

Architecture in the Fourth Dimension

Methods + Practices for a Sustainable Building Stock

November 15 - 17, 2011 / Boston, Mass., USA

New Challenges for the Open Building Movement: Architecture in the Fourth Dimension

The Open Building Implementation network (www.open-building.org) was formed in 1996, under the auspices of the CIB (International Council for Research and Innovation in Building and Construction). Members of the CIB W104 now come from many countries - including the incubators of open building Japan and the Netherlands – as well as the USA, the UK, Finland, Israel, Iran, France, Italy, Switzerland, Korea, China, Taiwan, Indonesia, Mexico, Brazil and South Africa.

Its original purpose was twofold. First, we intended to document developments toward open building internationally. Second, we would stimulate implementation efforts by disseminating information and by convening international conferences at which government and university researchers, practitioners and others could exchange information and support local initiatives. These activities focused largely on the technical and methodological aspects of residential open building. There was interchange between colleagues in the less developed countries and developed countries, but the dominant focus was the latter.

During the intervening years, we met at least 17 times, in Delft, Tokyo, Taipei, Washington, DC, Mexico City, Brighton (UK), Helsinki, Paris, Hong Kong, Muncie, Indiana (USA), and Bilbao, Spain, on a few occasions with other CIB Commissions, and at several of the triennial CIB World Congresses. The most recent conferences focused on education and sustainability. Each included an international student competition, with winners from Korea, China, Germany, the UK, Singapore and the USA.

Each conference has produced a published book of proceedings, containing a total now of over 300 peer-reviewed papers. A book titled Residential Open Building was published (Spon, 2000) and later was translated into Japanese. A second book, reporting on many new examples of open building is in preparation. A number of books have been published specifically on the subject and dozens of technical reports have been produced in several languages. Open building is referred to in countless books, scholarly papers, dissertations, and articles in professional journals, and in-depth country reports and studies have emerged in Finland, the Netherlands, the USA and Japan. (http://en.wikipedia.org/wiki/Open_building)

In the last few years, developments internationally suggest that the commission – and the open building movement more generally - needs to both continue its focus and expand its arenas of investigation. Residential open building is no longer a speculative idea of a few pioneer practitioners and theorists. It has or is poised to become mainstream. While disseminating information in professional journals, books and scholarly publications about the technical and methodological dimensions of residential open building still makes sense, there is reason to pose new questions or reexamine old ones. In fact, in 2009 at our meeting in the Netherlands, a new subgroup of W104 was initiated focusing on open building in the healthcare facilities sector.

State of the Art

Open Building is the term used to indicate a number of different but related ideas about the making of environment, for instance:

- *The idea of distinct levels of work in the built environment, such as those represented by 'support' or 'base building' or 'core and shell', and 'infill' or 'fit-out' or 'tenant-work'. Urban design and architecture also represent two levels of action.*
- *The idea that users / inhabitants may make design decisions in their sphere of control, as well as professionals;*
- *The idea that, more generally, designing is a process with multiple participants, among whom are different kinds of professionals;*
- *The idea that the interface between technical systems allows the replacement of one system with another performing the same function - as with different fit-out systems capable of being installed in a specific base building;*
- *The idea that built environment is in constant transformation, and that, as a consequence, change must be recognized and understood;*
- *The idea that built environment is the product of an ongoing, never ending design process in which environment transforms part by part. (www.habraken.org)*

Many observers have recognized for some time that shopping centers and office buildings exhibit the characteristics of open building. As far as we know, no theoretical or methodological work preceded their coming of age. Their first appearance and subsequent evolution progressed pragmatically, as a response to new realities, led by real estate developers and business entities of all kinds. Architects and contractors learned how to provide the needed services, often producing work of exceptional quality. Product manufacturers and their supply chains began introducing suitable products, fabrication and construction methods. New standards, regulations and financing tools were developed to match the new realities. These developments are international in scope, crossing economic, political, cultural and technical boundaries.

We now see that many parties – public and private - are asking for residential open building on a regular basis. This is evident in Finland, Poland, Japan, and the Netherlands. In other countries, residential open building – known by many names – is no longer seen as particularly unusual. We see evidence of this in Russia, Switzerland, Germany, China and to a lesser extent in the United States. New examples of housing designed by professionals to be incrementally upgraded in an informal user-controlled process come to light constantly, whether in Chile, Mexico, or South Africa. There is good reason to think that members of the Open Building network have contributed in some ways to this new coming of age of residential open building.

Mainstreaming of open building is apparently a response to the pressures, conflicts and waste caused by continued adherence to rigid functionalism – that is, defining functions and designing buildings to fit. Open building is also a pragmatic answer to a state of technical entanglement in buildings that has resulted from the incremental addition, over a long period of time, of new technical systems and the claim to these new systems by different trades who rarely cooperate. These pressures are forcing all parties to reconsider and realign their procurement and investment practices, their accounting methods, and their regulatory systems. In mass-consumer societies, attitudes toward the control exercised by inhabitants in the making and transformation of environments are changing vis-a-vis the control exercised by the many experts hired by large corporations, governments and communities. The idea that investments should consider long-term asset value is also forcing all parties to learn to make buildings – especially but not limited to multi-occupant buildings - that can adjust as technologies, social patterns, and preferences – both individual and community – evolve.

These changes in attitude and priorities are now taking the force of law. In part this can be explained by the widespread – and parallel - adoption of a sustainability agenda. For example, the Japanese parliament passed new laws in 2008 mandating 200 year housing, accompanying the legislation with enabling tools for use by local building officials who have the responsibility to evaluate and approve building projects. Projects approved under the new law receive a reduced rate of taxation. Other incentives may be added. In Finland, one of the largest real estate companies is regularly developing open building projects for their residential portfolio. In the Netherlands, a number of companies – from product manufacturers to developers to architects – are doing open building, by other names. In Warsaw, Poland, open building is known as the “Warsaw Standard”. In San Francisco, residential developers build “bulk” housing, ready to be fitted out individually. Around the world, old office buildings, retained their social and economic value, are being converted to residential occupancy, after being “gutted” to prepare them for new uses and layouts.

We also see that in many countries, under the pressure of a rapidly evolving health care sector, hospitals are moving toward open building. We see this in the United States, Switzerland, Germany, Belgium, the United Kingdom, and the Netherlands. Similar developments are undoubtedly happening elsewhere, under the radar screen. Hospital clients can no longer afford to let short-term functional programs drive facilities procurement methods and investment decisions. They are demanding “change-ready” facilities, assessed by their accommodation capacity over time, rather than by short-term functional performance. But significant regulatory and financing barriers remain.

These projects - often large and complex, providing space for housing, offices, commercial, health care and other uses - have the systemic properties of large private (or public) infrastructures. They involve many decision-making bodies and users over long time periods and often implicate numerous territorial claims. As such, they present technical, economic, political and cultural questions that go far beyond the dominant architectural discourse that still tends to emphasize the special case, breathless excitement over formal gymnastics, and the self-expression and self-aggrandizement of the designer and client. Generally speaking, these developments toward open building are not taking place for their ideological purity but for pragmatic reasons. In some cases, advocates of these new ways of working write and speak about them, but most simply get to work in daily practice, and meet new realities without much fanfare.

An important task to continue

While much remains to be done to make open building projects come about with architectural excellence, to improve coordination, and to make long-term adaptation take place without fuss and at high quality, those in the trenches have little incentive or time to report on and generalize from their work. A role continues to exist, therefore, for academics interested in detached and careful observation of what happens in the world of practice, with the expectation that new insights and sound generalizations may emerge to serve the built field.

Much remains to be done – on a continuing basis – in reporting on and accounting for developments toward open building. This effort should aggressively encompass not only residential but other ordinary classes of projects such as hospitals, schools, retail/commercial and office buildings and mixed-use properties and sites. The recent interest in new urbanism and other movements seeking thematic coherence of urban tissues will undoubtedly produce a building stock designed to accommodate varying occupancies.

Now that evidence is mounting that open building is not an aberration but a norm, we can expect building economists to develop data on the economic advantages of this way of working and to study the migration of economic activity toward the fit-out level. It should be possible for studies of buildings-in-use to track and evaluate user response to varying cycles of building and equipment change. Building information modeling software will soon enable designers and researchers to keep good records of how buildings change, enabling clients to make better decisions on their next investments. These signs of the evolution of the building stock should be carefully studied and general principles sought.

Some questions within the scope of the open building are:

BASE BUILDING ARCHITECTURE

Interior public space and the urban façade are two architectural issues that demand new thought.

John Habraken, Denise Scott Brown and others have written about the importance of interior public space as part of larger patterns of space in urban tissues. Both have used the Nolli Map of Rome to articulate a view of the connectivity of urban design and architecture. Next 21 in Osaka – one of the most significant open building projects to date - was conceived as three dimensional urban design, challenging old assumptions about where the city ends and the building begins, raising new questions about territorial hierarchy.

Form-based codes are showing how rules and themes defining building envelopes that shape public space can supersede traditional functionalist zoning and abstract form making. Property developers are instructing their architects' - each hired to do an individual building - to adhere to thematic agreements in the design of the facades of new buildings in large urban extensions.

These developments are not limited to open building, but nevertheless are defining the skill sets, attitudes, methods and knowledge needed to make high quality base buildings and lively urban tissues that exhibit variety-in-coherence. Open building advocates must take the lead by pointing out these and related developments not as random events but as signs of new understandings of an open architecture.

AN INFILL INDUSTRY

A new kind of business entity with a new customer value proposition is needed to meet the demand of variable fit-out in open building projects.

Base buildings do not cost more. This was established by sound economic analysis decades ago for the residential sector, most clearly by work done in the Netherlands. Recently, a developer in Amsterdam built an open building project, accepting an initial up-charge of 5%, but recouped that investment within 2 years. This return on investment is evident in the office building and retail sectors, even though little or no building economics' evaluations have been done to prove empirically what is already a matter of course. Base buildings in the health care sector will soon become the norm, albeit with little in the way of theory or economic analysis to back it up, out of the force of necessity. While there is much to be done in improving the design and construction of sustainable and energy efficient base buildings, we can reasonably say that these developments are already well on their way.

Research conducted in the United States in the early 1980's showed that an increasing percentage of value added in the building sector was moving to investments in equipment and away from construction. Equipment is the classification of products that – in the United States - are depreciated on a short cycle, as opposed to the 30-year depreciation schedule of real property (base buildings). Equipment constitutes the kinds of products governed by standards such as those used by the Underwriters Laboratory in the United States and their counterparts elsewhere. Other countries have probably experienced the same shifting investment phenomenon, although little or no research exists to prove this. From an Open Building perspective, these trends signal the growth potential of an infill industry.

The customarily disjointed and quality-plagued way of filling in the empty spaces in open building projects is no longer excusable. There are exceptions, such as the high cost product bundles manufactured and installed by multi-national companies such as Steelcase, Haworth, Herman Miller and similar systems furniture companies. These companies are now moving outside of their traditional market niche of premier office space and are investing heavily in the health care sector. Other companies have learned how to deliver just-in-time fit-out for branch banks, chain stores, and even branded kindergartens, from central warehouses using local certified installation crews. But these represent a very small percentage of total fit-out investments. Aside from these, current practices produce high costs, scheduling complexity, conflict and limited user-choice.

In the residential open building market, no fully integrated fit-out companies exist. Early business ventures such as Matura in the Netherlands (1990-95) provided important technical and business models that deserve careful analysis. That infill system is now being upgraded and is reentering the market as a related kit-of-parts rather than a fully integrated system. NEXT-Infill is finding a market for its integrated infill for the new construction and renovation market in Japan. Developments in Finland will almost certainly evolve into fully integrated logistics and infill delivery. Time will tell if these business ventures will succeed in displacing the conventional, disintegrated fit-out delivery process and if similar developments will take root in other countries.

But in general, a mature infill industry has yet to be born. In this arena, open building knowledge is crucial, and here, too we can be useful.

INCREMENTAL HOUSING IN DEVELOPING SOCIETIES

In developing economies, in which the informal sector is a vital part of the housing process, open building principles are evident.

New housing, designed by professionals, is incrementally adjusted, added to, and modified over time by the action of each household. This, too, is not new. New forms of public/private partnerships emerge, old technologies are used in new ways, and informal settlements become stable in ways that can only be understood by long-term observation. Recognition of the role of the user in the creation of environment is alive and well, if too often forgotten as part of the future of architecture. In developing economies, as in developed economies, experts in large bureaucracies and corporations are usually loath to relinquish control. But some learn to make money and protect the public interest by careful repositioning of their ways of working, harnessing the often invisible but complimentary economic engine of individual and local initiative in the housing process.

OPEN BUILDING FOR HEALTHCARE

The dynamics of the healthcare sector present tremendous challenges for which open building principles may be useful.

Many experts now recognize that hospitals and medical facilities, more than any other building type, are functionally diverse and technically complex, and never finished. Changes in demographics, diseases, treatment procedures, equipment, doctor's preferences, and regulations – with their demands for new spatial adjacencies and configurations – are forcing the emergence of a shorter use-life “fit-out” level of investment in more stable base building infrastructures, in which facilities

- 1) Are characterized by fine-grained functional units (many organizationally distinct functional units per building, often with different budgetary and accounting criteria) that change over time;
- 2) Have intricate and densely entangled MEP (mechanical, electrical and plumbing) systems that operate across accounting and investment boundaries, and
- 3) Have systems and spatial layouts characterized by varying life cycles measured not only by technical criteria but also in terms of the rapidly changing conditions within the health care sector.

Addressing the granularity of functional units, rate of change and systems entanglement according to varying life-cycle profiles are two of the major research tasks now facing medical facilities design under dynamic social and financial conditions. These are directly related to patient care and comfort, as well as to facility performance from the perspective of building users, managers and owners.

The focus on varying life cycles of technical and management systems is important because of changes in medical practices, insurance, demographics, regulations and other dynamics in 21st century society. Medical facilities are under unremitting pressure to adapt – physically and organizationally. But, most medical buildings procured following conventional practices have less than optimum capacity to adjust appropriately to these dynamic conditions. Given the extreme technical and organizational complexity of medical facilities, new insights are needed to manage these dynamics. Simply “tweaking” existing paradigms may not solve the problems.

The literature on the architecture of care environments is unambiguous in respect to the importance of patient-centered theory and practice. More than 40 years of methodical research in the “environment- behavior” field has produced useful insights, a good deal specifically related to medical facilities and users. The recent focus on “evidence-based” design practice is a sign that this research literature is finally being taken seriously.

Less recognized in the literature, however, is the fact that – given the dynamics of 21st century society – the functionalist approach to facility design is obsolete. While this way of thinking has been the norm, we can no longer assume that if we determine a program of uses and design a hospital to suit, the future functionality of such a facility is assured. The opposite is more often true; that is, buildings designed according to the functionalist paradigm perform poorly, while those designed to accommodate varying functions gain value over time.

These experiences are not restricted to any one geographic region – they are ubiquitous. Studying these widespread instances in depth and over time may well lead us to recognize general principles. These in turn may help us develop better methods to cope with the new realities facing all those involved in the design, management and use of health care facilities of all kinds.

EDUCATION FOR AN OPEN ARCHITECTURE

From the perspective of open building, a renewal of the education of architects is urgently needed. The schools need to catch up with a profession already taking part in addressing the new realities of an open architecture, and may be able to assist in developing the knowledge, methods and the tools needed for the job.

Open architecture calls for new ways of teaching and perhaps new kinds of courses outside the studio, aimed to teach design skills per se, liberated from functionalism. The most durable but most problematic fact of life in contemporary architectural education internationally is the assumption that every design project in the studio must begin with a program of functions. If we now see that programs of functions are inherently fleeting, we need a new basis for making architectural design decisions and assessing quality. Capacity – and methods to

assess capacity – is one key concept that must find its place in the lexicon and tools of architectural design education. But this may not fit well in the typical studio, where function is in the driver's seat.

Some studios should be crafted to teach the skills needed to handle form making in support of an open architecture. This has to do with handling form as such, under varying conditions – considering cooperation among designers, working on levels of intervention, and dealing with issues such as territory, working in a context set by others, and setting themes that others will follow. Building systems, building technology and structures courses all teach similar skills of a technical sort. There, exercises in technical thinking are most often assigned independent of specific uses or sites. The same is needed in architectural thinking and methods, not only for open building, but more generally.

Faculty in schools of architecture should be encouraged to make room for open building principles, methods and attitudes in studios and in other support courses. This is not easy in already crowded university curricula. There is no question that these skills and attitudes are developed in an ad-hoc fashion on-the-job, in offices all over the world. Architecture schools need to catch up and provide sensible leadership in improving the skills and knowledge needed in handling the new challenges.

Stephen Kendall, PhD (MIT '90)
Professor of Architecture
Ball State University, Muncie, Indiana

Joint Coordinator, CIB W104 Open Building Implementation
skendall@bsu.edu