Evidence-based design (EBD) has taken over the imagination of the design community. Conferences and seminars in the UK and in North America increasingly include papers on what it is, how it's done and why it's needed. Evidence-based design is built on the precedent of evidence-based medicine – that is, relying on up-to-date published research results to make diagnostic and treatment decisions. In part because of its medical roots, EBD has found favour among healthcare designers and architects, especially in North America. In the UK, the concept is being applied more broadly: to housing and new community planning, to crime prevention through environmental design, and to schools and offices.

Traditionally, the link between research into building design and use and the practical world of design and construction lies in a cluster of pre-design activities known as programming or briefing and post-occupancy evaluation (POE). The time-honoured POE approach identifies studies of existing building use and performance as a prerequisite to new building design. Study findings on how users function in the spaces provided, and also on how a building performs in terms of its systems and operation, provide a basis for new building design. Pre-design programming gathers information about users' needs from available POE studies and other research, and synthesises this information into both broad and generic, and targeted and specific sets of design guidelines and prescriptions to which the design team refers throughout the building design process. The goal of this process is to learn from previous projects and to apply this learning to new projects, in a context of continuous improvement.

In reality, this neat link between post-occupancy research and design often has more of a hit-or-miss character. The often voluminous results of POE studies commonly lie unread on researchers' shelves, or are published in academic journals infrequently consulted by practitioners. Moreover, pre-design programming frequently takes the form of a rapid summary of square footage requirements and projected growth in numbers of users, thus allowing each design team to invent the wheel, or, more commonly, to reuse ideas they have developed on their previous projects. One challenge the EBD approach seems prepared to take up is whether or not an EBD process can replace the typical hit-or-miss application of POE and programming with systematic acquisition of relevant information about building use and users' requirements that is easily and usefully applied to new design.

Defining evidence-based design

Definitions of EBD include:

“The conscientious and judicious use of current best evidence related to the physical environment’s effects on wellbeing, and its critical interpretation, to make significant design decisions based on sound hypotheses (concepts) related to measurable outcomes, for each unique project.”

And, more simply:

“The use of scientific method to guide design decisions based on empirical knowledge.”

Attempts have also been made to set priorities on what ‘evidence’ means. It is useful to set priorities on what can be considered evidence:

1. Strong evidence based on independently verified data;
2. Evidence based on weaker data;
3. Evidence from respected authorities based on available data.

Evidence-based medicine

These definitions, and indeed the whole notion of EBD, are based on a widely respected approach to medical research known as evidence-based medicine (EBM). EBM lightens the decision-making burden on medical professionals by using research to inform medical decisions. Studies of medical

Daylight penetration enhances wellbeing at the new Bexley Wing, St James Institute of Oncology in Leeds, designed by Anshen + Allen (Pic: Nick Kane)
and surgical procedures, their difficulties and their likely outcomes; of treatments such as pharmaceutical products and doses; and of new medical technology and tools, help practitioners to make the best possible diagnosis and select the best treatment.

By referring to the ongoing accumulation of published evidence, a medical professional treats a patient's condition by using up-to-date objective facts (rather than relying on previously acquired knowledge), as well as their hunches and convictions resulting from experience. For example, although it may seem obvious that inserting feeding tubes in elderly patients prolongs life, evidence from research has shown that feeding tubes increase infection, and do not in fact prolong life. In theory, the same evidence is available to others involved in treating the patient and even to the patients themselves.

Increasingly, doctors choose to explain to their patients the evidential basis for their decisions - something immediate access to electronic databases makes possible. Responsibility for an important medical decision is thereby shared between provider and consumer of medical treatments. Moreover, it has been demonstrated that the opportunity for a patient to participate in his or her own care increases the likelihood of a positive medical outcome. Similarly, then, using EBD to support architectural and planning decisions by design professionals provides an opportunity to building users and other consumers of design services to participate in design decision-making. And studies have indicated that in buildings, as in medicine, informed and engaged users have a more positive experience of the built environment they occupy.

The users’ perspective

Basing important decisions on research results rather than on experience, intuition and creativity - whether in medicine or in design - has an effect on the political role of the professional and on the balance of power between providers and consumers of specialised services.

Employing EBD equalises an unequal relationship in the building industry just as it does in modern medicine. Just as the patient has a more important role to play in a medical situation where the doctor shares ‘evidence’ in order to engage the patient in decisions, the architect has an opportunity to enlarge the role of the building’s users and to incorporate their previous experience into key design decisions.

In order to realise its full potential, EBD research incorporates evidence from and about users to make specific design decisions. Moreover, the availability of objective information shifts the balance of decision-making power, thereby affecting the outcome of a design and construction project. Professionals who want to continue doing things the same old way will find it difficult to defend this stance with up-to-date research results. Just as doctors take the Hippocratic oath to do no harm, designers and builders who create our environment have a new opportunity to use EBD research not only to protect building users and to do them no harm, but in fact to improve and enhance their environmental experience.

The relationship with POE

This emphasis on the building users’ experience raises the question of whether or not the evidence-based approach to design has supplanted or replaced post-occupancy evaluation (POE) as the way of using data on or about users to inform design. We would argue that EBD and POE remain two related, but distinct, pre-design activities. First, responsibility for EBD is located in the design process, whereas POE is considered to be research. Whereas an EBD approach seems by definition to support a high-quality design outcome, POE has tended to focus on questioning the design quality of existing projects. The term post-occupancy evaluation has always suffered from the judgemental approach implied by the term ‘evaluation’: the performance of all professionals in a design and construction project risks being ‘evaluated’ by POE. This possibility discourages stakeholders from engaging in POE - not simply an evidence-gathering exercise aimed at increasing knowledge about what works and what does not work, but also a judgement on how well the building delivery team performed.

In contrast, EBD contains no mention of evaluation or judgements. It is by definition scientific; it employs approved scientific methods of gathering data. According to labelling theory in social science, something’s name affects how it is viewed and used. Even if EBD were merely a semantic shift, it may turn out to be an important one, because it changes how designers, owners, and users view and use POE.

As mentioned above, post-occupancy studies tend to limit their data-gathering to the opinions of building occupants - a limited definition of building users - and to whether occupants like or dislike (“are satisfied with”) identified features of a building - a limited definition of how the built environment affects people. Evidence-based research draws on a broader base of stakeholders than simply the occupants of the building at a specific time, and focuses on a range of
证据为基础的建筑设计

在形式中使之相关于他们所面临的发展的决策。这种转变在EBD决定性中的自身‘bridging the gap’。

冲突与创意

随着建筑设计专业转向更加理性和基于研究的方法，设计者们可能更加容易避免获取能够告知设计决策的信息，他们过去的缺点。建筑师尤其倾向于避免获取将知识用于设计的专业人士可能更少。作为建筑设计师，专业人士可能更难于在设计时考虑知识。

新想法的思考EBD是在机制和策略中，这些策略使得能够促进这种亲密关系之间的研究和设计，消解为了什么是一个负担的前POE。研究人员：寻找一种‘dress up’的研究结果，并且使他们具有吸引力，可访问和可使用，由设计专业人士。这总是称之为‘bridging the gap’--即，存在的差距，这存在于设计和研究。EBD方法要求设计人员定义研究，这些研究在阶段中，这些研究是相关于做者的项目。尽管他们可能不设计研究--这是研究者的领域，他们驱动的风格是应用研究项目，似乎可能产生新的知识。

可测量的性能结果（如能源使用，健康增强的品质和功能性）支持用户活动。EBD可以添加和增强传统POE活动，并且使预设计编程提供一个更加精确的科学。

一项在POE研究的困难是寻找一个简单的方式，来沟通POE结果到建筑设计专业人士在他们可以使用的地方。使研究结果相关的设计是狡猾的逻辑和实践的陷阱。研究语言--更多的或更少支持对一个假设的，可能性的概率的特性，研究方法学的选择--是外于建筑设计和建筑的。此外，所有决定都是在压力下（时间，金钱，政治，或者所有三个），所以这并不可能去做出一个明智的决定基于可能性的结果。

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A signiﬁcant advantage of the EBD approach is that building industry professionals can focus and direct research to the issues that they have identiﬁed as needing evidence. In other words, each design team is in theory responsible for identifying one or more project-related research topics. Designers need access to databanks of research results that cover issues likely to arise during the design process and construction, much as the medical professional will review published evidence on current patients’ conditions. These data repositories are not limited to feedback from building occupants, but ideally should include information about materials selection and performance, construction technology and management, cost containment and risk control, and other areas of knowledge that are key to building successful buildings.

New thinking about EBD is focusing on mechanisms and strategies that enable and facilitate this intimate relationship between research and design, obviating the need for what was a burden on the former POE researcher: to ﬁnd a way of ‘dressing up’ research results and making them attractive to, and accessible and useable by, design professionals. This was always called ‘bridging the gap’—i.e., the gap that exists between design and research. The EBD approach requires the design professional to deﬁne the research in terms that are relevant to the practitioner’s project. So although they may not design the research—this is the researcher’s area of expertise—they drive the style of applied research projects that seem likely to yield useful new knowledge.

Conflict with creativity

As the building design professions shift to a more rational and research-based approach to design, professionals are likely to be less prone to avoid acquiring knowledge that could inform design decisions than they have been in the past. Architects in particular have tended to express concern that taking a rational approach to design may limit their creativity and ability to have new ideas, that having ‘too much information’ could reduce or even eliminate their ability to ﬁnd ‘artistic’ solutions to design problems. (In a question-and-answer session at the 2006 Annual General Meeting of the Society for Neuroscience, architect Frank Gehry stated that too much neuroscientiﬁc knowledge about people and their responses to buildings would limit his creativity.)

One of the positive impacts of the EBD approach is that it is based on the assumption that more and better information and knowledge will ipso facto improve the design of buildings, and that the value of informed design decision-making not only supports design creativity but— with so much more information available—trying to do without it is both foolish and dangerous. It is no longer considered the action of a responsible professional to embark on a building design project without paying attention to what is known about the impact of previous, related design decisions on human behaviour. As building-related research expands, building clients, regulatory bodies, and building users will increasingly expect design professionals to access the growing multidisciplinary knowledge base not only on how building users are affected by features of their environment, but also how to combine what we know about building user psychology and behaviour with the innovative features of buildings that have been certiﬁed by green ratings systems such as LEED, Green Star and BREEAM.

Recent research

At a recent conference in North America, the range of EBD research reported included a study focusing on systemic problems in how emergency healthcare facilities are designed and operated, in order to identify ways of enabling hospital staff to avoid mistakes and...
of increasing the effectiveness and efficiency of their time\(^{8}\). In another example, studies of the impact of improperly performing ventilation systems on illness, discomfort and stress are summarised to indicate ways of improving indoor air quality in a wide variety of building types\(^{9}\). A third study examines improving indoor air quality in a wide variety of building types\(^{9}\). A third study examines ventilation systems on illness, discomfort and stress are summarised to indicate ways of improving indoor air quality in a wide variety of building types\(^{9}\). A third study examines ventilation systems on illness, discomfort and stress are summarised to indicate ways of improving indoor air quality in a wide variety of building types\(^{9}\). A third study examines ventilation systems on illness, discomfort and stress are summarised to indicate ways of improving indoor air quality in a wide variety of building types\(^{9}\).

Our research on how office occupants assess a range of environmental conditions has generated a large amount of evidence on both supportive and non-supportive elements of workspace design. Part of the evidence indicates when and how these affect worker behaviour (task performance, communication with co-workers and employee retention) and worker mood (wellbeing, satisfaction and engagement)\(^{12}\).

Another useful topic for EBD in workspace planning is the optimal balance between individual workspace (offices or workstations, concentration rooms, places to work alone) and shared or communal facilities (meeting rooms, workrooms, coffee rooms and lounges, places that facilitate collaboration). Studies to date indicate that systematic analysis of the tasks people are performing and the environmental requirements for the types of work they are doing provide a solid basis for this key design decision in most instances\(^{13}\).

**EBD research and Alzheimer’s**

Our environment-behaviour model for Alzheimer’s design is also based on data from multi-site studies in which the correlations between specific design characteristics and behavioural health outcomes were measured\(^{14}\). Outcome behaviours or symptoms measured in residents of Alzheimer’s units include social withdrawal, agitation, aggression, depression and psychotic symptoms such as hallucinations\(^{15}\). Research findings clearly indicate fewer symptoms in more appropriately designed environments: anxiety and aggression are reduced where there is greater privacy and personalisation of bedrooms; social withdrawal is reduced in settings with not more than four communal spaces, each of which has a unique design character that helps residents orient themselves and make choices. There is a lower incidence of depression when exits are camouflaged using less visible electronic locks instead of alarms.

Another key symptom of dementia, which takes up staff time and disrupts the community, is physical agitation. Whereas agitated behaviours do not appear to be affected by environmental design characteristics, verbal and physical agitation taken together are less present in settings that are more residential than institutional. Verbal agitation is reduced in settings where residents understand more of the sensory input they receive, and where sensory stimuli are controlled; and there were fewer psychotic symptoms in environments with more opportunities for privacy and for personalisation, and where residents could understand their sensory environment.

We conclude these outcomes are related to the neuroscience of Alzheimer’s and environmental awareness\(^{16}\). Neuroscience and architecture is a fast-growing area of research in which links can be identified between the physical features of a building and the mental, emotional and behavioural effects on users, and is likely to have implications for future EBD research\(^{17}\).

**Information versus evidence**

One of the ways the European approach differs from the North American approach to EBD is the definition of ‘evidence’. In North American design circles, ‘research’ for a design project such as a hospital or office typically ranges from studying examples published in the architectural magazines, to visiting a recently completed project and looking around to see how it looks, perhaps asking a few people working there what they think of it, to systematically interviewing building users and applying the results to an architectural programme or brief, to performing or commissioning a full-scale...
The EBD approach represents an advance on this loose definition of how much knowledge is needed to gather sufficient evidence to build successful projects. At a recent seminar in the UK, specific initiatives – including government incentive programs and investment in innovation to increase urban regeneration and sustainability; a framework for acquiring, assessing and various ways of applying evidence in the workplace and schools; and managing building-related pathology such as offgassing materials that cause asthma – were all described as examples of evidence-based design research. On both sides of the Atlantic, the EBD approach emphasizes that researched evidence must be reliable and acquired using rigour, certainty and validity.

The evidence needed for EBD application has a hard edge to it that the casual POE approach does not.

Evidence is not knowledge: design professionals need a reflexive practice to turn information into knowledge. But evidence from research goes beyond informed opinion – it is predicated on proof. Therefore hypotheses must be identified and tested in order for designers to claim they are using an EBD approach. Casual user feedback is not a substitute for validating a relationship between users and built space.

Progressing from POE to EBD is a natural evolution of those professions concerned with creating the built environment. Basing design decisions on research evidence lends a scientific case to professional design, eventually having a positive effect on clients’ opinions of their designers (and on clients’ willingness to pay for professional design services) in much the same way as other professions such as medicine and law are respected in our culture. As this proof – or evidence – accumulates, it must be stored and maintained for easy access and retrieval in the context of project applications, much as legal decisions and opinions are stored for legal practice and as medical practitioners in clinical practice now have EBM data electronically available.

EBD alters the definition of design from a function of individual creativity to a process of creatively applying rules of evidence to building decision-making. This increase in respectability goes hand-in-hand with greater responsibility – for example, to demonstrate conclusively that the physical environment of hospitals and seniors’ residences is a form of treatment in healthcare, or that the physical environment of the workplace is a tool for performing work.

As designers employing EBD increasingly are able to influence such outcomes, they take on an even greater responsibility: the responsibility not to look the other way when evidence relevant to a design decision is presented, and not to make purely intuitive design decisions when EBD data are available. Designers, design researchers and their clients can now make all their decisions count. We should not miss this opportunity.

Author biography
Jacqueline C. Vischer is a professor at the University of Montreal and founder of the New Work Environments Research Group in the Faculty of Environmental Design. Her most recent book is Space Meets Status: Designing Workplace Performance.

John Zeisel is president of Hearthstone Alzheimer Care and visiting professor at the University of Salford. He lectures internationally on non-pharmacological approaches to treating Alzheimer’s disease, and his new book I’m Still Here: a Breakthrough Approach to Understanding Someone Living with Alzheimer’s is scheduled for publication in late 2008.

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Bridging the gap between user research raw data and creating personas is one of the biggest challenges for UX designers. UX designers need to transform insights, problems, observations, ideas, concerns and pain points into a concrete format to be able to understand their users in a holistic way. What is affinity diagram? An Affinity Diagram is a tool that gathers large amounts of language data (ideas, opinions, issues) and organizes them into groupings based on their natural Relationships. — Balanced Scorecard Institute. Affinity diagrams are an inductive technique where the small units (An i The gap between research and practice is strikingly evident in the area of information technology (IT) project risk management. In spite of extensive research for over 30 years into IT project risk...Â The Qualitative Difference in Information Systems Research and Practice, in A. Lee, J. Liebenau and J.I. DeGross (eds.) Information Systems and Qualitative Research, London: Chapman & Hall, pp. 11â€“27.CrossRefGoogle Scholar. Markides, C. (2011).Â Case Study Research: Design and methods, 4th edn, Thousand Oaks, CA: Sage.Google Scholar. Zmud, R.W. (1980). Management of Large Software Development Efforts, MIS Quarterly 4 (2): 45â€“55.CrossRefGoogle Scholar. Zmud, R.W. (1998). Service Design and Organisational Change. Bridging the gap between rigour and relevance. Conference Paper (PDF Available) Â· January 2009 with 2,431 Reads. Conference: IASDR09 conference, At Seoul.Â links to existing organizational theories. With this paper we would like to cover this gap by discussing some of the theories we have identified as relevant in this context, before we report on two pilot case studies conducted.Â By researching and visualizing the ideal CX mindset and skills as well as internal problems for reaching this ideal, the transformation management team was inspired to consider new perspectives on the company's change. Customer Experience Strategy Turned into Hands-On Actions Through a Design Approach.