?
2. What architecture design firm do you work for?
3. What is your position at the firm?
4. Describe your education.
5. Years of experience in design firms?
6. What certifications have you earned (NCIDQ, EDAC)?
7. What industry sectors do you have experience in?

### **Part II- interview questions:**

1. Tell me about your education and experience working in the field of interior design/design research.
2. What does research mean to you?
3. What is your firm's philosophy about research in design?
4. What do the terms Research Informed Design (RID) and Evidence-Based Design (EBD) mean to you?
5. Describe your process working on healthcare design projects.
6. Describe your process finding and using information to help guide interior design decisions.
  - a. Why was that information useful for you and your project?
7. What barriers do you encounter with using scientific knowledge?
8. Explain how you disseminate outcomes from your design projects. If you don't disseminate outcomes, why not?

## APPENDIX B: IRB APPROVAL FORM

PROTOCOLS



**COLORADO STATE  
UNIVERSITY**

**The protocol listed below has been approved by the CSU IRB Determinations Fort Collins on Wednesday, September 28th 2022.**

PI: Malinin, Laura H

Submission Type and ID: Initial 3846

Title: Make it make sense: Bridging the gap between design research and the design industry

Approval Date: Wednesday, September 28th 2022

Continuing Review Date: no date provided

Expiration Date: Monday, September 27th 2027

The CSU IRB (FWA0000647) has completed its review of protocol 3846 Make it make sense: Bridging the gap between design research and the design industry . In accordance with federal and state requirements, and policies established by the CSU IRB, the committee has approved this protocol under Exempt review.

Any additional comments regarding this approval are included below. If you have additional questions about this please contact RICRO IRB Staff.

**Please note:**

- This protocol will need to undergo Continuing Review and approval prior to no date provided.
- Any additional changes to this approved protocol must be obtained prior to implementation of those changes, by submitting an amendment request to the CSU IRB for review/approval.

Good luck in your research endeavors!

Initial exempt determination has been granted September 28, 2022 to recruit with the approved recruitment and consent procedures. The above-referenced research activity has been reviewed and determined to meet exempt review by the Institutional Review Board under exempt §46.104(d)(2)(ii) of the 2018 Requirements. This study is not funded.

## Attachments

Screening Tool or Procedure	Participant Screening.docx	Participant Screening Questions
Interview/Focus Group Questions	Interview Questions .docx	Semi Structured, Open Ended Interview Questions
Recruitment Materials	Email Recruitment.docx	Recruitment Email
Methodology Section	Methodology.docx	Methodology Section
Consent	IRB_SignedConsentForm.docx	IRB Signed Consent Form