The Housing We Need

The Evolutionary Housing System

Institute of Design • INDEX 2005
Arpita Agrawal, Michael Davis-Burchat, SoYoung Lee, Kris Marich, Stephen Palumbo, Rachel Serlin-Egan, Soungmin Yoo

For a full exposition see the report at http://id.iit.edu/profile/gallery/evolutionary_housing/
What if a house could…

employ new utilities based on their technological merit rather than on the politics of regulations
What if a house could…

employ new utilities based on their technological merit rather than on the politics of regulations

increase self-sufficiency and protect precious resources
What if a house could...

employ new utilities based on their technological merit rather than on the politics of regulations

increase self-sufficiency and protect precious resources

be built in a day
What if a house could...

employ new utilities based on their technological merit rather than on the politics of regulations

increase self-sufficiency and protect precious resources

be built in a day

be reconfigured to accommodate the changing needs of its inhabitants
Welcome to the Future of Housing
Relevant Trends
Relevant Trends

Population Growth

World population is expected to top 9 billion by 2050
Population growth is putting heavy demands on available resources. The world’s oil and water resources are becoming increasingly scarce.
**Relevant Trends**

**Population Growth**

**Scarce Resources**

**Global Warming**

Global warming is effecting weather around the world. Hurricanes, tornadoes, floods, and other natural disasters that destroy housing are on the rise.
**Relevant Trends**

Population Growth

Scarce Resources

Global Warming

**Emerging Technologies & Increasing Expectations**

Technological advances and the growing availability of television in remote areas are fueling demand for improved lifestyle.
1956
Jay Doblin’s “House of the Near Future” is introduced in a groundbreaking article in Popular Mechanics
1956
Jay Doblin’s “House of the Near Future” is introduced in a groundbreaking article in Popular Mechanics

1983
The Institute of Design’s House of the Future wins “First International Design Competition,” Osaka, Japan
1956
Jay Doblin’s “House of the Near Future” is introduced in a ground-breaking article in Popular Mechanics

1983
The Institute of Design’s House of the Future wins “First International Design Competition,” Osaka, Japan

2004
Dwell Magazine's “AB Parts House” helps regain prominence for prefabricated housing
Evolutionary Housing Principles: Grid System

Provides a structuring principal for handling complexity
**Evolutionary Housing Principles:** Grid System

*Provides a structuring principal for handling complexity*

*Facilitates installation*
Evolutionary Housing Principles: Grid System

Provides a structuring principal for handling complexity

Facilitates installation

Allows for easy renovation and additions
Evolutionary Housing Principles: Modularity

Combines the cost-effectiveness of standardization and the variety of customization
**Evolutionary Housing Principles:** Modularity

Combines the cost-effectiveness of standardization and the variety of customization

**Works with the grid system to allow for easy renovations and additions**
Evolutionary Housing Principles: Modularity

Combines the cost-effectiveness of standardization and the variety of customization

Works with the grid system to allow for easy renovations and additions

Allows reuse of modules in other houses
Evolutionary Housing Principles: Cores

A unit containing a series of related functions and services
Evolutionary Housing Principles: Cores

A unit containing a series of related functions and services

A collection of services and functions customized to user needs
Evolutionary Housing Principles: Cores

A unit containing a series of related functions and services

A collection of services and functions customized to user needs

Preassembled in a factory for installation on-site
Evolutionary Housing Principles: Kit of Parts

A foundation, a frame, and a spectrum of modules and cores ranging from modest to high-end
Evolutionary Housing Principles: Kit of Parts

A foundation, a frame, and a spectrum of modules and cores ranging from modest to high-end

Interchangeable modules and cores
Evolutionary Housing Principles: Kit of Parts

A foundation, a frame, and a spectrum of modules and cores ranging from modest to high-end

Interchangeable modules and cores

Offers many patterns of configuration
Evolutionary Housing Principles: Kit of Parts

A foundation, a frame, and a spectrum of modules and cores ranging from modest to high-end

Interchangeable modules and cores

Offers many patterns of configuration

Accommodates changing needs of users

Institute of Design • INDEX 2005

Arpita Agrawal, Michael Davis-Burchat, SoYoung Lee, Kris Marich, Stephen Palumbo, Rachel Serlin-Egan, Soungmin Yoo
Evolutionary Housing: The Model
Housing System Lifecycle

The point at which a house is purchased or acquired

- Entry
- Return
- Growth
- Decline
- Maturity
**Housing System Lifecycle**

The point at which a house is purchased or acquired

The stage during which a family is most likely to expand
**Housing System Lifecycle**

- **Entry**: The point at which a house is purchased or acquired.
- **Growth**: The stage during which a family is most likely to expand.
- **Maturity**: The point at which a family's needs stop growing.
- **Decline**: Return

---

Institute of Design • INDEX 2005

Arpita Agrawal, Michael Davis-Burchat, SoYoung Lee, Kris Marich, Stephen Palumbo, Rachel Serlin-Egan, Soungmin Yoo
The point at which a house is purchased or acquired

The stage during which a family is most likely to expand

The stage at which a family requires less space

The point at which a family’s needs stop growing
### Housing System Lifecycle

- **Entry**: The point at which a house is purchased or acquired.
- **Growth**: The stage during which a family is most likely to expand.
- **Maturity**: The point at which a family’s needs stop growing.
- **Decline**: The stage at which a family requires less space.
- **Return**: The point at which a home is sold or returned to market.

**The stage at which a family requires less space**

**The stage during which a family is most likely to expand**

**The point at which a family’s needs stop growing**

**The point at which a home is sold or returned to market**
Global Reach

The housing system strives to serve a full spectrum of cultural and socio-economic needs.
Global Reach

The housing system strives to serve a full spectrum of cultural and socio-economic needs

Institute of Design • INDEX 2005
Arpita Agrawal, Michael Davis-Burchat, SoYoung Lee, Kris Marich, Stephen Palumbo, Rachel Serlin-Egan, Soungmin Yoo
Global Reach

The housing system strives to serve a full spectrum of cultural and socio-economic needs.
Global Reach

The housing system strives to serve a full spectrum of cultural and socio-economic needs.
Global Reach

The following examples take you through the housing lifecycle in a middle class, urban, developed context.
Entry

An entry level home configuration

Institute of Design • INDEX 2005
Arpita Agrawal, Michael Davis-Burchat, SoYoung Lee, Kris Marich, Stephen Palumbo, Rachel Serlin-Egan, Soungmin Yoo
**Green Grid Roofing System**

**Structural Element**
A part of the *Grid System*, Green Grid Roofing is a live-plant roof cladding that arrives at the home planted and ready for installation. The modules, backed with recycled plastics, can be placed directly on an existing roof surface membrane or any other surface braced to handle their weight.
Photovoltaic Energy System

**Structural Element**
This system, which uses lead-free PV modules, provides power to the house and allows excess energy to be stored for later use, used by others in the community, or sold back to the power company.
**Zig Bee Node**

*Functional Element*
A part of the Environmental Core, the Zig Bee Node is a low-power, wireless controller for the home. It can be mounted in multiple locations in walls anywhere in the home to facilitate smooth operation of lighting, heating, cooling, and many special activities. New activities for control can be readily added with software updates.
The figure at right depicts Zig Bee in use. Touch pads throughout the home create a fully distributed control system.
Growth

From the entry phase, a patio is added, the second floor deck is expanded and a garage is added.
Growth

A growth level home configuration

Institute of Design  •  INDEX 2005

Arpita Agrawal, Michael Davis-Burcat, So Young Lee, Kris Marich, Stephen Palumbo, Rachel Serlin-Egan, Soungmin Yoo
 Functional Element

The Ceiling and Floor Modules are part of the Environmental Core. They permit rapid access and efficient maintenance operations without the need for masonry work. Panels contain interface connectors for utilities in the home. Heating vents are in floor modules, cooling vents in ceiling modules. Modularity allows utilities to be repositioned easily when room layouts are changed.
**Functional Element**
The Family Knowledge System is part of the Family Knowledge Core. The system archives, distributes and reassociates family data for special purposes. Special applications include the Share Square, Milestone Meter, and Learning Journal (see full report for more detail).
Maturity

From the growth phase, a maturity phase home is configured. Components are exchanged for other more appropriate ones.
Maturity

A maturity level home configuration

Institute of Design • INDEX 2005

Arpita Agrawal, Michael Davis-Burchat, SoYoung Lee, Kris Marich, Stephen Palumbo, Rachel Serlin-Egan, Soungmin Yoo
**Functional Element**

The SI Wall is a movable interior wall unit. Channels at the top transfer utilities. Extendable wheels at the bottom enable it to be repositioned within the home.
Nutri-Count Chef Sequencer

Functional Element

The Nutri-Count Chef Sequencer is a component of the Food Core. It helps to manage the food preparation process, keep track of recipes, maintain nutritional information, calculate food serving needs, control cooking processes, and organize the sequence of tasks to save time and effort.
Decline

From the maturity phase, subtractions or additions are made to accommodate the departure of children and changes in resources, interests, and aspirations. Houses may expand or contract in the Decline phase.
Decline

A decline level home configuration

Institute of Design  •  INDEX 2005

Arpita Agrawal, Michael Davis-Burchat, SoYoung Lee, Kris Marich, Stephen Palumbo, Rachel Serlin-Egan, Soungmin Yoo
**Structural Element**
CEX Surfaces system is an exterior wall panel cladding system that permits users to select surface textures that both provide environmental protection and fit the aesthetic surroundings of the community. Modular component sizes allow ready fits to window and door panels; Simplex Connects technology makes assembly to panels and frame structure easy.
**Personal Chamber**

**Functional Element**
The Personal Chamber is a component of the Rest Core. As a personal study and relaxation area, it is especially useful for homes with limited personal space for family members. Besides a restful seating area, the Personal Chamber has a viewing monitor and an option for white noise.
Return

The return phase is the point at which a home is sold or returned to the market. Key cores and components are reintroduced into the system to serve the needs of other home owners.
Institute of Design  •  INDEX 2005

Arpita Agrawal, Michael Davis-Burchat, SoYoung Lee, Kris Marich, Stephen Palumbo, Rachel Serlin-Egan, Soungmin Yoo
Return
Central Control Database

*Functional Element*

The centralized database incorporates elements from national and international sources. It aggregates construction information and specific data for entities that are related to the architectural process.
**Functional Element**

The De-part Auction is a database of housing components. Objects can be searched for and obtained or sold through an online auction center. Searches can be organized by price or location.
Global Reach

The following is a middle class, urban, developing example in the entry phase

Middle class

Poor

Urban

Rural

Developed

Developing

Institute of Design • INDEX 2005

Arpita Agrawal, Michael Davis-Burchat, SoYoung Lee, Kris Marich, Stephen Palumbo, Rachel Serlin-Egan, Soungmin Yoo
Bangalore

Institute of Design • INDEX 2005

Arpita Agrawal, Michael Davis-Burchat, SoYoung Lee, Kris Marich, Stephen Palumbo, Rachel Serlin-Egan, Soungmin Yoo
**Functional Element**

Filt Roofing is a water collection and integrated filtration system. Filtration tiles can be interlocked to create various size roofs. Panels can be used for flat, gabled or lean-to styles.
**Functional Element**

Dreamz is a component of the *Interaction Core*. It is software and an interface that helps users to freely imagine, plan, and record their goals, aspirations, and achievements.
Global Reach

The following is a poor, urban, developing example in the entry phase.
Sao Paulo

Institute of Design • INDEX 2005

Arpita Agrawal, Michael Davis-Burchat, SoYoung Lee, Kris Marich, Stephen Palumbo, Rachel Serlin-Egan, Soungmin Yoo
ASM Framing

**Structural Element**

ASM Framing consists of individual prefabricated structural elements that are assembled to form the skeleton of a house. Much like the structural skeletons for high-rise buildings, Evolutionary Housing is created with ASM Framing bolted together in single-level or multi-level units. Because it is modular, each house can be customized to user desires and plans. The strength of steel and the rigidity of triangulation greatly enhances its structural stability.
**Safe Water Filter**

**Functional Element**
The Safe Water Filter is part of the **Food Core**. The filter provides a family with an ozone treated water source. It effectively kills waterborne diseases such as cryptosporidium and bacteria such as e coli.
Vancouver

Homelessness is a problem even in some of the wealthiest parts of the world. The following is an example of how the housing system approaches homelessness in urban areas, such as that of Vancouver.
Walk-in Shelter

Institute of Design  •  INDEX 2005
Arpita Agrawal, Michael Davis-Burchat, SoYoung Lee, Kris Marich, Stephen Palumbo, Rachel Serlin-Egan, Soungmin Yoo
Fixed Address Module

**Functional Element**

The Fixed Address Module is a movable box that keeps records of personal, medical and municipal data on individuals who have “no fixed address.” The box is outfitted with a wireless receiver/transmitter combination that allows its user to call for emergency assistance, obtain mail and participate in municipal services. The location of the box is established by GPS.
The Evolutionary Housing System…

employs new utilities based on their technological merit rather than on the politics of regulations

increases self-sufficiency and protects precious resources

can be built in a day

can be reconfigured to accommodate the changing needs of its inhabitants
The Future is Here

For a full exposition see the report at http://id.iit.edu/profile/gallery/evolutionary_housing/