

IMPLEMENTATION OF EVIDENCE-BASED DESIGN (EBD) BY NON-HEALTHCARE DESIGN PRACTITIONERS

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Abstract

Evidence-based design (EBD) is an innovation to the normative design process for practitioners who strive to base design solutions on measurable outcomes. Published information about EBD—its purpose, process, and outcomes springs primarily from healthcare design sources. Little is known about the adoption of an EBD-approach by practitioners of other building types (offices, schools) or their degree of engagement with EBD. This study examined non-healthcare focused design practitioners' current 1) understanding of EBD, 2) degree of implementation of EBD, and 3) interest in learning more about EBD as determined from an exploratory study via interviews of 10 multidisciplinary firms' leaders. Findings indicated that these firms practiced normative design, having little knowledge of or engagement with EBD. To help identify reasons for this delay towards EBD, a comparative analysis of EBD-approaches in books published for design practitioners was conducted. It revealed a broad range of approaches, limited timelines for implementation, and promotion of practitioner/researcher collaborations. Additional resources/tools are needed by the non-healthcare focused design practitioners to support implementation of an EBD-approach into their normative design process.

Keywords: *Evidence-based design (EBD); Non-healthcare design; Design practitioner; Normative design; Measurable outcomes.*

INTRODUCTION

An evidence-based design (EBD)-approach to the design process enables practitioners to fully meet human and environmental challenges (Cama, 2009; Hamilton & Watkins, 2009). The holistic design process is structured by phases (i.e., pre-design, schematic design, design development), requiring collaboration across the design team and contributions by stakeholders (Jones, 2010; Johnston, 2010; Mourshed & Zhao, 2012).

How design decisions are determined has generally remained stagnant (Brandt, Chong, & Martin, 2010). Practitioners rely on normative design, principally comprised of what has been done before, commonly referred to as “best practices” and manifested in decision-making characterized by statements such as “I have seen it done before,” “I think it will work,” “I have always wanted to try it,” or “my colleague told me about it.” Normative design is grounded in knowledge from the practitioner’s personal education and experience and that of colleagues, but is that enough? Design solutions (i.e., outcomes) yielded via a normative approach are increasingly questioned by clients (Asfour, 2007; Barnes, 2010; Cama, 2010; Martin, 2009). Growing is a shift from blind trust in the design professional to a demand for ‘proof’ that a design solution will fulfill the practitioner’s promises (Andersson, Svennerlind, Malmqvist, & Anckarsäter, 2013; Brandt et al., 2010; Whitemyer, 2010).

In response to this challenge, EBD has emerged. The Center for Health Design (CHD) defines EBD as “the process of basing decisions about the built environment on credible research to achieve the best possible outcomes” (2012). Many authors note that EBD incorporates evidence *and* creativity (Brandt et al., 2010; Pable, 2009); though others are concerned that EBD is characterized by a prescriptive approach of knowledge integration (van Aken, 2005). An EBD-

approach requires that design solutions are evaluated relative to measurable outcomes (Hamilton & Watkins, 2009).

This challenge has been embraced by a growing number of healthcare designers (Hignett & Lu, 2009; Whitemyer, 2010). However, adoption of EBD by non-healthcare (e.g., office, hospitality, institutional, residential) designers is not seemingly evident, even though their clients could benefit. However, researchers have pushed forward with evidence-based design tools for use by practitioners and educators in the classroom. For instance, an evidence-based model grounded in the Sensory Design Theory has been used by Mostafa (2014) to identify design criteria for use with school children with autism via the Autism ASPECTSS Design Index. Also, Ryan et al. (2014) have identified 14 patterns of biophilic design relative to the design profession's need to develop empirical evidence that quantifies positive outcomes (cognition, physiology, and psychology effects) for occupants from the integration of natural elements in the built environment.

Adoption of EBD as an innovation to design practice is slow due to the lack of opinion leaders in the broader design community (Martin, 2009; Rogers, 1995), as is D. Kirk Hamilton in the healthcare design community (Andrade, Lima, Fornara, & Bonaiuto, 2012; Hignett & Lu, 2009). Also, the EBD-approach nurtured by the CHD's infrastructure has not been replicated by design typologies outside healthcare (Brandt et al., 2010; Lippman, 2009).

This exploratory study was conducted in two phases. The first phase consisted of a survey of leadership from 10 multidisciplinary, non-healthcare focused firms to identify their current 1) understanding of EBD, 2) degree of implementation of EBD, and 3) interest in learning more about EBD. The second phase consisted of a comparative analysis of published approaches to integrating an EBD-approach into the design process to explore the knowledge sources available to all design practitioners. Better engagement of this community about integration of an EBD-approach, dissemination of their EBD-solutions, and subsequent growth of the body of knowledge would elevate their work and their professional currency to their clients, inhabitants of the spaces they design, and society (Martin, 2009; Salama, 2007). Salama emphasizes this challenge to the architectural profession in stating, "without research, scholarship and a rigorous knowledge base, the profession cannot take stands on significant health, economic, social, political or ethical issues (2007, p. 64).

Background

Insights regarding non-healthcare design focused practitioners' understanding and implementation of EBD can be gained from comprehension of 1) the factors that are defining the design process as it is applied today, 2) the characteristics of an EBD-approach, and 3) the benefits and challenges an EBD-approach could have for design practitioners, their clients, and society as a whole.

Normative, i.e., traditional design is the basis of design practice across disciplines, such as architecture, interior design, and landscape architecture (Cama, 2009; Fisher, 2004/2005; Martin, 2009). It is informed by education, experience, and continuing education, and is manifest as "best practices." Groat and Wang (2002) tie characteristics of normative design to "the realm of convention, or 'rules of thumb'" (p. 78), in contrast with a positivistic or scientific approach. It incorporates aesthetic judgment, intuition, creativity, and personal preferences in decision-making as well as historical and vernacular precedent. It is grounded in the gathering of "information" relative to the client; context of the client, project, and building site; trends; and products and materials. However, the gathering of information is not the creation of knowledge, the outcome of research (Dickinson & Marsden, 2009).

"Best practice" is the accumulation of lessons learned within or beyond the design firm that have been documented and reported to members of the design team for replication within subsequent projects (Coleman, 2002; McCullough, 2010). Hasell and King in Marsden (2005) describe a continuum of four types of knowledge "of increasing validity and rigor" to guide design

decision-making. They range from hunches and speculation to propositions via application of literature, persuasion from empirical research findings, and research findings that are “causal, measurable, and repeatable” (p. 18). The latter two are essential in the creation of EBD-criteria through they are the least often used by practitioners (Guerin & Thompson, 2004; Hamilton & Watkins, 2009). Subsequently, design solutions are applied (i.e., generalized) beyond the initial application possibly without evidence that the solution is applicable (i.e., project, interior, building) but rather on what has been done traditionally (Asfour, 2007; Lippman, 2010).

The design process has become more complex in response to the escalation of the breadth and complication of problems designers are being required to address in their design solutions (Salama, 2007; 2008). As a result, collaborative and multidisciplinary design teams are increasingly becoming the norm (Hamilton & Watkins, 2009; Wheeler, 2010); subsequently, there is a call for multidisciplinary (Ryan et al., 2014) and trans-disciplinary in regard to research generation (Salama, 2007) for application in practice. Real and perceived ‘successful’ outcomes of the design team’s work are influenced by the media, socioeconomic conditions, and knowledgeable clients.

Regarding the media, a 2012 *Interior Design* magazine survey examining over 2,300 practitioners’ views about the business challenges of design, cited a false public perception of interior design and the negative influence created by HGTV, among other factors (Zimmerman, 2012). Concurrently, “design” and “design thinking” are increasingly part of public discourse about addressing business problems (Fisher, 2010; Safian, 2011).

In terms of socioeconomic conditions, the public minimally understands that the schools their children attend and the offices where they work result from the practitioner’s design process (Linster, 2010). Since the global economic downturn beginning around 2007, the number and scope of design projects has substantially diminished. Both architectural firm revenues and the number of practicing architects decreased, 40% and 28% respectively, 2008-2011 (2012 AIA firm, 2013). At the same time, clients are increasingly knowledgeable (Hamilton & Watkins, 2009). A practitioner’s design solution is decreasingly accepted at face value, i.e., “trust me.” Instead, measurable outcomes that meet corporate, agency, or governmental needs in a cost effective manner are required (Andersson et al., 2013; Brandt et al., 2010; Cama, 2009).

Evidence-Based Design (EBD)

These pressures on design practitioners have precipitated the emergence of EBD for healthcare facilities; a client base that increasingly relies on research via evidence-based medicine (EBM) (Cohen & Hersh, 2004; Doherty, 2005). EBD employs a “researched and documented knowledge base that includes the analysis and interpretation of research” (Stewart-Pollack & Menconi, 2005, p. 236) and the degree to which measurable outcomes are achieved determine the design’s degree of success (Hamilton & Watkins, 2009).

For these healthcare designers, an EBD infrastructure is anchored by the CHD. Its notable Pebble Projects® demonstrate an incremental approach to integration of an EBD-approach (Glenister, 2012). Publication of *Health Environments Research and Design Journal (HERD)* and CHD’s Evidence-Based Design Accreditation and Certification (EDAC) program (About EDAC, 2012) support adoption of EBD as do specialization credentials offered via the American Academy of Healthcare Interior Designers (AAHID) and the American College of Healthcare Architects (ACHA).

Healthcare design researchers and practitioners publish much about EBD (Cama, 2009; Hamilton & Watkins, 2009; van de Glind, de Roode, & Goossensen, 2007). Using an index of hundreds of databases limited to the last five years, the search term “evidence-base design” yielded 403 articles from a total of 15 refereed journals; of them, 390 articles from 12 journals were healthcare related. *HERD* published four times more articles (87) than any other journal. However, the extent to which non-healthcare practitioners access this information or are interested in engaging in EBD is largely unknown.

PHASE 1: NON-HEALTHCARE DESIGN PRACTITIONER SURVEY

Published information about EBD—its purpose, process, and outcomes springs primarily from healthcare design(ers). However, to a much greater extent it was not clear what was known by practitioners of other building types (e.g., offices, schools), nor their degree of engagement with EBD beyond the normative design process (Hamilton & Watkins, 2009; Lippman, 2010).

Method

A survey instrument was implemented as in-person interviews. Questions were open-ended and addressed firm background, information and research utilized by the firm, and the firm's understanding of EBD. Multidisciplinary firms selected for study were architectural firms or did employ architects and likely represent the majority of all US design firms in terms of business volume. According to the American Institute of Architects (AIA), even though firms of 10-99 staff comprise between 18-19% of the total number of firms, they contribute between 50-52% of the profession's billings (2012 AIA firm, 2013; *Overview of the*, 2009). Therefore, raising this cohort's awareness about EBD could generate its growth in non-healthcare focused design practice.

Therefore, the purposive sampling frame recruited subjects from 12 metropolitan-area, multidisciplinary firms ranging in size from small to large (7-100+ professional staff); the firm was the unit of analysis. Firm size categories (i.e., small ≤ 20 ; medium ≤ 50 ; large ≥ 51) were determined prior to identification of subjects. The goal was to have an equal distribution of firms across the three size categories. As the literature indicated that EBD must be promoted 'at the top' for it to be successfully adopted (Hamilton & Watkins, 2009), subjects represented firm leadership (i.e., principals or partners with financial investment/oversight).

Findings and Discussion

Responses to 10 questions (Q1, Q6, Q8, Q8a, Q9, Q9a, Q13, Q14, Q15, Q15a) addressed background and demographic information about the firm; understanding of the terms "information" and "research" (as underpinnings of decision-making) and if/how they were used by the firm; understanding of EBD; degree of engagement/or not with EBD; and interest in learning more about EBD, as listed in Figure 1.

<p><u>Firm Background Information and Demographics</u> Q1: What is your firm's greatest expertise in terms of building type (name top 3)?</p> <p><u>Information and Research Utilized by the Firm</u> Q6: What is research? Q8: Can you describe the difference between "information" and "research?" Q8a: Please provide an example of each. Q9: Does your firm consider research findings when creating design solutions? Q9a: Which type(s) of research findings are considered?</p> <p><u>Firm's Understanding of Evidence-Based Design</u> Q13: What is "evidence-based design (EBD)"? Q14: Does your firm engage in evidence-based design? Q15: Would it be beneficial for your firm to learn more about evidence-based design? Q15a: Why/why not?</p>

Figure 1: Survey of non-healthcare design practice firm leadership (Source: Author).

The 10 subjects were comprised of six females and four males; two large firm subjects recruited did not participate. Four were interior designers by education and were certified by the state. Four were educated as architects and licensed by the state. Of the remaining two design practitioners, one was educated in interior design and architecture and the other practitioner had a multidisciplinary design background; neither subject's practice was regulated by the state. All 10 subjects had a minimum of a bachelor's degree and had between 18 and 35 years of professional

practice experience. Further descriptive details were omitted to maintain anonymity of both the subjects and the firms.

Of the 10 firms, three were small-sized (1-20) with an average of 7.3 full time design practitioners per firm; six were medium-sized (21-50) with an average of 34.2 full time design practitioners per firm; and one was large-sized (51+) with 111 full time design practitioners (see Table 1). All firms had interior design and architecture; three medium-sized firms had engineering or planning. The majority of firms were founded between 1971 and 2004; the large sized firm was founded early in the 20th-century. For purposes of anonymity, firm disciplines, size, and year of founding were not correlated.

Table 1: Design firm demographics by practice typology.

Practice Typology ("x" denotes area of firm practice)	Firm Size (number of practitioner staff)									
	Small (x=7.26)			Medium (x=34.16)						Large
	S1	S2	S3	M1	M2	M3	M4	M5	M6	L1
	7	9	13	22	22	26	39	47	49	111
Banks/Financial Inst.		X					X	X	X	
Corporate/Workplace		X	X		X	X	X	X	X	
Criminal Justice										X
Education/Academic			X	X			X	X	X	X
Housing/Sr. Housing	X			X		X		X	X	
Industrial/Manufacturing					X			X		X
Libraries							X			
Medical/Healthcare					X	X		X		X
Municipal/Civic				X					X	
Museum/Cultural Center	X									
Residential	X	X								
Retail/Restaurant		X								
Worship Facilities								X		

Responses

Firms' Top Three Greatest Expertise in Building Types (Q1). Though firms were asked for their "top three" building typologies, many had several types that were equivalent in terms of fees. In those instances, more than three typologies have been noted (see Table 1). Firms have been identified by size, small (S), medium (M), and large (L), and the number of design practitioners on staff were noted. There were 13 practice typologies with over half of them practiced by more than one firm. Six of the 10 firms practiced in four or more typologies. Data indicated that there was a relationship between firm size and diversity of typology (see Figure 2).

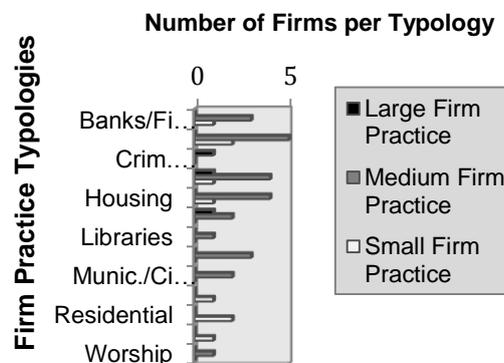


Figure 2: Practice typologies by firm size (Source: Author).

How Practitioners Defined “Research” (Q2). The majority of subjects was uncomfortable with this question and admitted lacking knowledge about “research.” Most responses could be characterized as defining research as “gathering information” and generally research was addressed as a verb, not a noun. In Table 2, subjects responses were compared to academic definitions of research and information, discussed earlier.

Table 2: Subjects’ definitions of “research” (Q6) compared with academic definitions of “research” and “information.”

Subject’s Definition of “Research” (direct quotes)	Academic Definitions	
	Research	Information
“It starts with a question or challenge...finding legitimate sources; gleaning what make sense...interpreting in the best interest of the client.”	✓	
“Gathering information that helps inform and inspire our design...could be technical or conceptual...backup, food for thought.”		✓
“Highly variable by person...collecting information/ things for future use in a purposeful manner.”		✓
“Paying attention to repeated conditions/issues; end up with breadth and depth with all used by the team.”		✓
“In-depth knowledge...go to books, information from the Internet, articles.”	✓	✓
“Any gathering of data or imagery or information that is going to inform an outcome, like journals and white papers...things that are published by reputable companies or organizations; does not always have to be analytical but can be gathered through conversation, experience, observation.”	✓	✓
“Not diving into one specific subject but gleaning information from everything around us...asking a lot of questions [from] the right people...understanding the entire industry versus just focusing on information from one group or client.”		✓
“Can be related to something specific...as simple as fact finding, part of the inventive process.”		✓
“Using out past experience to develop a program and direction...white paper research gathered by folks in-house...interiors folks [interior designers] do more research than anybody else [about materials]...the architects probably not so much.”	✓	✓

Some interesting points emerged as the subjects defined “research,” especially in context with their understanding of EBD (see Q13), discussed later. Several highlighted the difficulty of conducting research. They felt that it involved going beyond what they typically do, “it is more formal than it needs to be” and was a financial burden for the firm. Subjects doubted if it would be appreciated by the clients, “we don’t have folks here to do research, or enough of it,” and “full time [firm] research capabilities cannot be financially supported.” About a third of the subjects believed that they understand research and were already engaged in it, “I can create my own evidence...an exciting part of design,” and “some of these [research] principles are basic and intuitive to designers.”

Most responses focused on the correlation between research and a purposeful, planned and/or empirical process. Considered in context with the academic definition of research, most subjects were speaking of information gathering that defined programming (Brandt et al., 2010; Dickinson & Marsden, 2009; Hamilton & Watkins, 2009). Responses did not correlate with firm size or building typology experience.

How Practitioners Described “Information” and “Research” using examples (Q8/Q8a).

When asked to define the difference between information and research (Q8), subjects were visibly more comfortable than with the preceding question (Q6) that asked them to define research. Responses represented a broad range from uninformed to knowledgeable, as defined by academia (see Table 3).

Table 3: Comparison of “information” and “research” (Q8) with examples of each (Q8a).

“Information” Described (Q8)	“Research” Described (Q8)
“facts that are out there”	“a directed approach into something specific”
it comes to you, sometimes from clients	“collection and trying to gather/find all aspects of your challenge”
“we gather [it]...examining something from many viewpoints”	“a focused investigation about a specific subject based on a hypothesis, maybe”
“a product”	“a process, more statistical, grounded...follows a legitimate process...research is the act and information is the result”
“can be an option, statements without backup”	“empirical data that substantiates facts”
“sometimes not quantified...you have to decide if it is authentic”	“has been quantified, presents measurable outcomes; knowledge that results from a study”
“anything you could gather, but may not be tested/vetted, like Wikipedia”	“vetted, acknowledged by experts to be true, reliable”
Examples of “Information” (Q8a)	Examples of “Research” (Q8a)
<ul style="list-style-type: none"> • “stuff from vendors, sales people, product facts, magazine articles, client information” (S1, S2, S3, M5, M6, & L1) • “found in blogs” (S2) • “opinion-based articles or books” (M2) • “anything gathered” (M4) 	<ul style="list-style-type: none"> • “case studies or anything measurable” (S1) • “white papers or research studies” (S2, M3, & M4) • “more structured studies, often from furniture manufacturers” (S2) • “continuing education presentations” (M1) • “benchmarking studies as produced by organizations [e.g. ASID, IIDA, AIA]” (M2, L1)
<p><i>Note: All definitions/descriptions (responses to Q8) are direct quotes and attributable to the same subject when compared across the row. Refer to Table 1 for more information about specific firm typology.</i></p>	

Several subjects also cautioned about taking information or research on “face value,” verifying its accuracy, and using findings accurately (M3, M4, and L1). Subjects’ examples of “research” highlight their varying depth of understanding about that term and how it differs from “information.” Once again accuracy of response did not correlate with firm size or typology experience.

Practitioners’ Consideration of Types of Research Findings When Creating Design Solutions (Q9/Q9a).

All subjects claimed that their firms used research findings, except one of the medium-sized firms (M2) that only used them to respond to a client’s request for proposal (RFP). Research used focused on the following areas:

- Furnishings, fixtures, and equipment (FF&E), green building products, structural systems manufacturers’ information (S2, M1, M5);
- Sustainability, life-cycle costing (S1, S2, M6);
- Impact of design on human behavior; human factors; safety (M4);
- Impact of light on stress reduction (M3);
- Productivity (L1); and
- Wayfinding and landmarks (M3).

These research areas correlated with anticipated increases in engagement by practitioners across building typologies (Whitemyer, 2010).

How Practitioners Define EBD (Q13). Subjects demonstrated a broad range of understanding about EBD. Among the small- and medium-sized firms (n=9), five of them had no or little knowledge of EBD. Firm size did not correlate to knowledge of EBD. A sampling of responses is shown in Table 4.

Table 4: Subjects' understanding of EBD (Q13).

Firms with Little or No Understanding (n=5)		Firms with Some or Greater Understanding (n=5)	
Size	Responses	Size	Responses
Small (n=2)	<ul style="list-style-type: none"> “I have very little understanding of it” 	Small (n=1)	<ul style="list-style-type: none"> “going back to how do you root something not in just a guess but in some research...[to] back up certain pieces based on that research”
Medium (n=3)	<ul style="list-style-type: none"> “oh dear...taking certain solutions and evaluating [them] to track outcomes so I could recommend that to another client” “Provide solutions based on other precedent setting projects or systems that have been in place and are providing data that supports a certain solution.” 	Medium (n=3)	<ul style="list-style-type: none"> “using research and data; using other projects to inform how we design” “taking knowledge (some of it research) and experience... combined together and applying it to your situation”
		Large (n=1)	<ul style="list-style-type: none"> “[EBD produces] design solutions that are justified by numbers, and right now we don't necessarily believe [what] all those numbers are saying because they're so subjective.”

Note: All text in the table was directly quoted from subjects.

Subjects' definitions of EBD reflected a level of confusion and frustration with EBD, echoed in the literature (Hamilton & Watkins, 2009; Martin, 2009). The response from the large-sized firm (L1) subject illustrated this concern, noting the firm's uneasiness with the quantity and variety of factors influencing the outcome. Being unable to definitively state if the occupant's behavior was caused by a design intervention factor versus other factors (e.g., staff behaviors) undermined this firm's commitment to EBD.

Practitioners' Degree of Engagement in EBD (Q14). Of the firms that participated in the survey, three (S1, M2, and L1) did not engage in EBD. Of these firms, neither subject from the S1 or M2 firms defined EBD clearly, if at all; whereas, the subject from the large firm (L1) was able to clearly define EBD, but the firm did not engage in EBD (see Table 5). Reasons included: 1) perceived difficulty in adapting EBD to individual projects, 2) reliance on the depth of knowledge held by firm principals who led projects, 3) concerns with the reliability of depending on “numbers” as the basis of a design solution, or 4) the subject's personal lack of understanding about EBD. A sampling of responses illustrated that firms are generally practicing normative design and/or lack information about EBD, challenges commonly discussed by authors advocating for an EBD-approach (Martin, 2009):

- “No, not really. Every project has a firm principal on it, so lots of experience...this is empirical knowledge that we have because we’ve done all this work that says ‘that solution is going to be appropriate,’ work or not” (M2).
- “It’s hard to quantify EBD...when you’re talking about people’s feelings and/or attitudes that are influenced by your design it’s hard to actually put numbers to those” (L1).

There was no correlation between firm size and implementation of an EBD-approach. Regarding the firms that did engage, the majority (S2, S3, M1, and M3) of their responses were weak in conviction and clarity, such as “Boy, kinda-sorta. Does that make sense? I think we do root most of what we do in not just a whim and whimsy...[we] try to use the research that we’ve been able to find to support what we’re doing” (S2). However, one subject (M5) enthusiastically offered that the firm was engaged with expanding its implementation of EBD as a way to better address the increasingly complex projects that came to their practice, “...we can kill ourselves on design trying to save a thousand square feet here and there...but human costs are the largest expense.”

Practitioners’ Perceptions About Possible Benefits From Learning More About EBD (Q15/Q15a). Nine subjects noted that they would like to learn more about EBD. Reasons varied, but focused primarily on the increase in publicized information about EBD and the firm’s need to stay competitive (see Figure 3).

Subjects’ Responses About Why They Want to Learn More About EBD (direct quotes; n=9)
<ul style="list-style-type: none"> • The more we learn it better informs what we do and the value we bring to our clients—the environments we create (S2) • [EBD] that’s the research piece that should always be informing us...could bring it in as an added service (S3) • [Learning more about EBD] would create a more consistent level of awareness and organization in doing it [EBD]...it is a quality control issue...due diligence...it needs to be consistent (M1) • Yes, definitely. [Due to] complexity of project types...we want to differentiate ourselves in the marketplace...it comes down to client satisfaction, repeat business and the only way to demonstrate that our designs are innovative (M5)

Figure 3: Subjects interested in learning more about EBD (Q15 & Q15a) (Source: Authors).

Only the large-sized firm (L1) stated “no” in response to the question about learning more about EBD (Q15), citing some challenges:

[EBD] is kind of similar to sustainability...the client expects [it]. We do have clients that don’t believe it, partly because they think it’s going to cost them more money...If you have an assembly line and you can point to a point in that assembly line that increases productivity that’s quantifiable, but in our work we don’t have those obvious points that we can measure. (L1)

Summary of the Findings

Overall, the findings indicated that firms are generally aware of the term “EBD,” though the accuracy of their descriptions varied. The majority of firms did not engage in EBD; though for those that did, “research” was actually the gathering of information for programming or was undertaken ‘after the fact’ to justify design decisions previously determined via their normative design process. They indicated that they/their firms would like to learn more about EBD. This confusion was consistent with findings from the literature (Poldma & Thompson, 2009), though practitioners declare that they valued research and that EBD “is of mounting importance” to practitioners (Dickinson, Anthony, & Marsden, 2012, p. 18).

PHASE 2: COMPARATIVE ANALYSIS OF PUBLISHED APPROACHES

Based on the findings from the practitioner survey, the researcher considered factors possibly contributing to the non-healthcare design practitioners' lack of knowledge about EBD, i.e., do the current resources present information that is understandable, appropriate, and applicable? A search for published approaches to integrating an EBD-approach into the design process indicated a growing interest in this approach, originating substantially for and/or by healthcare practitioners. This interest paralleled the publication of peer reviewed articles/journals discussed earlier (see Figure 4).

<p>2008:</p> <ul style="list-style-type: none"> • <i>A Practitioner's Guide to Evidence-Based Design</i> Harris, D., Joseph, A., Becker, F., Hamilton, D., Shepley, M., & Zimring, C. Concord, CA: Center for Health Design. <p>2009:</p> <ul style="list-style-type: none"> • <i>Evidence-Based Healthcare Design</i> Cama, R. Hoboken, NJ: Wiley. • <i>Informing Design</i> Dickinson, J., & Marsden, J. (Eds.). New York: Fairchild. • <i>Evidence-Based Design for Multiple Building Types</i> Hamilton, K., & Watkins, D. Hoboken, NJ: Wiley. • <i>Evidence-Based Design for Interior Designers</i> Nussbaumer, L. New York: Fairchild. <p>2010:</p> <ul style="list-style-type: none"> • <i>Design Informed: Driving Innovation with Evidence-Based Design</i> Brandt, R., Chong, G., & Martin, W. (Eds.). Hoboken, NJ: Wiley. • <i>Evidence-Based Design of Elementary and Secondary Schools: A Responsive Approach to Creating Learning Environments</i> Lippman, P. Hoboken, NJ: Wiley. • <i>Evidence-Based Design for Healthcare Facilities</i> McCullough, C. (Ed.). Indianapolis, IN: Sigma, Theta Tao International. <p>2011:</p> <ul style="list-style-type: none"> • <i>Evidence Based Design: A Process for Research and Writing</i> Kopec, D., Sinclair, E., & Matthes, B. (2011). Upper Saddle River, NJ: Pearson Prentice Hall.

Figure 4: Books reviewed for comparative analysis of EBD-approaches (Source: Author).

Books were examined relative to 1) focus, how and when EBD is implemented into the design process (i.e., pre-design, etc.); 2) author(s)' type, design academicians/researchers, others; 3) EBD definition(s) and rationale, 4) EBD strategies, activities, and methods, and 5) timeline for implementation. First, a comparison of essential characteristics was conducted to identify author's/editor's background, intended audience, and if implementation of a 1) hypothesis, 2) theory, 3) collaborative/interdisciplinary approach, or 4) if having a researcher on the team or hired as a consultant were proposed (see Figure 5). [Note: books are referenced by first author in Figure 5.]

Intended audience was principally design practitioners and/or students (7:9), healthcare professionals (McCullough, 2010), and graduate students (Kopec, Sinclair, & Matthes, 2011). Audience by building typology was for multiple building types (including healthcare) (5:9), healthcare (3), and education (1). All authors defined EBD and described its purpose and rationale and raised concerns over the possibility of a prescriptive approach. The use of a hypothesis as the basis of determining measurable outcomes was prescribed by the majority of books noting its implementation as 1) a means by which to create a clear project vision, in schematic design (SD) (Cama, 2009); 2) as evidence to determine project goals (Brandt et al., 2010) or developed relative to potential outcomes (Lippman, 2010), both pre-design through

design development (DD), but unspecified in terms of identification; and 3) predicted outcomes linked to evidence-based concepts, SD through DD (Hamilton & Watkins, 2009).

Application of theory was proposed by three books, two for practitioners (Lippman, 2010; Nussbaumer, 2009) and one for graduate students (Kopec et al., 2011). Lippman (2010) noted theory's use in development of "macro questions." Nearly all books recommended and described a collaborative/interdisciplinary approach including primary stakeholders from the client's leadership/administration and the community to end users and visitors of the space, members of the design team, contractors, cost consultants, and researcher. Moreover, many advocated for practitioners to engage an expert research partner with the researcher's role varying by project, but focused on hypothesis generation and evaluating outcomes (Harris, Joseph, Becker, Hamilton, Shepley, & Zimring, 2008).

Figure 5: Comparison of essential characteristics across books.

Essential Characteristics	Authors/Editors (alpha order, first name only noted)								
	Brandt	Cama	Dickinson	Hamilton	Harris	Kopec	Lippman	McCullough	Nussbaumer
Authors'/editors' background	P/A	HCP	A	P/A	HCP/A	A/P	EP	N	A
Intended audience	P	HCP	U/P	P	HCP	G/P	EP	N	P/U,G
EBD definition, purpose, rationale addressed	X	X	X	X	X	X	X	X	X
User of hypotheses in process	X	X		X	X	X	X		
Use of theory in process						X	X		X
Collaborative/interdisciplinary approach for integration	X	X		X	X	X	X	X	
Advocacy for integration of a researcher on the team or hired as a consultant	X	X		X	X	N/A			
Integration timeline documented						N/A			
• Fully/specific		X		X					X
• Partially/implied			X		X		X		
• None/unclear	X							X	
Design phase when EBD is implemented to the greatest degree									
• Programming (Pre-Design)			X		X		X		X
• Programming & Schematic Design (SD)		X							
• Programming, SD, and Design Development (DD)				X					
Key: A = academician(s); EP = educational practitioner(s); G = graduate design student(s); HCP = healthcare practitioner(s); N = nurses and other healthcare provider(s); N/A = purpose of book makes this characteristic irrelevant; P = practitioner(s); U = undergraduate design student(s); X = yes.									

Books varied widely relative to identifying a timeline for integration of an EBD-approach. Three provided specific timelines, fully described (Cama 2009; Hamilton & Watkins, 2009; Nussbaumer, 2009) and three other books partially described or 'implied' a timeline (Dickinson & Marsden, 2009; Harris et al., 2008; Lippman, 2010). The remaining two books did not provide a timeline or what was proposed was unclear (Brandt et al., 2010; McCullough, 2010). Of those that prescribed when implementation should occur, four stated in pre-design (Dickinson & Marsden, 2009; Harris et al., 2008; Lippman, 2010; Nussbaumer, 2009); Cama (2009) noted integration as during SD and Hamilton and Watkins (2009) noted integration during SD and DD. In summary,

though essential characteristics were evident (see Figure 5), inclusion of an EBD-approach was inconsistent relative to omission of details for implementation, assumptions of practitioners' understanding, and conflicts occurring due to incompatibility of timelines (normative versus EBD-approach).

Limitations

Four of the firms (M2, M3, M5, and L1) do engage in healthcare design as one of a minimum of three areas of practice (see Table 2), though healthcare design was not the focus within their personal practice. Also, this purposive sample was drawn from an Internet search of organizational (e.g., AIA, American Society of Interior Designers) and firm Web sites, refined by the researcher based on 17 years of design practice. This approach might have interjected bias, though firms studied were ones where the researcher had not worked. Also, findings might be skewed by response bias due to the subjects' knowledge of the advanced degree of the researcher. And finally, books about EBD published outside of the United States were not evaluated.

CONCLUSION

This study's first phase implemented an exploratory survey of non-healthcare practitioners to identify current 1) understanding of EBD, 2) degree of implementation of EBD, and 3) interest in learning more about EBD. Findings indicated that beyond information gathered about a specific client (i.e., programming), design decisions were generally grounded in practitioners' knowledge from education and experience, intuition, creativity, "best practices," precedent, and information gathered from "soft sources" (i.e., trade publications, manufacturers' reports) (Dickinson & Marsden, 2009), i.e., normative design.

The subjects' unfamiliarity with research indicated that they were uncertain if they had the requisite knowledge to engage in EBD, and moreover, were unclear as how to distinguish it from the gathering of information. It behooves the academy to partner with the practitioner community to bridge this knowledge gap (Dickinson, Anthony, & Marsden, 2012). Clearly, this knowledge can be attained, as demonstrated by the community of healthcare designers.

Furthermore, the subjects demonstrated a casual application of knowledge, whether tacit or codified (Poldma & Thompson, 2009), generalizing findings from one design solution and/or client to another, commonly using intuition to determine applicability, a normative design approach (Groat & Wang, 2002). An understanding of basic research vocabulary and methods would enable design practitioners to be responsible consumers of research, allowing for consideration of hypothesis generation and inclusion of theory, as advocated by EBD books reviewed.

Though subjects noted that their firms integrated "research" findings into the design process, it was unclear if the information gathered was truly research (i.e., empirical) or if it was anecdotal in nature and none relied on hypothesis generation/testing or theoretical underpinning, as advocated by most books reviewed. Applying findings indiscriminately could subsequently give EBD a 'bad name'—similar to the trajectory of "green design" as 'green wash' a decade ago.

Also, subjects' reliance on firm leadership to "know enough" (i.e., to be subject matter/building type experts) continues to promote normative design. Firms relying on "best practices" may be reluctant to make the necessary fiscal investments in EBD (i.e., learning curve and extended time spent on projects), though incremental implementation lessens the initial negative fiscal impact of a longer design phase (Martin, 2009). Brandt et al. (2010) warn that delayed implementation of EBD will leave firms at a disadvantage among their peers.

Responses supported factors found in the literature, including the lack of knowledge about research and confusion about information versus research implicit in current non-healthcare focused design practice. Also, historical context (normative design/best practices) and external

factors (the media, socioeconomic conditions, and knowledgeable clients) seemed to suppress adoption of an EBD-approach to decision-making (see Figure 6).

Findings from the practitioner survey instigated the second phase of the study, a comparative analysis of EBD-approaches to the design process, published since 2008. Books advocated for the ‘practitioner as researcher’ (Harris et al., 2008; Kopec, Sinclair, & Matthes, 2011), advocated earlier by van Aken (2005), citing the growing complication of design process knowledge and resultant project. Though these books varied in their degree of prescription, exposure to their content could raise non-healthcare focused practitioners’ awareness about EBD, accentuating the “science” aspect of design disciplines’ “applied arts,” which has significant currency for the design disciplines (Pable, 2009).

Many authors identified challenges relative to EBD as an innovation to the normative design process and question if what evidence is available is enough to substantiate an EBD-approach (Hignett & Lu, 2009; Ullán, Belver, Fernández, Serrano, Delgado, & Herrero, 2012; van de Glind et al., 2007). Others warned of the prescriptive nature of an EBD-approach (van Aken, 2005). Meanwhile, many others acknowledged the benefits that an EBD-approach can bring to the normative design process in terms of measurable outcomes. Namely, the evaluation of the human behavior and needs factors in context with the built environment design parameters; as systematically identified, evaluated, documented and then applied via the design solution (Andersson et al., 2013; Andrade et al., 2012; Glenister, 2012; Olausson, Lindahl, & Ekebergh, 2013).

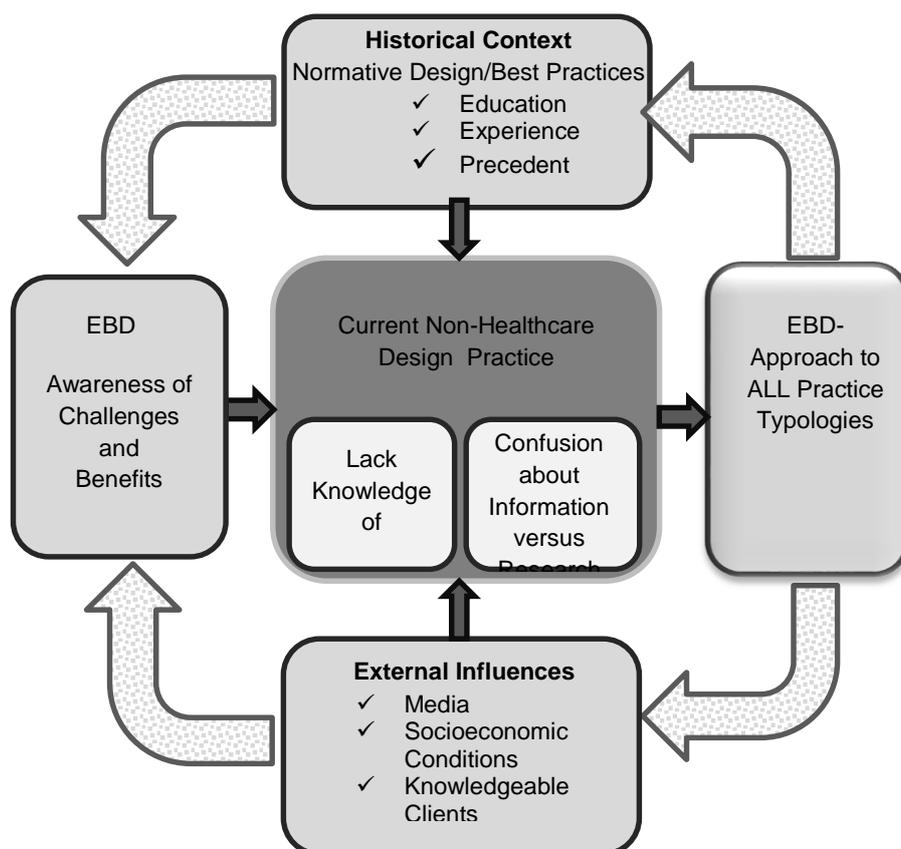


Figure 6: Current non-healthcare design practitioners’ design process

Due to this expanding dialogue, though largely healthcare facility related, much more is known about how to engage in an EBD-approach than when those first adopters embarked on this path. As stated by Cama (2009),

...a design team must think futuristically, for at the risk of building a better old building they must innovate. It is in the evidence-based process that innovation can be grounded in the security of an informed process where a certain amount of rigor replaces an educated sense. (p. 130).

Findings highlight non-healthcare designers' lack of clarity regarding EBD components and concerns about the challenges that accompany engagement in an EBD-approach (see Figure 2). Furthermore, the literature may not be going far enough with information about how to integrate EBD into the timeline of the phases of the design process. Researchers need to identify elements of an operational model for an EBD-approach to practice (Mostafa, 2014) as well as educational protocols (Plowright & Cole, 2012; Salama, 2008), and supporting materials and/or tools for multidisciplinary design firms' implementation (Ryan et al., 2014; Salama, 2007). Together, these deliverables could transform non-healthcare designers' normative design process and advance non-healthcare design practice as it is doing for healthcare design practitioners. This possibility incentivizes the academy to embark on a substantial educational effort within the classroom and through collaborative scholarship with non-healthcare design practitioners to encourage adoption of this innovation. Implementation of an EBD-approach will inform the design team's future work, improve the design outcomes for the client and inhabitants of the built environment, and enable dissemination of EBD outcomes to the design community, thereby adding to the body of knowledge. The design process must evolve beyond normative design to better integrate evidence to meet the challenges of the triple bottom line: people, planet, and profit (Savitz, 2006).

REFERENCES

- 2012 AIA firm survey. (2013). Retrieved from <http://www.aia.org/aiaucmp/groups/aia/documents/pdf/aiab095792.pdf>
- Asfour, K. (2007). Polemics in Arab architecture: Theory versus practice. *International Journal of Architectural Research*, 1(1), 53-69.
- About EDAC. (2012). Retrieved from <http://www.healthdesign.org/edac/about>
- AIA 2011 compensation report. (2011). Retrieved from <http://www.aia.org/aiaucmp/groups/aia/documents/pdf/aiab090998.pdf>
- Andersson, M., Svennerlind, C., Malmqvist, I., & Anckarsäter, H. (2013). New Swedish forensic psychiatric facilities: Visions and outcomes. *Facilities*, 31(1/2), 24-38. DOI: 10.1108/02632771311292491
- Andrade, C., Lima, M. L., Fornara, F., & Bonaiuto, M. (2012). Users' views of hospital environmental quality: Validation of the perceived hospital environment quality indicators (PHEQIs). *Journal of Environmental Psychology*, 32(2), 97-111. DOI: 10.1016/j.jenvp.2011.12.001
- Barnes, J. (2010). Evidence-based design: An interior designer's opportunity. In C. Martin & D. Guerin (Eds.), *The state of the interior design profession* (pp.129-135). New York: Fairchild Books.
- Brandt, R., Chong, G., & Martin, W. (Eds.) (2010). *Design informed: Driving innovation with evidence-based design*. Hoboken, NJ: Wiley.
- Cama, R. (2009). *Evidence-based healthcare design*. Hoboken, NJ: Wiley.
- Cama, R. (2010). The emerging profession of evidence-based interior design: Four myths about interior design that must first be dispelled. In C. Martin & D. Guerin (Eds.), *The state of the interior design profession* (pp.490-494). New York: Fairchild Books.
- Cohen, A., & Hersh, W. (2004). Guest editorial: Criticisms of evidence-based medicine. *Evidence-Based Cardiovascular Medicine*, 8, 197-198.
- Coleman, C. (Ed.). (2002). *Interior design handbook of professional practice*. New York: McGraw-Hill.
- Dickinson, J., & Marsden, J. (2009). *Informing design*. (Eds.). New York: Fairchild.

- Dickinson, J., Anthony, L., & Marsden, J. (2012). A survey on practitioner attitudes toward research in interior design education. *Journal of Interior Design*, 37(3), 1-22.
- Doherty, S. (2005). History of evidence-based medicine. Oranges, chloride of lime and leeches: Barriers to teaching old dogs new tricks. *Emergency Medicine Australasia*, 17, 314-321.
- Fisher, T. (2004 Fall/2005 Winter). Architects behaving badly: Ignoring environmental behavioral research. *Harvard Design Magazine*, 21, 1-3.
- Fisher, T. (2010). Future sense: Why design thinking matters. In C. Martin & D. Guerin (Eds.), *The state of the interior design profession* (pp.61-65). New York: Fairchild Books.
- Glenister, D. (2012). Creative spaces in palliative care facilities: Tradition, culture, and experience. *American Journal of Hospice & Palliative Medicine*, 29(2), 89-92. DOI: 10.1177/1049909111412581
- Groat, L., & Wang, D. (2002). *Architectural research methods*. Hoboken, NJ: Wiley.
- Guerin, D., & Thompson, J. (2004). Interior design education in the 21st century: An educational transformation. *Journal of Interior Design*, 30(1), 1-12.
- Hamilton, K., & Watkins, D. (2009). *Evidence-based design for multiple building types*. Hoboken, NJ: Wiley.
- Harris, D., Joseph, A., Becker, F., Hamilton, D., Shepley, M., & Zimring, C. (2008). *A practitioner's guide to evidence-based design*. Concord, CA: Center for Health Design.
- Hignett, S., & Lu, J. (2009). An investigation of the use of health building notes by UK healthcare building designers. *Applied Ergonomics*, 40(4), 608-616. DOI: 10.1016/j.apergo.2008.04.018
- Johnston, C. (2010). Technology's role in the design process. In C. Martin & D. Guerin (Eds.), *The state of the interior design profession* (pp.205-210). New York: Fairchild Books.
- Jones, E. (2010). A case for interdisciplinary design. In C. Martin & D. Guerin (Eds.), *The state of the interior design profession* (pp.159-164). New York: Fairchild Books.
- Kopec, D., Sinclair, E., & Matthes, B. (2011). *Evidence based design: A process for research and writing*. Upper Saddle River, NJ: Pearson Prentice Hall.
- Linster, J. C. (2010). Perceived identity. In C. Martin & D. Guerin (Eds.), *The state of the interior design profession* (pp.449-452). New York: Fairchild Books.
- Lippman, P. C. (2010). Evidence-based design of elementary and secondary schools: A responsive approach to creating learning environments. Hoboken, NJ: Wiley.
- Marsden, J. (2005). *Humanistic design of assisted living*. Baltimore: Johns Hopkins University Press.
- Martin, C. S. (2009). The challenge of integrating evidence-based design. *Health Environments Research & Design Journal (HERD)*, 2(3), 29-50.
- McCullough, C. (2010). *Evidence-based design for healthcare facilities*. (Ed.) Indianapolis, IN: Sigma, Theta Tao International.
- Mostafa, M. (2014). Architecture for autism: Autism ASPECTSS in school design. *International Journal of Architectural Research*, 8(1), 143-158.
- Mourshed, M., & Zhao, Y. (2012). Healthcare providers' perception of design factors related to physical environments in hospitals. *Journal of Environmental Psychology*, 32(4), 362-370. <http://dx.doi.org/10.1016/j.jenvp.2012.06.004>
- Nussbaumer, L. (2009). *Evidence-based design for interior designers*. New York: Fairchild.
- Olausson, S., Lindahl, B., & Ekebergh, M. (2013). A phenomenological study of experiences of being cared for in a critical care setting: The meanings of the patient room as a place of care. *Intensive and Critical Care Nursing*, 29(4), 234-243. <http://dx.doi.org/10.1016/j.iccn.2013.02.002>
- Overview of the 2009 AIA firm survey. (2009). Retrieved from http://info.aia.org/aiarchitecture/thisweek09/1009/1009b_firmsurvey.cfm
- Pable, J. (2009). Interior design identity in the crossfire: A call for renewed balance in subjective and objective ways of knowing. *Journal of Interior Design*, 34(2), v-xx.
- Plowright, P. D., & Cole, M. L. (2012). Bringing structure to judging success in architectural design: The 'TIOSE' qualitative measure. *International Journal of Architectural Research*, 6(3), 7-19.
- Poldma, T. & Thompson, J. (2009). *Proposing a dialogue about design research in interior design: New frontiers and possibilities*. Presentation at the Interior Design Educators Council International Conference, (pp.625-635). St. Louis, MO.
- Rogers, E. (1995). *Diffusion of innovations*. (4th ed.). New York: The Free Press.
- Ryan, C. O., Browning, R. W., Clancy, J. O., Andrews, S. L., & Kallianpurkar, N. B. (2014). Emerging nature-based parameters for health and well-being in the built environment. *International Journal of Architectural Research*, 8(2), 62-76.
- Safian, R. (2011, October). Design of things to come. *Fast Company*, 159, p. 22.

- Salama, A. M. (2007). Navigating housing affordability between trans-disciplinarity and life style theories: The case of the Gulf States. *International Journal of Architectural Research*, 1(2), 57-76.
- Salama, A. M. (2008). A theory for integrating knowledge in architectural design education. *International Journal of Architectural Research*, 2(1), 100-128.
- Savitz, A. W. (2006). *The triple bottom line: How today's best-run companies are achieving economic, social and environmental success -- and how you can too*. Hoboken, NJ: Jossey-Bass, Wiley.
- Stewart-Pollack, J. & Menconi, R. (2005). *Designing for privacy and related needs*. New York: Fairchild Books.
- Ullán, A. M., Belver, M. H., Fernández, E., Serrano, I., Delgado, J., & Herrero, C. (2012). Hospital designs for patients of different ages: Preferences of hospitalized adolescents, nonhospitalized adolescents, parents, and clinical staff. *Environment and Behavior*, 44(5), 668-694. DOI: 10.1177/0013916511403802
- van Aken, J. E. (2005). Valid knowledge for the professional design of large and complex design processes. *Design Studies*, 26(4), 379-404. DOI: 10.1016/j.destud.2004.11.004
- van de Glind, I., de Roode, S., Goossensen, A. (2007). Do patients in hospitals benefit from single rooms? A literature review. *Health Policy*, 84(2-3), 153-161. DOI: 10.1016/j.healthpol.2007.06.002
- Wheeler, G. E. (2010). Holistic revolution: Elevating the value of interior design. In C. Martin & D. Guerin (Eds.), *The state of the interior design profession* (pp.22-29). New York: Fairchild Books.
- Whitemyer, D. (2010, Spring). The future of evidence-based design: It's not just for healthcare anymore. *Perspective*, p. 9-14.
- Zimmerman, M. (2012, November). The architecture of satisfaction. *Interior Design*, 83(14), 53-66.

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