Actionable Knowledge:
A Research Synthesis Project For Affordable Housing Design Practice

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I. Introduction

In making decisions about affordable housing design, architects
and public officials typically draw on their experience, intuition, previous work or professional
contacts rather than a more explicit knowledge base. Within community design efforts, which
constitute a small yet significant segment of affordable housing practice, action research has found
a foothold in linking research and practice.[1] But action research is project-specific and efforts to
compile a comprehensive knowledge base acquired from these numerous site-specific studies have
not yet been attempted.

I would like to contribute another way of linking action and research: *actionable knowledge*.
Actionable knowledge, as I use the term, means more than knowledge derived from personal
experience. Actionable knowledge *for a profession* reflects an integrated and comprehensive–yet
always evolving–body of systematically-derived research that addresses use-inspired issues and
practices, and that is used by practitioners and policy makers. As the knowledge economy becomes
a more prominent component in many countries and industries today, firms and agencies are capi-
talizing on the payoffs resulting from integrating knowledge and action by creating means to best
exploit their knowledge assets. My focus in this paper is on affordable housing design practice
(ADHP), but the arguments and examples may be applicable to other design and industry types as
well.

In the U.S., there is no established agenda for organizing, disseminating and advancing the state
of knowledge of how good design is best employed to create long-term economic and social value
in affordable housing.[2] There are examples of "best practices," but many of these profiles provide
little evidence or substantiation of what makes them "best" or even establish the criteria for why
they are being judged as "best." A study by Wolman, Hill and Fordale[3] calls into question the use
of experts in identifying best practices. When a panel of urban economic development experts was
asked to identify the most successfully revitalized cities of the 1990s, their listing failed to cor-
respond to those cities that ranked highest on composite objective measures of revitalization and
resident economic well-being.

I am not so naïve to think that practitioners and policy makers take action based simply on research information, careful reasoning and rational thought. Politics, personal desire, power, and money all are factors. And so is a form of neophobia: the ease of doing something familiar, the way it has always been done. Learning something new, and subsequently acting in a different manner, is difficult not simply for architects but managers and leaders throughout various industries. As management expert Chris Argyis claims, "… [S]uccess in the marketplace increasingly depends on learning, yet most people don't know how to learn. What's more, those members of the organization that many assume to be the best at learning are, in fact, not very good at it. I am talking about the well-educated, high-powered, high-commitment professionals who occupy key leadership positions in modern corporation."[4] Research by Argyis and others[5] shows that many business and policy leaders rely on well-established but rigid knowledge structures they have acquired and used extensively, making it almost impossible to acquire new insights. But if we recognize the changing world of design practice, particularly as we truly address the responsibility of moving towards a more integrated one, we need to value evidence and develop actionable knowledge. The crux is how to foster an *evidence-seeking* design culture. That is a question I do not directly answer here, although it is a fundamental question and requires more attention than this single article can provide. Here I attempt to address how to start building a foundation for *evidence-informed* practice within architecture and ADHP in general.

Environmental planner and attorney Joseph F. Dimento[6] distinguishes two types of research influence. Influence is *instrumental* when research findings translate to the establishment of a specific action, regulation, policy, plan or design. Instrumental use is what is typically considered when talking about research influencing design or policy. But Dimento also suggests that *conceptual* influence may have the most long-lasting effect on policies and practices, wherein the research challenges and reframes the thinking of a policy maker about a particular issue or condition without necessarily resulting in direct actions. Instead, an idea enters public or professional dialogue. The sociologist Anthony Giddens claims that conceptual influence derived from social science research is more important than the practical insights through technical and natural science research because of changes in perspectives and new understanding.[7] Arguably one of the most influential books of the last quarter century in urban design, Jane Jacob's *The Death and Life of Great American Cities*[8] did not result in an immediate flurry of zoning and planning code changes. But it greatly influenced a generation of planners, architects, and public officials to reconsider the meaning of urban vitality, and the physical and social bases for that, which eventually led to a rethinking of many urban design practices within North America. I argue that actionable knowledge can have both instrumental and conceptual influence. Using Argyris' analogy of the thermostat to reflect two types of learning, a thermostat that automatically turns on the heat whenever the temperature in a room drops below 68 degrees is a good example of what he calls "single-loop learning" and what reflects instrumental use of knowledge. But a thermostat that asks "Why am I set at 68 degrees?" and then explores whether or not some other temperature might more economically achieve the goal of heating the room is engaged in double-loop learning, reflecting conceptual influence.[9]

To set a direction for moving towards actionable knowledge, this paper advocates for a professional approach towards the production and preservation of affordable housing that incorporates what I call *evidence-informed design practice* in fostering healthy, livable environments that reflect long-term economic and social value for residents and the communities in which they live.[10] The first section of this paper addresses the question, to what extent could evidence-informed practices be situated within the affordable housing design profession? The second section further addresses this question by considering one strategy–Research Synthesis–and describes a particular project being developed.

2. What is Evidence-Informed Design Practice?

Evidence-based medicine emerged as a movement in the mid 1990s, spearheaded by the York-based Cochrane Centre, to bring a more scientific approach to seemingly random differences in surgical techniques and clinical practice in hospitals. Today, the evidenced-based medicine movement has evolved into a more inclusive evidence-based health practice, involving physical and behavioral health, social work, and child welfare services.[11] Evidence-based health practice means integrating the best available clinical evidence from systematic research *with* individual clinical expertise. If we take our own selfish selves as examples, when we visit a physician we want to know that she is current on the latest medical and health research when considering our ailments. But we do not want her to simply treat us as a standard textbook case. We want her to consider our own individual situations, history, circumstances. We want her to work with us in deciding when best to apply medical research findings to our particular situation, and when not. A physician's expertise is reflected in many ways but particularly in the thoughtful identification and compassionate understanding of individual patients' predicaments, situations and preferences in making clinical decisions about their care. Indeed it is that expertise that determines whether the research evidence should be applied to the individual patient at all and, if so, how it should be integrated into a clinical decision.[12]

Following, an evidence-informed *design* practice would involve designers working with clients to make decisions based on the best information available from research and project evaluations *in conjunction with* the specificities, inclinations, and context of the client and project. The reflective practitioners' thinking, experience, and creativity continues to play a central role in the evidence-informed design process since the solution must be targeted to the specifics of client, program, context, and site, and within contexts of continuous flux, such as changing demographic, economic, cultural, technological, and political conditions.

The wholesale transfer of this model into *design practice* is a complicated matter. The processes that operate on communities, households, and organizations–occupants of the built landscape–are more complex and less well understood than those that operate within the human body. And rigorous, controlled experiments–considered hallmarks of quality research–are much more difficult to conduct in the lived landscape than in controlled medical experiments. Clearly evidence-informed design operates within architectural practice when we consider designing for the operational viability and safety outcomes of particular structures, materials, and environmental systems. Evidence resulting from systematic research and evaluation is portrayed in codes and specifications. But when addressing the more human implications of our design decisions–economic, social, behavioral, emotive, health –evidence is usually sporadic, sometimes idiosyncratic, and at times neglected. This may be changing. Designers and researchers within the healthcare industry are promoting evidence-based design practice and are convincing healthcare administrators to invest the time and money to build better buildings.[13] With serious fiscal, liability, safety and health issues at stake, many architects welcome the emerging research foundation on which to base important decisions.[14]

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ACTIVITY		LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
Interpret the Evidence	Read material to stay current on emerging research.	★	★	★	★
	Use critical thinking to interpret implications of research on current project.	★	★	★	★
	Collect success stories and historical data on completed projects.	★	★	★	★
Hypothesize and Measure	Perform applied research as a practitioner on real projects.		★	★	★
	Hypothesize intended results of design interventions.		★	★	★
	Measure the results associated with design interventions.		★	★	★
Share Results Publicly	Report unbiased project results in the public arena, writing and speaking.			★	★
	Perform independent 3rd-party postoccupancy evaluations.			★	★
	Improve understanding of research methods through advanced education.			★	★
Meet Academic Standards	Collaborate with credible academic researchers and social scientists.				★
	Publish research results in peer-reviewed journals.				★
	Write academic thesis or dissertation on evidence-based design topic.				★

Figure 1. Four Levels of Evidence-based Practice (from Hamilton)[17]

A leading proponent of evidence-based practice, architect D. Kirk Hamilton[15] details four levels of such a practice, each level representing an increasingly rigorous stage of commitment and methods (see Figure 1). At level 1, practitioners familiarize themselves with the research literature of their field and try to incorporate relevant evidence into their work. Level-two practitioners hypothesize the expected outcomes of design interventions and subsequently measure the results. At level three, they begin to share their results publicly in the trade and popular press. And level-four practitioners perform the same tasks as those at the other levels but also publish in quality journals that are peer-reviewed. They may also collaborate with social scientists in academic settings who contribute to the formal academic literature.[16]

There is an implicit assumption in Hamilton's model that level one activity–reading the material to stay current on emerging research–is the easiest. But actually it can be most challenging for practitioners whether they are designers, policymakers, or developers. Research can offer complex and sometimes contradictory insights, demanding comparison, criticism, evaluative judgment and synthesis beyond simply reading a series of articles. Most professionals can hardly keep abreast of new research developments. Even within medicine, a profession with a strong research foundation, clinicians face difficulties in keeping abreast of all the medical advances reported in primary journals. One study showed that keeping current with the reading for general medicine would require examining 19 articles per day, 365 days per year.[18]

Evidence-based design practices within the healthcare industry have made significant strides in the last decade, developing and implementing strategies for successfully bridging research and design practices, and resulting in better informed design decisions that ultimately impact the health of patients and staff. The AIA College of Fellows awarded its 2005 Latrobe Fellowship to Chong Partners Architecture, Kaiser Permanente, and the University of California at Berkeley for a research study that incorporates techniques from psychology, sociology and neuroscience. The research involves an unusual collaboration of architect, client, and university to determine how hospital design affects the recovery and healing for people of different cultures. Another important collaborative example is The Pebbles Project under the auspices of The Center for Health Design.[19] This project, over five years old, provides evidence-based examples of healthcare facilities whose design has made a difference in the quality of care and financial performance of the institution. Currently there are 37 active provider partners and three corporate partners. Each partner pays an annual fee of $30,000 for a three-year membership. In return, they receive prompt access to research information and expertise to questions they have. High-level consulting and technical assistance to facilitate the partner's research is also provided, as well as a proprietary research design methodology template. Most partners are healthcare facilities with one or more facilities being designed or continuously renovated.

It is perhaps not surprising that evidence-based design has found a foothold in the healthcare design profession. Members of the healthcare industry–whether medical administrators, hospitals, physicians, etc.–have historically elevated scientific results as the basis of decision-making. They also work within established industry borders: health facilities, for the most part, are institutionally-based.

This is a different animal from the housing industry. Desired outcomes are less agreed upon, more diffuse, and minimally measured. The historical base of the industry is geared toward profit-making and efficient, expedient construction rather than the care mission that underlies the healthcare industry. Evidence-based design appeals to the scientific minds of physicians and other clinicians who are trying to practice on the basis of medical evidence. This may be a harder sell among housing developers and others in the housing industry whose training has not embraced a research-practice mindset. But evidence-informed design does have its appeal to business leaders and public officials. It offers them the prospect of reduced costs and/or improved organizational performance, and can provide justification for some of the costly decisions made on projects.

There are lessons to learn and strategies to adapt from evidence-based practices of healthcare design. First, a glance at the healthcare facilities of the Pebbles' partners demonstrates that evidence-based design does not result in monolithic or standardized design. Second, as demonstrated in Hamilton's model, there are numerous ways to practice evidence-informed design, depending on context, stage of development, resources, and other factors. Third, as in most industries, return on investment (ROI) is foremost in the minds of these healthcare CEOs, and to date practitioners have been able to convince these CEOs not only of the health and social value of the design decisions, but the business case as well.

Fourth, social, behavioral, and health outcomes *can* be meaningfully measured, transformed into relevant "metrics" that have an appeal to business leaders, developers and policy makers. Critics often point out the difficulty of measuring outcomes of subjective intangibles like "satisfaction," "preference," and the like. In recent years a number of behavioral economists have targeted their research to demonstrate how health and human capital outcomes can be translated into convincing ROI arguments.[20] Housing researchers have been moving towards tangible measures that are particularly salient to health outcomes and highly valued social and behavioral outcomes, such as educational performance. For example, in an ongoing longitudinal study of housing affordability, policy researchers Joseph Harkness and Sandra Newman at Johns Hopkins University[21] are examining how housing costs impact nutrition, residential mobility, and parental stress, which in turn results in children's health outcomes and cognitive development. While this study focuses on housing affordability costs, it is not a stretch to see how housing quality and design factors – for example, size and layout of the dwelling unit and residential development; day lighting; accessibility; the manner in which units are clustered on a site–might result in similar health and behavioral outcomes.

To date, evidence-informed design has not reached the affordable housing field. This is not for lack of relevant research. Rather, research is often conveyed in journal articles and reports that are written for researchers, not for designers. And architects have little time to "translate" these or to stay abreast of current research. Further, finding germane research may require one to cull through several databases and irrelevant articles; and then still be left with questions on how to determine the rigor and quality of the research. While many affordable housing developers and designers wish to make informed decisions based on valid, relevant evidence, they may be stymied in their efforts to find synthesized, well-grounded, and concise accounts that are targeted to issues and questions of their concern. There are good, solid "databases" of housing-relevant research reports: examples include KnowledgePlex (http://www.knowledgeplex.org/), California's Housing and Community Development (http://www.hcd.ca.gov/hpd/biblio.html), and those within HUD's Office of Policy Development and Research (e.g. PATH, Regulatory Barriers Clearinghouse). Yet these databases consist of reports, with minimal attempt at synthesis of research *across* reports.

Further complicating the matter is the complexity and non-institutional nature of the affordable housing design practice (AHDP) which encompasses all those participating in the design and development of affordable housing whether they be in the architect's or developer's office, the State House or White House, on the planning board, or as a community organizer. Different constituents are confronted with different dilemmas, and an evidence-informed AHDP to be comprehensive and effective must address this diversity.

Yet there are challenges *all* these constituents face in implementing evidence-informed affordable housing design. All operate in arenas where time is tight and responses must be quick. Planners and government staff officials may have more luxury of time when establishing or revising long-term policy and regulations; but even among these constituents, succinct, visual, compelling, and relevant evidence is useful when trying to expeditiously convey the importance of the policy development to harried public officials. Today, with electronic resources much more accessible and user-friendly, synthesized and relevant research evidence can be expressed and transmitted in visual and concise formats that can be retrieved quickly.

3. Research Synthesis (RS) as a Strategy Towards Developing Actionable Knowledge

Once convinced of its value, how could we create products and processes that tangibly support *evidence-informed design practices* within the ADHP? In providing a historical context of housing research during the Macarthur Foundation's announcement of their new $25 million sponsorship of housing research,[22] Sandra Newman of Johns Hopkins' Institute for Policy Studies noted that we know a tremendous amount about housing in terms of bricks-and-mortar issues (construction, building systems), finance and management. In comparison, we know very little about the role housing quality, density/crowding, affordability, and ownership models play in the lives of children, families and communities. A cultural change in the ADHP profession that would value evidenced-informed practices would strive to better understand, design for and substantiate the impact of housing conditions and design factors on outcomes–in addition to structural quality and financial feasibility–central to long-term economic and social value of the residents and the communities where they live, outcomes such as: safety and security; health and resilience; social capital; privacy; livability and utility; and economic betterment of household and neighborhood.

But housing research on such topics is often conveyed in journal articles and reports that are written for researchers, not for public officials, architects or housing developers. Practitioners have little time to "translate" these, or to stay abreast of current research. And finding research targeted to a specific issue may require one to cull through several databases and irrelevant articles. While many developers, public officials and others wish to make informed decisions based on valid, relevant evidence, they may be hindered in their efforts to find synthesized, well-grounded, and concise reports that are targeted to issues of their concern. Existing housing research will not realize its potential use in design and planning practices if individual studies simply accumulate in academic journals. Efforts to simplify do not mean efforts to be simplistic – but rather developing innovative, relevant and useful methods to convey complex, seemingly contradictory, research information in a manner that is comprehensible so practitioners can build upon and incorporate.

The Stardust Center for Affordable Homes and the Family is a new community design and research center at Arizona State University whose mission is to serve the needs of organizations, neighborhoods and professionals in creating quality homes in vibrant, sustainable communities. Currently the Center is developing an accessible web-based strategy to help foster evidence-informed design among various stakeholders involved in affordable housing and mixed-income developments. In doing so, one undertaking currently under way is the Research Synthesis project. The methods and procedures for this come from health care, health policy and management professions. In the scientific community literature, traditional research reviews are a standard practice of summarizing research. Yet these traditional reviews often lack transparency in how the researchers identified and collected the evidence to include in their publications. And they often lack a use orientation. More sophisticated, transparent, and practitioner-oriented, Research Synthesis (RS)[23] practices have been developed and refined in the last 15 years by a number of organizations (most in Britain). The Cochrane Collaboration was initiated in 1993 to prepare and maintain systematic reviews of research into the effects of health care interventions and to make this information accessible to health care practitioners.[24] The Collaboration has grown exponentially, with thousands of researchers and non-researchers completing systematic reviews. It has had a profound influence not only on health care delivery but also on the type of research that is funded and conducted. Now underway, the Campbell Collaboration is doing the same, but in the areas of education, justice and social welfare.[25] In the United States, the Robert Woods Johnson Foundation is producing concise briefs and reports that synthesize research findings on health policy questions.[26] Brief and policy-focused, these synthesis projects are structured around policy *questions* rather than research issues; they distill and weigh the strength of research evidence in rigorous and objective manners; and they draw out the policy implications of findings. Also with an extensive RS program, at the University of London the Evidence for Policy and Practice Information and Co-coordinating (EPPI) Centre[27] is dedicated to making reliable research findings about health, education and welfare accessible to the people who need them, whether they are making policy, practice, or personal decisions.
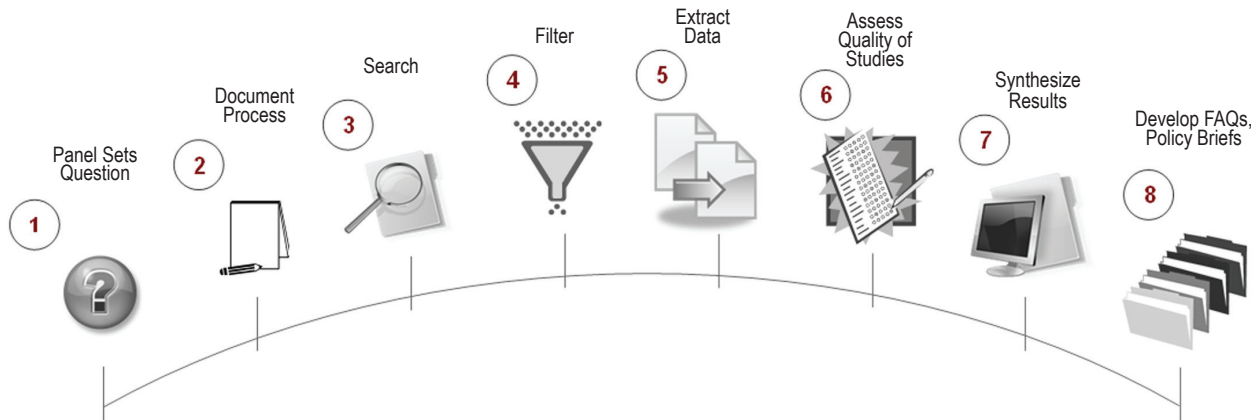
Figure 2. Steps in the Research Synthesis Protocol

RS is a carefully crafted, systematic, and effective methodology stressing transparency of process. In our project, we characterize RS as *a review of a clearly formulated question that uses systematic and explicit methods to identify, select and critically appraise relevant research, and to collect and analyze data from the studies that are included in the review.* Results are summarized in: (a) one-page FAQ-oriented overview; (b) two to three page summaries (or briefs), with both graphic and narrative description; and (c) a technical report that provides more detail of the process and individual studies that form the basis of the synthesis. Our approach is derived from the processes of the sources mentioned above as well as those in management practices.[28] Our process consists of eight steps described below and outlined in Figure 2.[29]

3.1 Panel Establishes Use-Inspired Research Question

The posing of a use-inspired question can be the basis for organizing an evidence-informed process. (Indeed, posing of the question is the first step in the research process.) Crafting the question is fundamental as it provides the framework for subsequent stages. A poorly conceived question can lead to loss of time and effort. Also important is the relevancy of the question. Evidence-based reviews, unlike traditional academic literature reviews, are driven by a user-led agenda. Involving practitioners and policy makers in developing this question helps ensure its usefulness and relevancy. In Stardust Center's RS project, a panel of reviewers from AHDP–architects, local and state housing officials, developers, real estate specialists, researchers, and journalists writing about affordable housing–form an *advisory panel* that formulates and prioritizes questions that are pertinent and salient and for which there has been some research conducted. The panel also examines the briefs and technical reports (see stage 8) to ensure their quality, applicability and language. High priority research questions identified at this time are listed in Figure 3.

The first one being undertaken is the first listed in Figure 3: under what conditions does affordable housing impact surrounding property values (referred hereafter as the *PV* issue)

Under what conditions does affordable housing impact (positively or negatively) surrounding property values?

What type of inclusionary zoning policies, and within particular economic and housing contexts, result in significant increases in affordable housing units for households working in the area?

What aspects of housing quality and design impact children's health and development?

What aspects of affordable housing impact children's educational performance?

Under what conditions (e.g. socio-economic; site, building and unit design; cultural) does higher density affordable housing affect crime and safety?

What aspects of housing quality and design impact (negatively, positively) household stress?

What are the most successful ratios of market-to-affordable units in a mixed income development (MID) that result in positive social interaction and sense of community? What important site, design and equipment (e.g. playground) features in MID result in positive social interaction and sense of community?

What are the costs and benefits (to residents, to neighborhoods, to community) of accessory units?

Figure 3. Potential Research Questions for Research Synthesis

3.2 Document the Process

The methods for the systematic review are made explicit in a protocol with a clear description of the process establishing: research question; comprehensive search and retrieval of the relevant research; data extraction and quality assessment of the primary studies. Transparency of the process not only ensures that users of the review can question the decisions and judgments made by the reviewers, but also encourages critical self-reflection. While no set of procedural canons can make the review process immune to the reviewers' biases, what can be done is to require that reviewers make their procedures explicit and open, so that readers can judge for themselves the appropriateness of the process for their purposes.

3.3 Comprehensive Search for Research Studies

The search needs to be comprehensive and systematic yet still targeted to answering the review question. A systematic search begins with the identification of keywords and search terms that are derived from the literature and discussions within the advisory panel. Electronic database searching is essential but not the only source. Also done is hand searching of journals and conference proceedings; searching of relevant websites; internet search engine searching; and personal contacts. Reviewers keep a 'search log' to record the detail of which databases and sources were searched as well as search terms used. The search strategy should be reported in detail sufficient to ensure that the search could be replicated. The output of the information is a full listing of articles, reports, books and other research documents.

For the PV issue, a total of 105 studies, articles and reports were identified.

Excluded:
Published before 1995 (21 of the 105)
Does not reflect primary research study of literature review (e.g. newspaper account of a reserach report; annotated bibliography) (22)

Excluded from Synthesis but Retained for Other Purposes:
For later reference check of synthesized results (12)
Of specialized housing types; may be relevant to a future research question or sub-question (e.g. nursing homes; trailer parks; supportive housing for special populations; mixed-income): (12)

Included for Synthesis: (38 of the 105)
Published in 1995 or later
Primary research article/report
Affordable housing characterized as either: public housing, tax-credit rental development, affordable housing, federally assisted housing, low-income housing (subsidized or non-subsidized)
Can include new developments; rehabs of existing developments
Study needs to examine at least one of the following: sales price, appraised price or other property value information of surrounding property

Figure 4. Inclusion and Exclusion Criteria for *PV* Issue

3.4 Filtering Studies Using Eligibility Criteria

Searches may result in a very large number of studies. Each study needs to be compared against inclusion and exclusion criteria. To be included in the review, a study needs to meet all inclusion criteria and not meet any exclusion criteria. The most important inclusion criterion is *germaneness* to the research question. Excluded studies may have a very useful contribution to make elsewhere– a reference check of the synthesized results (e.g. if the article is an academic literature review), as a source for additional research studies, or as an indicator of a new research question.

Figure 4 outlines the different eligibility criteria for the *PV* project, specifying the number of articles for inclusion, exclusion, or later reference.

3.5 Data Extraction

At the data extraction stage results and details of individual studies are extracted and stored in one place. Each study is scrutinized systematically, using the same set of pre-determined categories. These contain general reference information (title, author, publication citation); and details of research intent or hypotheses, research design/approach, and methods (e.g. sampling and sample, operationalization). The extraction form (1) provides a visual representation of the formulated review question and the planned assessment of the incorporated studies; (2) acts as a historical record of the decisions made during the process; and (3) becomes the data repository from which the analysis will emerge.[10] Once extracted data are ordered in one place, it becomes easier to synthesize the whole as well as to enable reviewers to assess the quality and relevance of the individual studies (see next step).

Methodological Quality and Intergrity: validity, trustworthiness or integrity, i.e. the extent to which the methods of the study high quality standards of the research design/approach

Methodological Relevance: appropriateness of the use of the study research design for addressing the RS's research question

Topic Relevance: appropiateness of focus and scope of the research constructs (and variables) for answering the research question

Sample Relevance: extent to which study samples are representative of specialized populations (e.g. of people, settings, house types, geographic areas) or of more inclusive population characteristics

Figure 5. Assessment Criteria[33]

3.6   Quality Assessment

After extracting data from these studies, an assessment of the quality and relevance of the research studies and findings is made. Methodological adequacy is evaluated primarily on the basis of the extent to which the study design and methods minimize bias and confounding factors and explanations. In disciplines with a strong scientific tradition such as medicine, hierarchies of evidence for establishing such validity of studies and minimizing potential bias and confounding factors are relatively straightforward, following a standard scientific hierarchy.[11] But in fields such as AHDP, which encompass multiple research disciplines, there are multiple criteria on which to assess the quality and integrity of research studies following different paradigms and research approaches. The Centre for Reviews and Dissemination (CRD) at the University of York, which has been undertaking extensive research synthesis since 1994,[11] establishes separate assessment criteria for different research designs (or approaches): experimental studies, observational studies, qualitative research, and economic evaluations. Our RS protocol similarly follows this research design-specific assessment of four common criteria.

As shown in Figure 5, the first two criteria assess the methodology of the study. The first–Methodological Quality and Integrity–responds to the degree of soundness and integrity of the study's methodology (in managing subjectivities, minimizing biases and confounding factors, documenting verifiable and systematic procedures, e.g.). The second criterion–Methodological Relevance–responds to the extent to which the research design/approach is appropriate for answering the review question. For example, qualitative observational studies may not be appropriate for assessing property values, a quantifiably defined metric.

3.7   Synthesis

Once high quality studies have been identified from the quality assessment, synthesis brings together, summarizes, and weighs the findings of these studies so that conclusions of the review are based upon the studies as a whole. In the synthesis, conclusions are qualified by the limitations of the studies conducted to date (e.g. research settings may tend to lie in certain regional areas, or in urban conditions and not rural ones, hence applicable to only certain populations).

Figure 6. FAQ (Introduction) Page from One of EPPI's RS Projects

3.8 Reporting

No rigid formula for presenting RS is prescribed, as formats must be adapted to the research being reviewed and the practitioners it is targeted towards. What we propose follows the structure of EPPI's multi-stage reports: a one-page summary that is formatted to reflect FAQs (frequently asked questions); a short (2-3 pages) policy brief which summarizes the findings and context of the review; and finally a technical report that provides documentation of process and more detailed description of individual studies and evaluation of them. A listing of the included studies is included in the technical report. These are to be web-accessed reports. Since the revised Stardust Center web site will not be available until late June or early July, an example of a one-page FAQ from EPPI[35] is shown below, indicating the type of formatting we will use.

4. Challenges & Conclusions

Clearly there are challenges ahead. One that arises is how to turn these RS briefs and reports into components of practice, not diminishing the importance of personal experience and problem-solving skills, but still valuing and incorporating research evidence and actionable knowledge in their own right. Encouraging a larger number of practitioners to set specific questions for review and to engage in the process may help in developing a more appropriate context for use.

Today's evidence-based design practice recalls efforts of the 1970s and 1980s to integrate research and design. Those efforts, which continue today, have now taken on new maturity within the healthcare design field, in part because of the growing sophistication and maturity of the research as well as an informed clientele seeking substantive evidence for decision making that will produce better building outcomes. The RS project presented here is only one small step towards fostering and enhancing an evidence-informant design culture within ADHP.

Notes

[1] There are many definitions of action research. The type I refer to here reflects "a research strategy that pursues action and knowledge in an integrated fashion through a cyclical and participatory process. In action research, process, outcome and application are inextricably linked." It addresses practical problems; generates knowledge; enacts change; is participatory; and relies on a cyclical process. See: O'Leary, Z. (2004) *Essential Guide to Doing Research*. Thousand Oaks: Sage. (139)

[2] Exception is in the U.K., most notably the work done by CABE (Commission for Architecture and the Built Environment). See, for example: CABE (2003). *The Value of Housing Design and Layout*. London: Commission for Architecture and the Built Environment; and, CABE (2007) *Housing Audit: Assessing the Design Quality of New Housing in the East Midlands, West Midlands and the South West*. London: Commission for Architecture and the Built Environment.

[3] Wolman, H., Hill, E.W., & Furdell, K. (2004) Evaluating the success of urban success stories: Is reputation a guide to best practice? *Housing Policy Debate*, 15/4: 965-997.

[4] Argyris, C. (1991) Teaching smart people how to learn. *Harvard Business Review*, 99-109 (p. 99).

[5] Grønhaug, K. (2002) Is marketing knowledge useful? *European Journal of Marketing*, 36/3: 364-372.

[6] Dimento, J.F. (1982) Much ado about environmental stressor research: Policy implications. In G.W. Evans, ed. *Environmental Stress*. Cambridge: Cambridge University Press. (327-366)

[7] Giddens, A. (1996) *In Defense of Sociology*. Cambridge: Policy Press.

[8] Jacobs, J. (1961) *The Death and Life and Great American Cities*. New York: Random House.

[9] See note 4 above.

[10] I use the term "evidence-informed" rather than the more common term "evidence-based" used in the health professional fields to stress that within affordable housing practice, and architecture in general, research evidence alone is insufficient and incomplete, that it reflects only one basis for decision-making albeit an essential one.

[11] Zlotnik, J.L. & Galambos, C. (20 November 2004) Evidence-based practices in health care: Social work possibilities; Editorial. *Health and Social Work*. http://staging.knowledgeplex.org/news/56698.html

[12] Sackett, D.L., Rosenberg, W.M.C., Gray, J.A.M., Haynes, B.R. & Richardson, W.S. (January 1996) Evidence based medicine: What it is and what it isn't. *British Medical Journal*, 312. http://bmj/bmjjournals.com/cgi/content/full/312/7023/71?eaf%2523R12

[13] For example, see: http://www.healthdesign.org/

[14] Hamilton, D. K. (November 2003) The four levels of evidence-based practice. Healthcare Design Magazine, 3. http://www.healthcaredesignmagazine.com/Past_Issues.htm?ID=2922

[15] Ibid

[16] Hamilton also warns of "level-zero practitioners"--those who acknowledge that there is research that demonstrates that the designed environment has an effect on people. But they cut corners. They take a single research article or conference presentation, make a personal interpretation that fits their design bias, and claim the subsequent design is evidence-based. They rarely read the original research, do not understand how to draw valid inferences from narrow and precise studies, and misapply important principles.

[17] Ibid

[18] See note 12 above.

[29] Much of this diagram's delineation is derived, but expanded, from that of the Robert Woods Johnson Foundation's Synthesis Project (see note 26 above).

[19] www.healthdesign.org/research/pebble/overview.php

[20] For example, see Nobel Laureate James Heckman's compelling economic models and ROI arguments for investing in early childhood learning: Heckman, J.J. & Krueger, A.B. (2004) *Inequality in America: What Role for Human Capital Policies*? Cambridge, MA: MIT Press.

[21] Harkness, J. & Newman, S.J. (2005) Housing affordability and children's well-being: Evidence from the National Survey of America's Families. *Housing Policy Debate* 16: 223-255.

[22] See webcast of "Housing and America's Future" held at the Furman Center on 12 February 2007: http://www.macfound.org/site/c.lkLXJ8MQKrH/b.2506557/k.DD61/Affordable_Housing__Housing_and_Americas_Future_Panel_Discussion.htm

[23] Sometimes also referred to as Best-Evidence Synthesis

[24] www.cochrane.org

[25] www.campbellcollaboration.org

[26] www.rwjf.org/publications/synthesis/about-the_project/index.html

[27] www.eppi.ioe.ac.uk

[28] For example: Tranfield, D., Denyer, D & Smart, P. (2003) Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, 14: 207-222.

[30] Clarke, M. & Oxman, A.D., eds. (2001) *Cochrane Reviewers' Handbook 4.1.4* [updated October 2001]. Oxford: The Corchrane Library.

[31] Davies, H.T.O. & Nutley, S.M. (1999) The rise and rise of evidence in health care. *Public Money & Management*, 19: 9-16.

[32] www.york.ac.uk/inst/crd

[33] Derived in part from EPPI: see note 27 above.

[34] A number of references that identify quality/integrity/validity assessments for different research design and approaches that are used here include: Bickman, L. & Rog, D.J., eds. (1997) *Handbook of Applied Social Research Methods*. Thousand Oaks, CA: Sage; Campbell, D.T. & Stanley, J.C. (1963) *Experimental and Quasi-Experimental Designs for Research*. New York: Houghton Mifflin; Creswell, J.W. (1994) *Research Design: Qualitative and Quantitative Approaches*. Thousand Oaks: Sage; Grosof, M.S. & Sardy, H. (1985) A Research Primer for the Social and Behavioral Sciences. New York: Academic Press; Neuman, W. L. (1997) *Social Research Methods: Qualitative and Quantitative Approaches*. Third edition. Boston: Allyn & Bacon; and O'Leary, see note 1 above. When the reviewers' rankings differ, discussion and subsequent revision ensues until consensus is reached.

[35] Ref EPPI page: eppi.ioe.ac.uk/cms/Default.aspx?tabid=942

[36] For example: Zeisel, J. (1981) *Inquiry by Design*. Cambridge: Cambridge University Press.