The Housing We Need

The Evolutionary Housing System

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Housing became a topic for inter-professional study in the Institute of Design’s fall 2004 Systems and Systematic Design course partly at the inspiration of the INDEX: Awards. Created in Copenhagen, Denmark to recognize worldwide design achievements, these awards celebrate the capacity of design thinking to affect quality of life positively at local, national and global levels.

Recognition by the internationally acclaimed INDEX: Awards confers credibility and guarantees widespread dissemination of the concepts recognized. For this project, that would accelerate the communication of new ways to deal with some of the most egregious problems introduced by population growth, as well as ways to adapt a variety of technological advances to housing in many locations around the world.

Using a computer-supported planning process called Structured Planning (summarized later in this Preface), teams undertook an extensive project to seek out, develop, and integrate inventive housing concepts in an adaptive system that could be implemented worldwide under a wide variety of economic, environmental and cultural conditions. Particular attention was to be given to the climatic changes to be expected from global warming and the resource exhaustion (notably, water) being hastened by burgeoning population growth.
Preface  The Project

Two project sub-teams of three and four members were formed to carry out the project. The first team was given responsibility for housing structure and utilities; the second took on the services and functionality necessary in the house to support human activities.

Charters were issued to each team setting the context of the project and its goals. The Charters acted as initiating briefs. Following are some sections from them:

**Background**

Political, social, economic and technological change are increasingly molding public expectations, creating greater demand for improvement in the quality of life. Complicating the problem, population expansion, with the relentless consumption of resources it brings, continues in all but a few developed countries. Yet, developed countries and developing countries -- rich and poor alike -- feel the quality-of-life pressure. The problem affects all because it is a problem of quality relative to what exists. Those living in deplorable conditions clamor for the simplest amenities. Those with better living conditions demand the improvements they see elsewhere or perceive possible. For all, strides in science and technology are a constant reminder that a better life is possible, and should be attainable.

Visionary models of “houses of the future” have long been features of world’s fairs, expositions and industry promotions, pressing the boundaries of the technologically possible to show what could be, if... the if’s being social, economic and political thresholds that must be crossed, but seldom are.

Despite the barriers, technological developments in manufactured housing and electro/mechanical services over the years have brought a slow but steady progression of quality housing improvements to the general public.

The difference today is that the press of exponential population growth is joining with environmental changes to make living conditions a matter of mandatory concern rather than a special project of liberal governments and the socially conscious. Diminishing natural resources from oil to water will directly affect quality of life and are already beginning to be felt seriously in some parts of the world. Dealing with them will require new approaches to the use of utilities. Another new factor, increased energy in weather and climatic systems, is creating more frequent and more violent natural disasters. Brought about by global warming, this will require stronger, more protective construction, smarter patterns of home and community design, and resilient systems able to survive unexpectedly disruptive natural events.

At the same time, the post-industrial technological revolution is bringing extraordinary new capabilities in engineering, communication, command and control, materials -- engineered and bioengineered -- and information technologies. The means are emerging to deal with the needs that are evolving. Both are significant in scope and potential impact. The increased urgency today reflects both the extensive destructiveness of the forces precipitating need and the power of the technologies supporting solution.

It is time to commit to housing designed as adaptive systems and to develop plans for components that can fit widely varying needs within different environmental, economic, social and cultural niches.
The problem is not finding a single solution to a specific problem, but creating a general system concept capable of particularized solutions to a wide range of problems. The house of the future needs to become the house of today, available widely in configurations appropriate for today’s conditions, but continuously adapting to the conditions of tomorrow.
Trends initiated by emerging technologies, changing environmental conditions, and evolving social needs and interests will have real impact on the needs and aspirations of individuals, families and communities -- as well as how design can serve them. Among such trends are:

**Population Growth**
Population growth continues to soar around the world. Particularly in developing countries, but also in countries with significant immigration (such as the United States), rates of population increase are putting heavy demands on available resources. Although estimates for a final asymptote have decreased, world population is still expected to reach 9 billion by 2050 and top 12 billion by the end of the century.

**Population Movements**
A combination of forces is creating a movement of people from rural to urban environments. In the developing countries, it is the perception that better jobs are in the cities. In the developed countries, it is the renaissance of the city as a cultural center coupled with the progression of societies from agriculture to manufacturing to service to information economies. The result is a need for housing systems that can adaptively create single-family and multi-family new construction as well as re-use construction for new and old parts of the urban environment.

**Energy Resources**
World oil resources are beginning to dwindle. Estimates for peak production vary from 2005 to a few decades later. The world economy is deeply associated with oil as fuel and hydrocarbon material resource. Energy needs will have to be met by other resources in the near future.

**Water Resources**
Water supplies are already becoming precious resources in many parts of the world. As these are strained by greater demand, new efficiencies in water distribution, use, purification and reuse will be mandatory to maintain communities.

**Global Warming**
The increased energy injected into weather and climate systems by global warming is beginning to affect the destructiveness of weather and climate events. Stronger and more frequent tornadoes, hurricanes other cyclonic storms will be one result. Longer and more intense droughts and flooding will be another. Barring a cataclysmic worldwide event, the growing severity of environmental conditions will require new approaches to individual housing and community structures, both to ensure preservation in bad weather and to maintain system function in the face of infrastructural pressures.

**Increasing Expectations**
The growing availability of television in remote areas is providing people with daily reminders of living conditions, products and services in commonplace use elsewhere in the world. These encounters create expectations that fuel demand and willingness to change.

**Growing Globalization**
Nations are less and less independent entities. International corporations and global trade are creating a one-world economy in which there are potential markets for virtually anything of value. Diversities of culture offer niche markets, but also provide specialized sources of products.
Internet Penetration
Computer use and Internet access grow exponentially every year. Information of encyclopedic detail can be obtained more and more easily, and complex, sophisticated processes can be used remotely. Access to high-quality communications and sophisticated computer tools are increasingly available to individuals and groups anywhere.

Emerging Technologies
The pace of technological change continues to accelerate, bringing new science to commercial and industrial uses at an ever quickening pace. Major technological innovations are appearing in the new fields of molecular nanotechnology, robotics and bioengineering/genetics.

New Relationships
Greater public mobility and access to information is changing the nature of association for many individuals and organizations. Organizations that once operated in isolation are now players in a common environment. Sometimes the emerging relationships are competitive, sometimes cooperative.

Economic Upheaval
Wars, droughts, environmental disasters and perceived opportunities in other locations are inducing people to abandon or supplement previous occupations with new ways to make a living. Entrepreneurial styles of working are finding new currency in a world where wages and funding are limited, but desires are fed by ubiquitous televised reminders of what is available.
**Preface**  Project Statement

Using Structured Planning methodology, conduct an advanced planning project to develop structure, utility systems, services and functionality for a housing system able to respond to the needs and technological resources of contemporary world societies.

**The system should:**

Treat housing as an adaptive system, adaptive to a variety of conditions at installation, adaptive over time to changing needs of users;

Accommodate through variability the social, cultural and economic needs/desires of developed and developing country users;

Utilize energy and utility technologies appropriately to maximize self-sufficiency:

Employ materials, structures and design concepts best able to economically provide safe occupancy under extreme weather and climate conditions;

Recognize and employ computer and communication technologies appropriate to aspirations and expected capabilities of communities; and

Put the functionality of the house in the service of helping individuals and family to grow intellectually, emotionally and socially.
As general guidelines the proposed housing system should:

Explore a full range of possibilities, paying especial attention to appropriate technologies and user needs and desires.

Consider both high- and low-tech proposals as they are appropriate.

Include ideas for processes, tools, systems and products -- including procedures, services, activities, organizational concepts and any relevant relationships among them.

Explore revolutionary as well as evolutionary ideas.

Consider the educational process through which individuals and groups learn to use the system and its components.

Accommodate all users of the system, from distribution to retirement and provide for them in the design. Thoroughness is a step toward system integrity.

Consider potential costs, pricing and funding thoughtfully; the proposal should not incorporate unnecessary frills, but it should not sacrifice quality for low cost.

Treat the design problem as design from the inside out; user needs come first, with every attempt possible made to satisfy them in some way, even when tough design decisions must be made.

Conceive the properties and features of the system as means to build trust between buyers, sellers, installers, maintainers, users and suppliers.

Overall, the solution should:

Assume that the proposal can be acted upon as it is conceived.

Do not underpropose on the assumption that a concept might be politically opposed.

Demonstrate what might be achieved. The value of the proposal is in its ideas, not its direct attainability. Ideas that might not be fully attainable under today’s conditions may be incrementally achieved tomorrow -- if they are known.
The semester-long Systems and Systematic Design course is a project-based course in which teams of graduate students, deliberately of mixed international origins and different academic backgrounds, apply the computer-supported Structured Planning process to complex design and planning problems. The goal for each project is to develop information thoroughly, propose innovative solutions that take maximum advantage of the information, and integrate these ideas into system concepts that can both be evaluated in their own right and (in a real situation) be the comprehensive project specifications for a follow-on detail design phase of development.
**Preface  Course Issues**

**Complexity**
What is the nature of “systems” concepts, where products, processes, services and settings are organized to act together to achieve multiple goals? What can be done to assure that a concept is as complete as possible, covering many functions and attaining a high degree of “wholeness” and organic reliability?

**Design and planning methods**
What is Structured Planning and how can its tool-kit of methods be used to collect, structure and handle information in projects of greater complexity than can be comfortably dealt with intuitively? How can such methods be used by a team to extend the effectiveness of all?

**Teamwork**
How do individuals with different cultural origins and different academic backgrounds work together successfully on teams? What roles are there to be played and what difficulties must be overcome?
Structured Planning, the systematic planning process taught in the course, is a process for finding, structuring, using and communicating the information necessary for design and planning activities. It is a front-end process for developing concepts thoroughly and cohesively.

A number of projects have been undertaken with it and used to further its development. Among nearly 100 of these, an early published project for Chicago’s transit authority (CTA) was Getting Around: Making the City Accessible to Its Residents (1972). In 1983, the House of the Future project won the Grand Prize in the Japan Design Foundation’s First International Design Competition. In 1985, the design of a habitation module for Space Station was undertaken for NASA. In 1987, the Aquatecture project won the Grand Prize again in the Japan Design Foundation’s Third International Design Competition. In 1991, Project Phoenix on global warming was honored as Environmental Category Grand Winner in Popular Science magazine’s “100 Greatest Achievements in Science and Technology” for the year. In 1993, two award winning projects, NanoPlastics and Aerotecture, were widely publicized in Europe and Japan. In 1995, the National Parks project developed plans for the future of the U. S. National Park Service, and in 2001, Access to Justice, a project sponsored by the National Center for State Courts, was implemented for use in state courts across the United States. As the process has evolved, it has become an increasingly useful planning tool for products, systems, services, processes and organizations. It is now being used commercially.
A diagram of the process, shown below in two figures, outlines the activities that make up Structured Planning and the working documents and final products that are produced along the way. The following general description follows the diagram. Where products of the process are discussed here in the abstract, it is possible to see specific examples produced for this project in the appendices that accompany this report.
The Structured Planning process begins with Project Initiation and the production of a Charter. This is a “brief” that serves as an initial communication vehicle between client and planners. It contains background, context, basic goals, a project statement that cuts to the heart of the planning task, resources to be used, and an initial set of issues to be investigated.

Defining Statements are mini “white papers” produced in the Framework Development portion of Project Definition. They focus the project within the direction of the Charter, concentrating on the issues and arguing specific directions that the project should follow with regard to them.

Together with the Charter, they define the project.
Any system can be viewed as a complex entity working with its users in different ways appropriate to its modes of operation. To plan effectively, a planning team must recognize these Modes, identify Activities that occur within them, and isolate the Functions that the users and system are intended to perform within each Activity. The result of the Activity Analyses conducted is a Function Structure.

Half of the purpose of Action Analysis is the enumeration of Functions. The other half is the development of information about these Functions that reveals insight about what happens as they are performed. During Action Analysis, insights are sought about why things go wrong in performing some Functions, and how other Functions manage to be performed well. These insights are uncovered in the Design Factor Description procedure and developed in documents that become part of a qualitative knowledge base. Activity Analyses record information at the Activity level; Design Factors document insights and ideas associated with Functions.

To capture as fully as possible the ideas suggested on Design Factors, Solution Element documents are written in the Solution Element Description portion of Action Analysis. These are one-page documents designed to capture enough detail about ideas to give them substance when they are needed later. They have three important sections: “Description” -- a short explanation, “Properties” -- what the idea is, and Features -- what the idea does. The Solution Element form is the tool used for committing ideas to paper.

The product of Action Analysis is three sets of critical information: a set of Functions (the Function Structure), a set of insights (Design Factors) and a set of preliminary ideas (Solution Elements).
Paradoxically, as useful as the Function Structure is for establishing coverage, it is not the best form of organization for developing concepts. Reorganizing information for use in concept development is the job of two computer programs, RELATN and VTCN.

The controlling factor for whether two Functions are associated from the planning standpoint is not whether they are categorically “related” in some manner, but whether a significant number of their potential solutions are of concern to both. Which Solution Elements are of concern to each Function is established in an Interaction Analysis procedure.

The RELATN program then uses this information in a Graph Construction process to establish links between Functions. Another program, VTCN, completes the information structuring process.

The graph establishes paths through the Functions by linking them when they are related, but, unlike a road map, a graph is not naturally arranged nicely for visual comprehension. In the Hierarchy Construction activity, VTCN finds clusters of highly interlinked Functions and organizes them into a semi-lattice hierarchy, a very general form of hierarchy most appropriate for planning. The hierarchy is called an Information Structure.
In its form from the VTCON program, the Information Structure is simply a hierarchical organization. Nodal points do not have names. The task of Means/Ends Analysis is to create labels for all nodal points in the hierarchy. Moving bottom-up from the known Functions in the bottom level clusters, the question is asked, “To what end are these Functions means?” The answering purpose, in turn is grouped with its sibling nodes and viewed as means to a higher level end. The process continues to a completely labeled Information Structure.

The process is then reversed as a top-down, structured brainstorming procedure: Ends/Means Synthesis. In this process, the planning team asks of high level nodes, “what means do we need to meet this end?” As means are established, they are treated in turn as new ends for which means must be found, until the means become concrete enough to be described as final elements of the system (System Elements). Solution Elements originally conceived for the Functions involved are constantly reviewed as possible end products. New ideas, however, are encouraged, and original ideas are modified or combined in the light of the means that evolve.

During Solution Evaluation, features of the System Elements are evaluated for their contribution to fulfillment of Functions in their part of the Information Structure. If there are unfulfilled Functions, this is the signal to return to the Ends/Means process for additional development.

System Element Interaction compares System Element with System Element in a search for additional synergies that can contribute to systemic qualities. More than simply recognizing relationships, the planning team proactively seeks out ways for System Elements to work together -- to the extent of modifying one, the other, or both.

Changes are incorporated in the properties and features of the individual System Elements.

The last task, System Element Description, completes the write-up of System Elements as specifications, including a succinct description, all relevant properties and features, and extensive Discussion and Scenario sections that contain detailed expositions of the ideas in both conceptual and operational terms.
Because the result of the Structured Planning process is a complex system, usually with a number of System Elements, a Communication Structure is frequently included as an aid to understanding. This is created during Concept Organization by the VTCON program from an assessment of how important the System Elements are to each other’s operation. Using this structure, the reader can understand the system and navigate its concepts with greater efficiency.

The product of the Structured Planning process, assembled in the Project Completion section, is a Conceptual Plan, made up of an Overview that provides background and introduces the system, the System Elements that describe the ideas and their relationships, and Appendices that contain all relevant support information, including the Defining Statements, Design Factors, Function Structure and Information Structure.
The design/planning teams for this project consisted of seven Institute of Design graduate students from: Canada, India, the Republic of South Korea and the USA. Individual members hold degrees in eight different fields of design and other disciplines.

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Introduction  What if...

A family could assemble their own house in one day

A housing system could increase self-sufficiency and protect precious resources

A housing system could employ new utilities based on their technological merit rather than on the politics of government regulations

A housing system could foster personal, familial and community growth
Introduction  Relevant Trends

World population growth is at an all-time high. This has put intense strain on housing around the globe. As a result of population boom, natural resources are becoming increasingly scarce. This has culminated into an even bigger danger, global warming. The danger of global warming will only increase under the current status quo. In addition, emerging technologies are causing people to want more. Unfortunately, these expectations are often unattainable due to high costs and institutional barriers.

Emerging Technologies

Population Growth

Scarce Resources

Increasing Expectations

Global Warming
The First Precursor is Jay Doblin’s 1956 article “Here’s Your House of the Near Future.” This is where The Housing We Need, derived the idea of cores. According to Doblin, cores are the mechanical centers around which every house is built. Even though nearly 50 years have passed since this article was published, Doblin’s words still ring true.

“At present, most of these mechanical parts are laboriously and expensively assembled at the site. These cores should and will be available as complete units which can installed easily at reasonable cost.”
The benefit of cores is that they are both modular and interchangeable. The home dweller can add additional cores or retire old ones with minimal effort. In addition, they are designed to serve a wide range of socioeconomic, cultural and environmental needs.

Cores are a unique and effective way to serve the ever growing and widely diversifying world population. They allow users to purchase a simple core with limited functionalities or a high-end core with many functionalities. In addition, it allows the user to select which cores are most appropriate for them. Additional cores can be added or subtracted based on the user’s resources and needs.
The idea of a “Kit of Parts” is that it offers a myriad of configurations. These configurations are made of interchangeable components that are designed to accommodate the changing needs of the user. This is done on a grid system, which allows for easy renovations and additions. Together, these components create a holistic housing system.
System Diagram  Life Cycle Scenarios

- **Entry**
  - The point at which a house is purchased or acquired

- **Growth**
  - The stage during which a house is most likely to expand
  - The expansion plateau of a home and its occupants’ needs

- **Decline**
  - The reduction in space needs for a home’s occupants

- **Return**
  - The redistribution of components of the home

The diagram illustrates the life cycle scenarios of a house, with stages labeled as Entry, Growth, Decline, and Return.
System Diagram Entry

- Entry
- Return
- Growth
- Decline
- Maturity
System Diagram  Growth
System Diagram  Maturity
System Diagram  Decline

- Return
- Entry
- Growth
- Decline
- Maturity
System Diagram

Return

Entry

Growth

Decline

Maturity
**System Element**  \( \text{H}_2\text{O Protector} \)

**Description**
The \( \text{H}_2\text{O Protector} \) is a water storage barrel with an anti-bacterial surface. It stores water cleanly and has a detachable water collection module.

**Discussion**
The \( \text{H}_2\text{O Protector} \) is designed primarily for those who live in communities with poor infrastructure. It allows the user to store water safely, gather water easily and fill cooking implements without having to lift a heavy, awkward vessel.

The \( \text{H}_2\text{O Protector} \) is focused on water safety. Many communities resort to using contains that once held chemicals for their water storage. In addition, the detachable modules allow the user collect water from a community source and store it in the barrel at their home.

In addition, the \( \text{H}_2\text{O Protector} \) is a useful asset as an emergency water source. Any family, regardless of socioeconomic status can benefit from an emergency water supply.

**Properties**
- Large water storage barrel
- Anti-bacterial interior surface for keeping water clean
- Removable filling tube and collection module

**Features**
- Allows the user to gather water easily
- Allows the user to store water safely
- Allows for easy filling of cooking and drinking vessels
**System Element**  Low Income Kitchen Core

**Description**

The Kitchen Core, in a homeless shelter context or very low income home is meant to provide amenities otherwise unavailable to their user.

**Discussion**

The Low Income Core targets both financial limitations and poor sanitation levels that are common in these contexts. In both cases, the intended user is at a disadvantage and the system elements provided in the core are designed to accommodate the user’s unique needs. The user is provided with a centralized heat source and sanitation area for preparing food. These solutions are both extremely economical and practical. The goal of the Low Income Kitchen Core is to maximize available space for food preparation while assisting the user in the collection of debris and soiled implements. In addition, the threat of food-bourn illness is eliminated.

**Properties**

- Sink
- Mirror
- Reheating source
- Storage for grooming supplies

**Features**

- provides a cooking facility
- provides sanitation tools and prompts
- provides hot and cold running water
**System Element** Chemical Cupboard

**Description**
Chemical Cupboard is secure storage area for solvents and cleaning agents. In its most basic form it provides storage that isolates this cache of chemicals from infants who might otherwise harm themselves with the contents. In addition, Chemical Cupboard provides storage surfaces for organization. At an advanced level, the cupboard will release self-healing compounds from shelving surfaces so as not to be marred by spilled contents.

Chemical Cupboard is a full function device that monitors and maintains an inventory of tagged cleaning agents (reduced function devices) based on usage recognition patterns. It will prompt the user when a supply is low, when effectiveness dates of the cleaning agents are passed and suggest responsible methods for disposal. It works in collaboration with the Chore Core. When a user selects a cleaning tool in the Chore Core such as a mop, it provides the user with knowledge of related cleaning supplies, their location, quantity, and availability.

**Discussion**
Cleaning agents rely on chemistry to perform. The properties that make them advantageous may be the very properties that make them dangerous or challenging to manage. The system is able to recognize users and bar those who do not understand their danger from access (such as small children). By applying Intelligence to the storage of cleaning compounds, the system is able to anticipate inventory needs.

**Properties**
- Identity sensing lock
- Self-healing shelving surface
- Inventory probe
- Effectiveness data calendar

**Features**
- Secures hazardous items
- Stores them in a protective manner
- Manages inventory based on usage
- Locates related cleaning tools
**System Element** Nutri Count & Chef Sequencer

**Description**
Nutri Count helps a family plan and eat healthy, well-balanced meals. It keeps track of the kind of meals that family member have had in the past few days and suggests nutritious substitutes accordingly. Chef Sequencer helps the user cook a few dishes in a sequence which saves time and effort. It helps the user complete parallel tasks to save time.

**Discussion**
Physical work in daily lives is decreasing, especially in cities. This change needs to be balanced with a regulated diet. Unhealthy diet is the root cause of many diseases, including obesity. Nutri Count helps the user plan a balanced diet, taking the users taste preferences into consideration. In addition, Nutri Count includes a database of recipes which can be recalled on the basis of their names, places of origin, ingredients, flavors or personal choices.

Cooking is a complex activity. The user has to organize multiple ingredients for each recipe. This task increases when the user has to cook multiple dishes. Chef Sequencer inputs the time the user has available for cooking. This time can be divided into hands-on time and cooking time. It then lists out the recipes that can be made in the time allotted. The user can also input the ingredients available in the house. Based on the users input options, Chef Sequencer lists out the ideal recipes. After the user identifies the recipes to cook, the Chef Sequencer outputs the ideal sequence for cooking the chosen recipes in the give time.

**Properties**
- Recipe encyclopedia
- Ingredient and nutrition database

**Features**
- Records all recipes
- Records food preferences
- Records diet plans
- Tracks special dietary requirements
- Suggest healthy recipe alternatives
- Displays recipes bases on ingredients
- Allows user to input multiple recipes
- Tells user the ideal sequence for cooking multiple recipes
- Chooses recipes based on available time
**System Element**  \( \text{O}_3 \text{ Food Prep Center} \)

**Description**
The \( \text{O}_3 \) Food Prep Center is a sealed cabinet with enough volume to store several dishes during the preparation stage of cooking. A probe for sensing changes in temperature of the food contents issues a prompt to an infrared scanner. The scanner will demonstrate to the user a visual display of bacterium formation. The user can introduce a dose of Ozone into the chamber, and then extract the surplus ozone before opening the cabinet.

**Discussion**
People prepare food in many forms around the world. Common ways of embodying meat with flavor are to marinate it, smoke it, cure it, and rub it with spices. Bacterial contamination can occur in any of these preparations methods, as they often require for food to sit for hours on a kitchen counter. Occurrences of contamination are widespread in developed as well as developing regions. Bacterial contaminations can have permanent effects on the user and can even lead to fatalities. The preparation center is a place for keeping food in the stage prior to cooking.

Ozone itself has dangerous properties and must be handled carefully or it too can have toxic effects. However, the \( \text{O}_3 \) Food Prep Center is a safe and effective way to disinfect food.

**Properties**
- Air tight cabinet
- Temperature alarm
- IR lamp for contamination preview
- Ozone re mediation cycle

**Features**
- Disinfects food
- Has an electromechanical disconnect
- Displays and monitor contamination risks
- Contains a small scale water purification
Food spoils if its temperature is not maintained. The Hot & Cold Container has temperature sensors that inform the user when food is no longer safe to eat.

The Hot & Cold Container addresses the problem of spoiling food due to unmaintained temperatures. Especially when running a busy household, there are times when attention to food temperature may lapse. This can be a hazard to the entire family.

The can even happen when food is refrigerated. For example, when electricity goes during the night, there is a lapse in the constant temperature inside the appliance.

In addition, when people carry their lunch in a hot climate, food may spoil in transit. This is also true for medicines and injections. Thus one might end up consuming the food or medicine which has already gone bad. Food poisoning is a common occurrence in hot climate.

The Hot & Cold Container displays the temperature inside of the container. Once the temperature exceeds the set limits, the display records that there has been a lapse temperature maintenance. Temperature limits can be set by the user depending on the food’s requirement. The temperature sensor and display are sealed inside a waterproof unit. It can easily be detached from the container while heating or cleaning.
**System Element**  Know-it-all Food Manager

**Description**  
The Know-it-all Food Manager is a complete kitchen management system that includes inventory management, inventory display located directly on the user’s pantry, resources for accessing the availability of foods for ordering and a digital food ordering service.

**Discussion**  
The Know-it-all food manager is designed to solve all the food inventory needs in the home. The inventory management feature, which includes the on-pantry inventory display, not only reduces the frustration of locating items, but provides the user with a quick read-out that assists greatly in grocery list and food preparation.

The other group of features in the Know-it-all Food Manager is the availability and ordering features. This is especially useful in underdeveloped or rural communities where the availability of goods may vary dramatically from week to week. When a certain food is not available, the digital ordering service automatically places a user’s food order from a list of “frequently ordered foods.” This information is sent to a central database that registered the order in a list of priority based on when the order was placed. Once the food is available, the user is automatically notified.

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**Properties**  
- Inventory Management including an on-pantry inventory display  
- Access to food availability  
- Digital food ordering and notifying system

**Features**  
- Provides the user a visual reference to their food inventory  
- Allow the user to check the availability of food items  
- Allow the user to order food automatically via a list of frequently ordered goods  
- Notifies the user when food becomes available
**System Element**  Shrinking Dishwasher

**Description**
The Shrinking Dishwasher is a dishwasher that is divided into different compartments. Each compartment can be run independently of the others. This allows for the use of a single compartment when there is only a small number of dishes to clean.

**Discussion**
In general, families are getting smaller. Subsequently the use of dishes that need to be washed at any one time is decreasing. Environmental consciousness also demands that water and electricity be used efficiently. When only a few dishes are soiled, a user can wash them without the guilt or waste of running the entire dishwasher.

**Properties**
- A dishwasher
- A number of individual compartment that can be run independently

**Features**
- Washes dishes and utensils
- Allows the use of a single compartment or multiple compartment at the same time
- Uses water efficiently
- Utilizes energy efficiently
- Saves time
- Prevents the user from hand-washing dishes when only a small number are soiled
**System Element**  Safe Water Filter

**Description**
The Safe Water Filter is part of the Autonomous House Core (for off-the-grid homes). This system provides a family with an ozone treated water source. Water that is input to this system can come from several sources such as a well, rainwater cistern, portable container and municipal supply line. The treatment process serves to effectively kill waterborne diseases such as cryptosporidium, bacterium and e coli. Available as an independent or redundant system (for using in conjunction with an existing infrastructure) this element provides one of the most important drivers of quality of life, clean safe water.

**Discussion**
There are three ways to improve the availability of drinking water: produce it more, distribute it better, and waste it less. Safe Water Filter converts rainwater into potable water and standing water sources such as wells and cisterns.

Waterborne diseases can be fatal over time. What makes them especially dangerous is that the contamination that causes the illness is difficult to detect.

Municipal systems are subject to human error. Failures can lead to full scale outbreaks. Home dwellers, especially those most vulnerable like the very young and the very old, would benefit greatly from a redundant installation. In a sense, this becomes a practical form of health insurance for groups most susceptible to illness.

**Properties**
- Compatible with multiple water sources
- Measure source for contamination levels
- Water quality readings
- Easy installation of ozone
- Safe storage of ozone

**Features**
- Treats water with ozone
- Reports water quality reading to the municipality
- Optimizes usage of available water sources
**System Element**  The Entertainment Core

**Description**
The Entertainment Core is a distributed service of streaming media that can be made available in part or in full anywhere in the home. Services include: telephony, video, gaming, music, still images, the World Wide Web as well as network programming. Available in a wide range of options this system provides opportunities for centralized entertainment experiences in social gatherings as well as personalized ones.

**Discussion**
From one central data connection, content can be routed wirelessly to any room in the home. The entertainment core provides a spontaneous array of choices that can either be sent or received. Much of the content in the Entertainment Core provides a passive form of entertainment, music and movies, but will work with tools for more active forms of entertainment such as Game Space and Story Podium.

A parental control is designed to limit functionalities according the meaning of the room, such as the bathroom or bedroom, where specific forms of privacy are vital.

**Properties**
- Incoming signals
- All band radio
- Wireless routing
- Photo and Video recording
- Multimedia display

**Features**
- Offers the user access to Video Telephony
- Displays movies on demand
- Offers a variety of Internet applications
- Plays music
- Offers room specific content control
The Information Emissary is an agent that is specifically charged with the collection of data that is relevant to the user’s place in the community. It seeks out community-based programs such as sustainability initiatives and entrepreneurial incentives and changes in zoning that may affect the home dwellers.

In addition the dweller of a rural community may need to know about services located a considerable distance from their home. The Information Emissary allows the user to designate their area of interest. This agent works in conjunction with the Family Database and the Discussion Wall. Relevant community notices are posted for the family to discuss, explore and respond to.

The Evolutionary House is available in a wider range of configurations. Some will be autonomous in their services and functionality, while many will not. In both cases, community planners will place higher-level requirements on housing that may affect the structure and functionality. In these instances, the Information Emissary can report to the community information such as land use registry, the current nature of the dwelling, its occupancy and contact information.

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**Properties**
- Family Database access
- Report feature
- Information display

**Features**
- Assesses current configuration of house
- Analyses community plan and incentives
- Automates payment for services
- Optimizes service requirements from the community
**System Element**  
Chore Core

**Description**
The Chore Core coordinates the location of cleaning and maintenance tools around the house. It is composed of one or a number of storage locations for cleaning tools such as brooms, brushes and mops. Each device is tagged with a Reduced Function Node and can be tracked relative to where it is used most frequently by all members of the family. Using a combination of motion and proximity sensing, a broom for example, could suggest to the user what location they should return it to after completing a cleaning task.

**Discussion**
Cleaning is a perpetual task for the purposes of health, beauty, hygiene and the avoidance of embarrassment. This is a ritualized process that frequently is distributed among all members of the household. Chore Core provides a communication platform between the tools and the storage locations, permitting a number of convenient innovations. User can identify a location in the Chore Core where a tool currently located. It will also recognize locations where the tool is most used and suggest the optimum place to return it after use. Parents can use the Chore Core to manage the distribution of tasks and monitor individual contributions to household chores.

**Properties**
- Full Function Node
- Reduced Function Node
- Suitable volume for storing tall items
- Cleaning supply inventory display

**Features**
- Identifies proximity to tool from a single location
- Optimizes tool location based on usage
- Monitor work sharing of tasks among family members
**System Element**  Financial Dataport

**Description**
The Financial Dataport is designed to assist user(s) in all of their at-home financial needs. It is a computer system, which can be located within a home office environment, that contains embedded Make Life Easy software as well as financial journaling and tracking, and a receipt capture/scanner. It is wireless internet enabled for easy information access from the user’s banks and credit cards.

**Discussion**
The Financial Dataport is a toolkit for managing family or individual finances from home. Many programs are already in existence, but the Financial Dataport organizes them all in a unique package. To address how important financial irresponsibly is to a success of a family, the Financial Dataport comes complete with a dedicated computer system.

One its most unique features is the Make Life Easy program; a tool for organizing complex income, spending and savings information within a family or household. Tools that support this including financial journaling, and a receipt capture/scanning device.

**Properties**
- Devoted computing system
- Internet enabled
- Make Life Easy software
- Financial Journaling
- Receipt Capture/Scanner

**Features**
- Allows user to manage all of their individual or family finances from home
- Provides an easy way to store spending before bills arrive with a scanner that captures printed receipts
- Allows families of all ages to actively contribute to a financially healthy future
**System Element**  
HUBS Education System

**Description**

HUB Education is an Internet portal that offers an environment where teachers, parents and students can cooperatively chart their course to success.

**Discussion**

HUBS Education provides a forum for enhanced communication between parent, teacher and child. In the United States HUBS has already partnered with the PDA. It allows parents to track their child’s progress and communicate with teachers. Not only does it foster a positive relationship between teacher and parent, but it prevents a situation in which parents only communicate with teachers when there is a problem with the child.

Children also have a unique channel of access to their teachers. This is unique because it breaks down the barrier of formality that often deters students from approaching instructors with questions, comments and problems. It also gives children incentive to communicate with their parents about school, since they can access that information through the HUBS portal.

**Properties**

- A portal where teachers, parents and students can collaborate on coursework

**Features**

- Allows parents to keep track of their child’s progress in school
- Allows parents, teachers and students to communicate through an internet portal
- Allows students to communicate with teachers in a less intimidating forum
- Improves communication between parents and teachers
**System Element**  Discussion Wall

**Description**
The Discussion Wall is an augmented vertical surface that a family can use to plan activities, experiences or journeys. Available in hi-tech and low-tech options, it provides tools for collecting and recording idea, and graphically rearranging them. All members of the family can interact with this device directly. It can be raised or lowered to meet the ergonomic reach of the user.

The high-tech augmentation includes fact-checking, location sourcing and image sampling that is made available by the Family Database. Users can interact with device based on interface cues similar to those currently used with computers. For example, tapping twice on the wall would in effect create the familiar double click and so on.

**Discussion**
Participation is a key aspect of collaboration. The scale of this tool promotes collaboration by ensuring that there is physically enough room to co-create. In addition, having more than one author requires several writing instruments to be accessible at the same time. By sharing in the coordination of tasks, events and journeys, family members build their interpersonal skills. Because the Discussion Wall only operates with direct interaction, it ensures that the user share the experience with other members of the home. This limit reinforces bonds and helps to make using the wall a family ritual. Embedding the system with access to check facts reduces time spent in argument and ultimately helps the users to make better decisions.

**Properties**
- Large vertical surface to accommodate several authors
- Augmented features to introduce Intelligence and multimedia
- Recording function
- Print output button
- Comparative analysis feature

**Features**
- Provides the user with an Activity Planner
- Supports interaction with a Story Planner
- Promotes creativity with a Journey Planner
- Fosters curiosity with an Idea Probe
**System Element** Family Knowledge Core

**Description**
The Family Knowledge System, available in hi and low-tech versions, archives, distributes and repurposes family data. This tool is comprised of a Share Square, a Milestone Meter and a Learning Journal. It works in conjunction with the Family Database, to provide the home with a broad range of services and functionality that enables the sharing, accumulating and measuring of emotional intelligence in a household.

**Discussion**
For a housing system to evolve in accord with the occupants, it must recognize significant way-points in the journey of a family. Significant markers are made of events as well as experiences. Overtime, many of these get lost. The Family Knowledge System is a repository as well as a short-term display space for achievements, events, memories, goals and discussion points.

The system works by direct involvement or by the use of cell-phones to send and receive responses from the system. This technology is appropriate because cell phones have become a de-facto virtual personal address.

Elements of the system will act upon notices to compile, prioritize and build patterns of achievement. This in turn will help to reinforce sought after behavior and mark rites of passage. Rights of passage may in turn prompt parents to consider and prepare for changes to the built environment of the household such as: room size, location and features.

**Properties**
- Available in hi-tech or low-tech
- Share Square
- Milestone Meter
- Learning Journal

**Features**
- Helps to save important family information
- Assists in educating users in the home
- Works directly or through cell phones
- Utilizes emotional data to help inform decisions
**Description**
The Milestone Meter is a display instrument that presents a detailed view of activities and achievements of a household dweller. The device operates by comparing a present image to a longer-term goal or by comparing a personal image to a family image or goal.

**Discussion**
It is estimated that over 80% of a person’s intelligence is visual. Mapping of information is one to take advantage of this knowledge. In a hurried world where both parents often have professional commitments and differing schedules, it is important to keep track of family goals, status and growth. Orienting members of the family toward personal goals can help emphasize individuality. Likewise, family goals such as savings targets or vacations can to build group cohesiveness.

This device not only promotes initiative, but it helps a parent to recognize growth that might otherwise get overlooked. This serves to foster new avenues of self-esteem for children.

**Properties**
- Manual Input
- Display feature
- Works with milestone meter
- Archive of data on Family information system
- Reports an achievement map to user

**Features**
- Display significant achievements
- Display intermediate achievements
- Orients family toward common goals
- Parental motivation tool
**System Element**  Story Podium

**Description**
The Story Podium is an interactive presentation device that works with the main communication network. By accessing data, the podium provides the user with narrative templates, multimedia content and information that enhances a story. This device can support the telling of histories or futuristic scenarios. Family members can use this tool to acquire cultural values or simply to play.

**Discussion**
At a basic level, the Story Podium is a location in the household where one can command the attention of others. It can be used to announce milestones or goals or to perform a musical act or tell an entertaining story. It operates within the Entertainment Core and uses the Lighting Master. This form of entertainment is designed to be more active than television or movies, where the experience is passive and likely to suppress conversation among family and friends rather than provoke it.

**Properties**
- Wall size display for viewing
- Virtual Lectern for centering the audience
- Recording function
- Quick-replay button
- Control lighting levels
- StoryBuilder

**Features**
- Records events for posterity
- Uses Sound Amplification
- Accesses knowledge, music, photos or video from family database
- Provides an instant replay option
- Uses environmental control of lighting
System Element  Reflections

Description
Reflections is a software that records different media within a single interface. It facilitates recall according to different moods and feelings. The same message can be linked to display in different groupings.

Discussion
People record their happy moments in different mediums like pictures, video, sound and text. Users store these mediums in different places. Reflections help to record and document different media into one interactive device. It is a record keeping, multimedia device whose interface facilitates meaningful documentation of the users past memories. Reflections allow these messages to be recalled in various groupings. The user can also access different media at the same time. For example, the user can listen to a recorded message and see pictures of the same person taken on different occasions.

The groupings can be scaled against personal and emotional value. The user can add notes or tag messages to every message. The interface has a dedicated button in which special messages sent by people close to the user can be stored separately. Friends and family can record their messages from remotely and the user can access this data from remote locations as well.

Properties
• A software based interface

Features
• Scrolls pictures, video clips, sound and text messages
• Allows the user to group and regroup messages into different categories
**System Element**  Dreamz

**Description**
A software interface that records the user’s dreams and aspirations. They can be recalled and recorded at any time.

**Discussion**
All individuals have personal dreams and aspirations. These may include winning the Nobel Prize, seeing a new country, learning a musical instrument, writing a book or simply learning something new.

As daily life becomes increasingly fast paced, people are often preoccupied with finishing the task at hand and getting on to their next task. This can cause dreams, aspirations, goals and wish lists to be set aside. Being disconnected with personal dreams can lead a feeling of overall discontentedness.

Dreamz is an interface where the users can record their dreams and aspirations. Dreamz can record in any medium and can be updated at anytime. Dreamz can replay the users dreams to keep the user motivated and focused. It would also keep the user informed about the related activities happening in their locality, city or other user-defined area.

**Properties**
- Multimedia interface
- Dream and aspiration recorder

**Features**
- Allows for multi-media user interactions
- Records user’s dreams and aspirations
- Suggest possible activities based on user preferences and location
- Allows for remote access
System Element  Ready When You Are Library

Description
The Ready When You Are Library is an information repository and distribution center. It works in conjunction with the Education Station and Learning Journal to develop smart reading lists for any individual in the home. In addition, dwellers of the household may choose to share their reading lists as means of generating higher-level discussions about each other’s current learning goals.

Available in high-tech and low-tech versions, the Ready When You Are Library can assist the user to cross reference content, develop categories and harvest relevant data according to subject area and everyday tasks.

Subjects can be made available from anywhere in the house but will track activities logged in by specific locations (for example, the Kitchen Core, Construction Center and Entertainment Core). When the system is ready, it will prompt the user “Ready When You Are” to show that content is waiting.

Discussion
As the information revolution enters the home, people are learning that having too much information can be difficult to manage. The Ready When You Are Library works in conjunction with the Family Database to recognize patterns of behavior in a user that demonstrate aptitudes, general interests and goals. For information to become knowledge it must have relevance to the user. The Learning Journal will tell the system facts about what a user knows and information they would like to know more about.

Properties
• Printed materials Database
• Senses patterns of activity in the house
• Access to Family Database as well as online resources
• Works with learning journal to optimize relevant content
• Clustering of material according location in the home
• Prompt signal
• Menu selector
• Display
• Print feature

Features
• Supplies user with information about a project currently underway
• Automates knowledge acquisition
• Refines queries
• Structures information according to stage of project development
• Combines knowledge from print and electronic sources
• Marks books by category
**System Element** Learning Journal

**Description**
The Learning Journal is a database of personal goals of all the household members. At a higher-level, familial goals can be established and moderated as a parental function. The tool promotes a two-way exchange of dreams, goals and objectives. In so doing, it interpolates with the Milestone Meter and the Share Square as a way to keep the information current, relevant and is ultimately applied to making decisions about operations of the household. Over a long period of time, these decisions will directly impact higher-level modes of the Evolutionary House. The Learning Journal is a subsystem of the Family Database.

**Discussion**
Expanded awareness of opportunities can create a sense of urgency to do more than is ultimately feasible. Balancing work and life requires concentration and focus. Having a toolset that assists this balancing act greatly improves family interactions and improves the quality of life of the home dwellers.

**Properties**
- A database of personal goals
- Two-way exchange of dreams, goals and objectives
- Sub-system of the Family Database

**Features**
- Promotes balance between work and family
- Allows the user to reflect on their personal goals
- Allows the user to reflect on the goals of the entire family
- Contributes to the emotional well-being of the household
**System Element**  Zigbee Node

**Description**
ZigBee node is a system component that requires low amounts of power and data. It can be embedded into all components of the housing system to help facilitate control systems in the household. ZigBee networks were designed as an ad hoc network that would be self-configuring and use low pulses to send data and in some cases power from node to node. These nodes can be used to control lighting, heating and cooling from anywhere in the home.

**Discussion**
Hard-wired control systems in housing require specialized technicians to plan, install and service them. Building codes specify current standards and practices of ergonomics and circuit layout. Hundreds of feet of wire can be removed from the system by controlling lighting temperature and cooling devices remotely. Additionally, one control node can operate multiple devices allowing the user the opportunity to turn off a light they might have forgotten from another room or location in the house. Furthermore, because these systems sense radio frequency identification, they can begin to identify and respond to patterns of use and behavior in order optimize the consumption of energy. Finally, this system promotes adaptability. Reconfiguring the control network is done via a plug and play activity that the user can perform in one day.

**Properties**
- 802.15 IEEE protocol
- Zigbee Coordinator
- FFD Full Function Node
- RFD Reduced Function Node

**Features**
- Control of systems from any where in the house
- Automation
- Capture usage data
- Embedded intelligence to optimize energy usage
- Convenient installation and reconfiguration
**System Element**  Game Space

**Description**
Game Space is a subset of the Entertainment Core. It contains an activity monitoring trigger as well as a catalog of games that a particular family plays. Two augmented surfaces, one that is horizontal and one that is vertical, characterize this space. The vertical surfaces are those found in the Discussion Wall and Story Podium. These have properties for graphic display of still and moving images as well amplified sound and modulated lighting. The horizontal surface is populated with marked paths and cards for different games. Advanced versions of this surface may include a playback feature as well as hints for the player.

**Discussion**
All cultures value and develop play. Play is unrestrained, amusing interaction with people or things, often in the context of learning. Play can be personal or take place among larger groups. The user can interact directly with games on the family database or with those that stream through the Entertainment Core. Personal games provide a mental environment that can soothe or allow escape while fostering personal reflection. Multiplayer games promote extroverted behavior and interaction. Activity monitoring sensors recognize social opportunities based on recorded patterns of behavior. These then prompt users to play a game, review a past challenge or continue an ongoing tournament. In addition, Game Space can be programmed to limit access.

Game Space works with the Noise cancelling zone to buffer and suppress unwanted sounds from the Game Space area to the rest of the home.

**Properties**
- Augmented Wall display for viewing
- Augmented Horizontal surface for playing
- Recording function for quick replay
- Activity monitoring prompt
- Sound level buffering
- Accesses knowledge music photos or video from family database

**Features**
- Contains an instant replay option
- Allows user to review actions
- Intelligently recognize opportunities for new or continued play
- Limit users from addictive use of the system
- Identify and prompt users with intelligent choices
- Suppress noisy interruptions of others nearby
**System Element**  Education Station

**Description**
Education Station is a system element that provides a home dweller with a place for uninterrupted learning. It coordinates the Learning Journal, Milestone Meter, Hubs Education Portal, Noise Cancelling Zone and the Family Database.
It is available in wide range of options, the most basic being a well-lit horizontal work surface. Additional levels of functionality include project storage, intelligent research agents and automated structuring of outcomes according to Bloom’s Taxonomy of the Cognitive Domain.

**Discussion**
Education is emerging as a life long learning process. Rapid expansion of information technologies and frequent changes domains of knowledge are demanding that people in developed areas continue the learning process well into adulthood.
Similarly people in developing countries that wish increase their station in life seek to learn skills and languages of commerce. This makes learning something more prominent in the domestic space. Advances in this capability support significant innovations in how people acquire, retain and build knowledge.

**Properties**
- Learning Journal
- Milestone Meter
- Hubs Education Portal
- Noise Cancelling Zone
- Family Database

**Features**
- Offers the family a place in the home for uninterrupted learning
- Supports constant learning of new technologies
- Supports language learning and commerce skills
System Element  Age Appropriate Content Manager

Description
The Age Appropriate Content Manager provides parental control on media that is received and or distributed in the home. Because media can be so widely used across the system, the parent may wish screen out aspects of violence, language, nudity or content of an explicit sexual nature. Varying levels of filtering will determine what a member of the family will have access to. These levels of filtering will be applied to different members of the household according to maturity settings recorded in the family database. The Age Appropriate Content Manager can consult with the Milestone Meter in order to establish current maturity settings for household members.

Discussion
As networks of content become larger, more specialized and authored by anyone, the risk of finding sensitive and often inappropriate material has increased dramatically. Parents need mechanisms that are consistent with their paternal beliefs to control media usage in the home. Children may seek out increasing levels of adult content that is relative to their Maturity Meter and Learning Journals. This helps to facilitate a gradual transition process that is consistent with the parameters set out by the parents. This is another case of the housing system adapting to the evolving needs of the user.

Properties
• Content filtering
• Content blocking
• Permissions management

Features
• Offers parents control of their children’s content exposure.
• Caters content to maturity levels.
**System Element**  Share Square

**Description**
The Share Square is a collaborative space in which all members of the home can strengthen their interactions. It is a short-term repository of the personal achievements, experiences, challenges and discussion points. Items are posted by the individual and after several weeks are visually recorded, annotated and archived by the system. All members of the family can respond to messages pertaining to or inspired by its contents.

**Discussion**
At a basic level, all members of the family have stories to tell. Share Square helps facilitate the story telling by helping the user tell of their achievements, disappointments and near misses. Share Square can be operated directly, or with more limited functionality, from a remote location. Parents and siblings can respond to postings with congratulations or advice that the originator can respond to. Progress toward achievement will be forwarded to Milestone Meter’s display.

**Properties**
- Display space
- Magnetic mounting elements: hooks, buttons and loops
- Automated visual recording function
- Mark-up language
- Key word analysis
- Time codification
- Redundant archive

**Features**
- Displays and share events with others
- Compares personal progress with goals in the Learning Journal
- Promotes cooperative learning
- Works with milestone meter
- Reinforces family goals
**System Element**  Home Business

**Description**
Part file cabinet, part toolbox, the Home Business is a unit containing supplies that are needed to conduct business at home.

**Discussion**
Many people work from home and in some parts of the world it is common for people to run businesses out of their home. These people often need to receive and meet with clients. In these cases, materials need to be close at hand to facilitate timely and professional transactions, which helps build a positive reputation.

**Scenario**
Reetika runs a tailoring and mending service out of her home. Frequently, clients will drop by to drop off their clothing. As they do, Reetika offers her client a seat as she places the mending on her Home Business unit and writes out a receipt and tags the clothing items. Receipts, tags, pens, and other supplies are conveniently kept in the Home Business unit.

**Properties**
- Wheels for easy movement
- Filing drawers for information storage
- Compartments for other tools and supplies

**Features**
- Organizes materials
- Manages power supply
**System Element**  Germ Guard

**Description**
Germ Guard is a sensor that is constantly on the lookout for germs. It triggers an inaudible alarm as soon as it discovers an unwanted presence. It then emits ultrasound waves to destroy the bacteria.

**Discussion**
Germ Guard is designed to reduce the infections caused by germs by eliminating them inside of the home. It is especially useful in kitchens and bathrooms. In both these places, moisture content is high, which promotes growth of unwanted bacteria. In the kitchen, Germ Guard helps eliminate harmful bacteria often left by raw meat.

The germ guard runs on electricity, or in case where it is used off of the grid, by battery power.

**Properties**
- A sensor
- An inaudible alarm that triggers ultra-sound rays

**Features**
- Detects germs around the home
- Emits ultrasound in the direction of the germs
- Makes the home safe for adults and children
**System Element**  Gray Water Flush

**Description**
Gray Water Flush is a plumbing system that uses non-potable water for human waste removal. It allows some water, such as bathing water, to be used twice before being sent for treatment. Bathing water and/or other non-potable water is routed to the toilet and used for flushing away human waste. A feedback gauge allows users to monitor water availability and use.

**Discussion**
Water is becoming one of the world’s most scarce resources. Toilets use an average of 26.7% of the water used in a home every day (the highest of any water fixture or appliance). Many communities around the world do not have enough water to drink, let alone to cook, bath, or clean. Other communities have a seemingly endless amount of water and therefore, waste it. Gray Water Flush conserves water and raises awareness through visible feedback.

**Scenario**
Sam is getting ready for bed. He washes his face and brushes his teeth. The water from the sink is routed to the toilet along with the water from the bath his little brother took earlier. He uses the toilet and since he’s left no solid waste or toilet paper, decides to use the single flush, which uses less water. The flushed water has now been used twice and gets sent to the community treatment plant for processing.

**Properties**
- Routes non-potable water to the toilet
- Dual flush options for full or half flushes
- Feedback gauges show water availability and use

**Features**
- Uses non-potable water for human waste removal
- Maximizes use of water before it is sent for treatment
- Gives users control over water conservation
**System Element** Isolated Alarm

**Description**
The Isolated Alarm is an personal alert system that can wake up home dwellers independently, allows other who share the same berth to sleep without interruption. The alarm is worn like earplugs, which digitally beep when the bedside hub send the signal that it’s time to get up.

**Discussion**
The Isolated Alarm addresses the problem of alarm clocks when home dwellers who share a room do not desire to wake-up at the same time. It is extremely common for some member of a family to be required to rise hours before anyone else in the family. This situation becomes even more pronounced during times of economic strife. When jobs are scarce, criteria such as hours are no longer components of employment selection. Thus it is a common inconvenience for members of the family to be disturbed at the sound of an alarm that has not been set for them.

**Scenario**
John and Kim are working class American’s living in a small farming town. John has to be awake at 4 a.m. to begin tending their crops. He no longer can afford the helper her used to have due to falling corn prices. Kim watches their three young children during the day. Their youngest child has been sick lately and has been sleeping very little. John’s alarm has been waking up both Kim and the children. Their youngest often takes hours to fall back to sleep, leaving Kim exhausted during the day. John and Kim recently purchased the Isolated Alarm system. Now Kim and the children are able to sleep soundly through the night, undisturbed by John’s early morning alarm.

**Properties**
- A wireless alarm headset
- Ear plug shaped alarm headphones
- A digital bed-side alarm hub

**Features**
- Alerts only the desired sleeper when it is time to rise
- Allows other members of the family in close proximity to sleep soundly
- Has an option for multiple headsets for multiple users.
**System Element**  The Divider Hider

**Description**
The Divider Hider is a moveable, collapsible wall that creates ad hoc, temporary divisions in rooms. It is made from a flexible, material that can be changed into a variety of shapes. It retracts from a small ceiling compartment.

**Discussion**
The Divider Hider is designed to increase privacy in small, cramped spaces. It is especially useful in homes where an entire family sleeps and eats in one room. These spaces can often cause tension and hostility when members of the group desire a moment of respite from human contact.

This flexible wall can accommodate a variety of configurations. For example, if one side of the room requires more space or if furniture would preclude the addition of a straight configuration, the Divider Hider can be easily bent to avoid obstacles and create unique, personalized spaces. When the wall is no longer necessary, the Divider Hider neatly folds into a ceiling compartment.

**Scenario**
In an ideal world, each family member would have an individual place to retreat to. In the real world, many families struggle with space limitations. The Divider Hider seeks to address this issue of privacy while giving home dwellers a private space to nap, read, study, meditate or just be.

**Properties**
- A moveable, flexible, retractable wall
- A small ceiling compartment for easy stowage

**Features**
- Provides a temporary place of privacy for any family member
- Seeks to reduce family tensions caused by small, cramped spaces
- Promotes the success of the family unit.
**System Element**  Easy-Fix Equipment

**Description**
Easy-fix Equipment is a set of common household electronics that are designed to be easy to fix. Internal components are easy to access and replace, reducing waste and increasing user competency.

**Discussion**
Easy-fix Equipment is designed to assist the home dweller in fixing their own electronics. The equipment is available in a wide range of home electronics. Items include the microwave oven, blender, television and vacuum cleaner. These items have panels that are easy to remove and reveal user-friendly internal compomentry. All components are color coded to assist the user in the repair. In addition, they are shock-proof to protect the user from injury.

Not only does Easy-fix Equipment reduce the need for professional repair, but it builds the esteem of the user and reduces waste.

**Properties**
- A group of household electronics that are designed to be easily repaired
- Easy internal access to componentry
- Color coded internal workings
- Shock-proof parts

**Features**
- Allows the home dweller to repair their own electronics
- Reduces waste from discarded equipment
- Protects the user from injury with shock-proof parts
- Assists the user with a easy-open hatch and color coded components.
**Description**
Boundary is an insect repellent system in which chalk is used to prevent insect from entering the home. Combined with an insect repellent, the Boundary chalk prevents insects from entering the demarcated area.

**Discussion**
In home all around the world, insects like ants and cockroaches are a regular problem. They are especially prevalent in the kitchen area, where there is often food lying around. Other means of preventing insects from entering the home include spraying insect repellent or emitting insect repellent fumes. In either case the users are exposed to harmful fumes. This is especially problematic for small children.

Boundary Chalk is a system that requires minimal usage of chemicals. The user simply draws a line across the possible points of entry for insects. The special chalk and repellent formula keeps insects away without spreading chemicals into the air. It is effective until erased by the user.

**Properties**
- Chalk combined with an insect repellent

**Features**
- Prevents insects from entering demarcated areas
- Ensures that users are not exposed to harmful, airborne chemicals
**System Element**  Sort ‘n Save

**Description**
Sort ‘n Store is a tool for planning and managing a user’s storage areas. Cabinets and containers display tips on storage planning as well as maps and legends for remembering what is stored in each location. Item placeholders are used temporarily while a stored object has been retrieved for use, ensuring the correct return location.

**Discussion**
Things kept out of sight are easy to forget about. Duplicates of forgotten items are repurchased. Lack of planning causes unlike items to be stored together, leading to difficulty in item location. Tidy storage areas are disorganized while searching for missing items. An effective storage area is one way to efficiently use space.

**Scenario**
Helen is making a photo album for her grandmother’s birthday. From the storage map she sees in which box the old family photos are kept. She removes the box and places the item placeholder in its place. A week later, when the photo album is finished, and the photo box needs to be returned. Helen quickly finds the item placeholder and puts the box back in its correct location.

**Properties**
- A set of instructions
- A master map & legend
- Item placeholder for easy return of objects

**Features**
- Allows you to plan storage based on grouping and retrieval requirements
- Maps your storage space
- Shows what items are in non-visible locations
**System Element**  Built-in Stepstool

**Description**
The Built-in Stepstool pulls directly out of storage cabinets for easy retrieval of objects placed on high shelves. Located just behind the cabinet door, the Built-in Stepstool is easily pulled out and returned using only one hand. It has two steps and folds into the frame of the lower cabinet.

**Discussion**
Being able to store object in high-up places and easily access them means being able to use your space more effectively. Even traditional folding steps tools can be large or heavy and require a dedicated storage location. The Built-in Stepstool is stored and used in the same location.

**Scenario**
Divna is preparing a large meal for her family’s Saint’s Day celebration. She needs to access the big baking dishes that she uses to make her dessert pitas. She keeps them on the top shelf of the upper cabinets since they are only used a few times a year. Instead of searching for, transporting, and opening a traditional stepstool, she opens the bottom cabinet (below the desired top cabinet) and with one hand is able to pull out the Built-in Stepstool. After she gets the dishes, she returns the Built-in Stepstool, again with one hand, to its folded position.

**Properties**
- Two steps for multiple heights
- Single or double width options

**Features**
- Folds away so that steps nest inside one another
- Allows for one-handed folding/unfolding
- Eliminates the need for additional storage
The Last Re-Sorter assists in the organization of items the user no longer wants or needs. It consists of several compartments, serving as a place to put garbage and recycling as well as items the user no longer wants, but doesn’t want to label as garbage. Other members of the household can adopt these items or they can be sent to the Donation Station. The Donation Station is a module that attaches to the Last Re-Sorter, where items are collected for local donation banks.

As the population continues to grow at its current rate, resources are becoming increasingly scarce. The Last Re-Sorter is designed to aid conservation by making recycling easy, and ideally changing wasteful behavior. Gauges track amounts of garbage and recycling and provide feedback to users. Commonly, people don’t understand or ignore the consequences of their actions. They may think they are being good to the environment by recycling, but their recyclables may not be sorted correctly or may be contaminated. Without feedback that behavior may never change.

The saying goes “one man’s trash is another man’s treasure.” How often do we find this to be true? Friends or family may have bragged about furniture “stolen” from a neighbor’s garbage pile, a great piece of thrift store clothing, or a favorite artifact that somebody was “just going to throw away?” The Donation Station gives perfectly good items a chance to be re-used by somebody else before they end up as garbage.
Description
The Archive Hive combines a set of useful archiving tools for a user of any skill level. It is one central location where the user has access to an electronic archiver, archive sealer, protective containers, an software based family tree builder and a KeepSafe.

Discussion
It is important to most families to preserve a few pieces of the present to save for future generations. Most families, however, do not send their goods to professional archivists. The Archive Hive allows users to save their most treasured items without the expense or the hassle of hiring a professional.

The Archive Hive supplies the user with an archiver’s tool kit complete with an electronic archiver, sealer, protective containers that fit easily into modules in the storage core, an electronic family tree builder and a KeepSafe. The KeepSafe allows archived items are other valuables to be stored securely in the home.

The Archive Hive has tangible benefits for family members both living and those who are yet to be born. Far too many memories are destroyed due to weather, mold and neglect. Many are simply lost. The Archive Hive allows users to enjoy these memories, and ensure they are not destroyed or forgotten.

Properties
- Central location for archiving
- Electronic archiver
- Archive sealer
- Protective containers
- Software based family tree builder
- KeepSafe

Features
- Allows the user to archive, store and protect valuable items all in one, in-home location
- Is easy and fun to use
- Ensures memories stay safe for years to come
**System Element**  Size Rite Shelving

**Description**
Size Rite Shelving is a system of shelving of various sizes, finishes and attachment methods. Shelves come in varying lengths proportionate to the length of the wall units. Three depths are available as well as a selection of finishes. Shelving is intended for storage, display, and workspace.

**Discussion**
There is rarely enough horizontal space in a home of display, work and storage. The Size Rite Shelving system serves both aesthetic and functional needs. People need places to display cherished artifacts, from a child’s stuffed animal to a family’s religious icons. Placing objects above the floor also makes more efficient use of space and keeps objects from getting dirty or damaged.

Shelves can be attached to the wall, or they could be attached to side pieces and attached to the ceiling or floor or be used as free-standing units. Wall units containing retractable or flip-up shelving can also be used for spaces like closets, kitchens, or work areas where storage and workspace needs often fluctuate.

**Properties**
- Shelving system with length, depth, finish, and attachment variations
- Size proportionate to wall sizes
- Retractable and flip-up shelving options

**Features**
- Allows for varying aesthetic & function requirements
- Provides storage, display, and workspace
- Reconfigurable for changing needs
**System Element**  Electronic Inventory Map (EIM)

**Description**
An electronic organizer designed to users map items stored in their home for easy location. The software is located in a handheld device that can hot sync to a personal computer. In addition, the user is able to visually map their home storage using a state-of-the-art scanning device, which digitally organizes household belongings.

**Discussion**
Disorganized storage is a major problem in many of today’s homes. Not only do items get broken and lost, but home dwellers waste countless hours each year looking for an item that they just can’t locate. The Electronic Inventory Map is designed to help alleviate much of the frustration associated with located and storing items in the home.

**Scenario**
The EIM caters to two distinct levels of storage. The first is items that need to be accessed on a daily or weekly basis. This includes objects such as clothing, toiletries and pots and pans. The second is items that are accessed on occasion; once or twice per year. These items are often kept in locations such as the user’s basement, garage or attic. In both scenarios, the user must first place a tiny locating tab on the item. The tab is both water and heat resistant. Once this simple step has been taken, the EIM can use its digital scanner to located the item and make storage suggestions based on similar items throughout the home.

**Properties**
- Electronic Hand-held organizer
- Visual mapping tool for your home storage, which includes a digital storage scanner
- Electronic locating tabs used with the digital scanner
- Computer software with hot sync capabilities

**Features**
- The EIM allows the user to easily map out their home on an electronic interface
- This map can be programmed with different storage categories
- Comes with software so the user can check or alter map from either the handheld device or their PC
System Element  Body Heat

Description
Body Heat is a heat sensor that the user wears while they sleep. The sensor is digitally connected to the room’s thermostat. It senses the user’s body temperature throughout the night and adjusts the temperature of the room to maximize comfort and minimize energy waste.

Discussion
Almost everyone can relate to the experience of waking up during the night either much too cold or much too warm. Body Heat is designed to eliminate that uncomfortable experience while preventing energy loss caused by an over-heated room. When the home dweller is awake, they are usually quite aware of whether a room is too warm or too cold. During sleep, however, it may take extreme conditions to alert the user to an inappropriate air temperature. Body Heat eliminates this problem by automatically adjusting the room temperature based on an individual or individuals body temperature. If more than one person is asleep in one room, Body Heat averages their temperatures in order to establish an ideal room temperature. Body Heat is especially useful with babies and young children who may become ill when they are exposed to uneven temperatures. The sensor ensures that even if a child has kicked off all of their blankets in their sleep, they stay warm and comfortable.

Properties
• A digital sensor that measures a user’s body temperature while they sleep
• A thermostat that’s receives a digital signal from the body sensor
• A system that reconciles user(s) body temperatures as they sleep

Features
• Ensures the user is as comfortable as possible during their sleep
• Saves energy by reducing the temperature of the room when user gets too warm
• Prevents illness in children caused by chills during the night
**System Element**  Light Master

**Description**
The Light Master controls all the lights in the home. User’s can set and adjust task, mood, and security lighting and program favorite settings. The system also monitors energy efficiency. Lighting can be set in the while in the home or remotely.

**Discussion**
Light has physical as well as emotional influences on the work that we do. We need certain amounts of light to complete certain tasks. Reading and mending for example require more light than using a computer or watching television. Quantities as well as qualities of light can also affect mood. Not having enough light can cause feelings of depression. Certain qualities of light can either make us irritable or set us at ease. Lighting can also be used for security, leading perspective intruders to believe people are home or awake.

**Properties**
- Energy efficiency monitor
- Favorites settings
- Local and remote setting

**Features**
- Allows remote operation of home lighting
- Saves optimized settings in system memory
System Element  Smart Security System with Control4

Description
Contains the emergency alert system, security system interrupt, rest arrestor, random lighting algorithm and the identity checking lock.

Discussion
Remote Home Control – Control4 subscribers have full control of their home from anywhere through the Internet. Users can securely connect to their home using a web-based version of Control4 Navigator software, allowing full monitoring and control of their home automation system from the same navigator interface they are used to at home.

Remote Home Programming – Remote Home Programming eliminates expensive on-site support and scheduling conflicts for both the dealer and the home owner. Control4 enables trained dealers to remotely connect and perform ongoing personalization and maintenance of a home automation system without needing to be on site. The Control4 solution facilitates connections to subscriber’s homes even without a publicly visible IP address.

E-mail Notifications – Control4 enables subscribers to receive personalized event notifications in their e-mail, wherever they are. Events could be sent to notify when its time to pay the utility bills, when the temperature drops, or when a security alarm is triggered.

Off site System Backup – Control4 protects the time and expertise invested in personalizing a home automation system with periodic off site backups of system configuration data. In the event of any catastrophe, a user’s home automation system can be quickly restored saving both time and money.

Properties
- Emergency Alert System
- Security System Interrupt
- Rest Arrestor
- Random Lighting Algorithm
- Identity Checking Lock
- Control4
  - Remote Home Control
  - Remote Home Programming
  - E-mail Notifications
  - Off site System Backup

Features
- Allows the user to secure their home from a remote location
- Alerts the authorities at the sign of an intruder
- Allows the user to lock an intruder out of the room the user is occupying
- Lights the home in random patterns to deter potential intruders
- Checks the identity of those who enter the home
System Element  Emergency Alert System

Description
The Emergency Alert System is a feature of the Smart Security System. It alerts the proper authorities (e.g. the police), through a cellular transmission, when a break-in occurs. In addition, users are able to activate and deactivate (Security System Interrupt) the system easily.

Discussion
The Emergency Alert System is designed to increase the security of the user(s). It reduces potential dangers, such as theft and injury, by reducing the time the user waits for help. It is unique in that it can be set to either engage automatically or manually - initiated by the user.

In the event that the alert system goes off accidentally, the Security System Interrupt can be used to disengage the signal.

The system is especially useful to those in older users who may suffer from physical disabilities. Used in conjunction with the Rest Arrestor, the Emergency Alert System effectively protects all home dwellers.

Properties
- A feature of the Smart Security System
- Cellular transmission that alerts authorities of a home intrusion
- Manual or automatic signal deployment

Features
- Signals authorities during a home invasion
- Allows users to deploy signal manually or set the system to deploy automatically
System Element  Security System Interrupt

Description
The Security System Interrupt is a feature of the Smart Security System. It allows the user to disengage the Emergency Alert System in the event of an accidently engagement. The user can operate the Interrupt by placing their finger on a touch pad located near all entrances to the home.

Discussion
A common problem with alarm systems is that they often engage accidently and can be difficult to turn off. The Security System Interrupt is designed to avoid this problem by giving a 30-second warning before the Emergency Alert System notifies authorities of the break-in. In this grace period, the user can place their finger-tip on a touch pad, located near all entrances. The touch pad can identifies the home dweller by their fingerprint. This subsequently causes the alarm to cease, and prevents it from sending out its signal to the police.

In addition, the Security System Interrupt has Pet Protection. This feature can be added by any user who owns a dog or a cat that enters through a pet door in the home (since intruders often uses these doors to break into homes). The pets paws are registered on the Digital Mat upon entering the room, which prevents the alarm from sounding.

Properties
• A feature of the Smart Security System
• Alarm dis-engager
• Pet Protection
• Finger print touch pad

Features
• disengage the Emergency Alert System in the event of an accidently engagement
• Allows the user a 30-second grace period to disengage the alarm system
• Identifies and disengages the alarm via a finger print touch pad
• Prevents pets from setting off the Emergency Alert System with the Digital Mat
**System Element**  Random Lighting Algorithm (RLA)

**Description**
The Random Lighting Algorithm is a feature of the Smart Security System. It is a lighting scheme that is designed to deter potential intruders when the home dwellers are away from the home.

**Discussion**
The RLA lights rooms in the home based on a mathematical algorithm. While the home dweller is away, either or the evening or on a long vacation, the RLA lights different rooms in the home for different periods of time depending on the user’s preferences. This gives the allusion that there is someone home, and serves to deter potential intruders.

The algorithm can be personalized to turn on lights in certain rooms or in the entire home. In addition, it can be adjust so that lights are left on for longer or shorter periods of time (although the algorithm ensures it is always unpredictable to evade detection).

**Properties**
- A feature of the Smart Security System
- Algorithm with a random lights schema
- Personalized settings for locations and times of lighting

**Features**
- Deters intruders with random lighting in the home during the user’s absence
- Allows users to personalize lighting times and locations
**Description**

The Rest Arrestor is part of the Smart Security System. It allows the user to activate their home security system from their bedroom or place of rest. In addition, the Rest Arrestor has a panic setting that allows the user to, at the press of a button, lock an intruder out the room they are occupying and signals the Emergency Alert System contacts the authorities.

**Discussion**

The Rest Arrestor is designed to increase the safety and security of the home dweller. During rest, the home dweller is in their most vulnerable state. Although the initial intent of this system was to keep users safe while they sleep, each room in the home would be equipped with an access panel that allows the user to engage the alarm system. In addition, panic locks keep the user safe in case an intruder should enter the home.

The Rest Arrestor is especially appropriate for single occupancy homes. It gives the home dweller the extra security they need to feel safe and reduces their vulnerability to break-ins and theft.

**Properties**

- A feature of the Smart Security System
- Room activated alarm engagement panels
- Remote room locks and automatic Emergency Alert System dialing

**Features**

- Protects home dwellers from intruders
- Provides a back-up system with automatic room locks
- Alerts the proper authorities whenever a break-in occurs
**System Element**  Identity Checking Lock

**Description**
The Identity Checking Lock is a feature of the Smart Security System. It registers the identity any person entering the home by identifying the fingerprint on a touch pad.

**Discussion**
The Identity Checking Lock is virtually impossible to evade. When the user first sets up the system, they simply record their fingerprint and enter a code. Anyone other than the home dweller(s) can also register their fingerprint in the system. Once the initial set-up has occurred, the user and any registered guests can enter the house.

The Identity Checking Lock eliminates the need for keys. Keys are not only a hassle but a security threat. Users no longer need to leave keys under their planters or have to worry about getting accidently locked out of their home.

**Properties**
- Finger print key pad
- Easy set-up
- Multiple print storage
- Keyless entry

**Features**
- Eliminates the need for keys
- Makes set-up and guest registration easy
- Ensure the ultimate safety of the home
- Eliminates the worry of accidental lock-out
System Element  Personal Chamber

Description
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.

Discussion
The Personal Chamber is designed to help quiet the mind and refresh the spirit of the home dweller. Those families who ordinarily could not afford (either in money or space) to have such a luxury, can now have a special area dedicated to relaxation.

The Personal Chamber is a long-overdue component of the home, especially in lower income homes. Parents often get little or not rest during the day. The Chamber is simply a place for the user to reconnect with themselves and relax or study for a few minutes each day.

Properties
• An area of personal space and study
• A white noise sound canceller
• A movie viewing area

Features
• Allow the user to relax and unwind
• Affords a variety of income levels to enjoy the same level of luxury and peace
**Description**
FiltRoofi ng tiles have a water collection and integrated filtration system. These are made as standard size components that can be interlocked to create various sized roofs. Because of the construction, the panels can be used for flat, as gables or as lean-to type roofs. Each tile has perforated holes that allow rain water to run through the top surface and through a filtration system. The filtered rain water can then be diverted into a utility water collection system that can be accessed by the user.

**Discussion**
World-wide, clean water is becoming harder to access. Rain water can be a very good alternate source. The FiltRoofi ng system offers an integrated way of collecting and filtering rain water. The roofing tiles are designed with a hollow system and perforated holes that allow the rain water to stream and divert through the filter system, cleaning the rain water. When the tiles are connected side-by-side, the filtration system is integrated and diverts the rain water directionally to a water collection system. This makes the water directly assessable to the user. The system can be installed quickly and easily. The tiles come in standard sizes that can be interlocked by use of Simplex connectors. This makes it easy and doesn’t require someone with conventional roofing skills. In return, labor costs for construction are reduced significantly. Because of the variety of roofing tile styles that are available, there is no limitation to look and function the user can create. This gives the FiltRoofi ng system global appeal.

**System Element** FiltRoofi ng

**Properties**
- Made of molded recycled composite
- Heat, UV and stain resistant
- Color through exterior surface

**Features**
- Makes available a variety of surfaces including: rubberized flat sheeting, Architectural tar shingles, metal ridge panels and terra-cotta clay
- Allows user to remove filter cartridge for easy access cleaning
- Allows user to create new reconfigurations
- Contains a Simplex connection system that allows easy assembly
**System Element**  PC Windows

**Description**
PC (poly carbonate) Windows are a new type of windows that provide many practical and functional features. They are designed to offer the user benefits from sun protection to security. They are available in different sizes and can be easily interchanged with CEX Surface wall panels or FiltRoofing tiles.

**Discussion**
The windows are made with poly carbonate sheeting that is 250 times stronger than conventional window glass. The material has high tensile strength and is clear, strong and tough. With concerns of crime the rise, this type of window help to ensure home security. Available in various sizes, and closed pane and slide track configurations allow for user customization. They are usable as wall or sky light windows. The versatility provided by PC Windows can change the appearance of the house from traditional with (few windows) to modern with (wall windows). For added privacy or sun protection, switch controlled tinting with electro-transparent technology allows instant shading at the touch of a button.

**Properties**
- Panes made of clear poly carbonate sheeting
- Maintenance free color coated framing
- SlideTrack mechanism with scroll screen for open air access

**Features**
- Provides UV resistance protection from sun damage to items in the interior space
- Provides switch controlled tinting technology (electro-transparent glass), privacy at the touch of a button
- Is 250 times stronger than glass, providing security for the user
- Is interchangeable with CEX Surface panels and FiltRoofing tiles
System Element  CEX Surfaces

Description
CEX Surfaces is an exterior wall panel component system that allows the user to select customize their home’s exterior. It is available in a variety of sizes and styles. Simplex connects technology allows an easy and secure method of attaching the panel system to the frame structure.

Discussion
The advantage with the CEX Surface components over other home designs is that it allows adaptation and customization that addresses different cultures and preferences. The selection of surfaces available includes textured stucco, horizontal siding, metal sheeting, faux concrete, and brick veneer. This gives the user the components to create a housing structure that blends in within an existing neighborhood or create a dwelling that is unique. From stucco enclaves in New Delhi to the horizontal sided houses of North America, this system provides flexibility in style. On the low end of the economic spectrum, metal sheet panels are available that are less expensive and provides low cost components to poorer regions. The Simplex and Snap-klic connection systems provide a low skill method that eliminates the need for conventional skilled labor, thus reducing costs.

Properties
• Snap-klic edge connection allows quick assembly panel to panel
• Heat, UV and color fastness on pre-finished panels
• New Simplex connects technology attachment system
• Made of molded recycled composite

Features
• Allows interchangeability with PC Windows
• Is Reusable and reconfigurable for customization and remodeling
• Offers a variety of paintable faux surface selections including textured stucco, metal sheet, smooth concrete and horizontal siding
**System Element**  Green Grid Roofing

**Description**
The GreenGrid System is a lightweight, modular design that arrives at the home ready for installation. The modules, composed of recycled plastics, can be placed directly on the existing roofing membrane or any other surface, provided the structural capacity is present.

**Discussion**
Depending on the typical weather patterns, up to 90% of an area’s typical rainfall can be absorbed by a green roof. GreenGrid can reduce the surface temperature of a roofing membrane significantly, up to 40 degrees Fahrenheit on hot sunny days. As a result, life expectancy of the membrane or roof can reasonably be expected to double.

GreenGrid cools the surrounding air. This micro climate can significantly reduce adverse “urban heat island” weather patterns. In addition, it can absorb airborne toxins and respirate oxygen into the air. The modules come in three different depths. The 2 in. depth modules will support sedums and weigh approximately 10 lbs. per sq. ft. (wet). The 4 in. depth modules will support grasses, sedums and wildflowers, and weigh approximately 15 lbs. per sq. ft. (wet). The 8 in. depth modules will support a large variety of ornamental perennials and shrubs, and weigh approximately 28 lbs. per sq. ft. (wet). The modules are available in square, rectangular and various other custom shapes.

**Properties**
- Modular design can be easily adjusted and rearranged after installation to meet a change in stylistic preferences or planting schemes.
- General labor-saving technologies around the home
- Simple and flexible
- Different depths and custom shapes available

**Features**
- Improves building’s thermal performance
- Insulates from heat loss in the winter and heat gain in the summer.
- Lengthens roof life by two to three times
- Offers low maintenance requirements
- Removes nitrogen pollution in rain
- Improves drain water management.
- Provides substantial noise insulation.
- Improvement of air quality
Description
This system, which uses lead-free PV solder modules, is targeted at users living in areas around the world where the local electrification infrastructure is insufficient or nonexistent.

Discussion
Solar energy is a powerful and efficient energy source for housing because it is clean, efficient, and plentiful. Traditionally, nuclear reaction, fossil fuels and hydroelectric generating dams, generate housing utilities. The heating of fossil fuels is one of the main causes of air pollution. Not only can nuclear reaction can be very dangerous but hydroelectric generating dams depend on a solid infrastructure.

Sunlight can be used in two ways to generate energy: direct heating and photovoltaic electrical generation. In the direct heating method, while direct sunlight can be used to create heat, it is of limited value in electrical generation. However, the photovoltaic generation (direct conversion of sunlight into electricity) is a more efficient and effective way of generating energy for electricity.

Properties
- Lead-Free PV Module -(clear anodized aluminum alloy frames)
- Bypass diode
- Frame holes

Features
- Resists corrosion
- Prevents energy decrease caused by shade
- Makes installation flexible
- Enables effective generation at 17.1V/17.6V.
- Enables high quality construction
- Enables high level of energy conversion efficiency
- Decreases harmful chemicals
- Reduces harmful dioxide emissions
- Supplies electricity without being connected to a commercial grid system
- Does not require costly infrastructure like power plants or cables
**System Element** Thin-joint Construction

**Description**
Thin joint construction is a very effective construction method designed by Thermal. It uses thin joint mortar, a pre-mixed cement-based product, which only requires the addition of water to work.

**Discussion**
Thermal first conducted trials on thin joint construction in the 1980s. The increasing demands of the UK construction industry for higher build quality, greater productivity, improved thermal performance, air tightness and waste reduction, meant that the benefits offered by thin joint mortar are increasingly relevant. Thin joint mortar differs from traditional mortar in that it sets faster, thus providing early stability to the construction. It allows the depth of the mortar to be reduced from at least 10 mm to 3 mm or less.

**Scenario**
Chris is a construction manager who works on housing. He has recently been using thin-joint mortar instead of traditional mortar and construction concrete blocks. He noticed right away that he was saving money on materials due to the reduced amount of mortar needed. He also likes that the joint blocks are light and solid. It is so easy to use that Chris recommends it to a handy friend who wants to do his own construction.

**Properties**
- Large format blocks
- Partitions
- Wall ties
- Light weight

**Features**
- Speeds up the construction process
- Increases productivity
- Saves money
- Enables designers and builders to comply with CDM regulations.
- Works with ordinary hand tools
- Reduces the number of blocks and the amount of mortar needed
**System Element**  ASM Framing

**Description**  
ASM Framing is individual, prefabricated frame components that when assembled form the structure of a house. These components assemble side by side for single-level and top to bottom for multi-level structures. The modularity of this system allow for size customization based on user wants and needs. The system has a 3-point ridged corner brackets to insure structural stability.

**Discussion**  
Innovation and advancements in technologies have allowed products to be produced in more efficient methods. This raises the expectations of the users for all types of products. Unlike conventional housing, this system allows quick assembly that does not require typical construction methods. The individual frame components of the ASM system come in a 3ft by 10ft rectangle (standard size) and includes other components that have angles for roofing walls. The Easy-loc connectors make the assembly process of the frame structure simple and quick. ASM Framing also eliminates the need for skilled labor and reduces costs.

**Properties**  
- Made of Prefabricated steel reinforced material  
- 3-point ridged corner brackets

**Features**  
- Easy-Loc for quick assembly  
- Component adaptability allows size and design customization of housing structure  
- Works in concert with FiltRoofing and CEX Surfaces.
System Element  SI Wall

Description
SI Wall component allows it to be wheeled into place desired. This system could have in a wide variety of shapes and sizes as long as walls fit in the specified ceiling height, and contain standard connectors for attaching to the power bus, or wet wall when applicable.

Discussion
The interior of each house would be fit out quickly and inexpensively by using in-fill modules designed specifically for this purpose. These in-fills could come in a wide variety of shapes and sizes as long as they fit in the specified ceiling height, and have standard connectors for attaching to the power bus, or wet wall when applicable. All interior in-fill would be brought up by means of the elevator and rolled or carried to their assigned location. They would be fixed in place in a secure but non-permanent manner to allow for easy reconfiguration. In particular case a wall is shown that can be rolled into place on integrated casters. The wall is then fixed in its location by simple screw jacks, which press against the ceiling and force the casters to compress up inside the bottom of the unit on springs. The in fill may be connected to power and data by directly attaching it to the bus in the chassis structure, to specified plugs in the floor, or by attaching it to a neighboring in-fill unit.

Properties
• New prefabrication methods for remodeling conventional construction systems
• Mass Customization system efficiently manufactured
• A new approach for an overall decrease in the labor component of housing cost.
• Strong adaptability related to individual needs
• Space creation system
• Truss structure for stability with using indispensable pillars
• Optional noise cancelling upgrade

Features
• Moves the wall simply to a new location
• Reconfigures for easy upgrades
• Allows for change and resale
• Allow for variety including: aesthetics, technology and energy efficiency.
**System Element** Ceiling Grid System

**Description**
The Ceiling Grid System is purposely designed to respond to the desire for flexibility in the home. This system consists of ceiling modules that enable the installation of cables and connections such as lights and fans.

**Discussion**
This “lay-in” style frame makes installation of grilles, registers, diffusers, and other ceiling components as simple as inserting them in a standard ceiling frame. For typical applications, the frame has adjustable fastening clips which adapt to a variety of ceiling module thicknesses. When heavy duty support is required, the frame can be suspended with wire from the housing structure. Accessories such as lights, speakers, ceiling material cutouts, “hidden” access panels, and other devices may also be inserted in the frame. Standard module sizes (mm) are: 500 x 500-600 x 600-750 x 750, with special sizes are available on request.

**Properties**
- Simple location and relocation of ceiling components
- Easy access system without the use of special tools
- Efficient maintenance due to durable, washable polyester powder finish
- Economical application of relocating rooms and technical equipment
- Flexible layout
- Specification of desired location for the customer’s needs

**Features**
- Provides flexibility and easy reconfiguration to accommodate the changing needs.
- Uses individual panels for easy maintenance and remodeling.
- Makes it easy to configure the optimal lighting and fanning for any application
- Increases flexibility by using the “upper ceiling” space to operate facilities.
- Supplies a simple ceiling to install and maintain with a wide variety of surface finishes available for use.
System Element  Fresh Flooring

Description
The Fresh Flooring system is designed to respond to the continuous need for flexibility required by technological innovations in the home. The system consists of a raised floor that enables the installation of cables and connections of every type (electrical, telephone, computer, etc). In addition, vents in the panels allow for the distribution or heat in the winter months.

Discussion
A typical fresh floor consists of modular, load-bearing, concrete-filled steel floor panels 0.6 m x 0.6 m (2 ft x 2 ft) square supported on pedestals at a height of 0.3 - 0.46 m (12 - 18 in.) above the concrete structural slab of the building. The pedestals are glued to the structural slab and the panels are typically attached with a screw to a pedestal at each corner, allowing them to be easily lifted and removed for access to cabling or equipment within the under-floor plenum.

Properties
- Tiles can be raised for easy maintenance
- Time and cost savings
- Heat and ventilation system
- Housing connections for easy reconfigurations

Features
- Provides freedom to redefine a space to fulfil new organizational needs or to meet new standards
- Increases flexibility by using the “under floor” space to run wiring (electrical, telephone) and special equipment
- Obtains Energy savings, since the cavity created between the ground and the raised flooring can function as a thermal insulator
- Supplies a simple floor to install, clean and maintain with a wide variety of surface finishes available
- Distributes the desire of heat delivered to specific locations
System Element  Walk-in Shelter

Description
The Walk-in Shelter consists of separate compartments 365.76 cm long x 274.32 cm wide x 274.32 cm tall (12’ x 9’ x 9’) that provide the most basic of human needs. It provides shelter from weather, heat (when necessary), space for sleep, and basic sanitation.

Discussion
Although government programs and non-profit organizations strive to lessen the problem, homelessness exists even in the wealthiest parts of the world. Some homeless people are simply victims of circumstance. Creating opportunity for these people is the first step to minimizing the epidemic of homelessness.

One of the other major problems of homelessness consists of the untreated mentally ill. These people live a transient lifestyle and require assistance fulfilling basic human needs.

Until a wholistic solution to homelessness is embraced, the Walk-in Shelter can be used to ease the physical burdens of life without a home. Instead of being a permanent residence, it is meant to be used with the Fixed Address Module and support the transient lifestyle.

Properties
- Individual shelter compartments
- Temporary
- Coin-operated heat

Features
- Provides shelter
- Provides heat
- Provides sanitation
- Can be cleaned with a hose
**System Element**  Fixed Address Module

**Description**
A Record of personal and medical and municipal data that is stored on individuals who have “no fixed address.” The records are kept with a wireless receiver/transmitter combination. The location of the user is established by use of a GPS signal.

**Discussion**
In addressing the problem of providing housing for the homeless the problem of identity is crucial. Without a home, one is branded with the label of ‘no fixed address’. This has a multitude of consequences; from the exclusion from censuses to the lack of ability to vote. By providing these members of society with a home, the Fixed Address Module encourages participation in the democratic process and promotes personal welfare. The module is intended to preserve personal data such birth certificates, municipal data and medical records. By providing shelter and an address, a municipality can better manage the needs of this demographic group who are otherwise marginalized and unaccounted for. In addition, this approach helps to alleviate the management of hostels and other temporary institutions. Most importantly, however, it seeks to reduce further marginalization and encourages the homeless to become functional members of society by recognizing and valuing their presence.

**Properties**
- Record of personal medical and municipal data
- Wireless receiver
- Wireless transmitter
- GPS signal

**Features**
- Provides municipality with personal record
- Stakes a claim on temporary shelter owned by the municipality
- Informs the user of opportunities to vote in elections, proxies, etc.
- Limits access of temporary shelter to user
**System Element**  De-part Auction

**Description**
The Depart Auction is a clearing house for cores and components of the housing system. Users can search for these parts by area, price and part or core type.

**Discussion**
The central idea of the De-part Auction, is that levels the playing field for users who need to purchase new cores or components for their home. Rather than going to a store to buy parts, the user can “bid” on items. This allows the user to search for a good deal rather than buy it for a set price. In addition, like other auction houses like Ebay, the user can develop a relationship with different sellers.

Users can also add a Want List into their De-part Profile. This allows sellers to search for buyers in addition to buyers searching for sellers. Anyone who owns parts they no longer want or need can become a seller on the database.

The user can find the parts located nearest to them by inputting their location. If they can’t find at certain core or part in their area, they can opt for a wider search with an additional shipping fee.

**Properties**
- Component and Core clearing house
- Search by location
- Seller or buyer initiated search
- De-part Profile
- De-part Want List

**Features**
- Connects users to buyers and buyers to users
- Allows sellers to search for buyers based on their Want Lists in their De-part Profile.
- Levels the playing field for buyers
**System Element**  Centralized Construction Database

**Description**
The Centralized Construction Database aggregates construction information and specific data for entities that are related to the architectural process.

**Discussion**
Centralized Construction Database is total information database. In includes an aggregate of the following databases:
ICONDA – The International Construction Database – covers world-wide technical literature relating to all aspects of planning and construction. Mechanical Construction Databases – used to estimate commercial, industrial and residential projects.

The database also contains many rebuilt assemblies organized in 7 divisions. There are assemblies for Plastic, Copper and Drainage Piping as well as Plumbing fixtures and Duct work.

**Scenario**
Kelly is a construction manager who’s job it is to ensures standardization of materials as well as manage material cost and requisitions. For conducting effective control, he researches required construction information through the Centralized Construction Database system. Kelly is able connect the database with his PDA, and can input or search necessary information.

**Properties**
- Nation wide connection
- World wide database system
- Wireless data connection
- Database for cost & time schedule estimator
- Supporting data for environmental management

**Features**
- Connects construction facilities
- Controls construction process
- Estimates accurate costs for construction
System Element Illustration  GreenGrid Roofing

Diagram:
- Plant Layer
- Soil Mix Layer
- Soil Filter Fabric
- Drain Mat
- Waterproof Membrane
- Sub Membrane Layer
- Roof Deck
System Element Illustration  Floor Module
System Element Illustration  Family Knowledge System
System Element Illustration  S.I. Wall
System Element Illustration  Nutri Count Chef Sequencer

- Preference
- Nutrition
- Cook Time

Database

Nutri Count
Recipe
Food Kinds
Nutrition Value
Cook Time

Ingredients
Servings

Chef Sequence
List of Recipes
Cooking Sequence
System Element Illustration  CEX Exterior Surfaces
System Element Illustration  Personal Chamber
System Element Illustration Central Control Database
System Element Illustration  
De-part Auction
System Element Illustration  FiltRoofing
System Element Illustration  Dreamz
System Element Illustration  ASM Framing

Individual ASM Frame

3-Point Rigid Corner Braces
System Element Illustration Safe Water Filter
System Element Illustration  Stand-alone Photovoltaic (PV) Electricity System
System Element Illustration  Fixed Address Module

- Outside Mail Slot
- Inside Mail Slot
- Emergency Button (911)
- Community Notice (Monitor)
System Element Illustration  Sao Paulo Housing Configuration
System Element Illustration  Bangalore Housing Configuration
The Housing We Need is a system of components and cores that are designed to make housing more affordable for low incomes users, suitable for all parts of the world, adaptable to any culture and easy for the user to assemble. There is no housing system that currently serves all of these needs.

What if a family could assemble their own house in one day?

What if a system could increase self-sufficiency and protect precious resources?

What if a housing system could employ new utilities based on their technological merit rather than on the politics of government regulations?

What if a housing system could foster personal, familial and community growth?

All of these things can be achieved and The Housing We Need can achieve them.
The Housing We Need  Sources


