Nimble Urban Dwellings

Re-enabling Permanent Impermanence

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Abstract. *This paper considers an evolutionary type of urban dwelling—where permanent impermanence may be a preferred state for those who favor nimble dwellings that are better able to respond to change. These changes may be socio-economic, geographic, technological, environmental, cultural, employment-related, or simply the result of unanticipated disruptions. The goal of this research is to describe a system which enables improved functionality, flexibility, and desirability for modest, yet highly diverse, urban dwelling solutions based upon an evolving, open-source system of digital design standards. Given that consumer product designers have, for more than a decade, successfully utilized digital technology to design and produce highly desirable products, this paper asks whether urban dwellings might benefit from concerns more in keeping with those of consumer products.*
Keywords. *Emergency Dwellings; Mass Customization; Open Source Architecture; Urban Housing; Architecture.*

INTRODUCTION

> "Today's architecture is at a turning point. The big trends of the last decade are outlived and only a few buildings in the world manifest architectural perfection while paving new ways into the future". —Frei Otto (2006)

Over a decade ago, authors Makimoto and Manners asserted that continued adoption of mobile technologies will create large-scale societal changes (1997). In the past fourteen years, many of these predictions have already come to pass, such as: exponential increases in global trade, remote work potentials, migratory urban populations, increased web-based business reliance, and more. These nascent technological changes, combined with escalating ecological concerns, are already having a significant global impact on how developed societies live.

Aside from (and perhaps partly because of) the gonzo visions of the late 1960's and 70's—by the likes of Superstudio and Archigram—recent literature is curiously lacking ambitious proposals to these combined topics. This research dares to lean in a similar direction, drawing not from fanciful speculation but from analysis of a variety of disparate, yet increasingly inter-related conditions. This research attempts to realistically forecast the parameters necessary to create a desirable type of compact urban dwelling which is not fixed in place, features, or appearance.

CONTEXT

As global population swells toward 7 billion, urban areas are experiencing growth at a rate that is eighteen times faster than rural ones; while, currently, more than 50% of the world's population is now living in urban areas (UN-Habitat, 2004/05). Urban population worldwide is expected to grow to 4.9 billion by 2030, with more rapid urban growth expected in less developed countries. In comparison, the world's rural population is expected to decrease by some 28 million between 2005 and 2030 when 81% of the world's population is projected to live in urban areas. These dramatic increases in urban population are already straining existing infrastructure the world over, confounding optimal solutions for dwellings at all economic levels. In urban areas, for those above the poverty line, affordability, availability, and proximity are prevalent concerns. For those below the poverty line (living in favelas, barrios, and slums) domestically satisfying basic health, safety, and welfare is increasingly elusive.

In addition to these challenges, population concentrations are proving to be highly vulnerable to unpredictable natural disasters, which may rapidly render large numbers of people without housing, as was seen in the New Orlean's hurricane flooding in 2005, Haiti's earthquake in 2009, and Japan's tsunami of 2011. For those displaced by a disaster, immediate housing is paramount. Temporary, affordable, and rapidly deployable solutions dominate this housing sector. However, as history has shown, the impermanent often becomes permanent.

These forces, combined with emerging trends examined below, suggest the need for a more flexible type of urban living environment. Proposed is a possible solution that utilizes open-source standards combined with digital design and production technologies to enable the creation of diverse free-market components which may be easily combined in different ways by consumers. Such a system would permit the creation of urban dwellings that are flexible, adaptable, affordable, sustainable, recyclable, technological, and mobile.

Several projects by third year architecture students at The Pennsylvania State University are shown which consider the mobile urban dwelling less as architecture, but more as a consumer product, for reasons which will be discussed. In particular, these students explore the controversial concept of branding as discussed by Anna Klingmann in Brandscapes: Architecture in the Experience Economy (2007).

MOBILITY: PAST, PRESENT, AND FUTURE

Nomadic behavior has defined more than 90% of known human existence. Settlements (towns first, with cities later) were established only in the last 13,000 years—ostensibly for agricultural purposes, trade, and defense. Today, given increasingly mobile technologies (affecting both work and play) one wonders if our genetic predisposition to roam will result in greater mobility between today's highly porous cities.

The moving of one's household might serve as an imperfect but suggestive index regarding mobility. While reliable global migration statistics are not available, in the United States over the past seventy years, moving is most certainly on the rise—particularly among renters. In the 1940's, renters moved 1.5 times more than owners.[1] From 2009-2010, renters moved 5.6 times more than owners. This represents an increase of 362%.

While few would consider household moving purely nomadic, if we wish to examine another form of wide-spread, modern day nomadic behavior, one

need look no further than tourism. In 2007, tourism accounted for 9% of the world's GDP, or $4.85 trillion US dollars.[2] These "temporary relocations" suggest that the nomadic impulse remains a significant societal force. Reasons cited for the growth in tourism include increased economic status for a number of developing countries, as well as extended vacation stays due to the increased ability for people to perform some degree of work via mobile technologies—up from 18% in 2006 to 23% in 2008.[3]

On the other end of the mobile spectrum, the RV (Recreational Vehicle) is an increasingly popular tourism solution—especially among Americans. Research performed by Dr. Richard Curtin (2005) of the University of Michigan reveals that one in six automotive owning families planned to buy an RV in the next five years, while one in twelve currently own an RV. The pre-recession purchasing projections were undoubtedly not realized; however, they suggest that for consumers, the RV is quite possibly the most widely accepted and most desirable form of prefabricated dwelling in existence.

Given that tax codes and financing instruments both qualify RV's as second homes it seems an oversight to overlook these consumer products both as forms of dwellings, as well as forms of prefabrication. Due to the ease of mobility and the capability for people to remain "connected" electronically, increasing numbers are making RV's their full-time homes. With the average ownership age being forty-eight, it is clear that RVs appeal to far more than retirees (Lee, 2004). RV lifestyles are becoming so popular that the US postal service announced Premium Mail Forwarding in May, 2005, a service that continually forwards mail for the frequently mobile.[4] The question considered in this paper is whether a similar mobile solution is desirable, or even possible, for urban environments.

THREE ESSENTIAL ATTRIBUTES FOR NIMBLE URBAN DWELLINGS

To enable nimble urban dwellings, three primary aspects must be addressed, all of which are consistent with various attributes of consumer products: A) improving the desirability of these dwellings through branding; B) the development of uniform standards for interchangeable components, shipping, and installation; and C) enabling personalization and mass-customization of spatial, technological, and aesthetic aspects. I have dubbed this type of dwelling a Jump Box in honor of the jump drive—those compact, portable, usb flash-drives that house our digital lives and may be plugged into any computer.

Branding and Desirability

Despite a number of notable examples of prefabricated dwellings (Le Corbusier, 1919; Gropius and Meyer, 1923; Buckminster Fuller, 1929; Dreyfuss

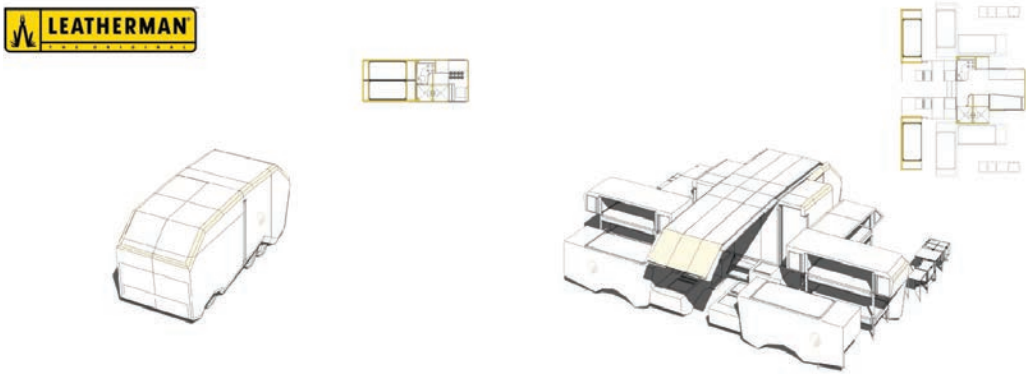

Figure 2
Leatherman Emergency Relief Unit, by Adam Longenbach, The Pennsylvania State University, ARCH 332.

and Larrabee Barnes, 1947; Jean Prouvé, 1950) the prefabrication industry as a whole has struggled with perceptual challenges since inception. Initial objections—formed during WWII when mobile homes and travel trailers served as barracks for soldiers—have only deepened due to perceptions of shoddy workmanship, Byzantine tax codes, class segregation, and more. In 2005, elevated toxicity for FEMA trailers deployed in New Orleans after Hurricane Katrina have only reinforced these negative perceptions.

Are there mechanisms that would improve desirability? In The Journal of Consumer Behavior, Business Professor Banwari Mittal (2006) suggests that our culture relies heavily upon brand-name products for self-identity, he writes, "Membership in today's consumer collective is gained through the purchase of celebrated popular products". As Michael Sorkin (2002) suggested in his Harvard Design Magazine article "Brand Aid," "to create the success of any commercial multiple, the brand is critical… And, of course, celebrity is the main measure of authority in Brandworld."

Thus, it appears that architects and designers may gain access to wider markets by branding their Jump Box efforts in a fashion similar to that of Christopher Deam's redesign for Airstream—the company responsible for the iconic aluminum travel trailers. Instead of trying to launch a brand from a position of relative obscurity, architects might associate with already recognized and highly desirable brand names such as Leatherman, Burberry, Puma, Apple, and others.

Uniform Standards

As Witold Rybczynsky (2001) convincingly argues in One Good Turn: A Natural History of the Screwdriver and the Screw, the best solution is not always the one most widely adopted. When screws were first proposed, "inferior" slot head screws were initially adopted instead of the "superior" square drive screws, largely because they did not require a special driver. Today, the number of specialty screws (with varying heads, shanks, and pitches) number in the thousands.

This commonplace example illustrates three inter-related and valuable lessons for the introduction of a voluntary, market-driven standard, such as what I am proposing here. First, and somewhat tautologically, for a standard to proliferate users must adopt it. In effect, the barriers to entry that face a novel idea must be surmounted by whatever design is deemed most desirable at the time of introduction. Second, and less obvious, the criteria used to determine "the best solution" is highly dependent upon those evaluating the solution; thus, defining what is "best" is often more elusive than one might imagine. In our screw example, which is better: a screw head that does not strip but needs a special driver (i.e. reliability), or a screw head that

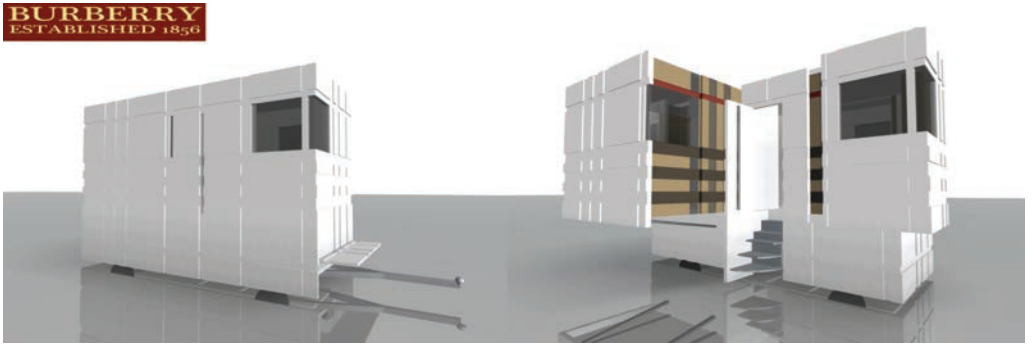

Figure 3
Burberry Jump Box, by Terri Garlewicz, The Pennsylvania State University, ARCH 332.

may strip, but can be used with a kitchen knife (i.e. convenience)? In this case, convenience was initially preferred over reliability; however, this might not always be the case. Third, product refinement and development are iterative processes which occur naturally over time and only as a direct result of increased use. Once screws were initially adopted, reliability, and a whole host of other specialty attributes were developed due to demand. The social criteria for evaluation had evolved since the introduction of the idea.

No different than many new products, prefabricated dwellings have for the past century hinged upon the development of system of standards. However, prefabrication standards have largely been, and continue to be: proprietary, incompatible with each other, and/or require sophisticated sole-source tooling. The inability for prefabricated standards to either work together, or to accommodate commonly available substitutes has ultimately been self-limiting, thus restricting adoption. As such, most of today's prefabricated offerings, each uniquely fashioned, are not substantively different (from a manufacturing perspective) than previous efforts—from Buckminster Fuller's Dymaxion House to Jean Prouve's Maison Tropical—all of which ultimately failed to be widely adopted.

When considering the development of voluntary new standards, as this research aims to do, there are two possibilities. The first is to develop what are felt to be "the best" standards, and hope to stimulate broad market-adoption. This is the strategy taken historically by prefabrication and the results have been poor. The second strategy is to work within a pre-existing set of widely adopted standards. This consumer product strategy is no different than Apple taking standards developed for MP3 players and turning them into the wildly successful iPod. Given this successful strategy used by many products, what existing standards suggest beneficial outcomes? Given the compact domestic nature of RVs, it would be foolish to overlook this platform and the lessons to be learned from this typology. For the shipping of large and heavy geometries, a vast international network already exists for transporting intermodal shipping containers.

In the mere fifty-six years since the invention of the intermodal shipping container, there are now enough units in existence to wrap around the equator—stacked two high (Taggart, 1999). While inventive dwellings made from these modules (by Wes Jones, Jennifer Siegal, Hybrid Design, LOT-EK, etc.) makes some sense from a purely economic point of view, they lack broad aesthetic appeal, no

Figure 4
PUMA Soccer Training Camp, by Gino Colan, The Pennsylvania State University, ARCH 332.

matter how much they are customized. What shipping containers do offer is a valuable lesson for prefabrication—the potential for a standardized chassis to readily use existing global transportation techniques. Mobile products based on a compatible standardized chassis could be radically customized from the ground up through online configurators that would allow multiple designers and producers to create unique, environmentally responsible, and technologically advanced products that could easily permit mass-customization in a way predicted by Joseph Pine (1992) in his book Mass-Customization.

The 2002 GM concept vehicle, called the Hy-Wire, offers a notable chassis worth emulating conceptually. This chassis contained all automotive mobility requirements and was designed to easily accommodate several different body types. Similarly, a Jump Box chassis would serve as the core component. In its most stripped and economical form, it would merely provide a structural base. Moving well beyond this, and depending upon the amenities desired, it would also accommodate modules for water (fresh, grey, and black), electrical and data wiring, heating and cooling, and power generation, as well as various body types above.

A related concept, based upon a twenty foot shipping container, was released by Daiwa Lease in February, 2011. The EDV-01 (Emergency Disaster Vehicle) is an expandable unit which provides disaster relief housing in a self-sustaining package for two people for one full month. This concept, two years under design development, integrates a variety of cutting edge technologies (solar power, water vapor gathering and filtration, advanced battery storage, biological toilets, and more), but has not yet been fabricated. Animations of deployment may be seen on their website[5] and YouTube.[6]

As stated, the primary goal of the Jump Box chassis would be compatibility with shipping container standards to allow transportation on ships, trains, and trucks. With a unique assembly fixed to the top of this chassis, it could perform as a freestanding shippable unit, or a rolling RV chassis if equipped with wheels. Instead of this chassis being proprietary, the design constraints are proposed to be open-source and widely available via web distribution. This is anticipated to further encourage broad market adoption and refinement over time. One additional benefit of accepted standards is that urban structures could be built that would accommodate a Jump Box—think "apartment building with removable apartments". In this way, these structures would not be too dissimilar to a boat dock, but arranged vertically, instead of horizontally, using a large lift, instead of water to move the dwelling units about. If a courageous developer were to build such a structure (with traditional apartments mixed with several Jump Box slots), others would follow, provided there was demand. If the Jump Box

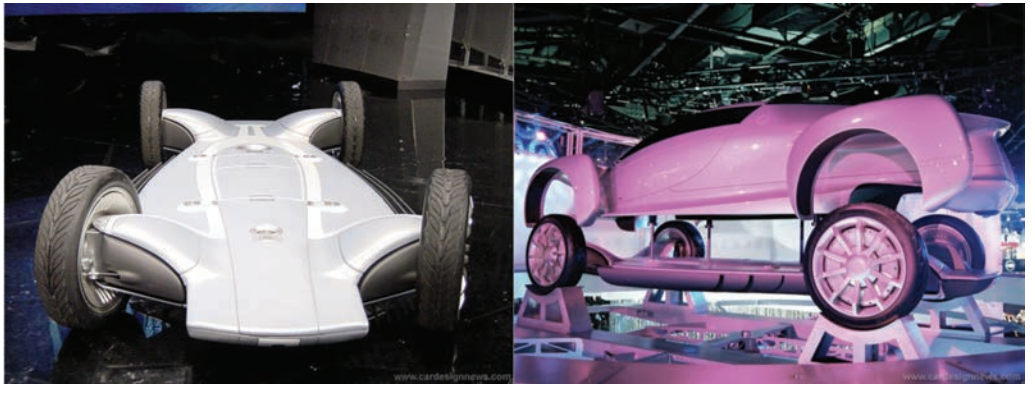

Figure 5
GM Hy-Wire Concept Vehicle (photos by cardesignnews.com)

concept failed to be adopted, the developer would merely have risked the cost of the lift, since the building could be still be used for traditional apartments.

Personalization & Customization

The second aspect of open-source development work is geared toward the creation of dimensional standards above the chassis that will permit universal connectivity for interior and exterior systems, similar to Pine's Bus Model, used widely in the computer industry. Universal connectors would permit interchangeability of diverse components designed and manufactured by any interested party. Mobile products based on such a chassis would allow multiple designers to create parametrically varied products that could easily fit together to permit mass-customization. Like the prefabricated living suites by Piikio Works for the cruise ship industry, these creations need not look anything like shipping containers (Schodek, et al, 2005). Standards for body components would permit vast stylistic diversity, enabling easy upgrades over time as fashions, finances, and/or technologies evolve.

CONCLUSIONS

The research presented is undoubtedly more aligned with the processes and expectations for the design, production, and consumption of sophisticated consumer products than traditional architectural

Figure 6
Daiwa Lease EDV-01GM, Emergency Disaster Vehicle.

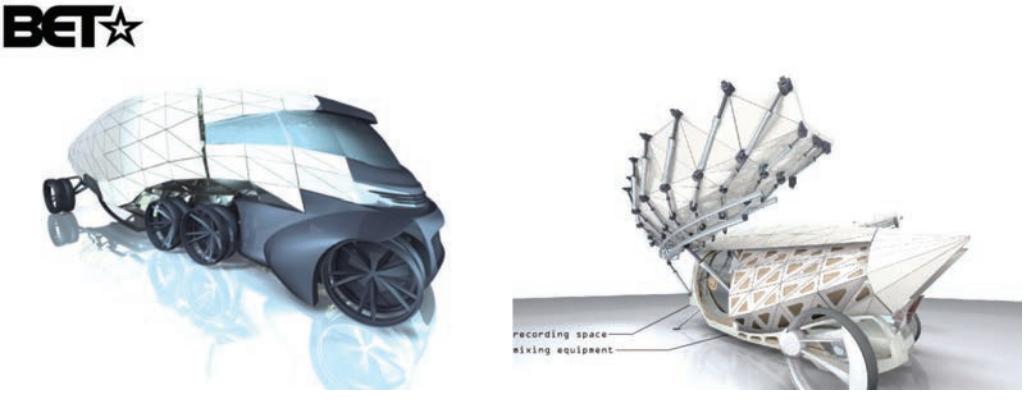

Figure 7
BET (Black Entertainment Television) Urban Studio, by Matt Hoffman, The Pennsylvania State University, ARCH 332.

Figure 8
Apple Dwelling, by Caryn Brown, The Pennsylvania State University, ARCH 332.

dwellings. Consumer products, unlike the majority dwellings built today use sophisticated digital techniques for design and production, which, if applied to dwellings would offer a number of substantial benefits. While traditional fixed-foundation homes offer many advantages, they have several limitations that will be increasingly felt by a number of modern dwellers. These limitations are:

1. The absence of substantive feedback loops (evident in product-design but mostly absent in architecture) prohibits in-depth analysis, adaptation, and evolution.
2. The lack of mass-production techniques restricts innovation and integration of new technologies, competitive pricing, recycle-ability, and variability.
3. Consumers' desire for brand identity and status is not well recognized.
4. Mobile technologies do not require services provided only by fixed dwellings.
5. Fixed dwellings are expensive to purchase or rent, located further and further from urban centers, and involve costly efforts to move.
6. Web-based ordering is influencing consumer expectations. Options, appearances, cost, and delivery times are increasingly expected to be known in advance.

Certainly there are a number of significant challenges to this proposition—especially since governing institutions still rely heavily on settlement patterns based upon agricultural and manufacturing conditions that often no longer exist. Among these challenges are: voting boundaries, land ownership laws, tax structures, zoning laws, school systems, and land based utility infrastructure.

However, in light of current technological considerations, the cost and popularity of urban habitation, environmental changes and catastrophes, and occupational fluidity, fixed dwellings, for some, may become less desirable than options that more easily enable mobility and technological integration. Should this tipping point come to pass, a process using digital design, manufacturing, and purchasing methods could easily support a dwelling product that is more culturally responsive and more consistent with expectations forged through positive experiences with consumer products.

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