***deliverEroom*:**
A NEW PHYSICAL SPACE FOR THE RESIDENTIAL UNITS TO COME

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This is to certify that I have examined this copy of a master's thesis by

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Abstract

DeliverEroom: a new physical space for the residential units to come

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The need to allocate vendors of the 13th century castles gave origin to a large hall where all could gather, work and sleep. The need of iceboxes to be constantly replenished in the early 20th century gave origin to the ice/service entrance in many houses. In the 1950's the milkman model brought also the milk-box, a unit to be installed or built into customer's homes.

Once again, deliveries will influence the architecture of the households, fueled this time by the e-commerce economy. Soon, a new appliance that will enable the unattended delivery of physical goods is going to be part of future households, and architects will have to plan ahead in order to accommodate this necessity of the Internet world.

The space for this appliance, the deliverEroom, will have to be accessible from the interior and exterior of the house, allow enough capacity for the appliance that must accommodate most if not all deliveries, and access to it will most probably be controlled through the Net.

ACKNOWLEDGEMENTS

DEDICATION

To God and my wonderful Family, here and there

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Settlement of the Idea:

PREFACE

The definition of the word thesis is etymologically related to the word proposition. This approach is the one the author considers more valuable to explore in this one time opportunity as a student, having in mind this document is intended to be a legacy to students and fellow architects.

Although the major considerations for the thesis hereby presented are grounded in the physical realm of architecture, this document analyzes a problem which solution is intrinsically connected to the existing sociologic and economic framework that constitutes the so-called "real world". The assumption that there should be place for this kind of thinking in the University of Washington has been clearly backed up by a group of teachers with open minds and critical positions towards the meaning of an architecture thesis in our days.

This is not a conventional architecture thesis; please open your mind.

CONCEPTUAL FRAMEWORK

A major shift in society is taking place in our time. The Internet has made it possible to keep up with life without moving away from home. [1] Our nomad ancestors would have a difficult time trying to understand this new possibility for human habitation: sedentary life at its maximum.

E-commerce infrastructure can deliver to the home a book, a CD, a car, a diamond ring, groceries, flowers, the latest garment, dinner for the night, or anything else we can imagine. Nevertheless, this whole system has a major gap, a missing piece that must be provided in order to optimize the efforts of each of the parts involved in the system: The threshold of the customer's home.

A solution to the problem -an appliance- will soon optimize the convenience of the online shopping process and the reception of its goods. In the near future, a space will have to be dedicated in many households to fit this solution in the least obtrusive way.

A deliverEroom is an internet controlled secured physical portal of the household that will enable the twenty four hour a day, seven day a week unattended delivery of physical goods, providing a place for deliverers and recipients to exchange packages without sacrificing the privacy of the customer's home. In the years to come, architects will acknowledge the need to provide a space within the infrastructure of the house since the design stage.

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[1]www.dotcomguy.com has decided to take this statement from an hypothetical observation to a proven reality.

DEFINITION OF THE PROBLEM:

Early l900's: refrigerators were called iceboxes. They needed big blocks of ice each couple of days, in order to remain cool. Ice was delivered in horse driven wagons and put directly into the refrigerators of clients. As an architectural solution, a few houses incorporated an independent entry to the ice closet, so that the people who serviced the icebox did not enter through the main door. Even fewer provided a door that would allow the iceman to deliver ice directly from the exterior of the house.

In the 1940s the milk delivery industry began. Some milkmen delivered dairy produce directly into the referigerator of the home, leveraging the friendly service relationship that icemen had already built into their clients. The early system did not seem appropriate though, and soon the milk delivery industry introduced the milkbox to benefit their business model.

February of the year 2000, Consumer Electronic Show in Las Vegas: A refrigerator is on display with a flat panel screen that can connect to a bar-code scanner which orders groceries from the web when you run low. How is the " future milkman" supposed to deliver the milk to the inside of the refrigerator whenever the machine places an order?

If home shopping trends follow expectations, delivery of physical goods to the home will represent a greater concern than ever before. Thus, the delivery of physical goods must be solved in a more efficient way. There are in particular two important problems: the unattended delivery problem and the privacy invasion problem.

Almost everyone in the United States has experienced the inconvenience of receiving a "Sorry we missed you" note. When packages are most likely to be delivered – during daytime - there is most likely nobody home in 50% of US households. This is known as the *unattended delivery* problem.

People who order groceries online experience the discomfort of sacrificing the privacy of their home when allowing the deliverer to bring the produce directly into the kitchen (if not into the refrigerator). This service model inspired by its milkman predecessor is neither efficient for the industry nor comfortable for homeowners. This service would be rendered suitable if the deliverer would not step into the private realm of the house, but could deliver directly from the public space. This perception enables us to identify this problem as the *privacy invasion* problem.[2]

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[2] Even though the deliverEroom concept must consider this last problem, it is more difficult to address from a business standpoint, since it is less tangible and does not interest the economic players directly. Nevertheless, in a long term solution it will increasingly become important.

SCOPE OF INVESTIGATION

The purpose of this thesis is to:
1. Identify the problems of the current system and argue they are a long term concern for our society.
2. Propose, explore and test a solution in order to ensure it is the most convenient one for all the parties implied.
3. Analyze the architectural possibilities and physical solutions to solve this problem, taking into account a historic frame.
4. Demonstrate how the concept would be deployed in established housing prototypes.
5. Materialize this concept as a physical element to illustrate the optimal solution.

Geographical scope
The geographical, demographic, sociologic, and economic scope of this study is the United States of America. This country is not only considered a solid economy on its own sufficient to be addressed as a case study, but also the country with the largest Internet penetration.[3]

Time scope
The future, as we imagine it, is nothing more than expectations put together. As the most reliable information is based on expectations up to the year 2005, this seems to be an appropriate limit for this paper's speculation. From the technology point of view implied in the project, five years also seem as a maximum speculation period, since computer-based technology has the quality of being "auto catalyst", it has the property of self-accelerating development.[4] So conditions beyond five years in the future are generally unpredictable and unstable.

It is important to note that the architectural implication of this concept is not specific to this country or time frame. First, because the online shopping phenomenon is irreversible, ubiquitous, and growing constantly; second, because architectural transformations generally take place at a very slow - but definitive – pace.

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[3] "Around half of the 300 million Internet users around the world are in North America. Time Magazine, June 2000. "What will replace the Internet?" Vinton Cerf
[4] Time Magazine, June 2000. Is technology moving too fast? Steve Brand.

HOW DOES THIS TOPIC RELATE TO ARCHITECTURE?

This topic can be filed under "house of the future". Computer-induced transformations in society reflect on the architecture of residential units, and are a widely studied topic. To locate the project within this realm, I wrote a short essay[5], based on a recently published document[6].

A more tangible reference for this topic could be the problem of "the machines in the home"[7]. The car, refrigerator, dishwasher, washer and dryer, heaters and air conditioners are all examples of machines already present in the household. Throughout the twentieth century architects have struggled to embed these machines into the home to reduce their obtrusiveness.

Even though in its early stage the deliverEunit would appear obtrusive in size and location, architects will learn to include this space into the architectural design just as they do with other machines. Today they do this in various ways, according to the individual needs and possibilities of each project; it is up to the individual designer to decide the final solution. That is why the result of this thesis is not a specific architectural design, but a research paper that identifies the problems, analyzes the possibilities, and provides the tools to design the next household with this solution already in mind.

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[5] It is presented as Appendix 2

[6] "The Unprivate House", written by Terence Ripley for the Museum of Modern Art (MOMA) in New York in 1999.

[7] Charles Moore and other two authors dedicate the second chapter of their book, "Home Sweet Home- American Domestic Vernacular Architecture", (Rizoti Inetrantional Publications Inc. New York, 1983.) to study the implications of the machines in the houshold from an architectural point of view.

Siegfried Giedion, in his book Mechanization Takes Command, (Oxford University Press Inc., 1948) also dedicates the sixth chapter to study how mechanical processes and appliances have gained a space in the household from a historic point of view.

INTRODUCTION

Working on a housing concept for a hypothetical high-tech client during spring quarter 2000, I designed an apartment with a secondary entrance for the unattended delivery of physical goods bought through the Internet. After all, my client would be a fully "wired" person who was seldom at home to personally receive his online purchases. This entrance would allow deliverer agents to deposit the goods directly into a small room accessible from the exterior of the apartment and the kitchen.

Two issues were left unsolved that interested me most in the project's "delivery room" by the end of the quarter. The first one, a physical one, was to determine the spatial characteristics of the room (size, location, relationship with other areas of the house, etc) in a way that could be standardized along American homes; the second, a technical one, was to provide a control device and/or design that could enable secure access for each delivery to the delivery room.

With the help of other people in a newly founded company out of the university, we studied the possibilities of a device that would allow one time access and provide signature upon receipt for each online order.[1] The solution for the device was simple, but to establish the place where it should be installed was not. The physical problem remained unsolved, and became the major topic of this exploration.

The apparent need in households of the future for a solution to the unattended delivery problem encouraged me to turn this interest into a thesis project. The hypothesis stated that all new households would soon incorporate a space that would allow milkmen, grocery deliverers, conventional carriers and other deliverers to securely deposit their products from the outside of the household even if there was nobody home. My arguments were inspired by the belief that this space was to become ubiquitous as the online phenomenon spread over the entire American society and not only among "yuppies" or Internet fanatics.

The solution seemed logical, but there was a long way to go before demonstrating the validity of the hypothesis, especially given that architecture is a codependent activity of all major forces of society. Much broader research was needed.

The following chapters report on this research. They each investigate an important aspect of the idea:

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[1] . To get a quick idea of the technology implied please refer to Appendix 2.

a.) ECONOMIC BACKGROUND

In the chapter one, on economic background I argue that online shopping is here to stay; it is not just a trend of the "new economy" culture. This argument is backed up by facts related to computer market penetration, Internet use in society, and current online shopping data and future expectations. As market necessities will drive the determinants of this space, the chapter presents data analyzing the most common products and processes of mail order retailers.

Proving this concept useful for industry players ensures the development of the idea in a simple way to commercialize, standardize and subsidize; hence its penetration in American households. The chapter identifies industry players who are likely to be interested in the future of online delivery, and to analyze how this solution would fit into their plans.

b.) HISTORIC PRECEDENTS

History is said to repeat itself. Chapter two, on historic precedents examines similar cases in the past, especially delivery processes during the 20th century. Close parallels are discussed in two delivery processes and units of the 20th century: the iceman - icebox, and the milkman - milk box.

The chapter also presents a brief study of the conditions that led to the appearance and disappearance of both phenomena to challenge the long-term validity of e-commerce and its deliverEroom consequence.

In the case of household appliances, industry captured the market, profiting from an opportunity to serve existing households that architects could not address. This supports the argument that the physical solution is an appliance ("deliverEunit"), rather than a specific room to be designed for each household individually. But households will indeed be affected, as architects will provide a defined space ("deliverEroom") to accommodate the appliance.

c.) HOUSING CONSIDERATIONS

Chapter three, on housing considerations presents information about the number, type, size and location of housing units that will inform the conceptual and spatial limitations of this solution for American households.

Data related to the number, occupancy rates, and structure types of American homes show that the deliverEroom is a particularly suitable solution for the United States of America. Hence, the USA will likely be the first country to witness this transformation.

The conclusions of this research are materialized through specific proposals. Several possibilities are suggested for the insertion of similar delivery solutions into existing housing units, and into more complex facilities such as multi-unit buildings and high-rise towers.

d.) DESIGN FEATURES

In Chapter four, on design features I argue that even though architects will propose varied and personal solutions for deliverEroom concepts in future designs, they will all have to provide spaces with similar requirements to embed the deliverEunits. This unit will therefore constitute the point of departure for future architectural considerations.

Far from being a unique solution and a definitive design, this exercise performs the difficult but necessary task to transform an abstract concept into a tangible element. A daring last step is to provide a design solution for a deliverEunit and its possible implementation.

Each of the following chapters presents a brief argument as outlined above. The Appendix section provides facts and other additional material that support each chapter's content.

The goal of this thesis is to convince the reader of the validity and necessity of the deliverEroom, and to provide an understanding of the design considerations necessary for developing the residential projects of the future.

CHAPTER 1 :
ECONOMIC BACKGROUND

This chapter explains the changing shopping patterns that are the result of widespread internet penetration into the US economy, in particular, the adoption of online or internet shopping. Online shopping creates a demand for package delivery services, so that customers can receive the goods they order online. The "last mile", or delivery to the residence, is the most costly part of the process, largely due to the need for attended delivery. Couriers and e-tailers have a high stake in addressing this problem, and have devised various approaches. This chapter discusses this problem and the approaches that various industry players have proposed.

ONLINE SHOPPING ADOPTION

Online Shopping is not an ephemeral fashion of the "new economy", but a long-term change in society. Computers are becoming part of every home in the United States at an impressive speed, and soon they will be as present in households as televisions[2].

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[2] In 1997 computers were already present in more than one out of every three household. Households with incomes greater than $75,000 had at least one computer, while only 25% of those with incomes less than 25,000 had them. The Survey also shows that the computer adoption rate has increased in an average 60% every 4 years. Census Bureau Office Inform: Computer Use in the United States, 1997.

Computer Presence in the Home, and Use Anywhere by year
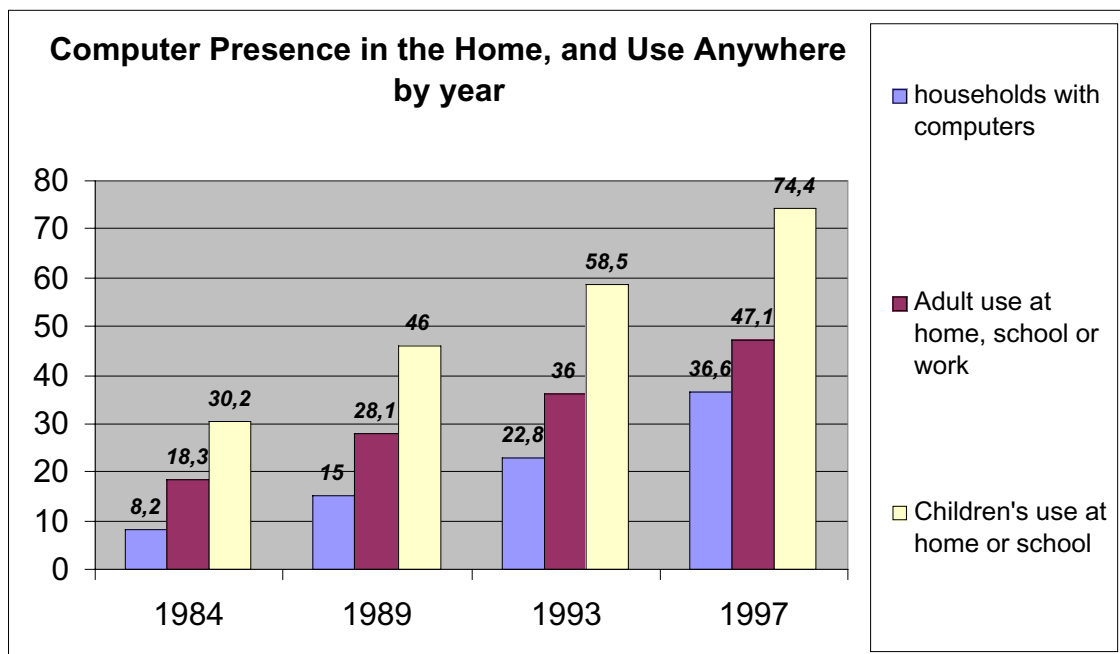
Table 1. Computer presence in the home, and use anywhere by year. Source: Data of the American HousingSurvey 1997, published by the Census Bureau Office at http://www.census.gov/hhes/www/ahs.html

Internet deployment shows a parallel growth: In the year 2000 already more than 20 million households were online, a number that is expected to increase to 50 million by 2004.[3] Americans are acknowledging this change in society in various ways related to every aspect of their lives: work, study, communication, entertainment and commerce.

A relatively small part of e-commerce is online shopping. Online shopping enthusiasts are divided into three categories[4] in order to understand the impact of the phenomenon and to estimate growth:

- *Net shoppers* are those people who *use* e-commerce sites. 70 million people of them were counted in the United States during the year 2000, a number that is expected to arise to 95 million in the year 2002.
- *Online Buyers* are those who *have purchased at least one item* through e-commerce sites. From 44 million in the year 2000, they are expected to grow to 63.7 million by the year 2002.
- *Regular Buyers* are those who purchase *at least one item every three months.* The 20.6 million regular buyers counted in the year 2000 are expected to become 32.3 million by 2002. [5]

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[3] Roland Jones, The Street.com. Pg 93
[4] Definitions and data are taken from the article "E-tail market is growing", published in January 2001 by E-stats market data.
[5] idem

Table 2 illustrates the current number of people in each category throughout the world, comparing it with the number of US population aged 14 and over, and with the total e-commerce sales in the US in millions of dollars.
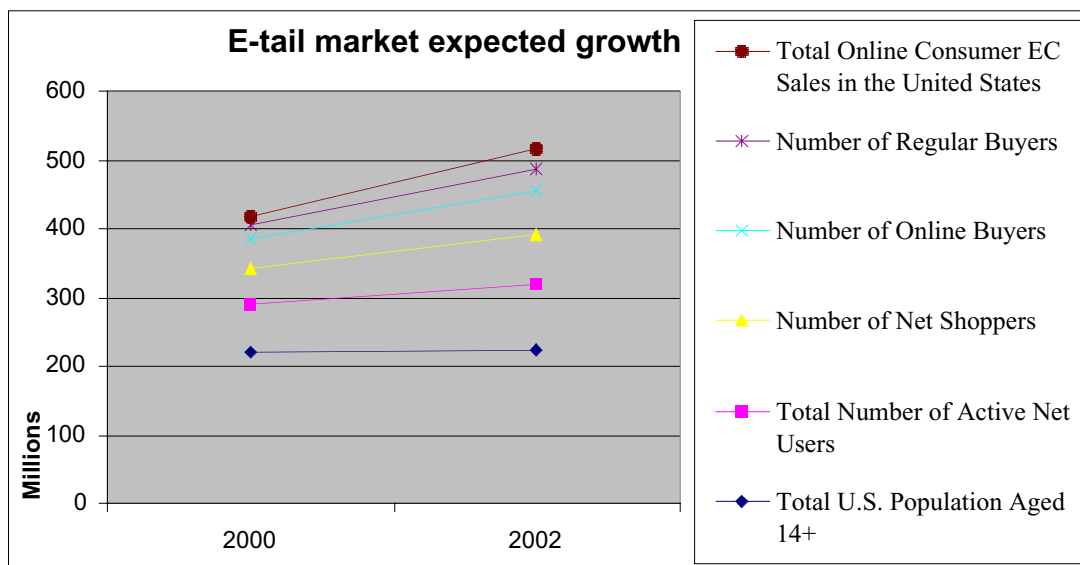
Table 2: overall e-tailing market projected growth. Source: article "E-tail market is growing", published in January 2001 by E-stats market data.

Consumers are receptive to online shopping or "e-tailing". E-tailing currently represents only 1%[6] of total retail sales, but catalog[7], television[8], and even brick and mortars are building their online businesses increasingly. Mail order shopping includes all of these trends, and it represents a figure that ranges from 3.8% to 10% of total U.S. retail sales[9]. As the online shopping marketplace continues to develop, E-tailing in its different versions will soon account for most of that percentage.

Despite the decrease of stock prices witnessed in the year 2000, E-tailers are doing well, when one considers that *customers are being educated for a lifetime of consumption*. Most E-tailers are expected to be out of the business by the end

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[6] tlgp Digital General Contractors (http://www,tlgp.com/Digital%20Times_e-Commerce_Rise_in_US.html) publishes US Census Bureau figures on the percent of total sales in the US that e-commerce represents. In Q4 2000, e-commerce accounted for 1.01% of total sales in the quarter. In Q4 1999, e-commerce represented only 0.63% of total US sales.

[7] Amy Blankership, spokeswoman for the Direct Marketing Association, in "Catalogs for the In box, not the mail box" published in the New York times on October 19, 2000, stated that 95% of paper catalogs already had an online presence in the year 2000. 9% of catalog purchases occurred online in the year 2000, more than doubling the 4% of the previous year.

[8] "Television networks, cable and satellite operators, producers, and advertisers agree -- interactive television (ITV) is inevitable. Five years from now, TV-based web browsing in 13 million homes will generate…"according to Forrester Research. Published in the page http://www.dvault.net/00_news.html.

[9] Data is ambiguous as some analysts measure this figure according to different moments of the year, geographic regions and other variables. "Catalog retailing hovers around 10% of total retail sales", says Ellen Neuborne in the article "The Delivery Dilemma could box E-commerce", published in Business Week, May 10, 1999. "Last year's mail-order sales were only about 3.8% of total retail sales [(approximately $86 billion mail-order vs $2.25 trillion total retail sales(sans autos)]" states an article published at www.fastlaundry.com/evidence.html in October 2000.

of the year 2001[10], but the few ones that will remain will most probably succeed. One thing is for sure: *e-tailing is here to stay:*

Not more ten years have passed since online retailers went into business, and some articles are sold among experienced online shoppers more through the web than through any other physical channel[11]. Books, music, videotapes, flowers and gardening articles are some examples.

Customer satisfaction is one way marketing analysts use to measure the success of stores. A marketing rule of thumb indicates that for every satisfied customer another three will come, and for every unsatisfied customer ten will go away. Customer satisfaction of the online shopping experience is higher than brick and mortar shopping and catalog shopping.[12] Another rule of thumb indicates that word of mouth is still the most effective advertising strategy. We can expect the word of mouth to bring increasingly more customers to online stores.

ONLINE SHIPPING INCREASE

According to an American Express Survey, the US is the country with highest expectations for online purchases in the year 2001, as US Internet users are expected to make an average of 8 purchases online during the present year.[13]This figure includes purchases of non-physical goods, such as airplane tickets, but still it is quite a remarkable number. Even more impressive seem Forrester Research's expectations: "Market research suggests that the average consumer will receive 13 packages this year from e-commerce transactions, a figure that is set to rise to 37 per year in 2004."[14]

In the year 2000, already 1 billion packages were delivered to residential recipients.[15] For the year 2003, the number is expected to increase to 2.1 billion, and packages ordered online to account for more than 60% of them[16]. Shipping companies show awareness of this fact in their estimates. "One shipping industry study estimated that annual package deliveries in the United States will grow

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[10] "Most Internet retailers will go out of business by the end of next year because of funding problems and competitive pressures, said Forrester Research Inc..". Study: Most e-tailers will fail by 2002, Tech Investor, USA Today, 04/11/00

[11] Article "Source of gift Purchases for the Holiday season 1999" published by Andersen Consulting in January 2000.

[12] "Nearly three quarters (73%) of experienced web buyers ranked Internet shopping the highest in terms of overall satisfaction compared to brick and mortar stores (60%) and catalogs (56)."King, Caroline. "E-tailers beat out retailers in Customer Satisfaction Survey". InternetNews.com. The actual American Customer Satisfaction Index (ACSI) supports this fact, and so does Anderson Consulting press releases.

[13] American Express Survey, New York, October 24, 2000

[14]Abbot, John, "Start-Up. tackles last mile delivery" published at the451.com in August 15 2000.

[15] "Missed Deliveries Vex E-tailers" By Rachel Beck Associated Press June 4, 2000

[16] FEDEX publishes in its home page that, according to Forrester Research, "The number of packages shipped to residential recipients each day by 2003 is expected to increase by 119% - 2.1 billion packages a year up from 1 billion in the year 2000- with the number of shipments related to online purchases accounting for more than 60% of residential package deliveries.

from 5 billion to 25 billion pieces annually in the next five years"[17] The shops' losses are the delivery services gain. Thus, this increase of online shopping presents a great opportunity for many.

A GAP IN THE SYSTEM: the unattended delivery problem

Analysts estimate that some 250 million "Sorry we missed you" notices are distributed by shipping companies each year, out of a billion residential packages delivered in the year 2000. [18] In other words, 25% of packages with a residential destination could not be delivered nor left unattended during the year 2000.

Currently courier companies bear the costs of re-deliveries, warehousing of unclaimed packages, and customer service for frustrated recipients, which they pass on to the public in the form of higher rates. Incremental costs that range from $1.50 to $2.00 per failed delivery for a company like UPS[19], up to $7 to $15 for a company like DHL[20], are simply hidden in the overall cost basis of package shipping.

Such costs explain why approximately 50% of all residential packages are left unattended on customer's doorsteps[21], a decision based mainly upon the courier's judgment of neighborhood quality. As residential delivery will double in the next two years, stolen and lost packages will become more common, and it is likely that consumers will demand higher levels of service and security.

This "unattended delivery" is part of what is known as the "last mile" problem. The solution of this problem is necessary for online shopping to succeed; it is a business opportunity for many; and it has architectural implications for the design of the home.

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[17] "Ze Clever New zBox: a convenient new service accpets and safeguards your home deliveries", New York Times, Sunday, January 27, 2001

[18] "Missed Deliveries Vex E-tailers" " By Rachel Beck Associated Press June 4, 2000

[19] From interview with Casey Roy of Amazon.com, April 11, 2001

[20] From interview with Mike Epeneger from DHL, April 12,2001

[21] Personal communication with Mike Epenegr, business development representative of DHL Seattle, April 12, 2001.

BUSINESS ANALYSIS

The "last mile" problem has been a hot topic during the year 2000. Courier companies, online retailers/deliverers, and even independent consumers have tried to come up with better solutions that range from the "invention of a better mousetrap"[22] to the reinvention of the whole supply chain.

How the problem is being addressed:

1. By Carriers:
The major players in this field are *United Parcel Service (UPS) – which delivered 55% of web deliveries in the holiday season 1999-,* the *United States Postal Service (USPS)* -35% of web deliveries in holiday season 1999- and *Federal Express*(*FedEx) -* 10% of web orders in the holiday season 1999-.[23] Their plans to address this problem include:

UPS

UPS Stores: UPS plans to open "Pack and Ship" stores where customers can pick up all sorts of packages including failed deliveries. The first was opened in Atlanta and UPS plans to open more in the next two years throughout the US. They are also supporting business models that aggregate packages into one location, such as Package Net, which allows consumers to pick up online packages at supermarkets.

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[22] "Build a better mousetrap and customers will come". In the business field this sentence is often used to describe an idea that seems so good that the product will be sold immediately. Nevertheless, it bears a huge ironic content, as it implies a closed-minded understanding of business as a whole.

[23] Zona rosa Research

USPS

The company plans to become the "gateway to the house": it has signed an agreement with Airborne Express, and is planning to sign another with FedEx, so that USPS takes care of the last mile part of deliveries for both companies.
The USPS has two legal advantages: By law only USPS can deliver into the mailbox, and they must provide service to every household at least six days a week. This has given them an advanced position for picking up returns from customer's homes.

FedEx

Although the company announced that it prefers to focus on the B2B market, FedEx has re-branded its ground delivery[24] as FedEx Home Delivery. A program to be launched nationwide this year, FedEx Home Delivery charges ground delivery fees and $1 more for any package with a residential destination on the label. It also allows customers to schedule a delivery day for $5 and a specific delivery window (day and time) for $30.

Partnership with giant USPS is on the way, and still must overcome a law suit by UPS. If approved, the agreement would let USPS take care of the last mile delivery for FedEx, as well as allow the installation of drop-boxes in their offices for FedEx packages. In exchange USPS would use FedEx's air fleet to move urgent packages.

2. By E-tailers[25]

Any online purchase of physical goods requires their delivery to the customer's home or workplace. Instead of having to drive to the store and carry the product back to his home, the customer enjoys the "convenience" of shopping online. The retailer thus incurs labor and transportation costs that used to belong to the customer. These costs tend to be "sunk" costs, as the customer has to go to the store anyway for other items he does not buy online. Home-delivery costs for retailers "are incremental costs instead, because they must pick, pack and deliver"[26] the goods.

Another problem particularly visible in the delivery of packages and groceries to the home is known as "demand disaggregation"[27]. While traditional shopping

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[24] RPS, Inc., a subsidiary of FDX Corporation that entered the business-to-business ground small-package market in 1985.

[25] This analysis is based entirely on Mohanbir Sawhney's article, " The Longest Mile" published on December 01, 1999 in the magazine Business 2.0.

[26] Mr. Mohanbir Sawhney, " The Longest Mile" article in the December 01, 1999 issue of the magazine Business 2.0.

[27] idem

methods are based on a high volume of products collected in one place, the online method tends to disperse that bulk into individual customer's homes.

Problems for demand disaggregation and labor and transportation costs are addressed by e-tailers in different ways to solve this "last mile" problem that can be classified into the following five essential approaches:

- PORTAL

The portal strategy offers various kinds of products from different categories intending to generate enough sales volume to negotiate bulk prices from the various suppliers. Players adopting the portal strategy include Streamline (RIP[28]) Shoplink, (RIP), Peapod (announced closing) Homegrocer (sold) and Webvan in the US.

- OVERBUILD

This approach is the most risky, considering the necessary investments. Overbuild players believe that they can take over the entire fulfillment infrastructure by building warehouses and direct to-the-home delivery systems. Players in this area are best exemplified by Webvan, Sameday.com, and could include, Canadian EBox, and Kozmo. (RIP)

- CACHING

The caching strategy consists of bringing volume re-aggregation in local collection centers. Their convenience is high considering that besides bringing enormous benefits for the deliverer, they are also solving the unattended delivery problem for the customer. Players adopting the caching strategy include: Hannaford's HomeRuns, PaxZone, and brick and mortars such as Circuit City.

- SPEED

The convenience of having products delivered in only 30 minutes, to wherever the customer is. The speed strategy relies on quick delivery of products. Kozmo (RIP) and Urban Fetch are the most well known examples. Pink Dot (now PDQuick) is another one.

- NICHE

E-tailers specialize in those products that are logistically efficient (such as computers, cosmetics, or gourmet foods) or require specialized fulfillment infrastructure. Players of the niche strategy include Drugstore.com and EthnicGrocer.com.

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[28] Players in each area have been identified during the year this research has taken place. As many of those have closed their doors during this time they are hereby identified with the letters RIP.

Knowledgeable business analysts agree that whoever wins or loses this "last mile" race, we will witness "the reinvention of the milkman".[29] Once this is understood it will be easier to understand the re-invention of the milk box. This time though, various milkmen will deliver to the same milk box.

3. By Individuals

Individual attempts to solve the unattended delivery problem include arrangements with managers or neighbors to receive packages, using workplace addresses, leaving authorization or instruction notes for the delivery people, etc. Most individuals though, simply pay for the inefficiency with their time.

Companies operating at the consumer level are manufacturing and selling trap or keypad boxes that customers are expected to buy and operate. In other words, better mousetraps for packages that only a few consumers may buy. This solution does not allow the system to integrate and has no future beyond selling them at an individual level.

In order for this concept to be a solution it requires the integration of the three parties involved: the consumer, the retailer and the carrier. The use of existing retailer channels is necessary to target the right consumers on one hand and to push carriers to use a system that lowers the shipping prices on the other. Carriers do not have an existing relationship with consumers, and it is not in their interest to install boxes themselves.[30]. Nevertheless both parties are already willing to include this system within their operations.[31] After all, it is within their main interest to lower the overall price of package shipment.

This solution that integrates the three parties can be referred to as the "Networked boxes" solution. Consumers, retailers and carriers collaborate to make the system work. Four companies are already working in the US with that model[32]: "Some of the best ideas are those that serve to bridge the gap between parties. In "Heading in the right direction"[33], Callan and Johnson refer to this solution, and point out that "Ironically, in a period of Internet induced dis-intermediation, here's a case of re-intermediation adding customer value while

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[29] Not only Mohanbir Sawhney, who concludes his article with this phrase, but other analysts have published articles in Parcel Shipping and Distribution magazine, Fortune magazine, and national newspapers. Relevant extracts can be read at the appendix of this section.

[30] They are trying to solve the "last mile" problem in very different ways, aggregating packages into one location, charging consumers to schedule appointments, etc. They cannot open the market to install boxes themselves because they would have to allow its use by other deliverers, as consumers would not be willing to install three different mailboxes. Carriers are not in the box business, but may certainly be interested in the future to buy this system when it has enough market penetration to appear as a threat or an opportunity for them. For further analysis refer to the business analysis appendix.

[31] UPS, USPS and FedEx have begun test markets for related concepts in Washington D.C. and San Francisco with Brivo and Zbox respectively. Zbox had some success signing retailers within their network, but carriers were still not willing to give discounts since the market is too young.

[32] The companies are Brivo Inc, Zbox Inc, SPH Solutions and Shoppermailbox. Refer to the Appendix 3 for further information.

[33] John G. Callan and Andy Johnson, " Heading in the Right Direction- Examining new residential delivery modes" , available in the Parcel Shipping and Distribution Magazine Nov-Dec 2000 issue.

reducing carrier costs." Apparently it is a good idea. A summary of the benefits and problems for each of the parties involved is presented to support this thought.

VALUE PROPOSITION OF THE "NETWORKED BOX" MODEL						
Benefits			**Problems**			
For Carriers						
Eliminate redelivery costs			Carriers may not be interested in losing contact in the last stage			
Operating efficiency for the system			If they have to pay for the system it would be an incremental cost			
Prevent package theft						
Increased customer satisfaction						
For Retailers						
Increasing customer satisfaction			Modifying retailer's systems can be a costly obstacle for many			
Decrease shipping expenses			Another transaction in their systems may slow down a purchase			
Branding opportunity inside the deliverEunit						
For Replenishers (E-tailers who deliver as well)						
Extended delivery window			System is against the "personal touch" principle of Home deliverers.[34]			
Efficiency in operation			The "tipping" incentive for their drivers would need to be replaced			
For Consumers						
Not having to be at home to receive packages			Loss of human contact			
No need for signature or tips			Give up space and image of their house			
Security when package left unattended			Change in consumer habits			
Provides secured area to leave items for pick-up			Costs of the system			

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[34]WebVan sees the friendly driver role as key to their business model. Stewart Wadsworth, manager of the company's Mountain View hub, said in an interview published in their homepage:. "Webvan sees the courier's image as a key part of their mission. The company is asking customers to change one of their most basic routines, so it's very important to make them feel comfortable throughout the process". Bryan Stafford, a driver based in the company's Mountain View hub said: "`It helps to give a personal touch because we are the only face of the company that they see because it's all over the Internet,"

CHAPTER 2:

HISTORIC REFERENCES

History repeats itself. Studying past examples of delivery processes will help us to understand the social factors that gave birth and death to those processes, and to compare them with the present situation. This will help demonstrate the long term validity of the deliverEroom concept.

Reviewing how other appliances have been adopted by society and how they influenced the architecture of the household will help us understand how the adoption of online shopping may influence household architecture in the near future.
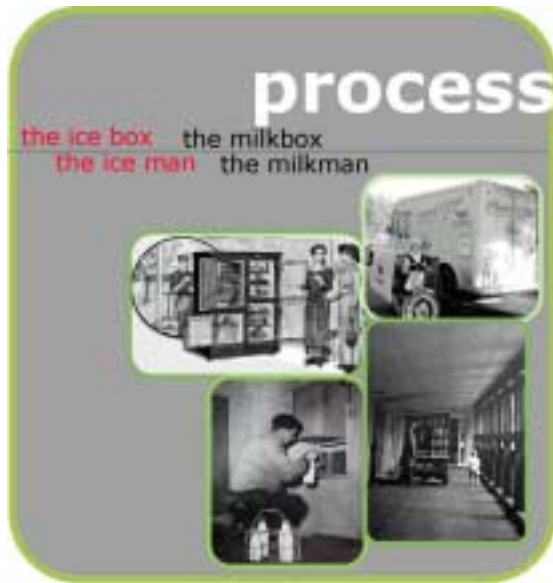
HISTORY OF SIMILAR PROCESSES

This section analyzes previous delivery problems and solutions that have been adopted. The idea is to shape the physical solution learning from previous examples of delivery industries and their relationship to the two problems identified earlier: unattended delivery and privacy intrusion.

The unattended delivery problem has existed throughout the 20th century. Ice delivery began in the mid 1800s in America, and around 1870 it grew enough to be considered an American enterprise.[35] Milk delivery began in the 1890s, and it developed as an industry in the 1940s[36]. Both industries' deliverers provided a

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[35] Mechanization Takes Command Pg. 598, after The Great Industries of the United States, Hartford, 1872, pg 156.

[36] www. whymilk.com/about/story/index.html

one to one human interaction that rendered their figure into that of a friend of the family[37]. In certain geographical areas, delivery men would come into the house to replenish directly ice and produce into the icebox. This solution, although used successfully at the time, is certainly not appropriate for the present time, as it required both, attended delivery and privacy invasion.

When the icebox developed into the electric refrigerator in the 1920s the need for ice delivery was eliminated. The latest models of the icebox already had solved these two problems. A Catalog from the McCray Refrigerator Company dated 1915 offered an icebox that could be served from the outside of the house.(Figure 1) "The outside icing feature keeps the iceman outside so that he does not leave muddy tracks and ice drippings on your kitchen floor –and your refrigerator can be iced whether you are home or not."[38]

Figure 1. "Keep the iceman outside" Section of the McCray Catalog page dated 1915, shown in the appendix 5.

As the milk industry grew it needed to solve these problems and therefore implemented a container that would enable deliveries to be made without entering the house: the milk box. Success in delivery attempts, extension of the time window for delivery, and the effectiveness gained for the system overall repaid by far the cost of the boxes. Customers had to allow the installation of the units in their front porch or yard, even though they exhibited the names of their dairy company sponsors. (The same case is still visible today with newspaper boxes.)

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[37] Refer to the appendix to see various testimonials that support this.
[38] Catalog page from McGray refrigerators, dated 1915. Available in the Historic Appendix.

The system did not allow the resident to retrieve goods from inside the house.[39] Neither did it offer a solution for the aesthetic problem of having these containers located in the porch or front yard, which people often refer to as the first image of their house. Conscious of this problem, some architects designed embedded types of milk boxes, providing a completely non-obtrusive and perfectly functional solution for their clients. These are still present in some American houses, although occupants might not be aware of their original purpose.

Figure 2: Milk box from Harvey Milk industry

Figure 3: Current condition of an embedded milkbox in a building from 1940

An impressive example of this kind of solution is that devised by Le Corbusier in 1946 in the units of the "Unite d' Habitation" in Marseille, France.(Figures 4 and 5) Local milkmen, icebox replenishers and even food deliverers of the adjacent hotel could serve this milk/ice box from the exterior, while homeowners could access it from the interior. Orders could be "…delivered directly from the corridor of access to the apartments, without the deliverer having to enter in the household or without having to alert the house keeper. »[40]

Figure 4: Milkman in L'unite d´Habitation

Figure 5: Exterior appearance of the main entrance of the apartments

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[39] This is particularly a problem because the products delivered in the morning are normally fresh milk, juice, and newspapers, which are often consumed before dressing up.

[40] Personal Translation from the French. The original version can be seen in the historic appendix, and in: Jeanneret-Gris L'unite D'Habitation de Marseille, Le Point Novembre 1950 Chapitre V. Pg 55

Milk delivery was deeply affected by the development of other containers that did not demand recycling, such as plastic-coated cartons (1932) and plastic bottles (1964)[41], and specially by the rise of the modern supermarket in the '70s.[42] By 1973 only 10% of Americans received milk and by 1995 fewer than 1%.[43]

Analyzing this historic process, the question arises whether this new kind of box solution will be looked upon in the future as a momentary trend (just another gadget of the internet gold rush) or a permanent consideration important enough to affect the physical design of the house.

The answer depends on whether the huge expectations for computer adoption, online shopping growth and related industries repercusions shown in the previous chapter will be enough to change the world we live in.

On a different level, a historic parallel between the repercussions in society of the internet and the telegraph can be useful to answer that same question. Tom Standage, in his book 'The Victorian Internet' addresses this topic wisely and concludes :

« That the telegraph was so widely seen as a panacea is perhaps understandable. The fact that we are still making the same mistake today is less so. The irony is that even though it failed to live up to the utopian claims made about it, the telegraph really did transform the world. It also redefined forever our attitudes toward new technologies. In both respects, we are still living in the new world it inaugurated. »[44]

HISTORY OF SIMILAR APPLIANCES

I first conceived of the deliverEroom as a space where people could come to deliver physical goods, with access controlled by the locking mechanism previously described. The room would allow access to a refrigerated area, a secured area, and probably a back-door entrance to the household. Soon I realized the incoveniences of this scheme : the space requirements were too demanding, such a complicated solution seemed unnecessary, the lack of clarity of the space as private or public turned it into a no man's land, few housholds could afford it, and overall, it would be a solution exclusively for new designs, leaving the existing 102 million American households unaddressed.

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[41] Available at www. Whymilk. com

[42] "The milkmen still cometh:" DAN McSWAIN, Staff writer. NCTimes, 4/9/00

[43] Available at www. Whymilk. com

[44] Standage, Tom, *The Victorian Internet*, published by Berkley Books, New York. pg 207.. Published by Berkley Books, Copyrighted in 1998.

I began to think about an external unit that current householders could locate in the exterior of their properties. Over time homeowners would begin to embed it inside the walls of their house, and architects would realize the importance of providing a space in their designs to install this unit unobtrusively. The milkbox examples described in the previous section reinforced this thought. History had once again something to say : This unit thus fell under the rubric of appliances, and its adoption would depend on forces of society beyond architecture.

Appliances began entering the household in the early years of the 20th century, although many patents for stoves, vacuum cleaners and refrigerators were filed in the mid 1800s. "The lightening of household burdens by the mechanization of work progress was most conspicuous among the cleaning tasks: laundering, ironing, dishwashing, carpet sweeping, and furniture cleaning. Parallel with this ran the mechanization of heating and refrigeration."[45] The turning point for their adoption came in the early 1900s as electric current began to be available in American households.

Some appliances can be moved around and stored, such as the vacuum cleaner or the blender, but others require fixed connections and a permanent location, such as the refrigerator, the washer, dryer, dishwasher, air conditioning system and heater. As these machines have strong physical presence and requirements, from the begining problems threatened their adoption. The acceptance of large industry players was key to market these appliances: In the case of the refrigerator the appliance industry played a great role producing lower cost machines and advertising their benefits[46], and in the case of dishwashers, promoting architectural design competitions to redesign the kitchen under a "single working surface" idea, under which the dishwasher and the electrical stove would appear seamless.[47] Architecture bows to the needs of society, and particularly when pushed by the economic forces.

From this perspective, it is possible that the physical requirements of the deliverEroom concept will not be an unsurpassable barrier, and judging by the players [48]backing the "networked boxes", strong economic forces will soon push for its adoption.

The Unites States household design evolution has been strongly driven by industry and business processes optimization ideals. Sigfried Gideon writes, in his book 'Mechanization Takes Command': "Household organization in Europe

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[45] Sigfried Giedion, Mechanization Takes Command, Oxford University Press, Inc. 1955. Pg 597

[46] "Around 1916 the large corporations started production. The price was still high, the refrigerator cost $900. Not until the mid twenties the mechanical refrigerator became popularized. In 1923 there were 20,000 refrigerators in the United States. In 1933: 850,000. How the curve rises sharply: 1936: 2 million; 1941: 3 and a half million. With the automobile the mechanical refrigerator had become an indispensable element of the American household.", Sigfried Giedion, Mechanization takes command, Oxford University Press, Inc. 1955. Pg 602

[47] Sigfried Giedion, Mechanization takes command, Oxford University Press, Inc. 1955. Pg 575

[48] Already Whirlpool and Electrolux have taken stock in two of them. USPS is also said to help promote the boxes soon.

found its starting point elsewhere: within the new architectural movement. In the nineteenth century kitchen and bath, the plan of the house, its very organization, had bowed before decorative ambitions. Cutting away the false front economy, the young architectural movement based itself upon the functional. This limitation proved a most beneficial cure. The Continent trend then, stemmed neither from the industry nor from scientific management. Its mover was the architect. The architect restated the whole problem of the house, and reconquered the position he had lost in the nineteenth century. He became once more the specialist to build a framework for living."[49] Once again, the deliverEroom concept will be driven by American corporations first, since the US is the country that requires it the most.

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[49] Sigfried Giedion, Mechanization takes command, Oxford University Press, Inc. 1955. Pg 576

CHAPTER 3:
HOUSING CONSIDERATIONS and SPECIFIC PROPOSALS

I have argued that the delivery solution is not a short term trend of the internet boom, that it matches the industry players best interests, and having established similarities with historical processes and solutions. One step remains before defining the physical characteristics of the unit: to analyze the types of households Americans live in and the possibilities they offer to accommodate this new type of appliance. Combining the results of this analysis with the findings in the US demographic data shows that the deliverEroom solution is especially suitable for the US.

HOUSING CONSIDERATIONS

The US Census Bureau clearly differentiates between a household and a housing unit. A household consists of any group of related or unrelated people who share living arrangements, a single family, one person living alone, two or more families living together. A housing unit is defined as 'a house, an apartment, a mobile home, a group of rooms, or a single room that is occupied (or if vacant, intended for occupancy) as separate living quarters.'[50] A vacant apartment (vacations, for rent, etc) is counted as a housing unit, but not as a household. By definition, the number of occupied housing units is equal to the number of households.

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[50] Separate living quarters are those in which the occupants live and eat separately from any other people in the building and which have direct access from the outside of the building or through a common hall.

102 million households accommodated the 276 million people that account for the US population in the year 2000. Households are grouped into two main groups: urban and rural, and into 3 categories depending on their location: central cities, suburbs and outside metropolitan statistic areas (MSA). Crossing these two databases, the Census establishes that:

30% of households are located in central cities in urban areas.
33% are located in suburbs in urban areas.
14% are located in suburbs in rural areas.
 3% are located in rural areas
15% are located in urban areas outside MSA.[51]
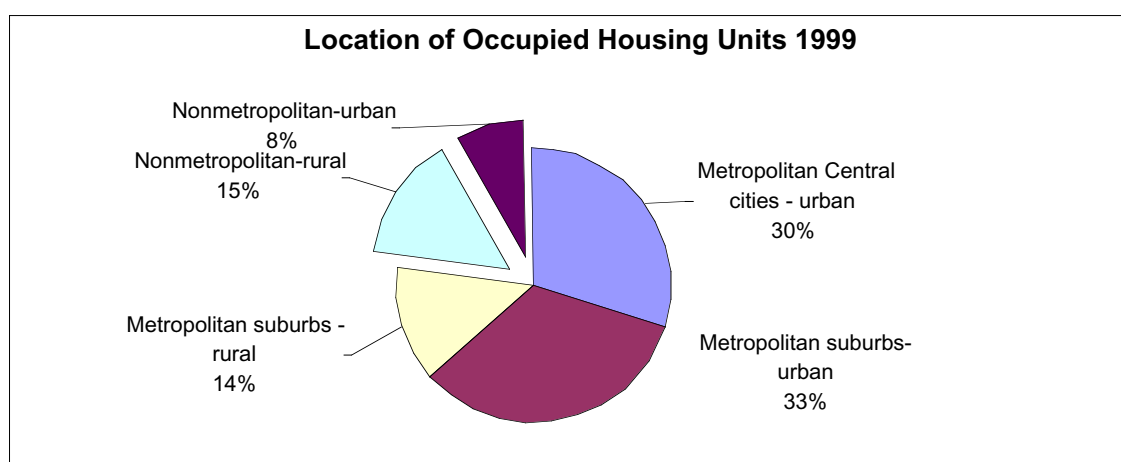
Table 3: Location of Households in the USA. Data of the American HousingSurvey 1997, published by the Census Bureau Office at http://www.census.gov/hhes/www/ahs.html

A housing structure can hold one or various housing units. (An apartment building is one structure, regardless of how many units it holds.) In determining the number of housing units in a structure the census counts all units, occupied or vacant, and presents statistics for the number of housing units, not the number of residential structures. Therefore, the numbers shown are related to the number of all housing units (a total of 115 million).

Housing structures are divided into single unit and multi-unit structures depending on whether they hold one or more housing units. Statistics show that 76% of housing units are located in single unit structures and the remaining 24% in multi-unit structures. More specifically, of the total number of housing units 68% are located in single detached structures, 7% in single attached ones. Housing units located in multi-unit structures are grouped according to the number of housing units of the structure that hold them: 2-4 (8%), 5-9 units

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[51] Households located in rural areas outside MSA are not ideal for a deliverEroom solution, since they have reduced service conditions from delivery services .Delivery companies normally do not deliver to the doorsteps of these kinds of houses, but they aggregate packages in public locations or groups of mailboxes. Even though a deliverEunit solution could be implemented to replace those grouped-box solutions, those will not affect the architecture of the house even in the long term.

(4.7%), 10-19 (4.3%), 20-50 (3.25%), and more than 50 units (3.24%). This is better illustrated in Table 4.
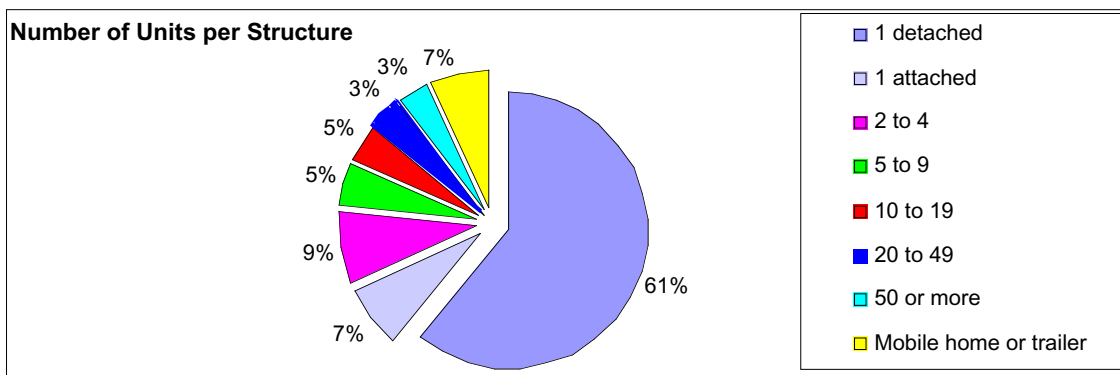
Table 4 Number of units per structure. Data of the American HousingSurvey 1997, published by the Census Bureau Office at http://www.census.gov/hhes/www/ahs.html

The combination of housing type and location most common across the US is the single detached suburban house, which accounts for almost one third of all the households. Another third is composed by single detached houses in other locations. Table 5 illustrates the overall results:
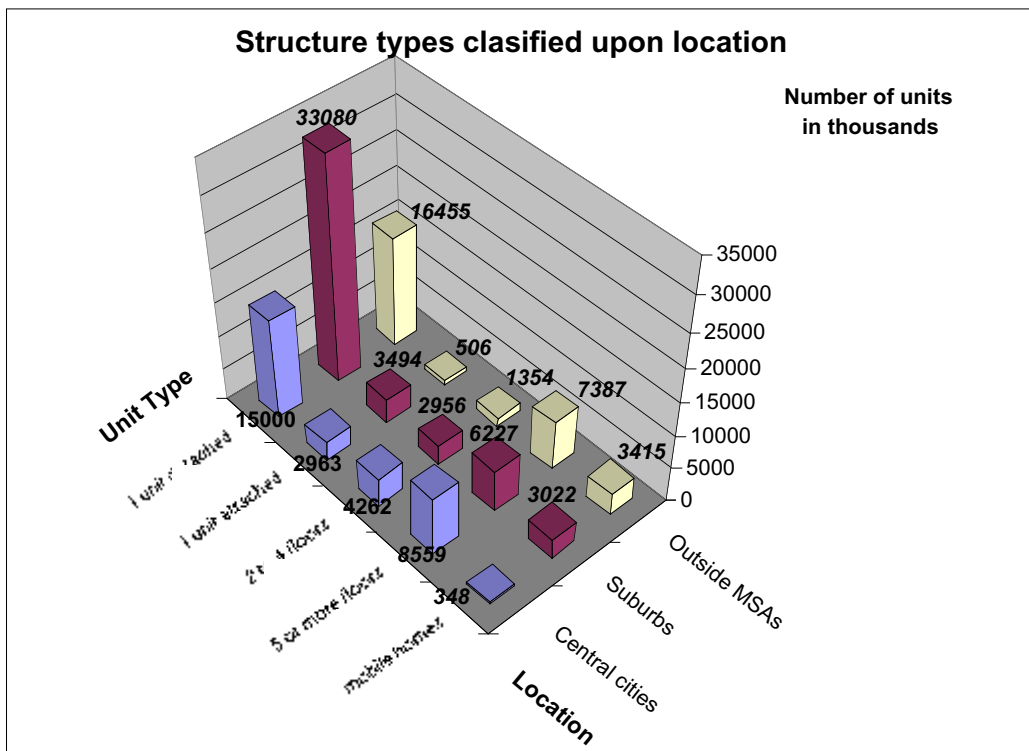
Table 5. Structure types classified according to their location. Data of the American HousingSurvey 1997, published by the Census Bureau Office at http://www.census.gov/hhes/www/ahs.html

Perhaps the most astonishing fact lies in the demographic composition of households in the US. Twenty-six percent of all households are occupied by a single inhabitant[52] and an additional thirty-three percent are occupied by two people[53]. If we take into account that the great majority of single dwellers work, and as many as seventy percent of couples have two incomes, we can see why delivery agents often find nobody home. During daytime, when packages are most likely to be delivered, there is usually nobody home in almost half of the US households.

Two-person households occupying single unit structures are the most predominant combination (23 million), followed by single occupancy households in single unit structures (12 million). Single attached housing unit structures occupied by a single person and by two people number 2 million cases each. Table 6 illustrates the numbers of those and other combinations.

Units grouped by number of residents per household for each Type of Structure
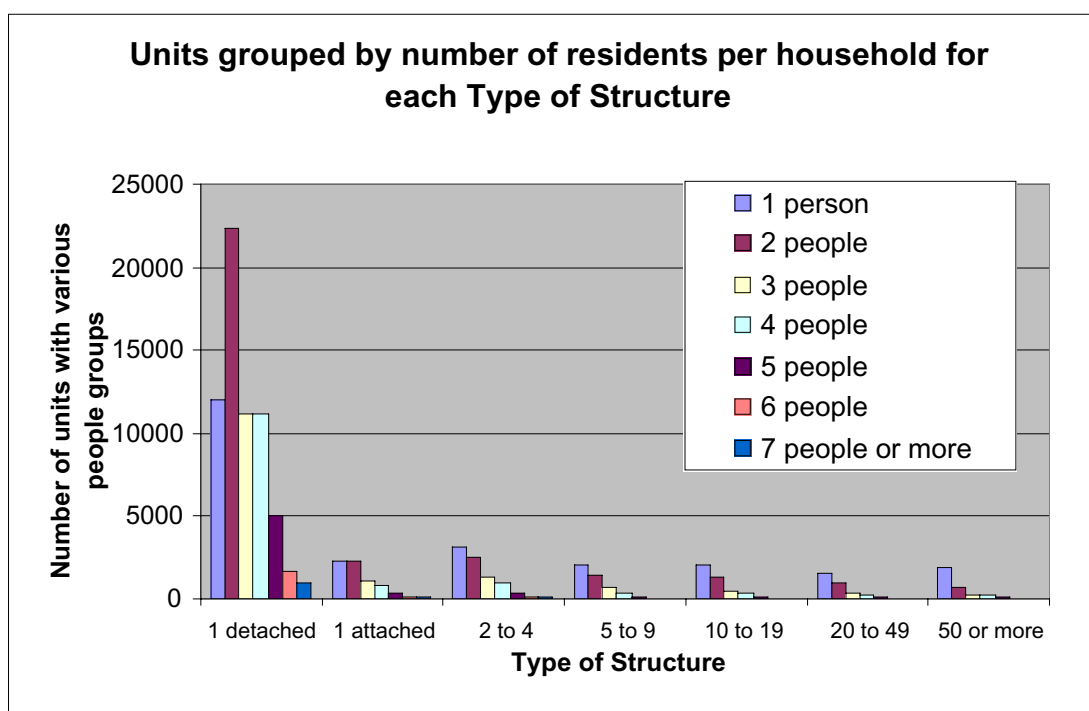
Table 6 . Type of units by number of people in structure. Data of the American HousingSurvey 1997, published by the Census Bureau Office at http://www.census.gov/hhes/www/ahs.html

From the preceding analysis we can conclude that the number of American single unit structures that most clearly require a solution for the unattended delivery problem adds up to 31.75 million. (70% of 22.5 million + 12 million + 70% of 2 + 2), almost one third of the total number of households in America.

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[52] Single dwelling has been a constantly increasing trend since the 1940s. Historical data show that one person occupancy rates have been increasingly growing in the history of the US: 7.7% in the 1940s, 13.3% in the 1960s, 22.7% in the 1980s and 24.6% in the 1990s.[52]

[53] From the tables of the American Housing Survey for the United States 1997, published by the Census Bureau in 1999.

(102 million). Housing units in multiunit structures are occupied by a single person in 10.5 million cases and by two people in approximately 6 million. In particular 17.5 million housing units require a better solution.

SPECIFIC PROPOSALS

Different solutions for the different types of housing units are suggested below. The proposed solutions derive from the previous housing, economic, and historic analysis.

Single Unit Structures

a) The porch

Historically the porch has been used to receive merchants or deliverers, as well as to leave unattended packages. We can expect a reasonable number of these areas to accommodate deliverEunits in the United States.[54]

A "porch, deck, balcony or patio" has been reported[55] in
- *90% of all single-detached*
- 76% of single-attached
- 59% of multi-unit households.

In the same way that a balcony would be present particularly in the multiunit (and multistory), porches in single housing units are expected to account for most of the reported units.

This area of the dwelling would particularly be feasible in the suburbs, where 86% of *all* housing units report a "Porch, balcony, deck or patio". [56] It is likely that housing units are on average larger in suburban areas than in the cities, and thus porches in suburban areas are likely to be larger than in the cities. There would be as many possible locations for deliverEunits as there are porches.

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[54] The Census Bureau only counts this spaces if they have a minimal dimension of 4 by 4 feet.

[55] Pg 105 AHS 99: Out of 64536 thousand detached single unit houses, 58081 thousand have reported a porch, deck, patio or balcony. Out of 6963 single unit attached houses, 5305 have it. From 24,518 thousand multiunit, 14,511 thousand report it.

[56] 22416 out of 31131 occupied housing units in central cities. 41788 out of 48780 in suburbs. 19295 out of 22891 outside MSAs.

b) Front Yard Area

Another possibility would be locating an independent unit in the front yard area. Units would then play a role of urban furniture, offering the possibility to provide signage for the address, a lamp for the front yard, or whatever its user wants it to be. (See figure 6 for a similar approach)

As the same person of each courier company makes 95% of deliveries to each house, "disguised" units would not present a problem for deliverers, especially when one takes onto account the increase in their efficiency, not having to climb stairs or walk paths all the way to the front door to deliver a package.

In the suburbs the "front yard" solution would prove particularly efficient: Houses in the suburbs normally have a path or entryway to access the unit. Where this path meets the main road, the traditional mailbox unit is normally located. Law enables exclusively USPS to use this mailbox. Other courier companies must go all the way to the doorstep of the unit, ring the doorbell and wait for an answer in order to leave a package. Size and design considerations would be determinant in this scenario, as the unit would inevitably be exposed.[57]

The deliverEunit could be also located either in the entryway next to the main road, if courier companies invest in this system believing they can increase their efficiency. It would be located inside the house area, most probably in the porch of the house, if it is the consumers who adopt the system.

c) The garage[58]

Another possible location for the deliverEunits is the garage or carport (by definition a covered area), when its use and entrance are exclusive to the housing unit.
Single detached units seem to be the only feasible adopters of this system.

- 77% of single detached units report a garage space.
- 44% of attached units
- 4% of multiunit housing units report it.

The locking device can be adapted to the garage door itself, turning the entire garage into a deliverEroom. This adoption depends on the trust users will develop in their deliverers, or other additional control methods designed individually.[59]

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[57] In a press-release at ebox.com, an article featuring a person selling boxes to be buried in customer's front yard supports this idea.
[58] More precise data of garage presence among US housing units will be found in Appendix 4.
[59] Streamline.com provided this system for a year, with excellent results for the consumers but terrible economic ones for the company. Their system also included the rental of a refrigerator and the installation and rental of a keypad device on the garage door –or other selected area- for $30 a month. Peapod Inc. recently bought the company and decided not to keep the system.

d) Built-in

Although 72% of housing units in cities have a porch, neighborhood security concerns and direct exposure to street life seem to threaten the success of freestanding deliverEunits in urban areas.

The built-in type would be more favorable for housing units within the city, providing also a more useful service making the goods available from the inside of the household. Because of their location within the house, electricity can be used to add refrigeration capabilities to the deliverEunit, making it an intermediate stop for produce that will end up in the refrigerator or the shelves. This seems especially useful for everyday grocery deliveries, as it fits perfectly with their marketing strategy: Online grocery deliverers only offer their services within central cities, due to the cost of transportation and the efficiency requirement of the system.[60] Therefore the built-in type would be particularly appropriate for the cities.

The built-in unit could be located in a variety of places[61]:
- Main door entrance, as part of the portal to access the household.
- Back door entrance, where existing and if accessible to couriers for the street. In most cases, whenever there is a backdoor entrance in the house, it leads to the kitchen or a service area.
- Locating the unit in the kitchen interior would make the deliverEunit part of the shelves and appliance system.

Multiunit Structures

Although multiunit housing only accounts for 24% of the total number of housing units, they seem to have almost 1/3 of the total online delivery failures.[62]

Many multifamily complexes are secure from entry, so usually delivery companies can't get access into the building. They depend on managers or doorkeepers to leave a package when the customer is not home, as leaving it unattended on the doorstep of a multifamily building is not an option.

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[60] To tackle the economic challenge of making on-demand delivery profitable, Webvan, Peapod, Streamline.com and HomeGrocer.com have all built their first delivery networks in major cities targeting upper-middle class families in high-density neighborhoods. A busy, well-to-do household tends to make an average order in excess of $100 recurring 40 times a year versus singles who tend to spend half that approximately 10 times a year. According to many of the companies, the former rather than the latter is the only way to make it work." Taken from Reviving Home Delivery Christopher M. Smith, Danilo Lacayo and John Callan, management consultants with PricewaterhouseCooper's (PwC) Global Postal Industry Team. Available at www.pwcglobal.com.

[61] Refer to Appendix 8 to visualize these solutions

[62] In 1999, there were over 250 million missed residential deliveries in the United States, with 80 million of these occurring in the multi-family housing market. A Forrester Research study found that the number of missed e-commerce deliveries to multifamily residential communities will double from 80 million in 1999 to 160 million by 2001". This assumption is based on the number of missed deliveries notes that multiunit report, according to shopperbox's website: www.shopperbox.com

Managers or door keepers usually receive and retain deliveries until tenants claim them. This works well for packages, and with the exception of after-hours deliveries the system would be difficult to improve. Nevertheless, doorkeepers are not commonly available in average multiunit buildings, and deliveries take longer when the delivery person must follow instructions to find the manager when the recipient is not home.

Solving this problem calls for a higher degree in the technological solution. The following are a range of possibilities devised to address this incipient problem:

Electric Manager:

A deliverEunit can incorporate a scale. In this way, the device not only registers who opened the box and when, but also the weight of the interior of the box before and after it was opened. Multiple deliveries for multiple users would be possible. This unit would necessarily have a larger capacity, and would probably be built upon request to accommodate not only the number of users but also its location. Some multi-unit structures have porches (at least some kind of covered area where visitors can wait for the door to be opened while protected from weather conditions) and almost all have a lobby. This would be the place to install deliverEunits.

DeliverEunits for each apartment + Entercom

In apartment buildings with doormen, they can open the door, receive goods, and/or control access of deliverers to the units. Where there is no doorkeeper, a more technologically advanced solution is required to open the door. For example using an Entercom[63]. The building's main intercom stores or receives codes that match those available in each apartments' unit. Every time a code is produced for any of the units inside the building, that same code is sent to or generated by the intercom system. The electronic signature is only released once both codes have arrived at the destination.

Cluster boxes

Another solution is to implement a cluster of boxes, just as traditional mailbox builders have done for a long time. This has a historic precedent in the 1940s: "In 1945 fashionable New York apartment houses were to install basement locker plants with at least one locker for each tenant."[64] In the time of online orders, a computer-based device could control and monitor access to each box independently, and would provide an electronic signature per box.

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[63] currently under development by SPHSolutions Corp.
[64] Sigfried Giedion, Mechanization takes command, Oxford University Press, Inc. 1955 Pg 605

The question here would be whether the cluster of boxes would be located inside or outside the multi-unit entrance door. Similar units have been placed traditionally for mail. Deliverers from the United States Postal Service can obtain a key to enter the building lobby, where usually these cluster boxes are located. In order for this to happen, the building administration must send an official request to the USPS to incorporate their key into the key chain of the deliverer. No other courier may do this. On one hand, security concerns could be raised; on the other hand, FedEx, UPS, Airborne, and other couriers have not been trained to carry around 200 keys on their pocket. They might argue the system would be inefficient and that if nobody is home, why bother to enter the lobby when in the majority of the cases a signature is required?

This leads to the conclusion that either the cluster boxes would have to be located outside of the building, or that a solution similar to the Entercom solution described above would be required in combination with this system.

Other problems:

Reception of perishables:

Managers will not receive and store groceries for every resident of the building, considering space requirements and the perishable character of produce. Managers (or doorkeepers) normally open the door to allow the entrance of deliverers once the customer is at home. This could work with a deliverEunit installed at the apartment entrance (preferably built-in) for the convenience of the two parties. This is easy to accomplish in new construction, though difficult for existing units.

High Rise multiunit buildings

Many High-rise apartments have doorkeepers and sometimes also service entrances. Besides this, people living in luxury high rise buildings usually have some kind of daily home service. DeliverEunits would not be a particular necessity for unattended delivery but would serve architectural intentions in this tiny segment of the population. Deliveries to the home could bring back clearly differentiated service areas expressed in independent vertical and horizontal circulation designed to serve the households.[65]

A close reference to this kind of use was provided by Le Corbusier in the Plan Voisin, where he designed an independent service circulation on each floor.

[65] Some buildings could use this solution already, according to the following testimony:"At 2:10 on a recent afternoon, Mr. [Randy] Cervantes pulls out of Webvan's San Francisco depot and heads for 100 McAllister St., a high-rise dormitory for Hastings College of the Law. This is one of Webvan's best -- and most exasperating -- stops. More than 50 law students there now order groceries online. "We've had days where all you have to do is park at this building and take the elevator up and down for hours," delivering groceries, Mr. Cervantes says.[65] Wall Street Journal Print Media Edition: Eastern edition, New York Dec 15, 1999

Surely he was considering the delivery problem as in the Unité d'Habitation, but with a different approach for a different kind of user.

Although these solutions seem interesting, the current document will not explore it further. First, because they would require a customized solution for each case, and the result would depend on a wide set of individual variables. Second, because 75% of all households are located in single unit structures, and addressing those primarily fits the focus of this thesis best: to propose an in-depth solution for the great majority of American housholds.

The following section explores the design considerations to establish the physical features of the deliverEunits to be included in the single housing structures, and therefore, those of the future deliverErooms.

CHAPTER 4:

DESIGN FEATURES

Based on the previously proposed solutions for the single unit structure housing types, three stages for user's adoption have been identified:

1. The deliverEunit as a mailbox totally detached from the home.

2. The deliverEunit as an external object, though connected directly to the home through a back door.

3. The deliverEunit embedded inside the architecture of the house. (This is generally only possible for new construction or remodels only)

The design proposed would work appropriately in any of the three stages defined, and allow users to "upgrade" to a next level of comfort when they become familiar with the benefits of making it a portal to their house. The major concern at this point is the design of the deliverEunit itself. Although the first stage imposes minimal architectural considerations, in the second and third stages they are outstanding.

Notice the conflicting physical determinants for the design:

The unit should:

- Be theft-proof and strong, but attractive or at least unobtrusive for the user.

- Be as small as possible – space limitations are evident especially in the cities- but capable of receiving as many packages (if not all) as the user demands. Every inch counts.

- Allow users to self-install the unit, but at the same time be impossible to steal.

- Appear evident for deliverers as a delivery portal, but unnoticeable for passers by. The fact that the same delivery person does 95% of deliveries to a specified house helps.

- Be ergonomic for deliverers - who do around 45 deliveries an hour[66]- to deposit a package without sacrificing owner's comfort.

- Be as standardized as possible, in order to reach economy in the mass production process.

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[66] Personal communication with Daniel Nicholls, Financial operator at UPS Seattle on December 4, 2000.

- Be cost effective to ship (volume and weight) or otherwise transport.

- Be able to receive perishables if the user desires (upgrade to) an insulated option, without changing major design features.

- Provide several possibilities for the end user, to satisfy a wide range of users and places where the unit would need to be accommodated.
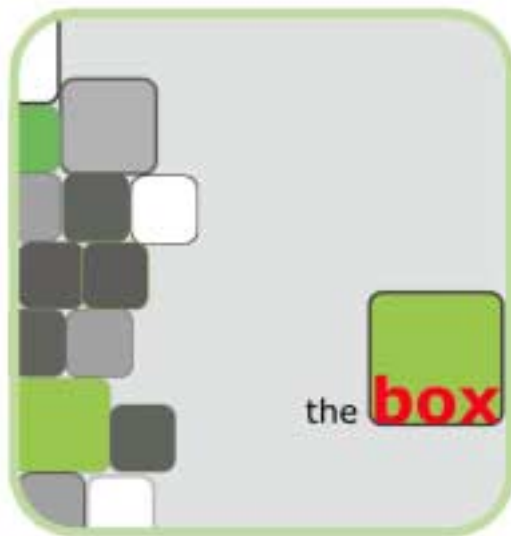
DESIGN PROCESS

This exercise aims to transform an abstract concept into a tangible element. It provides a design solution for a deliverEunit and its possible implementation.

The industrial design exploration addresses four main parameters: size, materials, physical presence or design, and installation method. The method used to address these issues was based on the following steps:

1. Analyze related solutions from other companies.

2. Establish the required dimensions

3. Finding a similar industrial design object and attempt to design the unit.

1. Analysis of similar solutions[67]

Most of the companies presented below had not been launched in May 2000, when I began to develop these ideas. The fact that almost one company each month has been created from May 2000 to May 2001, strongly supports the idea that this concept is spreading widely.

a) Dvault

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[67] For a complete presentation on each company's products users can refer to the Appendix 7

With a simple trap principle used for years by deliverers in their drop-off boxes, Dvault has taken a further step making this product available for consumers. It solves mainly the unattended delivery problem for consumers and deliverers, providing a secure space to deposit packages, and making packages retrievable only to the owners through a key-locked back door.

It solves the delivery of any kind of package, not only e-commerce packages, but does not acknowledge receipt of packages (signature). The company claims it is working on that through a wireless solution. The company acknowledges the wide range of user's tastes suggesting that wrap the box with materials such as brick, stucco, stone, etc. This makes sense because these boxes are designed to sit in the front yard.

Figure 6:dValut boxes covered with stuco and brick

Dvault also offers a built-in type box, or wall mounts. Although the built-in box appears as a better architectural solution, it becomes a portal to the house that raises security concerns, since anybody could drop in anything.

b) Shopper's Mailbox

Shopper's Mailbox solves the problem of unattended delivery for consumers and deliverers based entirely on the consumer's participation. It has a programmable key-pad lock that the user can program and leave a note to the delivery company to use any number that only they know. For example, the consumer can instruct the deliverer to use the first 6 numbers of the 25 digit tracking number.

This is the simplest use of technology to solve the problem. It relies entirely on the consumers' need of receiving the package and does not provide security for multiple deliveries.

c) EBox:

This Canadian company based in Toronto and New Hampshire targets the entire fulfillment chain. They offer an e-shopping website, specially designed silent trucks to deliver at night, and e-boxes accessed only by their deliverers. Each eBox is equipped with a keyless and wireless entry system that is uniquely programmed, allowing entry only to the owner and the deliverer through an infrared access card (similar to the pocket transmitter that can be used to open garage doors).

d) Z-box:

Z-box is a consumer oriented, integral solution for the delivery problem. It allows the key-pad to be reprogrammed with one 4 digit code for the user to open the recipient's box always, 4 5-digit codes for the user to write down as part of the address in web sites that are not part of zBox' program, or to provide them to friends and family for sporadic use. It also allows access through certain 6-digit codes that only the Z-box server has access to, and that are embedded in the address line of online orders made from their browser-style site. This gives users the convenience of receiving multiple and repeated deliveries, and provides also for returns.

e) Brivo Systems:

Based in Arlington, VA, Brivo offers the most technologically advanced solution for the unattended delivery problem. Seeking to capture the entire market, they offer a wireless solution to program keypads of single and multi-unit households, and businesses.

The Brivo system is operated via a website that is connected to a wireless communications network. The software architecture and business model are engineered to make it easy for an appliance company, a consumer electronics firm, a homebuilder, or any other manufacturer to design, produce and market its own products that work on their operating system. They have marketed their own product as well, the brivo box. The box contains a two-way wireless modem with an embedded 386 processor that tracks who delivered what and when, then alerts its owner by email, and keeps track of each delivery.

f) @lantes:

This direct competitor of Brivo seems to have closed its doors, having recently announced a change in their business model to that of an Application Service Provider. Their technology was based on wireless programming of the keypads and smart cards given to deliverers with the codes for the day.

They were supposed to offer three types of smart box solutions. Each model was to include a module featuring a keypad, an LCD screen, and a smart-card slot, which would allow authorized individuals to securely access the box or the garage.

g) Ezzebox

Based in Australia, this company offers the same product as the Brivo box with variations in its size.

An ezzebox is a stand alone item - battery operated, has its own modem yet is completely wireless, which means you can locate it wherever you choose. It features a state-of-the-art touch key pad and a proprietary access system that generates a unique code for each delivery.

h) Shopper'sbox

The ShopperBox is an Internet connected multiple compartment delivery station that would be located within multi-family apartment complexes, condominium communities, gated neighborhoods and commercial complexes. They are also intended to be located in public congregation spaces such as malls, each with an individually assigned address.

Deliverers have a universal key that opens all the boxes in an area. They may deposit in any compartment of the locker cabinet. Through the internet connection of the unit (it is connected to electric supply and through cable and telephone lines to the internet site), the network notifies the owner of the package by mail, pager or telephone that a package is waiting, and provides the one time use code to open it. The service is free for members, and landlords and apartment complex owners pay a rental fee. The company plans to charge carriers for their service and a universal key to open all stations.

2. Establish the dimensions

The most crucial question of the deliverEunit is the size. A customer who acquires a box for online shopping would not appreciate that after purchasing and installing the unit, giving away considerable space, and counting on the system, he found a "sorry we missed you note". If the recipient has space limitations the owner would need to calculate packaging sizes for his orders. What is worse, the business model to make this system sustainable (and therefore widely accepted by the industry) would fail, when carriers were unable to discount shipping prices in mass and would have to make individual calculations. On the other hand, calculating the size of every package would become a costly addition to the e-tailers' already complex shipping process.

The only way this model could work is if there were a guarantee of delivery, and the unsuccessful exceptions were so few that they could be overlooked by carriers.

The departing point for this analysis is an architectural consideration directly related to the built-in type space: wall interior dimensions. Following is a brief description of issues related to the shipping industry and the box sizes the three main carriers handle and sell. The third part gathers information from the people who have more knowledge of shipping package sizes: the companies whose business is to manufacture boxes for online shoppers. The ideal design would relate these three parties in an optimal manner.

a) Built-in considerations:

A design should take into account these future considerations in the first place. If the unit is to be embedded in the wall its design must consider the interior dimensions of the walls. The great majority of construction in the USA is built with a wood or metal framing structure. Large panels of 8' x 4' agglomerates cover the walls of framed studs (2x6 normally, 2x4 to 2x8 sometimes). Studs are usually located every 16" on center (3 per panel) to give appropriate support, though sometimes they are spaced 24" on center (2 per panel) when pursuing economy or working with stronger panels.
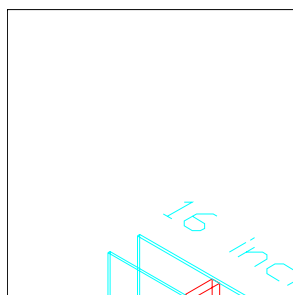
Figure 7. Dimensions of the unit to fit into wood framing construction

This separation between studs suggests the dimensions of the embedded units to be 16, 24, or 32 inches in order to fit in or match the structure. Some hints of this have been observed in some of other companies' products.

The most common boxes sold in stores exceed in length, width and height the 14.5" between the faces of two consecutive studs. Although it is a generous size, a 14.5" box would only accept one third of the packages UPS sells at their customer Centers. Perishables cannot be piled on top of each other, and the 14.5" dimension would allow only two or three grocery bags, which seems too small for future home delivered groceries.

The next consideration, one more subjective, is that this object must *appear* as small as possible. A series of experiments through 1:1 models produced the following observations:

- Even though the volume contained inside is the same, a vertical object appears more obtrusive than a horizontal one when sitting on the porch.

- Proportion is important to give the appearance of lightness to the object. Increasing the length of the unit made it appear slimmer.

- This object is too massive to make it a "sexy" object. Inspirations such as Apple's computer "cube" and other forms seemed inappropriate.

- A cube is the least flexible receptacle for package capacity. All three dimensions are the same, and this only happens in a very small fraction of shipping packages.

- The unit should work in three different orientations: lying on its height, on its length or width. An ideal unit could accommodate different people needs in the most varied ways. Once again, a cube only allows the unit to be set up in one way.

- An ideal height would allow users to sit on the object –use it as a chair on their porch. The dimensions should be kept low enough, at least in one side, to allow this to happen.

b) Shipping industry standards:

The most useful data for shipping cost effectiveness is that given by UPS. Length is defined as the largest dimension. Girth is the sum of the 4 sides of the width and height. When added to the length, this number cannot exceed 130 inches in order to maintain the cost effectiveness. If this constraint is exceeded, the shipment will carry a minimum surcharge of 50 dollars. This is the largest capacity shippers usually work with.[68]
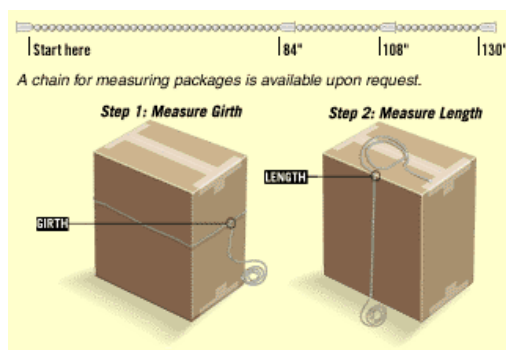
Figure 8. Girth + Length<130"

"UPS carries only the boxes that have the highest commercial use in its customer center counters", a customer service representative said over the phone. They

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[68] This information is important as well to consider the shipping cost-effectiveness of the deliverEunits.

offer only six sizes that range from 30.5 x 22 x 10 inches to 12 x 12 x 12 inches.[69] Both UPS and FedEx offer a large box called the 25 kg box, used only for international shipments:19.5x17.5x13. USPS announces at its customer service points that it will not carry a package with dimensions greater than 20 x 20 x 25.

c) Similar company's dimensions:

Some other important dimension information comes from the companies' analysis presented previously:

- o From Dvault:: "The curbside model's storage compartment is 19 inches wide, 19 inches deep and 27 inches high. "We can take the biggest garment package from Macys.com."

- o From Brivo: "About 96% of e-commerce delivery would fit into two cubic feet of storage space"

- o From zBox: "A container 32' x 24' h x 21'd, is said to allow the reception of 80% of online orders and 70% of double online orders".

d) Shipping package industry

Two alternative interior dimensions for the deliverEunit were established based on all gathered information described above: 22 x 22 x 30 inches and 20 x 22 x 30 inches.

An analysis that studied the shipping package industry was required to choose from both. The conclusions are presented in Table 7.

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[69] Although in some of the largest centers (San Francisco and New York) they carry 30 x 26 x 22 or 30 x 30 x26 sizes, UPS's biggest available box in most of the country is 30.5 x 22 x 10. The other five sizes vary according to the city, but they could be generalized in the following measures: 24 x 22 x 20, 20 x 22 x 10, 19 x 12 x 3,18 x 18 x 14, and 12 x 12 x 12 .

			Would not fit in 20x20x30	would not fit in 20x22x30	not cost effective to ship
Corrugatedboxes.com	Total	80 sizes			
Total			23	21	1
total cost effective shipping			22	20	
Percentage that does not fit in the deliverEunit			7.31%	6.64%	
Percentage that fits in deliverEunit			92.69%	93.36%	
hillas packaging network	total	99 sizes			
Total			4	4	1
total cost effective shipping			3	3	
Percentage does not fit in the deliverEunit			3.19%	3.19%	
Packagingsupplies.com	total	241 sizes			
total not that does not fit			30	30	6
total cost effective shipping			24	24	
Percentage of packages not received in deliverEunit			10.04%	10.04%	
Percentage that fits in the deliverEunit			89.96%	89.96%	
Americanbox.com	total	772 sizes			
Percentage that fits in the deliverEunit			96.81%	96.81%	
Total			88	78	9
total cost effective shipping			79	69	
Percentage that does not fit deliverEunit			10.29%	8.98%	
Percentage that fits in deliverEunit			89.71%	91.02%	

Table 7. Percentage of packages that fit into the 2 preselected sizes for deliverEunits

The conclusion from this exercise is that approximately the bigger box would allow an average 0.5% more of conventional shipped boxes, while being noticeably bigger. The interior dimension 20 x 22 x 30.5 was chosen. It also fits 5/6 of UPS sizes, USPS biggest size, any FedEx's, Macy's biggest package.

3. Design attempt

Figure 9. Industrial Design inspiration

This plastic unit sold by IKEA is light, durable, flexible and resistant. It is also easy to produce, assemble, attach and combine.

These features inspired the properties of the deliverEunit proposed here.

The material selected is Low Density Polyethylene. Besides the characteristics described above, it is recyclable, secure and weatherproof. It can be mold injected into a hollow structure, allowing apparent thickness but low weight. The hollow thickness of the box's walls is required for the assembly system to work. It also allows manufacturing an insulated version of the box without making changes in the molds.

A thickness of 1- 1/2" provides the necessary strength for this lightweight structure. It also fits closely with the dimensions of wall studs in houses.

The box is to be accessible from its smaller dimension, so the lid and bottom are located in the largest sides. The lid location in the top is a useful feature for delivery people, but it would make it difficult for the owner to pick up a package without using his/her back muscles. Liability for back injuries would have to be clearly stated in the assembly instructions so that the owner makes the final decision. Otherwise, the unit can be installed vertically, and package delivery and pick up can be done by properly flexing the leg muscles.

The unit designed is a simple 4-sided box as the one pictured in Figure 10, with additions: metallic L-shapes to secure it, locking device and hinge, and installation pieces. Assembly procedures and possibilities, as well as the identification of individual components are presented in Appendix 8.

A 1:1 prototype of the unit and locking device was built and shown in the thesis presentation.

Figure 10. Non-insulated (translucent) and insulated (opaque) deliverEunits

CONCLUSION

We live in a rapidly changing world. The Internet has brought irreversible changes to our society, influencing and complementing existing patterns of communication, education, work, commerce and entertainment.

Online shopping is one of the ways commerce has evolved with the Internet, and purchasing physical goods online, one of the categories of this transformation known as e-commerce, is expected to become part of our common habits as the system continues to evolve.

Two clearly identifiable ways that consumers will increasingly use the Internet for shopping are:

Sporadic purchases:
In the same way that consumers go to the mall every now and then, the average e-shopper is expected to triple sporadic purchases within three years, and nearly double annual expenditure. These expectations are tied to increases in online security, decreases in shipping and handling costs, availability of a broader range of products, and maturing of consumer habits. The shops' losses will be the delivery services' gain.

Daily replenishment of produce
Taking advantage of the convenience of the Internet, customers can now have fresh produce delivered daily to their homes. Costs are still high due to the lack of scale efficiency in the system, but e-tailers are betting on the revival of this milkman model. Local milkmen, or "replenishers", are also using the net to revive and increase their businesses too. Either locally or nationally, these companies' aim to offer one stop shopping for their customers, and in doing so, developing one more possibility to deliver other e-commerce products efficiently.

No matter who wins or loses in the delivery business race, a major gap remains in the system:

If conventional package delivery will grow five-fold in the next five years, the 25% unattended delivery failure in the system will be impossible to maintain. This means that more efficient business processes will flourish. One of them is the reinvention of the milk box, enhanced by modern technology. The whole economic chain will benefit from this procedure, so marketing promotions will tempt customers to succumb to the industry player's interests. Customers will accept the system as it is strongly beneficial for them too, particularly in a country where three out of four of housing units are inhabited by a single person, two out of three households are composed by two people at most and 70% of the coupled households are dual income. The success of this system is guaranteed

because it makes sense for each of the three parties involved: carriers, e-tailers and customers. How will these solutions affect the appearance of the home?

Contrary to my initial hypothesis, this research suggests that the deliverEroom will not be a room that architects can design individually for each housing unit. Although in certain isolated cases a deliverEroom could bring extra comfort for dwellers, the core of this system requires standards and generalized procedures in order to work properly within existing households. It will become available first as an appliance that customers can buy and install in their homes.

The milk delivery companies from the mid 20th century provided milk boxes. They were large enough to accommodate various bottles and goods, and they exhibited their sponsorship proudly on the side. If customers were willing to allow this obtrusive elements in their porches and front yards why wouldn't they allow them nowadays?

Size, theft risk, cost, and accessibility are answers to that question and different companies are trying to address these problems through design and technology. Over the past nine months eight companies have come out with a related solution for unattended delivery. This proves the demand for a solution, but leaves homeowners and architects with the problem of providing an appropriate space for the units within their properties.

Three stages for user's adoption of the deliverEunit have been identified.

1. The unit as a milk box - totally detached from the home.

2. The unit as an exterior addition but connected to the home through a back door.

3. The unit embedded inside the building; i.e. in the deliverEroom.

In the first case there are no direct physical implications for the household, only for its surroundings. Around 70%of all housing units in America report some type of porch that could fit this unit, providing also shelter from weather and at least a perceptual protection from theft. Most deliverEunits will probably sit on the porch, just as their milk box predecessors. Three out of Four housing units in America are single units offering other possibilities for the location of the units in the front yard, the garage or the kitchen entry. Multiunit housing units require a higher degree of technology in order to provide a fully automated solution.

In the second and third stages there are strong spatial implications, and this is where the deliverEroom concept particularly demands attention from architects.

The concept of the deliverEroom is co-dependent with that of deliverEunit, as the first one is a space in the house to accommodate the second one. In the same way as a laundry room's shape and size depend on the washing and dryer machine's features, the deliverEroom's characteristics depend on the deliverEunit's features: its size, shape, and physical connections.

As it is impossible to universally state the architectural rules of a laundry room: It can be located near the kitchen, as part of the maid's area in certain societies, near the bathroom, inside a closet, close to a patio, in the garage, etc. it is also impossible to state a set of rules for the deliverEroom other than the most basic ones: dimensions and physical connection to suitable semi-private exterior and interior spaces.

Although the size of the deliverEunit may appear over-dimensioned at first glance, every cubic inch is necessary in order to provide an integral solution for the overall problem, and every linear inch is determined to fit the 2" x 4" framing structure that composes the great majority of American housing units. The deliverEunit will seem obtrusive and over-dimensioned at first (32" x 24" x 20" on center), but once architects incorporate this concept in the design stage, the deliverEunit will appear unnoticed and related harmoniously to the rest of the house. Remember that the dishwasher and the electric stove were not aligned underneath a single working surface until 1930, and before that time they seemed oversized and obtrusive.

This new appliance has spatial relationships even more critical than the traditional ones, and it is in the architect's hands to handle them properly. I expect this document helps in some way to introduce a useful concept for new projects and to provide the right tools to implement it.

The deliverEroom will be a requirement of the household of the future.

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APPENDIX SECTION

APPENDIX 1
BRIEF TECHNOLOGICAL DESCIPTION

The deliverEunit's access is controlled by a locking device that is networked to a central server. A brief explanation of the technology implied is presented here below with the sole purpose to give the reader an basic idea of the functioning of the system.[70]

The scenarios have been organized in three stages, according to the evolution of the technical possibilities.

2001

The locking device has 10,000 pre-stored 5 digit codes that serve two at a time. Every time a code is used, it becomes useless and requires the next secret code in order to be opened. Once the deliverEunit is closed again, it provides a confirmation number in the screen that the deliverer keeps as a proof of the transaction. That same number is stored in the device's memory to know exactly the order in which people have opened it.

Three possible scenarios.

1. The owner is e-shopping.
The owner clicks the check-mark "Do you have a "deliverEunit" at Amazon, Barnes and Nobles, Homegrocer, Drugstore or any other site. The address and name of the person go to the CGI and look for the related box number. It replies sending the box's next code to the deliverer, arriving at the same time as the rest of the order. Instead of a "Signature required sentence", the deliverer receives a legal authorization with a code attached. Invisible for the consumer, reliable for the deliverer, secret for anybody else.

2. Somebody sends a package.
The deliverer receives the package and logs into the server. Fills in the address of the person, or his name, obtains the box number, fills in the name of the office and a password, and obtains a code. Other no commercial delivery people can have a registration password to ask for codes too, if the owner of the box has them authorized. (For example the owner's boyfriend that wants to leave flowers) Let's suppose the company or person is not registered. The code is not released, and a notification notice is sent to the owner (e-mail, beeper or PDA) consulting if the person claiming access should be included in the list (become a guest). Same delivery-confirmation process.

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[70] The technology under development belongs to SPHSolutions Corp and is patent pending.

3. A phone order is placed.
The retailer logs into the server via the web with the automation software and checks if there is a deliverEunit in that address. The process described above takes place.

2003

All locking devices are connected to the main server, via telephone lines, cable or wireless connection, following the example of credit card terminals.
The owner places an order. The same automated process is repeated, having the check-marked butler-device box enabled. A code number is randomly produced at the central server, and is sent to the box itself, together with the transaction number.

Possibility 1
a) A Fed Ex courier comes to your house and identifies himself with his   electric id or smart-card that has encrypted his codes for the day. He slides it, or sends a wireless message to the box, and the box opens, comparing transaction and code numbers with its own. When closed, it provides a confirmation code to the deliverer and to the site, which immediately notifies the courier, retailer, and the owner of the unit.
b)The courier comes and inserts the transaction number printed in the package when prompted, followed by the code assigned.

Possibility 2
If another person comes, and the box cannot give access to him after reading his/her identification or receiving incorrect codes, she sends a message to the site, which immediately sends a wireless message to the owner asking for permission to deliver a new code. The owner replies from wherever he is, and the box can be opened or the visitor dismissed, after replying to certain password questions.

2005

Wireless (IP) appliances have taken most of the house. Web cams are very cheap and help monitor your house. A web cam is included in the deliverEunit, so that you know who the person asking for codes is, to check the inner state of your box, and to survey the quality of your products upon arrival. They can record everyday transactions, assuring maximum safety for the user in each of its transactions. The owner, if at home, may not want to receive the products personally. After all, he has already paid for it with his credit card, money transfer order, or electric wallet. He can also receive a doorbell signal to let him know when the outer door has been opened.

APPENDIX 2
EVOLUTION OF THE HOUSE AS A CONSEQUENCE OF MODERN SOCIETY

The essay written by Terence Ripley to support the exposition "The Unprivate House" in 1999, addresses the spatial evolution of "the house" as a consequence of recent changes in our society. His comments and observations in that document have been summarized in this paper and, supported with other findings on related topics, locate the "deliverEroom" concept within the "House of the Future" concept.

Some of the examples provided in the exposition can be seen only as vanguard attempts to introduce new concepts to the conventional house, but in essence, all together evidence through architecture a change in our social behavior. According to the curator of the exposition these modifications can be grouped into five main topics presented here below, but the way commerce will influence the household is not included.[71]

1. The Presence of the Public
"At the end of the twentieth century, a new relationship between public and private is emerging-one where the private is engaged with the public through media and technology. In both theory and practice, the ascendancy of these digital technologies has become a catalyst for contemporary architectural innovation and experimentation." [72]

Since the inclusion of media our society has become more sensitive to publicness. " A famous newspaper photograph shows an unconscious man lying on the ground, attended by doctors. He has been pulled form the sea and may die. Kneeling by his side is his fianceé. In the photograph, she has just noticed the camera, so she smiles brilliantly at it and adjusts her swimming suit." [73] It would appear as if being famous was a goal of our latest generations. Magazines that inquire useless details of the life of our so-called "celebrities" teem everywhere as a proof of this reality.

The consequences of the inclusion of media appliances have also help in the change of our social behavior. People can't live anymore without TV and radio. Web Cams and Spy Cams fill the Internet to show us whatever we need or have

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[71] Most probably the explanation to this is that the exposition gathers existing projects that feature certain characteristics. As this deliverEroom concept has not yet been materialized in any project, it is not possible to include.
[72] Riley, Terrence. Essay for the MOMA Exhibition, The Unprivate house.
[73] Architectural Design Magazine: Architects in cyberspace. Philip Tabor. I am a videocam- The glamour of Surveillance, pg. 1 8.

ever been curious about. We have become actors and spectators without knowing. Being on display is valid even if it is inside our own house.

2. Privacy

Private and public are not any longer clearly understood. " Once the last refuge from the hurly-burly, private houses long ago opened their doors. Even when the front door is shut, fax machines hum on bedside tables. Phones invade the sanctity of the bath." [74] Cellular phones interrupt classes and bus rides; conversations are publicly held regardless of the privacy of the issues involved. " Privacy has always been related to political considerations and individual rights, but of late these issues involve not only physical privacy, but the increased presence of electronic media in people's homes and daily lives as well." [75]

A project recently held in Barcelona hired an actress to live temporarily in a glass house, where all of her common-day acts could be seen. The world community was shocked; maybe they have forgotten Mies Van der Rohe's glass houses. Most of the 20 houses gathered by Riley are also clearly marked by some kind of exhibitionism factor.

3. The Family

"Today people who live alone or with one other person are the general public in many parts of the industrialized world."[76] "Around a quarter of American households now consist of one person. Half of the families in America consist of couples without any children living under the same roof."[77] Facts only suggest that this is a settled situation. "The population bulge is aging, suggesting that more people will live alone, or at least, without growing children at home" [78].

Many Americans leave home around 18. Going to college usually means moving to another state. Graduate School, if next, implies taking the best opportunity regardless of the geographical location. Young professionals are transferred from state to state depending on where their companies need them most. It is not surprising that Americans show such high rates of individual inhabitation.

4.Domesticity

Modern homes and lofts with their wide opened spaces, minimalism, and transformable spaces changed a domestic concept inherited from centuries behind. But it has nothing to do with fashion, but with the feeling of domesticity

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[74] The Washington Post, Washington, Oct 8, 1999. Linda Hales. Dream housing In a Dicital Age: Forget the Rules. Focus on how you really live.
[75] Riley, Terrence. Essay for the MOMA Exhibition, The Unprivate house.
[76] Riley, Terrence. Essay for the MOMA Exhibition, The Unprivate house.
[77] www.census.org
[78] The Washington Post, Washington, Oct 8, 1999. Linda Hales. Dream housing In a Dicital Age: Forget the Rules. Focus on how you really live.

itself. Changes originated with the feminism revolution are also related to this demographic alteration.

Ripley writes: "Of typical representations from the first half of the nineteenth century of German private houses, the historian Alexandra Richie (in Faust's Metropolis: A History of Berlin; 1998) describes how the "the rooms were cozy and homely, with wooden floors and striped silk wallpaper, filled with dainty furniture of lavender and cherrywood. The center of this world was the family. The comfort of the houses suggested by Richie's words, and the orderliness and functionality that would have maintained them, were not spontaneous inventions of an architect. Rather, they represent highly refined attitudes that could scarcely have developed if it were not for the fact that for over two centuries the intellectual and physical capabilities of bourgeois European women and their later middle-class American counterparts had been channeled toward the near-exclusive responsibility of tending their houses and caring for their families." [79]

5. Work

According to the definition of telecommuters as " employees of business or government agencies working part or full time at home instead of at the office" [80] there is clear evidence this work trend is a major transformation in the United States since the beginning of the1990's. [81] As of this moment, the Internet had not yet influenced people's life as in the end of the decade. Some actualized data is certainly impressive. " Reversing a process begun nearly four hundred years ago, the reintroduction of work into the private house now under way is extensive, with some twenty million Americans now using their homes as principal workplaces." [82]

"Home builders are notoriously responsive to market forces. Operating on slim margins, they shy away from ideas that lack proven mass appeal. But the industry is very attentive to changing demographics." [83]Be aware that the Internet

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[79] The Washington Post, Washington, Oct 8, 1999. Linda Hales. Dream housing In a Dicital Age: Forget the Rules. Focus on how you really live.

[80] Robert E Calem, " Working at home, for Better or Worse," The New York Times, Sunday, April 18, 1993, Business section, PP 1,6.

[81] William J. Mitchell, in his book City of bits writes: " But by 1993 there was a clear and accelerating trend: there were 6.6 million home-based telecommuters in the United States, up 20 percent from 1991." (Pg. 96) He also references in the footnotes that " By this point, newspaper reports were increasingly suggesting that telecommuting was significantly on the rise in the United States: The Miami Herald (December 13, 1993, p.24) reported that one million more people were telecommuting in 1993 than in the previous year, marking a 15 percent increase in the number of company employees who worked at home part or full-time during normal business hours; The Wall Street Journal (December 14, 1993, p.BI) reported that 20 to 40 percent of all employees surveyed would like to telecommute; The Atlanta Constitution (January 2, 1994, p.E2) reported that the trend toward electronically supported work at home accounted for 45 percent of all new jobs from 1987 to 1992; The St.Petersburg Times (January 3, 1994, p.19) claimed that men's suit sales had plummeted because "dealing with people through faxes and computers" meant that "there is no need for appearance to be as large a factor."

[82] Riley, Terrence. Essay for the MOMA Exhibition, The Unprivate house.

[83] The Washington Post, Washington, Oct 8, 1999. Linda Hales. Dream housing In a Digital Age; Forget the Rules~ Focus on how you really live.

will influence life in ways not yet absorbed. How working at home affects house design can be seen on a variety of scales.

In the next decade, we will certainly witness new architectural solutions, for which the 20 houses in the MOMA are only precursors.

A missing piece of the puzzle

At the beginning of his essay, Terence Riley traces the origins of the private house back to medieval times. "Merchants and visitors ate, slept, and worked alongside the inhabitants in a Great Hall", he says. This reference appears as a hint to the issues his essay will address. Throughout the document he attempts to describe the very peculiar relationship among inhabitants, visitors and the general public, as the common denominator of the residential units he has selected. But he seems to have left something out of the initial referral to the origins: *the merchants.*

The situation of these people "sleeping, eating and working" inside the house cannot be further away from today's reality, but it is totally related in the sense that once again, our products come to us. E-commerce will be increasingly taking the merchant's place in the scheme.

When speculating on the house of the future. I find the lack of analysis in this sense to be a missing piece of the puzzle he is trying to solve. This is where the deliverEroom concept.

APPENDIX 3:
ECONOMIC ANALYSIS

ONLINE SHOPPING PHENOMENON

In the first stage of this support material, facts demonstrate how computers are becoming part of every house in the United States at an impressive speed, reminding us that soon they will be present in households as often as televisions. Children are being brought up with very high levels of computer use, which suggests that future generations will probably grow dependent on it for most of their activities. This comes closely related to the Internet adoption rates among Americans, who apparently are acknowledging this change in every aspect of their life: study, work, communication, and entertainment. Moreover, a close look at the online shopping phenomenon is presented, based on precise categories of online shoppers.

Expectations are a useful means to grasp an idea of how this trend will grow up exponentially as computer presence, internet use, and online shopping tendencies reach a mature state. Relevant research is included with the results, answering what kind of items are bought online, how competitive this method is compared to traditional shopping trends, and how and who delivers the goods.

1. Computer adoption rates:[84]

More than 1 in 3 households had computers in 1997. This number is higher in the present year, and is still growing at impressive speed.

Considerations:

There is an evident economic barrier for computer acquisition still:
Households with incomes superior to $75,000 had at least one computer, while those with income lower than $25,000 had a computer in only 15% of the cases.

If society follows the television adoption rate and price decrease, there will soon be no households without computers. This is possible to infer also when analyzing that children are being raised highly dependable on computer use:

First*, 3 out of 4 children* have had access to a computer in the year of the survey, and second, the fact that public schools are spending as much capital as private ones in computer acquisitions suggest this.

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[84] The official facts shown are taken from the Census Bureau Office Inform: Computer Use in The United States, 1997. It is the most recent Official Survey found.

2. Internet Adoption rates

- 76 million Americans are active Net users- they surf and e-mail regularly.[85]

- There are currently 20 million households online, and that number is expected to grow to 50 million by 2004.[86] (Out of a total of 102 million)

- Around half of the 300 million users the Internet has around the world are in North America[87]

- In the year 2000, 135 million people-almost one-half of the US Population-enjoy Net access through schools, libraries, and other shared facilities.[88]

- Back in 1997: 56.7 million American 3 years and above (22.2%) used the Internet. 22.6 % of all the American children (ages 3 to 17) used the Internet in 1997, compared to 22.1 % of adults (18 years and older). [89]

3. Who buys online? Source: "E-tail Market is growing" taken from Estats market data.

Net shoppers: People who use e-commerce sites
Online buyers: People who have purchased at least one item through e-commerce sites
Regular buyers: People who have purchase at least one item every three-month period.

	2000	2001	2002
Total U.S. Population Aged 14+ (Millions)	219.6	221.9	224.2
Total Number of Active Net Users			
Millions Online	70.9	77.6	95.1
As a percent of total population 14+	32%	35%	42%
Number of Net Shoppers *			
Millions Online Who "Shop" Percent of Total Net Users	50.4	56.7	72.3
As a percent of total number of Active Net Users	71%	73%	76%
Number of Online Buyers **			
Millions Who Have Ever Purchased Online (within past year)	44	51.2	63.7
As a percent of total number of Active Net Users	62%	66%	67%
Number of Regular Buyers ***			
Millions Online Who Buy Regularly (At least once every 3 months)	20.6	24.8	32.3
As a percent of total number of Active Net Users	29%	32%	34%
Average Annual Expenditure Per Buyer	$269.00	$339.00	$427.00
Total Online Consumer EC Sales in the United States	$11.80	$17.40	$27.10

Table 8. Current and expected number of Net shoppers, Online buyers and Regular buyers. Source: article "E-tail market is growing", published in January 2001 by E-stats market data.

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[85] Yahoo Magazine, September 2000, pg 93
[86] By Roland Jones, The Street.com, Sept. 8, 2000
[87] Time Magazine, June 2000. What will replace the Internet? Vinton Cerf
[88] Yahoo Magazine, September 2000, pg 93
[89] US Census Survey: Computer Use in the United States 1997

"According to Forrester Research, just one of every 50 visitors to an e-commerce Web site buys something."[90]

Projected growth in the percentage of net users making at least one yearly purchase online (2000-2002)

	2000	2001	2002
Cyber Diague	39%	43%	N/A
The Strategy Group	24%	27%	30%
Legg Mason	40%	45%	50%
Estats	62%	66%	67%

Table 9. Projected growth of online buyers expected by four different market research companies

4. Age considerations:

At a first glance, **adults** would be the only ones allowed to shop online due to credit card laws. Although this is only partially true (teenagers may select payment by check in certain web sites, obtain a check-card account before age 18, ask for an adult favor…) it certainly drives the fact that not even 1% of online sales are attributed to minors.[91]

5. Estimates and Facts:

- Only 20 percent of wired adults--and only 5 percent of North Americans--have made even one online purchase. [92]

- 28.4 million households will be shopping online in 2000. Eleven million of those households will be new to online shopping, and many of these new ones will be less affluent than earlier online consumers. [93]

- In fact, according to research conducted by Forrester Research, Inc., most shippers anticipated online business to grow 750% between the summer of 1999 and 2001.

[90] "Quickly getting merchandise to your home is emerging competitive battleground in e-commerce" By Jon Fortt and Joelle Tessler. San Jose Mercury News. Knight Ridder Newspapers

[91] 68% of all U.S. web users will be online by year-end 2000, compared to 53% of internet-using teens. This is primarily due to the fact that most teens do not have access to a personal credit card. As a result, online spending by teenagers is only 0.15% of their total expenditures on products and services, and it represents less than 1% of total U.S. on-line spending. eMarketer projects that 5.8 million, or 53% of teenage users will make at least one purchase by year-end 2000. By 2003, 9.8 million, or 74% of teen users will have made a purchase online.
Source: New eConsumer Shopping Report: 77% of U.S. Internet Users Will Be Shopping On-Line By 2003 available at emarketer.com
[92] "Window-Shopping the Web" , article published on March 16, 2001 at PCWorld.com
[93] E-tailers may be stuck with shipping costs By Greg Sandoval Staff Writer, CNET News.com December 31, 1999

- Forrester Research in Cambridge, Massachusetts, for example, expects online sales to vault from $4.8 billion in 1998 to $17 billion in 2001--small change in the United States' vast economy, but an exponential leap nonetheless.[94]

- The American Express Survey 2000: Internet users overall plan to make an average of six purchases online over the next 12 months. Australians and Americans, in particular, show the greatest number of expected purchases during this period, with an average of eight and seven, respectively. [95]

6. What items are bought online?

Top Items Purchased on the Web on September 1997[96]:
1. Books 2.3 million people
2. Computer hardware purchased by 2 million people
3. Computer software purchased by 2.8
4. CDs/cassettes/videos purchased by 1.4
5. Travel purchased by 1.2
6. Clothing purchased by 900 thousand people

Top Items Purchased on the Web on June 1998[97]

1. Books, purchased by 5.6 million people
2. Computer hardware, purchased by 4.4 million people
3. Computer software purchased by 4.0 million people
4. CDs/cassettes/videos purchased by 3.4 million
5. Travel (purchase of airline tickets, and making hotel and car rental reservations) purchased by 2.8 million people
6. Clothing, purchased by 2.7 million people

According to the American Express Survey of 1999 , the most popular items purchased online included:

Toys (35 percent),
Electronics (34 percent)
Books/magazines (27 percent)
Music/movies (17 percent)
Clothing (15 percent).

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[94] "Window-Shopping the Web" , article published on March 16, 2001 at PCWorld.com
[95] American Express Survey, published at NEW YORK, October 24, 2000
[96] Anita E. Hennessey New York University Center For Publishing Professor Robert E. Baensch
Capstone Course Spring. Thesis prepared for the Center for Publishing, New York University, e-mail: scps.publishing@nyu.edu
[97] idem

Not many things changed for the survey of the year 2000, except that some items -like toys- were reorganized. The majority of online purchases are "small-ticket items", like:

Event tickets (46 percent)
Books (40 percent)
Videos, CDs and computer games (28 percent)
Stocks (21 percent)
Electronics (20 percent)
Household appliances (16 percent)

7. Is this a growing demand in consumers?

It is possible to answer this question focusing on customer satisfaction levels. There is a proven statistic in marketing that says that every satisfied customer brings another 3 customers to the company, while every unsatisfied customer takes 10 away[98]. If this is true, online sales will hit the boom soon.

- "In its first-ever comparison between online and offline customer satisfaction levels, the American Customer Satisfaction Index (ACSI) Monday reported that e-tailers are succeeding in meeting shoppers' demands. Customers are more satisfied with making retail purchases online than they are at shopping at traditional retail outlets, according to ACSI. In fact, satisfaction with online retail earned a score of 78 on a scale of 0 to 100."[99]

- Nearly three-quarters (73 percent) of experienced Web buyers ranked Internet shopping the highest in terms of overall satisfaction compared to brick and mortar stores (60 percent) and catalogs (56 percent)… The survey also revealed that nearly all (95 percent) online holiday shoppers said the experience of shopping via the Internet was positive and that 96 percent said they would continue to shop online in the future. [100]

- Even though 88 percent of experienced Web buyers abandoned their online carts at some point during the 1999 holiday season and 40 percent reported various problems, Internet shoppers were generally more satisfied shopping online than anyplace else, according to a study by Andersen Consulting.

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[98] Notes from the class "Business and marketing for non-business majors", given by the Forestry Department of the University of Washington.
[99] Article for InternetNews - E-Commerce News :E-tailers Beat Out Retailers in Customer Satisfaction Survey. By Carol King
[100]Experienced Internet Shoppers Satisfied with Online Shopping ,article prom Cyber Atlas

8. Who are the top E-tailers for home shopping?

In the e-tailing market, the top companies' positions vary drastically from month to month. Pets.com, for example, was in place number 4 in May, 13 in April, 3 in June, 9 for July, and soon went out of business.

More constant in their ranking appear companies like Amazon - always first -, Ticketmaster, Barnes and Noble, CDNow, and Gateway.

Top 20 Web Retailers Among US Home Users						
November, 2000						
Nov. Rank	Oct. Rank	Web Site	Projected Buyers 0	Overall Reach (%)	Unique Users 0	Buy Rate (%)
1	1	Amazon.com	3,019	28.9	26,302	11.5
2	5	jcpenney.com	894	6	5,461	16.4
3	15	half.com	642	11.8	10,742	6
4	2	ticketmaster.com	568	5.7	5,159	11
5	8	sears.com	557	6.7	6,069	9.2
6	4	barnesandnoble.com	554	7.7	7,014	7.9
7	25	eToys.com	487	6.2	5,634	8.6
8	3	cdnow.com	466	9.1	8,241	5.7
9	6	buy.com	460	6.6	5,985	7.7
10	20	Bestbuy.com	391	7.8	7,096	5.5
11	7	drugstore.com	360	3.3	3,026	11.9
12*		walmart.com	313	7.4	6,713	4.7
13	18	Staples.com	275	2	1,787	15.4
14	9	Spiegel.com	224	2.1	1,865	12
15	11	landsend.com	209	2.3	2,073	10.1
16	13	gateway.com	192	4.4	4,030	4.8
17	24	Oldnavy.com	178	3.9	3,590	5
18	21	iprint.com	177	2.8	2,592	6.8
19	44	jcrew.com	174	1.4	1,304	13.4
20	10	real.com	171	14.8	13,451	1.3
Source: PC Data Online						

Table 10 : Top 20 Web Retailers Among US Home Users for November 2000 Source: PC Data Online

An expectation from Forrester Research is that the company expects most of dotcom companies to have closed their doors by the end of the year 2001. Only a few will survive.

9. Other forms of mail-order shopping

- Catalogs

  "When catalogs first arrived on the consumer scene, they often brought goods and services to shoppers who could never get access to them otherwise. That bought them a loyalty base. "The Sears catalog was once the link to retail civilization," says retail consultant Kurt Barnard… Catalog retailing hovers around 10% of total retail sales."[101]

  Not all data agrees: Last year's mail-order sales were only about 3.8% of total US retail [(approximately $86 billion mail-order vs. $2.25 trillion total US retail (sans autos)].[102]

  Nevertheless, what seems to be a fact is that 95% of paper catalogs have their own Internet sites, and that 9% of mail-order catalog sites occurred online for the year 2000, more than doubling the 4% of the previous year[103].

- "Home Shopping - QVC claims to be the leader in electronic retailing, with 1999 sales of $2.8 billion. QVC transmits live retail programming 24 hours a day, seven days a week, to over 61 million U.S. households and averages two customers each second. The company received more than 111 million phone calls and shipped over 76 million packages in 1999." [104]

- "Interactive Television Will Generate $20 Billion In Revenues By 2004 - Television networks, cable and satellite operators, producers, and advertisers agree -- interactive television (ITV) is inevitable. ITV will be the next wave of the interactive commerce gold rush. Five years from now, TV-based Web browsing in 13 million homes will generate $5 billion in revenues from subscriptions, advertising, and commerce." [105]

These shopping trends will continue to exist, most probably influenced by the Internet. What is evident is that all forms of mail-order purchases have always had the same delivery problems that online shopping is experiencing in our days. The delivery solution proposed would work for these companies also. (See appendix 1 for more information).

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[101] "The Delivery Dilemma Could Box In E-Commerce" article by Ellen Neuborne published at Business Week Online since May 10, 1999.
[102] Article at http://www.fastlaundry.com/evidence.htm
[103] Stated by Amy Blankership, spokeswoman for the Direct Marketing Association. Published in the article "Catalogs for the In box, not the Mailbox", in the New York times, Thursday, October 19, 2000.
[104] Published in www.dvault.net, quoting Forrester Research's analysis.
[105]idem.

10. Comparison among traditional and Internet shopping trends

Source of Gift Purchases for the Holliday Season 1999		
	Percent purchased via	
Type of Gift	Internet	Catalog	Stores
Toys	48	33	57
Books	47	15	34
Music	42	15	34
Videotapes	35	17	30
Clothing	29	41	81
Computer Hardware/ Software	25	10	29
Collectibles/Candies/ Knickknacks	23	26	48
Household items/ Appliances	17	12	34
Consumer Electronics	17	10	25
Cosmetics/Personal Care	16	--	29
Sporting Goods	14	--	16
Greeting Cards	13	--	35
Food/Wine	11	10	17
Gift Certificates	9	6	38
Flowers/Gardening Items	9	--	5
Pet Gifts	6	--	21
Periodical Subscriptions	5	--	4
Jewelry	3	--	24
Other	13	11	8
Source: Andersen Consulting		

Table 11: Source of Gift Purchases for the Holliday Season 1999 Source: Andersen Consulting

"Experienced Web users bought more books online than in stores this holiday season. In fact, ccording to the survey, books and videotapes were the only categories in which more online shoppers made more online purchases than in stores or via catalogs."

Experienced Internet Shoppers Satisfied with Online Shopping. Andersen Consulting

This is an impressive change in culture, recalling that Amazon.com, number 1 seller of online books, music and videotapes, was born only six years ago.

11. Catalog Shoppers by Region

It is important to have in mind the number of inhabitants per region in order to evaluate the data of catalog shopper's distribution. It is remarkable that the Mid West region, having only 66% of the inhabitants of the most populated region, has the largest number of catalog shoppers out of all regions. (35%)

	South	Mid West	West	Northeast
Number of inhabitants (millions)	36	24	22	20
Number of Catalog Shoppers (%)	34.3	35.3	20.4	14.9

Table 12: catalog shoppers by region. Table elaborated by combining the information from eStats and the census information.
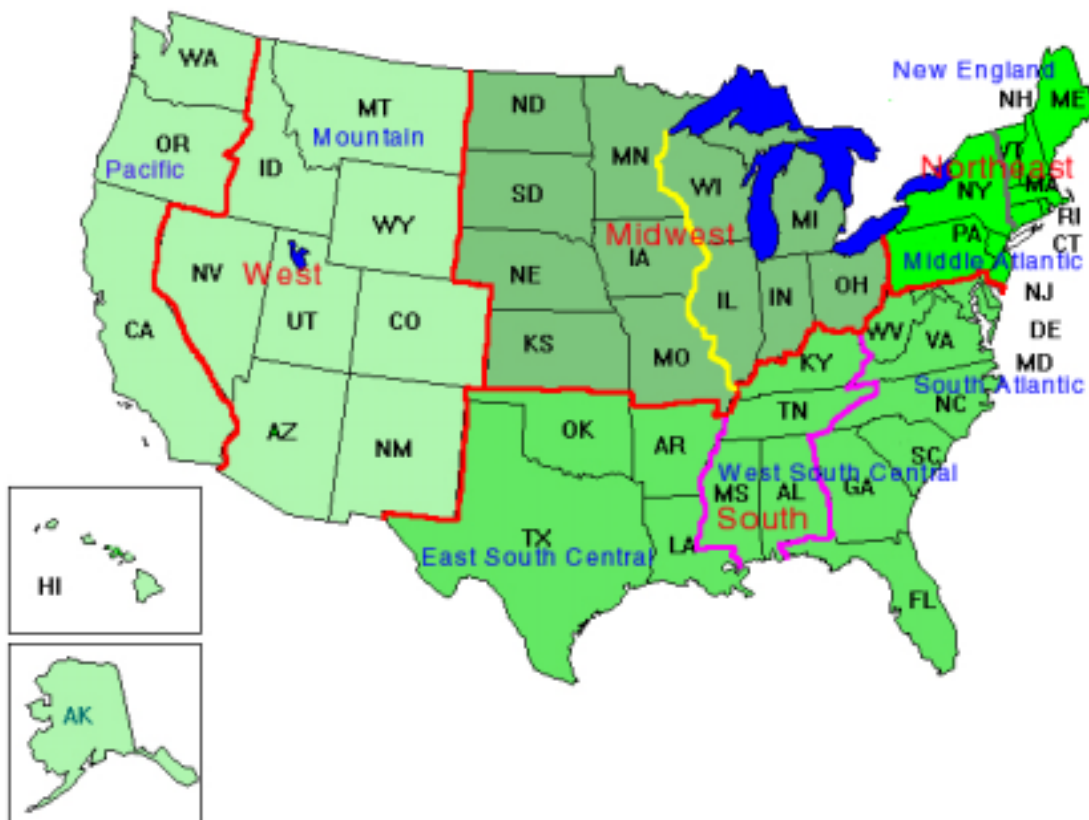

Figure 11: Geographical Regions of the United States used to study market behavior

12. Geographical location of the top e-shoppers

Online shoppers are difficult to locate by geographical region, as the online companies normally do not share this statistics. Nevertheless, from an article in the wall Street Journal in July 2000[106], it is possible to know that the highest concentration of online shoppers is located in San Francisco, California. This city's number of online buyers is closely followed by Atlanta's.

A very good hint as to where the best customers are located is given by the cities that are targeted the most by online companies. For example, Webvan's planned expansion takes into account the metropolitan areas of the following cities: Webvan said it expects to serve metropolitan areas in Atlanta; Baltimore; Bergen County, N.J.; Chicago; Dallas; Los Angeles; Orange County, Calif.; Portland, Ore.; Sacramento; San Diego; San Francisco; Seattle and Washington.[107]

13. How are the goods delivered?

According to the Zona Research investigations, UPS handled some 55% of Web deliveries in the holiday season of 1999, US Postal Service 30%, and FedEx about 10%.

That leaves only a 5% of Web deliveries to non-traditional deliverers, mainly but not exclusively, to the web deliverers such as Webvan.

14. How will they be delivered?

Forrester Research suggests that the average US consumer will receive 13 packages this year from e-commerce transactions, a figure that's set to rise to 37 per year by 2004[108]

One shipping industry study has estimated that annual package deliveries in the United States will grow from 5 billion to 25 billion pieces annually in the next five years[109]

Altogether these fact suggest that there will be various opportunities for different industry players to take a bigger stake of the online deliveries. It is a race that has already begun.

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[106] "Market data put Atlanta second only to San Francisco in terms of Internet shopping and ahead of the other cities in household income and population growth "Profit Delivery Stalled, Webvan Hits New Roads Wall Street Journal Print Media Edition: Eastern edition New York, N.Y. Jul 31, 2000 Authors: Jim Carlton
[107] Webvan Will Acquire HomeGrocer.com, New York Times Print Media Edition: Late Edition (East Coast) , New York, N.Y., Jun 27, 2000
[108] Start-Up tackles "Last Mile" Delivery Problem, John Abbott, the451.com, August 15, 2000
[109] NYDaily News. Sunday, January 07, 2001 Ze Clever New zBox A convenient new service accepts and safeguards your home deliveries

We can conclude that changes to our society due to computer presence and Internet use are already irreversible, such as highways for cars were in the 1950s. Online companies are over-spending their millions to educate customers for a life-long term of service. Although only a few will remain, they will handle a large segment of the overall retailing. They will never replace it, that is for sure, but they will help modify and complement usual shopping trends.

A big change as a consequence of this will be the multiplication of deliveries. "The mall's loss is the delivery services' gain"[110], and deliverers know that.

This sociological impact is something to look closely at. In most major cities, it is rare to live a day without seeing delivery trucks and employees. Home shipping is going to grow five times in five years, will we see five times as many trucks? Let's hope not.

The next section will take a closer look at what delivery companies are planning for the next five years.

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[110] "zBox keeps online orders safe", article by Francis X. Donnelly published in The Detroit News, October 23, 2000

APPENDIX 4
BUSINESS ANALYSIS

This appendix includes information that widely addresses the problem of delivery of physical goods in its entire dimension, and provides quotes and findings from business analysts to support the argument. It departs from the independent perception of carrier's, e-tailers and consumers, identifies the actual problem with conventional delivery methods, explains who and how is tackling the problem, and clearly points out the advantages of reviving the milkbox concept for each of the parties involved.

a) The problem:

1. For Carriers:

Delivery companies need to solve the "last ten feet" problem in order to increase their productivity and operating efficiency. Currently, they bear the costs of missed deliveries, warehousing of unclaimed packages, and customer service for frustrated recipients, which they pass on to the public in the form of higher rates. A better system not only contains these costs, but may lower the overall cost basis of package shipping, resulting in a more friction-free environment for e-commerce and more business for delivery companies.

Analysts estimate that some 250 million "Sorry we missed you" notices are distributed by shipping companies each year, out of a billion packages in the year 2000. [111] That forces consumers to wait at least a day or longer to receive their goods--something that is especially annoying to those who shop on-line because the process hinges on being fast and convenient.

The industry average of claims for stolen or lost items represents 1% of annual product revenue or approximately half a billion dollars for a company like UPS. 112 Leaving packages unattended at home's doorsteps certainly contributes to this overall loss.

2. For E-tailers

Sellers of delivered goods including catalog merchants, e-tailers and direct sellers through television carry both direct and indirect costs under the current system. They must provide customers with a fast, seamless, secure and well-documented shipping process in order to compete with traditional retailers and they must also deliver customer care to handle package tracking and customer complaints. Failure of fulfillment on the delivery side not only leads to lost sales, but also to negative customer perceptions that are damaging to a carefully-

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[111] " MISSED DELIVERIES VEX E-TAILERS" By Rachel Beck Associated Press June 4, 2000

[112] "The last 50 feet" article by Penelope Patsuris, published at Forbes.com in January 7, 2000

groomed brand image and costly to correct through customer acquisition expenses.

Shipping procedures and costs are making it hard for online retailers to be competitive.[113]

3. For Customers

"You're never home. More important, you are least likely to be home when packages are most likely to be delivered - that is, daytime."[114]

Online shoppers and other heavy users of courier companies pay for the inefficiencies of the current system with their time. Waiting at home for the arrival of expected items is, at best, frustrating and at worst entirely impractical. Traveling to a shipper's warehouse to claim a parcel is time-consuming and negates the convenience value of shopping from home in the first place. However, leaving packages unattended and undocumented raises security concerns.

Despite some people find it convenient to order to their offices, this procedure is a hurdle for most and frowned upon within companies.

b) How the problem is being tackled

Once the last mile problem has been identified, a broad analysis is necessary. Various companies are working to solve this problem.*.*

1. By Carriers

i) UPS: *3 bites to a bigger stake of e-commerce*

- Cash on delivery

  UPS is retooling for e-commerce: It now provides a cash-on-delivery service for companies like Gateway, collecting payment for computers as it delivers them and depositing the funds directly into Gateway's account. In Europe, UPS even hired a staff of professional musicians to ensure that Fender guitars arrived in tune."[115]

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[113] Forrester Techno graphics® survey of 5,831 online shoppers revealed that for 82% of consumers, shipping costs factor into their purchase decision. Furthermore, 62% of consumers pay close attention to shipping costs, and 31% pay at least some attention. :

[114] "The Future of Retail" By Nicholas Negroponte. Found in the July 1998 issue of Wired magazine.

[115] DESPERATELY SEEKING A HIPPER SHIPPER. Article by Damien Cave, published at salon.com on January 19, 2000.

- UPS Stores

    United Parcel Service Inc plans to open stores that would help people pack and ship packages, competing with such chains as Mail Boxes Etc. The planned UPS stores also would hold packages for customer pickup, sell office supplies and provide copying services and rental mailboxes.

    The world's largest package-delivery company opened its first pack-and-ship store in Alpharetta, Ga., an Atlanta suburb about 12 miles north of UPS headquarters. A handful of additional stores probably will be opened in other U.S. cities during years 2002 and 2003, company officials said. If the initial test is successful, UPS could gradually expand the pack-and-ship stores into other areas of the country.[116]

- Roadnet's software and hardware systems licensing for delivery routing

    And what about groceries? UPS has not revealed any plans to consider local same-day delivery of perishables in its big brown "cars," but it is not letting this opportunity go unaddressed either. Through Rodent Technologies, Inc., a UPS Logistics Group unit, online grocers such as Albertson's.com, GroceryWorks.com, HomeGrocer.com and Streamline.com, have each licensed Roadnet's software and hardware systems for delivery routing, vehicle fleet optimization and customer service. Based on its ability to successfully leverage the appropriate technologies, if UPS were to enter into the delivery of on-demand goods and services, it would pose a significant threat to many new and existing providers.

    ii) FedEx *: 1 move and a huge step towards another one*

    FedEx reported for 1999 the lowest share of the e-commerce delivery market (10%)[117]

- FedEx Home delivery

    "FedEx recently unveiled new initiatives aimed at entering the residential ground delivery market. The most significant move is the re-branding of RPS products and services as FedEx Ground and the introduction of a new residential delivery service under the name FedEx Home Delivery. This is a significant move for FedEx since it previously focused on the B2B air overnight market while RPS focused on the B2B ground market."

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[116] UPS Is Planning Pack-and-Ship Stores In Test Aimed at Luring New Customers Wall Street Journal Print Media Edition: Eastern edition, New York , Feb 17, 2000

[117] US Postal Service, which, says Zona Research, handled some 30% of Web deliveries in 1999, UPS (55% of Web deliveries) and FedEx (about 10%).

The FedEx Home Delivery service will reach approximately 50% of the US population and is intended to make FedEx Corp. a major player in delivering goods ordered online. FedEx Corp. should be successful in leveraging the reliability of its FedEx brand to win a share of the home-delivery market. Perception alone, however, is not what its going to take to win in this new B2C market. Driving costs down while at the same time offering competitive and customized delivery options are what it will take for FedEx Corp. to grab market share, and it appears their recent initiatives are in direct response to the market demand for this. [118]

It's price is the same as the FedEx Ground B2B(previously RPS) plus $1 "for any location that has a bed". For any premium service a fee is charged:

To select a specific day of delivery	$5
To select the delivery to be made during the Evening (5-8)	$10
Signature required upon delivery	$3
To schedule an appointment for delivery	$30

- Joint Operations Proposed (still to jump a legal hurdle)

Sept. 7, 2000 — The U.S. Postal Service and FedEx are trying to team up to take on their common competitor, the United Parcel Service Inc. Postmaster General William Henderson ...said under the plan being discussed, the post office would do residential delivery and pickups for FedEx, which would then collect parcels at post offices and transport them. The post office would be paid for its collection and delivery and would also gain access to FedEx's larger network of aircraft, he said.[119]

UPS has openly opposed to this situation, and has supported legal action to stop such agreement from a public-policy standpoint. "The company also cited what it said were "recognized deficiencies" in Postal Service performance, and wondered, "Why would anyone pay FedEx prices for postal service?"[120]

iii) USPS: Two steps ahead and moving

Required by law to provide universal mail delivery service to every household six days a week, the Postal Service clearly dominates America's neighborhoods.[121]

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[118] Press release from Fedex online.
[119] Article published at ABCNews.com , on September 7, 2000
[120] Marriage in works for delivery rivals [Final Edition] Seattle Times Seattle, Wash. Sep 8, 2000 Authors:Randolph E. Schmid

[121] Heading in the Right Direction Examining new residential delivery modes By John G. Callan and Andy Johnson, Nov. Dec 2000

- Legal advantage

  "The United States Postal Service has an obvious advantage in the home delivery game. The USPS already has a box attached to your home where it can leave small packages -- and, by law, no one else can make deliveries to it. [122]

- Returns
  According to Forrester industry figures that put returns within the mail order industry at 25%, this could mean staggering increases in retail returns, many of them being e-returns.[123]

  Still, the postal service is trying to better facilitate e-commerce. About one-quarter of all online purchases are returned, so the USPS now lets e-tailers offer the option of pre-paid return labels; a customer returning merchandise can print them directly from the USPS Web site." [124]

- Becoming a "Parstal" System Operators[125]

  For several years now, the USPS has been building residential delivery volumes through successful work-sharing drop-ship programs with postal consolidators like CTC, Parcel Direct, Paxis, RMX, etc. Beginning with its alliance with DHL to provide co-branded guaranteed two-day delivery to most worldwide destinations, the USPS next partnered with Airborne Express (Airborne@Home) to handle its drop-shipped residential deliveries, then with Emery in a similar arrangement and finally with FedEx in a yet to be fully defined "coopetitive" alliance. The USPS acts as "gateway to the household."

The conclusion to this analysis is that we can expect this three companies to prioritize their home delivery within their businesses. Unbelievably, none of them were very interested in that segment of the business before the online shopping expectations, as it was less profitable. (The actual cost of that last mile represented 42% of the price of the package in home delivery, while it only ate up 26% in business delivery)[126]. Now it seems more profitable when achieving economies of scale to handle those 25 billion packages expected for 2005 mentioned in the last chapter.

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[122] DESPERATELY SEEKING A HIPPER SHIPPER. Article by Damien Cave, published at salon.com on January 19, 2000.

[123] This is stated at www.shoppersbox.com.
[124] idem
[125] Definition found in Article by John G. Callan and Andy Johnson's article Heading in the Right Direction- Examining new residential delivery modes , available in the Parcel Shipping and Distribution Magazine Nov-Dec 2000 issue.
[126] "The last 50 feet" article by Penelope Patsuris, published at Forbes.com in January 7, 2000

2. By E-tailers

The explanation of the e-tailers' solution requires a more in depth examination of the business variables. This is a brief resume of an article published in the magazine Business 2.0, by professor Mohanbir Sawhney[127], enriched with examples and annotations of similar publications. It extends on what has been mentioned in the thesis document.

Problems for demand disaggregation and labor and transportation costs are addressed by e-tailers in different ways to solve this "last mile" problem. They can be classified into the following essential approaches

- **PORTAL**
"The portal strategy relies on creating a "fulfillment portal" by aggregating demand across categories, thus achieving economies of scope."
They offer a wide range of products (groceries, prepared meals, pet food and supplies and postage stamps) and services (such as laundry, shoe repair, video rentals, film processing, and package retrieval form UPS) and delivery of these items directly to customers' homes.

"These companies believe if they are successful in establishing themselves in this market, they can own the entire household replenishment process, which Forrester defines as the "consumers' use of the Internet to automatically reorder small-ticket items." What is at stake is the privilege of being considered a family's "one-stop shop" of home-delivery and errand services."[128]

Players include Streamline[129], Shoplink, (Both have already closed their operations), and WebVan.

- **OVERBUILD**
This approach is the most risky of all, considering the investments necessary to make it possible. Players in this area think that they can take over the

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[127] This analysis is based entirely on Mr. Mohanbir Sawhney article in the December 01, 1999 issue of the magazine Business 2.0. Mr. Mohanbir Sawhney is the McCormick Tribune Professor of Electronic Commerce & Technology at the Kellogg Graduate School of Management. He is a contributing editor and a member of the advisory board for Business 2.0.

[128] Reviving Home Delivery Carriers are evolving to stay competitive among dot-com companies Christopher M. Smith, Danilo Lacayo and John Callan

[129] "Streamline takes a novel approach to solving the "Sorry we missed you" problem. For $30 a month, the company will not only schlep your stuff across town, but will install an electronic lock to your garage or basement and lend you a fridge or shelves, so they can make secure deliveries even when you're not home

Streamline.com thinks it costs the company less to handle its own deliveries than to hand them off to traditional package delivery companies. Streamline.com has one delivery person and one vehicle for every 250 homes it delivers to, and it serves about 8,500 homes in Boston, Washington, D.C., and Chicago. Tim DeMello, Streamline.com's chairman and chief executive, says Streamline.com can get the cost of delivery down to about $3 an order.

entire fulfillment infrastructure, by building warehouses and direct to-the-home delivery systems.

Their approach of delivering groceries is just a first stage of their long-term plans: the entire household replenishment process, and eventually deliveries of any e-commerce product.

Players in this area are best exemplified by Web Van, Sameday.com[130], and include Homegrocer[131], Peapod[132], Ebox, and Kozmo.

- **CACHING**

Although this strategy differs from the others because it does not touch the home directly, it is being considered because it intends to solve the same two problems mentioned above. The caching strategy consists on bringing volume re-aggregation in local collection centers. Their convenience is high if considering that besides bringing along enormous benefits for the deliverer, they are also solving the unattended delivery problem for the customer.

Players include:

Hannaford's HomeRuns offers a special kind of delivery service, where groceries and prepared meals are delivered to corporate parking lots at the end of the working day.

A start-up called PaxZone in Chicago lets you program the delivery of any online order to local shops. The customer then picks it up at his own convenience.

"Convenience store giant 7-Eleven is considering using its stores as repositories for products bought online; a place where its customers can pick up CDs and books bought online, as well as a gallon of milk."[133]

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[130] Though Sameday.com of City of Industry, Calif., is an e-tailer itself, it primarily handles inventory and delivery for a fast-growing roster of Web merchants in the Los Angeles area--more than a dozen at last count. Founded in May 1999 with backing from Idealab, a venture capital firm in Pasadena that takes an active role in running its Internet startups, Sameday.com maintains a warehouse in which client companies' toys, books, CDs, apparel, software, and gift items account for most of the stock. While individual e-tailers wage ad campaigns to promote their Websites and take orders from retail customers, Sameday.com is the fulfillment company behind the scenes that actually packs up their goods and rushes them to purchasers.

[131] For instance, Internet superstore Amazon.com owns a stake in HomeGrocer.com, which now delivers food and staples in Seattle; Portland, Ore.; and Orange County, Calif. HomeGrocer.com plans to expand into 20 new markets next year, and Amazon.com could eventually use HomeGrocer.com's infrastructure to help deliver its own books, toys and electronics.

[132] Peapod said it will begin service in the Washington-Baltimore area by the end of the year, taking over Streamline.com's facilities, work force and customer base. The Washington area facilities include a Gaithersburg distribution center as well as the refrigerators that Streamline.com has installed on customers' porches and in garages.

Streamline.com delivered groceries once a week to refrigerators at customers'homes that could be accessed even when no one was home. Peapod will adopt that strategy transitionally and will continue to operate under the Streamline.com name during a transition period, van [Marc van Gelder] said. Customers who want to retain the unattended delivery system can do so after the transition.

[133] By Roland Jones, The Street.com, Sept. 8, 2000

Some Brick and Mortar online solutions are providing a similar solution (fashionably called Click and mortar). Circuit City, for example sells products at its physical stores, as well as offering a discount for ordering online and picking up products at the store's external pick-up area.

"Though supermarkets are unlikely to disappear anytime soon, they must, however, adapt — in some cases, radically — and evolve. Supermarkets and pharmacies can compete effectively with online retailers by providing online ordering and drive-through pickups of groceries and prescriptions. They can also provide auto-replenishment and home delivery of routine items such as milk, eggs, diapers, bread, and orange juice in partnership with third-party logistics firms.

By acting swiftly to create "click-and-mortar" hybrid models, supermarkets and pharmacies can defend their franchises quite effectively from online players that lack a physical point of presence. But if they do not act quickly, they will face debilitating erosion of sales and profits."[134]

- **SPEED**

The speed strategy relies on quick delivery of products. Kozmo and Urban Fetch are the most well known examples. Pink Dot (now PDQuick) is another one. Their mission is clearly expressed by Kozmo's directives:

"People love shopping on the Net, but most sites lack the ability to give them instant gratification," said Yong Kang, president and co-founder of the New York-based company. "This fulfills the true promise of e-commerce to be fast and easy." "If someone can build that infrastructure, you have not only a captive audience, you've also hit a nerve with the consumers," said Joseph Park, CEO of Kozmo.com. "You can easily leverage that relationship to sell more and more products to them on a regular basis."[135]

- **NICHE**

In the niche strategy the e-tailers specialize in those products that are logistically efficient (such as computers, cosmetics, or gourmet foods) or require specialized fulfillment infrastructure. Customers in this area do not

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[134] Mr. Mohanbir Sawhney, " The Longest Mile" article in the December 01, 1999 issue of the magazine Business 2.0.

[135]   Another Internet company to tap the local market is Kozmo.com. It began with just online video rentals in March 1998, but now offers DVDs, books, music, games, magazines and junk food, such as Krispy Kreme doughnuts and Ben & Jerry's ice cream.
   At Kozmo.com -- available in New York, Seattle, San Francisco and Boston -- shoppers can browse through the virtual aisles, see what's in stock, pick what they want to rent or buy, and have the goods in hand within an hour. Because messengers make Kozmo.com's speedy deliveries -- by bike, car or scooter -- there is no shipping involved. Kozmo.com's average delivery time is 32 minutes. All rentals are good for three days. To return the goods, there are dozens of drop off boxes around the cities, or Kozmo.com will pick up the products from a customer's home for an additional $1 charge. If you rent or buy something else on the same day, Kozmo.com will waive the fee. Its prices are comparable with most major retailer and rental chains.

appear to be as price sensitive as in others, which enables the use of conventional delivery infrastructure.

Players include Drugstore.com which focuses on prescription drugs that are cost-effective to ship and EthnicGrocer.com specializes in non-perishable and high-margin ethnic products that are hard to find at local groceries.

The conclusion to this e-tailer analysis is that we can expect the **reinvention of the milkman.**

"As the contours of the battle for the analog last mile become clearer over time, there will be interesting opportunities for large firms as well as for startups. Whoever wins or loses, we can look forward to the reinvention of the milkman, who will make our busy lives a little bit easier by bringing the fruits of ecommerce home to us."[136]

Other business analysts share the idea:

The idea of home delivery of perishable goods is hardly a new one. Not too many years ago, it was the only way suburban families took possession of milk. But, the Internet as a 24/7 ordering tool has given rise to a number of re-incarnations of the milkman, most boldly defined by San Francisco-based Webvan. What drives the dream of success for Webvan and similar approaches like Peapod, HomeGrocer, Shoplink, Homeruns and Streamline is the concept of replenishment. Households consume milk and other daily staples as a habit. Therefore, they buy many items often. Perishables must be delivered regularly, quickly and with minimal degradation in temperature. A typical armful of groceries amounts to many dollars spent, several times a week.[137]

"An older generation remembers the friendly milk man, who like clockwork at 6 a.m. deposited bottles on the back stoop. Those simpler days are long gone. But in the age of the Internet, someone might ride a bicycle to your home to deliver milk -- within an hour after you clicked your mouse."[138]

"The home delivery of milk was once affordable and profitable because the costs of delivery were shared by an entire neighborhood. Many upstart dot-com companies believe the economies of scale found in the milkman model have

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[136]M Mr. Mohanbir Sawhney, " The Longest Mile" article in the December 01, 1999 issue of the magazine Business 2.0.

[28] John G. Callan and Andy Johnson's article Heading in the Right Direction- Examining new residential delivery modes , available in the Parcel Shipping and Distribution Magazine Nov-Dec 2000 issue.
[29] Reviving Home Delivery. Christopher M. Smith, Danilo Lacayo and John Callan are management consultants with PricewaterhouseCooper's (PwC) Global Postal Industry Team. Available at www.pwcglobal.com
[30]"How E-Tailers Deliver Within Hours", Fortune.com 5/29/2000
[138] "Quickly getting merchandise to your home is emerging competitive battleground in e-commerce" .By Jon Fortt and Joelle Tessler. San Jose Mercury News. Knight Ridder Newspapers

returned as a result of the power of the Internet and the breadth of e-commerce."[139]

"Ironically, the appearance of e-tailers offering same-day delivery conjures up a nostalgic picture from bygone decades, when some stores delivered milk, bread, and produce daily to town dwellers. The lady of the house thought nothing of phoning in grocery orders until chain stores began drastically undercutting local grocers' prices and cars became more common. Today, setting a delivery time is more of a problem because the lady holds a full-time job."[140]

c)The "milk-box" business benefits and problems

This analysis extends on the adoption of a milkbox concept, focusing on the advantages and problems for each of the parts involved.

1. For Carriers

Benefits:
- Effectiveness for the system ($)
"If the system works, it could mean ten times as many stops-per-hour for delivery trucks," says Tom Frey, founder of the Longmont, Col.-based Internet research firm the DaVinci Institute.[141]
"The actual cost of a residential delivery represents 42% of a delivery charge, while for businesses that cost eats up just 26% of what the customer is charged, according to SJ Consulting Group, a Pittsburgh-based carrier consultancy".[142]
Carriers that now spend an average of $8 to deliver a package could save tens of billions a year by avoiding costly return trips[143]

- Prevent package Theft
SJ Consulting also found that the industry average of claims for stolen or lost items represents 1% of annual revenue, which for a company like UPS that had 1998 revenues of $25 billion is no small figure[144].

Problems:
 Carriers could argue that accepting a middle man that charges them per operation implies that they would also be paying for 75% of the actual successful delivery attempts. This would suggest that each company would develop their own box as it is very unlikely that any one of the carriers will do the work for the

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[141] "The last 50 feet" article by Penelope Patsuris, published at Forbes.com in January 7, 2000
[142] idem
[143] Published at @lantes.com website, a company that closed its doors without having opened them.
[144] "The last 50 feet" article by Penelope Patsuris, published at Forbes.com in January 7, 2000

others. Consumers will never accept this, as nobody is willing to take 4 considerably sized mailboxes in their yard. The payment for the "middle man" will simply come from savings in their operations.

b) For E-tailers

For the overall e-tailing market there would only be benefits:
- Increasing customer satisfaction based on convenience and security
- Decrease in Shipping expenses

i) *For Replenishers:*
Benefits:
Operate in Extended delivery window
Efficiency in operations when not having to deal with human interaction

Problems:

Personal touch of Home deliverers:
"Because companies like Streamline.com, Webvan and Peapod.com, an online grocer engaged in a battle with Webvan in the Bay Area, send their own employees to their customers' homes, they are also able to establish a personal connection in a business that to many seems very impersonal.
Amy Nobile, Webvan's manager of public relations, said many Webvan customers come to know their couriers since the same group of drivers regularly delivers to the same neighborhoods. ``It helps to give a personal touch because we are the only face of the company that they see because it's all over the Internet,'' said Bryan Stafford, a driver based in the company's Mountain View hub.
Webvan sees the courier's image as a key part of their mission. The company is asking customers to change one of their most basic routines, so it's very important to make them feel comfortable throughout the process, said Stewart Wadsworth, manager of the company's Mountain View hub.

Tips:
Usually these companies leverage their employees' salary with tips provided by customers. This would act in customer's advantage but directly against the replenishment companies' ideas.

c) For Customers

Benefits:

Not having to be at home to receive the packages

Not dealing with signature or tips when receiving a delivery
Security when package left unattended

Problems:

Cost: If consumers need to pay for this system, this would become an additional non-priority expense for households, turning this appliance into a high tech gadget instead of an industry service. Adoption rates would seriously be influenced.

Consumer habits: Darren Allen, a senior analyst for eMarketer says, "The way consumer attitudes are now, they much prefer being home to accept deliveries."[145]

Space[146]: Even if consumers want this product, would they have enough space to place them in their houses? Some may use garages, porches, or front yard to place the units, but would they be willing to give space (physical and visual) for this unit? Are architects willing to incorporate such a unit into their designs or construction firms willing to risk to plan for such a new product not yet in the market?

This last consideration has direct relationship with architecture and housing considerations. An in-depth analysis of housing in America is presented in one of the following sections, as that architectural issue to solve before proving the validity of the deliverEroom concept.

The conclusion of this appendix is that we can expect deliverEunits to become part of households, as industry players (carriers or online players) subsidize various types, and while different companies with a wide range of business models struggle to take a bigger stake of the market.

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[145] Delivering the Goods Finally, a better idea in package delivery. December 12, 2000 issue Business 2.0
[146] Mr. Mohanbir Sawhney, " The Longest Mile" article in the December 01, 1999 issue of the magazine Business 2.0, wrote: Consumers may be reluctant to give up valuable real estate in their garages for these boxes, described as the size of "a good-sized Manhattan kitchen." Apartment or condo dwellers are out of luck because they may not have garages

APPENDIX 5
HISTORIC REFERENCES

HISTORIC BACKGORUND – the ice / box / man – the milk / box / man

This appendix has been divided into two parts: similar appliances (icebox and refrigerator) and similar delivery processes. This chapter has a strong component of testimonials, as they represent the widest and most eloquent documentation found.

1. The icebox/refrigerator history

The precise precedent of the refrigerator is the icebox. (The actual word in Chinese for refrigerator translates "electronic icebox".) This enables this research to address both appliances' evolutions as one.

Even though there are various appliances to look at in the broader frame[147], this paper focuses on the icebox-refrigerator evolution because of considering its industry codependency and architectural relationship a similar situation to what the deliverEunit has to face.[148]

a) Brief Refrigeration History

- Around 500 B.C. the Egyptians and Indians made ice on cold nights by setting water out in earthenware pots and keeping the pots wet.

- People cooled their food with ice and snow, either found locally or brought down from the mountains. The first cellars were holes dug into the ground and lined with wood or straw and packed with snow and ice: this was the only means of refrigeration for most of history.[149]

- In 18th century England, servants collected ice in the winter and put it into icehouses, where the sheets of ice were packed in salt, wrapped in strips of flannel, and stored underground to keep them frozen until summer.[150]

- The houses for storing ice through the summer, a still found in Pennsylvania or other rural parts of the thirteen original states, are not

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[147] Together with temperature control, industry found in the cleansing tasks a major penetration product line into the household. "The lightening of household burdens by the mechanization of work progress was most conspicuous among the cleaning tasks: laundering, ironing, dishwashing, carpet sweeping, and furniture cleaning. Parallel with this ran the mechanization of heating and refrigeration."

[148] *The Unites State's household design evolution has been strongly hauled by industry trends and business processes optimization moreover than by architecture; hence the importance to review it from this industrial perspective. "Household organization in Europe found its starting point elsewhere: within the new architectural movement. In the nineteenth century kitchen and bath, the plan of the house, its very organization, had bowed before decorative ambitions. Cutting away the false front economy, the young architectural movement based itself upon the functional. This limitation proved a most beneficial cure. The Continent trend then, stemmed neither from the industry nor from scientific management. Its mover was the architect. The architect restated the whole problem of the house, and reconquered the position he had lost in the nineteenth century. He became once more the specialist to build a framework for living." Sigfried Giedion, Mechanization takes command, Oxford University Press, Inc. 1955. Pg 522 For example, the kitchen's redesign to incorporate all appliances underneath a single working surface was strongly pushed by big corporations in the USA, rather than by the Bauhaus movement, in Europe.*

[149] Inventors: with Mary Bellis, published at about.com in "The History of the Refrigerator".

[150] taken from www.historychannel.com

native to America, although it is here that their development was vastly expanded…At first, icehouses were dug into the ground, as in Europe, the excavation being covered by a roof. The aboveground house was introduced in the early nineteenth century; it was constructed with double walls and doors on the principle of the ice stores of the ships that exported ice to the West Indies. [151]

Figure 12: Men cutting ice and storing it in an above ground ice house with the help of an inclined plane
Figure 13: Ice-delivery cart..
Source: Both have been copied from the book Mechanization takes Command of Sigfried Giedion, pgs 526 and. 598 respectively.

- Natural ice was harvested, distributed and used in both commercial and home applications in the mid-1800s. The ice trade between Boston and the South was one of the first casualties of the Civil War. "Cutting and storing ice in large quantities for export and domestic supply is (1872) a strictly American enterprise, which began nearly seventy years ago, and from a small beginning has grown to a great business employing thousands of men and millions of capital. Besides the great depots (Portland, Maine and Boston)…almost every town has its local companies to supply what has been long ceased to be a necessity in almost every family."[152]

- Icebox appears in 1880s[153] in America.
  At the beginning of the 19th century, ice boxes were used in England.[154]

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[151] Sigfried Giedion, Mechanization takes command, Oxford University Press, Inc. 1955. Pg 597
[152] Mechanization Takes Command Pg. 598, after The Great Industries of the United States, Hartford, 1872, pg 156.
[153] UNITED STATES HISTORY SURVEY: 1870 - Lecture 6. Industrialization Hits Home. Revised Feb. 3, 1997. Copyright John F. Reynolds. For use in History 1053, The University of Texas at San Antonio.
[154] www.historychannel.com

Figure 14: Examples of Iceboxes. Source: iceboxes.com

- "I don't recall how many customers we had, however we would arise at 4:00 a.m., drive to Topeka, Kansas, load the ice, deliver it and try to have the route completed by noon. This done to conserve as much as to beat the heat. The ice was in 300# cakes that were run through a scoring machine to cut groves in the ice that made the size cutting easier. The scoring machine was nothing but a machine with saw blades that cut groves about 1/4th inch deep in the ice from both sides of the 300# cake or block. We could then take our ice pick and cut individual blocks from 25# to 100#. All this came to an end as electricity became more available to our rural areas. My last year of delivering ice was in 1946 the summer I returned from service in World War 2." [155]

- "I remember when the iceman delivered ice for our ice-box. There was a black pasteboard window card divided by an X that displayed 4 different pound designations in each cross section. The lady of the house placed the card in a window visible from the street with the number of pounds of ice she needed in the up position. The iceman drove slowly down the street looking for the card display in a flatbed truck with a huge slab of ice covered by a heavy tarpaulin. When he spotted a card he stopped, uncovered a part of the ice and chiseled the size that was needed with a hammer and ipecac, picked it up with ice tongs and carried it to the back entrance and into the house to place it within the top of the icebox. [156]

- Wooden boxes lined with tin or zinc and insulated with various materials including cork, sawdust, and seaweed were used to hold blocks of ice and "refrigerate" food. A drip pan collected the melt water - and had to be emptied daily.[157]

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[155] Published in Our Pioneers' Way of Life How Our Ancestors Lived, in a site run by AOL for its members available at http://members.aol.com/ntgen/hrtg/wol1.html#mail

[156] Testimony of Marybeth (Lantow) Mays, Published in Our Pioneers' Way of Life How Our Ancestors Lived, at the AOL site http://members.aol.com/ntgen/hrtg/wol1.html#mail

[157] Sigfried Giedion, Mechanization takes command, Oxford University Press, Inc. 1955. Pg 598

- "Of course the ice melted. The tin-lined area that held the ice had a rubber tube that was attached to the bottom at a drain hole to relay the water to a pan under the icebox. There was always a puddle of water on the floor to remind us that it needed emptied. My Dad got tired of the mess and drilled a hole in the floor and added a length of tube to extend it to lead to a drain in the basement floor." [158]

Figure 15: examples of iceboxes. Source: iceboxes.com

- "Despite external changes the standard form towards which it was moving at this time is patterned on the old ice-box. The early American refrigerators around 1919 had the same dark wood exterior as the old iceboxes. Later they were exposed, like the automobile, to the streamlining fashion, and their bulk was deliberately inflated for selling purposes."[159]

Figure 16: old fashioned refrigerators. Source: Iceboxes.com

- Food refrigeration moved from the icebox and gas-powered refrigerator to electric units in the 1930s. Among other effects, this changed the way homemakers shopped. For example, rather than buy food in large quantity

[158] Memory of small town Defiance, Defiance County, Ohio about 1946-7, Published in Our Pioneers' Way of Life How Our Ancestors Lived, at http://members.aol.com/ntgen/hrtg/wol1.html#mail

[159] Sigfried Giedion, Mechanization takes command, Oxford University Press, Inc. 1955. Pg 603

to keep in a storage room, housewives brought home small amounts that could fit in the refrigerator.[160]

b) Refrigerator in the industry:

The refrigerator was an invention of the early 1800´s. Nevertheless, it took a century before it became an appliance of the household. On the first place, toxic gases were used before the 1930. On the second, Industry players became interested only then, when the appearance of the supermarkets made it an indispensable appliance. At that point industry players became so interested that they even sponsored the scientific research to replace the toxic gases.

- "The first known artificial refrigeration was demonstrated by William Cullen at the University of Glasgow in 1748. However, he did not use his discovery for any practical purpose. In 1805, an American inventor, Oliver Evans, designed the first refrigeration machine. An American physician, John Gorrie, built a refrigerator based on Evans's design in 1844 to make ice to cool the air for his yellow fever patients".[161]

- "Refrigerators from the late 1800s until 1929 used the toxic gases ammonia (NH_3), methyl chloride (CH_3Cl), and sulfur dioxide (SO_2) as refrigerants. Several fatal accidents occurred in the 1920s when methyl chloride leaked out of refrigerators. Three American corporations launched collaborative research to develop a less dangerous method of refrigeration; their efforts lead to the discovery of Freon. In just a few years, compressor refrigerators using Freon would become the standard for almost all home kitchens. Only decades later, would people realize that these chlorofluorocarbons endangered the ozone layer of the entire planet".[162]

- The prerequisites were the same as those for the other mechanized household tools: reduction to compact size, and the built-in electrical motor. As with the washing machine, motor and equipment had to be merged into a unit not requiring supervision or maintenance.[163]

- In the 1920s and '30s, consumers were introduced to freezers when the first electric refrigerators with ice cube compartments came on the market. Mass production of modern refrigerators didn't get started until after World War II.(1945)

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[160] Posted: Sunday, October 10, 1999 | 10:08 a.m. in Postnet.com, article by William Allen Post-Dispatch Science Writer
[161] Inventors: with Mary Bellis, published at about.com in "The History of the Refrigerator".
[162] idem
[163] Sigfried Giedion, Mechanization takes command, Oxford University Press, Inc. 1955 Pg 600

- The acceptance of large industry players was key to market the appliance. "Around 1916 the large corporations started production. The price was still high, the refrigerator cost $900. Not until the mid twenties the mechanical refrigerator became popularized. In 1923 there were 20,000 refrigerators in the United States. In 1933: 850,000. How the curve rises sharply: 1936: 2 million; 1941: 3 and a half million. With the automobile the mechanical refrigerator had become an indispensable element of the American household."[164]

- Today, the refrigerator is America's most used appliance, found in more than 99.5% of American homes.[165]

This popularization of the refrigerator was the result of an economical co-juncture with two other independent events in the society: the popularization of the automobile and the appearance of the supermarket. Ironically, the first icehouses were the first kind of supermarkets.[166]

Once again, an appliance that needs industry back up has begun to emerge. The question is if the history is once again to repeat itself.

2. Milk delivery

a) First milk deliveries

Refrigeration was first used to take diary products to market in 1803, says Cummings, the Historian of American Food Habits. The trade increased greatly after the invention of the ice plow, and especially when the above-ground icehouse was introduced in the 1820's.[167]

b) Ice-man and Milk-man were contemporary

…A milkman's day started at 4:30 in the morning. Before the time of refrigerated milk trucks, the local ice company would make a daily delivery of 300 to 400 pounds of crushed ice. We would bag the ice and put it on top of the milk cases in insulated trucks to keep the milk cold until delivered. As refrigerated trucks

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[164] Sigfried Giedion, Mechanization takes command, Oxford University Press, Inc. 1955 Pg 602

[165] American Housing Survey 1999, available at www.census.gov

[166]"Icehouses are linked directly with the time of full mechanization. Once more we find small houses scattered across the land, preserving supplies over long periods. This time, however, they are not for storing ice –obtainable by simpler mechanized means-but for preserving perishable foods, which a new quick freezing process allows for many months in unaltered freshness. The first installations of this kind are said to have been converted from unremunerable artificial ice factories " Sigfried Giedion, Mechanization takes command, Oxford University Press, Inc. 1955 Pg 598

[167] Sigfried Giedion, Mechanization takes command, Oxford University Press, Inc. 1955 Pg 597

became more common, freezers were added to allow us to sell ice cream, ice cream bars, popsicles and other frozen treats. [168]

I remember riding with the milkman down the street. I could wait in the truck as he delivered milk to customers on my street. The milk came in glass bottles that were stored in the back of the truck; huge blocks of ice kept them cool. The milkman went right into our house, opened the fridge, knew what we needed, and kept us supplied. We never ran out of milk He marked what he gave us on a ticket in his truck, and we got billed at the end of the month. No questions asked.[169]

"The milkman would come into the kitchen and rotate the new and old milk bottles in the fridge on delivery day! …And the ice man would come put ice in our ice box and we'd climb on his truck and chip pieces of ice off to eat!![170]

"Until those paper milk cartons that are used today were introduced shortly after World War II, milk was universally sold in glass bottles. And before milk delivery was curtailed and finally almost completely eliminated since then, those bottles of milk were delivered to home doorsteps or milkboxes by milkmen. When I was a youngster, those milkmen traveled in horse-drawn wagons, but by the 1950s (when I was a milkman myself) the horses had all been retired and trucks were used."[171]

c) Timeline[172]

• The first milk delivery was in August of 1886 in Ogdensburg, New York[173]

• In 1942 home milk delivery begins as an industry (initially intended to save gas as a war conservation method)

• 1973, Only 10% of Americans still receive home milk delivery.

• By 1995, fewer than 1% of American homes are visited by the milkman.

Figure 17: Milk deliverers in front of the truck

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[168] Back when milkmen make 'house calls' By Bob Schmidt. Article published in the Kansan-Republican Online Newspaper, on Wednesday, January 31, 2001
[169] http://www.bbhq.com/wheniwas.php3
[170] *Bev., New Canaan, Ct 1947* Testimony of a woman in www.millkdelivery.com
[171] Testimony by Gerry Rising, found at http://www.ascu.buffalo.edu/~insrisq/nature/
[172] Facts found at www.whymilk.com
[173] http://www.cowtunes.com/funfacts.html

d) Economic conditions that lead to the extinction of milk home-delivery.

Lack of bulk in the system:

"The home delivery of milk was once affordable and profitable because the costs of delivery were shared by an entire neighborhood."[174]The clientele loss had a domino effect on the entire system, which quickly showed unprofitable.

Different alternatives for shopping:

"The rise of the modern supermarket nearly led to the extinction of home milk delivery by the early 1970s as expanding grocery chains began processing their own milk and squeezed independent dairies out of business". [175]

Other containers that did not demand recycling were introduced.

In 1932, the first plastic-coated paper milk cartons were introduced commercially. In 1964 the plastic container introduced commercially.

Figure 18: collection of milk bottles

e) The Resurrection of the Milkman

Many of the milk-delivery companies about to be extinguished, have seen in the internet a possibility to re-start (and re-state) their businesses, following examples of the largest internet retailers.

28 Reviving Home Delivery Christopher M. Smith, Danilo Lacayo and John Callan are management consultants with PricewaterhouseCooper's (PwC) Global Postal Industry Team. Available at www.pwcglobal.com

[175] *The milkmen still cometh: It's a small but determined business now in North County DAN McSWAIN*
Staff Writer of ", says Klaas Dehaan, the controller of Hollandia,

Figure 19: "Milkman Jack Whirlow, enters the home of a sleeping customer during his rounds earlier this week. Although many customers simply place coolers outside for the home delivery service, others, like this customer, entrust the dairymen with house keys."
How many customers can really trust their milkman this way?

Examples include:
http://www.milkdelivery.com/
http://www.yoderdairies.com
http://www.homemilkman.com
http://www.oberweisdairy.com
http://www.cowtruck.com/
http://www.expressdairies.co.uk

Figure 20: Milk boxes of companies in the year 2000. Source: Yoderdairies and Oberweis Dairy

f) The Milkbox

"Customers were furnished with a yellow milk box for me to put their milk in for early morning deliveries. As the day progressed, I would knock or ring the doorbell to let customers know their milk was being left.

Over the years, a lot of trust was developed between me and my customers. Eventually, I would knock at their door, announce myself by saying "milkman," and walk into the house to leave the milk in their refrigerator, along with other requested products (butter, cottage cheese, ice cream, etc.)".[176]

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[176] Back when milkmen make 'house calls' By Bob Schmidt. Article published in the Kansan-Republican Online Newspaper, on Wednesday, January 31, 2001

Figure 21: Ancient milk boxes. Varied Sources: from the web

The embedded milkbox

Many people had a "milkbox";(for you kids: a small opening in an exterior wall of your house with a door on each side.) With a little insulation on the walls, the milk would stay cool for several hours in the box. Theft? Dishonesty? Never a thought. Those were the good old days! – [177]

I remember having an extended funny conversation with her through the box where the milkman would leave the milk. [178]

3. Avant-garde designers that incorporated delivery areas into their units.

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[177] http://www.bbhq.com/wheniwas.php3

[178] Miss Meryle Secrest's testimony found at "One From column A", published in August 3 1998, in http://www.sondheim.com/comedy/columna/past/45.html

Safety From Taint—
Economy of Food

are assured by the use of a McCray Sanitary Refrigerator built on correct principles of scientific refrigeration.

The walls are scientifically insulated with heat repelling materials that insure a low temperature. The perfect circulation of pure, cold, dry air keeps all foods fresh and wholesome. The outside icing feature keeps the iceman outside so that he does not leave muddy tracks and ice drippings on your kitchen floor—and your refrigerator can be iced whether you are home or not.

McCray
Sanitary Refrigerators

For Residences, Hotels, Clubs, Hospitals, Public Institutions, etc.

The cold air in the McCray Refrigerator is in constant circulation. It is always moving. That's the big point in perfect refrigeration and food preservation. This active circulation of pure, cold, dry air carries all the impurities and foul odors to the ice chamber where they are condensed by contact with the ice and automatically discharged through the water sealed drain pipe.

When you realize that 90% of your food is dependent upon your refrigerator's efficiency, you can see how necessary it is to have a refrigerator that keeps your foods fresh—free from spoilage and contamination. The health of your family is at stake.

For over 30 years McCray Refrigerators have been recognized as best and are used in many of the finest residences, both large and small, in this country. In the U. S. Pure Food Laboratories—where the requirements are most exacting and selection is decided by scientific tests—the McCray Refrigerator was chosen. They are used in the best hotels, clubs and public institutions where efficient refrigeration is demanded.

McCray Refrigerators are built in a large variety of sizes to meet the requirements of the small bungalow or the most elaborate residence. Or you can have one built-to-order if desired. The linings are "snowy white" opal glass, porcelain or white enamel as you prefer and are easily kept clean and sanitary. Any McCray can be equipped with an Ice Water Cooler, racks for Bottled Beverages and may be arranged for outside icing from the side or rear of the ice compartment according to the plan of your porch or entry.

Get Our Catalog—Investigate

No. 92—Regular Sizes for Residences.
No. A. H.—Built to Order for Residences.

No. 95—Hotels, Restaurants, Clubs and Public Institutions.

No. 90—For Grocers.
No. 81—For Meat Markets.
No. 75—For Florists.

McCray Refrigerator Company, 741 Lake Street, Kendallville, Indiana
Chicago, 1000 Michigan Ave.   New York, McCray Bldg., 7-9 W. 30th St.

For Branch Salesrooms in other cities see your Local Telephone Directory

Figure 22: Catalog page from McGray refrigerators, dated 1915.

2. Le Corbusier: L'Unite d'Habitation,

Figure 4: Milkman in L'unite d´Habitation

"Chaque cuisine avait en effet deux ouvertures donnant sur la "rue corridor". Par l'une d'entre elles, le livreur pouvait introduire directement du dehors les barres de glace dans la glaciere; l'autre etait un casier qui pouvait recevoir la bouteille de lait et le pain; la cuisine du restaurant pouvait egalement y deposer a la demande des plats tout prepares."
Ruggero Tropeano, Le Corbusier, une encyclopedie, pg 200. L'unit'e d'Habitation

« Each kitchen had actually two overtures that could be accessed from the corridor. Through one of them, the deliverer could introduce directly from the outside the bars of ice inside the icebox. The other one was a locker that could receive the milk bottles and the bread; the kitchen of

"L'equipement de cette cuisine est construit avec les apartements eux memes. Il s'agit de…, l'armoire-glaciere, qui par economie n'est pas une glaciere electrique, mais un armoir dans laquelle les morceux de glace sont livres directement depuis "la rue interieur" d'acces aux apartements, sans que le livreurs aient a entrer dans le logis ou a alerter la maitresse de maison."
Jeanneret-Gris L'unite D'Habitation de Marseille, Le Point Novembre 1950 Chapitre V. Pg 55

"« The equipment of this kitchen is build with the apartments itself. It consists of…, the ice-box closet that, due to economic considerations is not an electric one, but is more of a closet into which the ice-bars are delivered directly from the corridor of access to the apartments, without the deliverer having to enter in the household or without having to alert the house keeper. «

Figures 5 and 23. Delivery Area in L'unite d'Habitation. Exterior picture and plan view
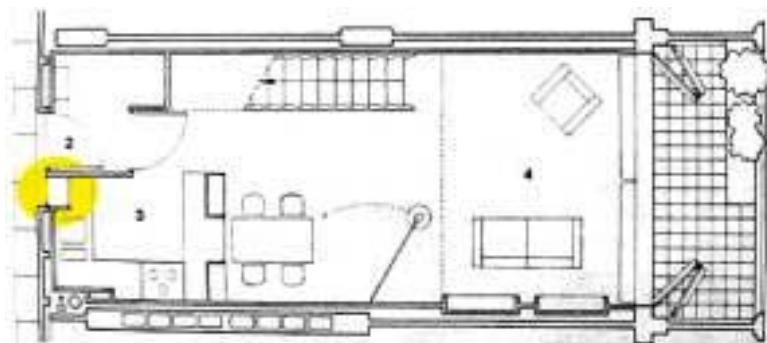
3. Park Hill, Sheffield, England, Jack Lynn and Ivor Smith, 1957

Figure 24:
Aerial view of Park Hill
Source: All Pictures from the Book Park Hill,
what's next? By Andrew Saint, Published by the
Architectural Association in 1996

Designed by architects Jack Lynn and Ivor Smith, under the supervision of the City Architect Lewis Womersley, the Park Hill Complex was a considerable investment made by Sheffield's City Council in public housing. Besides providing deck-access to something less than a 1,000 households, it offered pubs, shops, a nursery school, and a primary school.
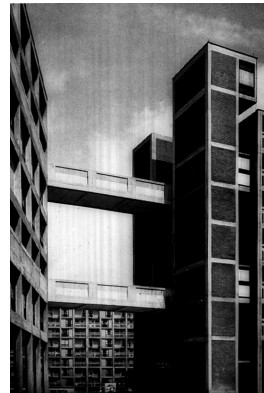
Figures 25 and 26: Internal Views of Park Hill

 A deck area that was intended to replicate the street characteristics surrounded the buildings every three stories. Combined with a vertical circulation system of elevators, it was possible to move freely from building to building, from floor to floor.

Even though the architects' main reason to provide such a space was social interaction, a complex delivery system was designed to support the new life-style proposed. The milk cart could arrive directly to the doorstep of each house and deliver milk bottles and produce whenever it was convenient.

Figures 27 and 28 Internal view of Park Hill

APPENDIX 6
HOUSING CONSIDERATIONS

HOUSING CONSIDERATIONS[179]

Data has been gathered from the American House Survey in three different fields.

Numeric: number of housing units, types of structures, percentage of each within the whole, area categorization, number of stories, and particular features.

Demographic: number of inhabitants per household and the most common structures they are located in.

Economic: total expenditures is presented as a proof that Americans spend considerable values in their homes' improvement and repairs, and could easily acquire a deliverEunit and build it into the home as the next one.

1. Numeric: number, type, and stories in structure

a) Number and Location of Households in America.
There are approximately 276 million people living in the United States of America, according to the U.S. Census Bureau Office. These people are gathered in a total of 102,803,000 households[180], but there are a total of 115,253,000 housing units[181], including vacation houses and other unoccupied housing units. All the following analysis and considerations are based on the numbers of occupied housing units only[182], which by definition are equivalent to the number of households.

b) Type of structure households belong to

According to the precise definitions of the census, there are only two types of housing structures: Unitarian and multiunit. The single unit structure has been classified into detached and attached, depending on its surroundings and divisions from other units.[183] From this we know that a house can be a house, but can still hold various housing units. This would render it into a multiunit structure.

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[179]All the following investigation is based on the facts provided by the Census Bureau Office, particularly but not exclusively, through their American Housing Survey for 1999.

[180] A household includes all people who occupy a housing unit. A household consists of a single family, one person living alone, two or more families living together, or any other group of related or unrelated people who share living arrangements.

[181] Housing Unit - A housing unit is a house, an apartment, a mobile home, a group of rooms, or a single room that is occupied (or if vacant, intended for occupancy) as separate living quarters. Separate living quarters are those in which the occupants live and eat separately from any other people in the building and which have direct access from the outside of the building or through a common hall.

[182] Occupied housing Unit: A housing unit is classified as occupied if there is at least one person who lives in the inot as a ususal resident at the time opdf the intercview, or if the occupants are only temporarily absent, for example, on vacation. However, if the unit is occupied entirely by people with a usual residence elsewhere, the unit is classified as vacant. By definition, the count of occupied housing units is he same as the count of households.

[183] In determining the number of housing units in a structue, all units, occupied or vacant, were counted. The statisctics are presented for the number of housing units, not the number of residential structures. A structure either has open space on all sides or is separated from other structures by dividing walls that extend from ground to roof.

Single units

76% of all occupied housing units are single units.
> 90% of these single units are detached structures, and only 10 are attached.

Multiunit (2 or more units)

The other 24% of multiunit housing structures is composed by:
Structures holding:
- 2-4 units (8.3%)
- 5-9 units (4.7%)
- 10-19 (4.3%)
- 20-50 (3.25%)
- More than 50 units (3.24%).

As it would be expected, most of the multiunit structures are located within the cities, where land value and people density are the highest. Single units, on the contrary are mostly located in the suburbs, counting for more than those built in cities and Outside MSA together.

- 54% of the multiunit structures are located in Central cities
- 37% in the suburbs
- 8% in Areas outside MSAs.

c.) Number of Stories in Structure

About 55% of single-family detached units have two or more floors. Among attached units, the proportion rises to 65%, with units in multiunit buildings coming in at 87%. Whether attached or detached, single-family homes are seldom taller than three stories (about 5% of attached and 3% of detached are higher). Even among multiunit structures, 80% of units are in buildings with three or fewer floors. Approximately 5% of apartments are in buildings with ten or more floors.

Stories in Structure by location

(Chart legend: Central cities, suburbs, outside MSA)

Stories in Structure	Central cities	suburbs	outside MSA
1	9,250	15,410	8,753
2	10,052	17,018	6,721
3	7,183	11,114	3,597
4 to 6	2,857	1,847	376
7	1,841	1,441	370
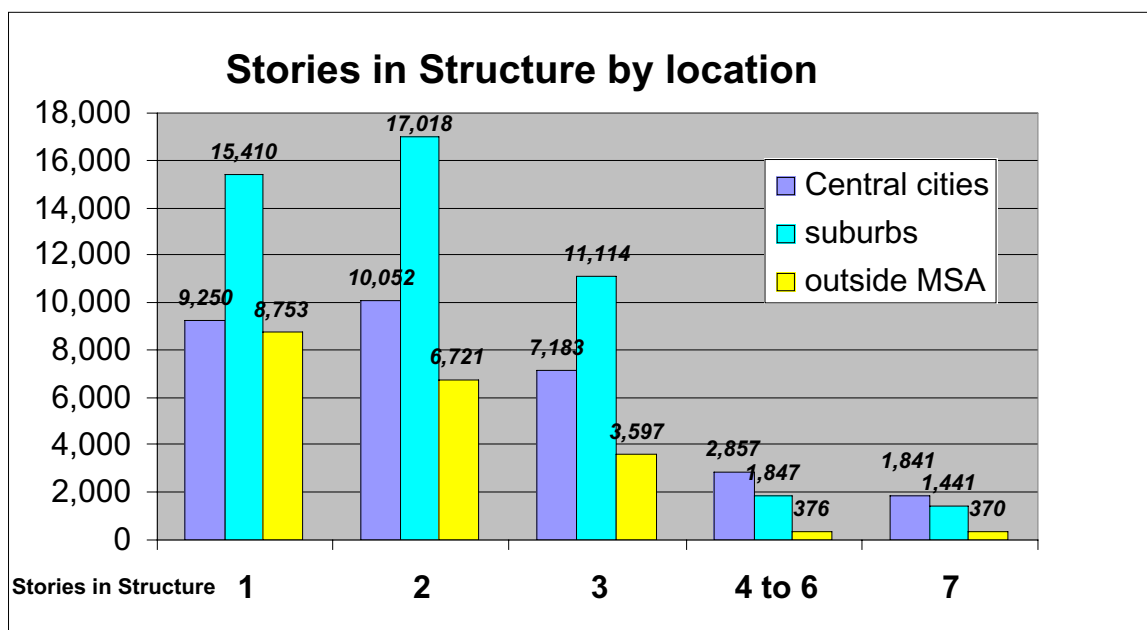
Table 13 Stories in Structure by location. Based on the AHS Data

Structures of 3 stories or less are mostly located in the Suburbs. The value of land and use demand in the city makes taller structures commercially feasible.

With the exception of mobile homes, the majority of residential units are in structures with more than one level.

i)Development of the different Type of Structures in America through History

This information has been taken directly from the American Housing Survey observations, and it is presented to show the current tendencies of construction of new housing units.

"The types of homes Americans live in have changed over the past 50 years. On a percentage basis, one-family detached houses reached their climax in 1960, when they made up over two-thirds of the total housing inventory. Since then, detached houses have steadily declined; by 1990, they made up a bit under 60 percent of the inventory.

One-family attached houses (rowhouses, townhouses, and duplexes) increased a little from 1980 to 1990, but their share of the inventory was highest in 1940, at the time of the first housing census. Units in small apartment houses with 2 to 4 apartments had their high water mark in 1950, when they made up almost one-fifth of the total housing stock. By 1990, they had shrunk to less than one-tenth of the inventory.

Units in larger apartment buildings of 5 or more apartments have become increasingly more popular in recent decades. Note the big increase in these types of units from 1960 to 1980.

However, the biggest story is the explosive growth of mobile homes. In 1940, they were a mere afterthought, lumped into the "Other" category with boats and tourist cabins. By 1990, mobile homes made up 7 percent of the total housing stock."[184]

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[184] American Housing Survey. Observations to the Census 1997, Section on the History of Structuresin America

d) Number of houses with garages

There is a concern with householders allowing goods to be left unattended in certain spaces of their house. It is common to leave a note to carriers after receiving the first "sorry we missed you" note, authorizing the package to be left somewhere secure or out of sight of the main street. Spaces like carports, porches, or back door steps are commonly used, but provide no guarantee for the householder or the delivery company. If these spaces were enclosed and secured, a they could be turned into a delivery area. A garage can be a very suitable area for this scenario, as proved by the online company Streamline in the Boston area.

How many houses have a garage area that could be adapted as a deliverEroom?

Garages are certainly an issue for a country where more than nine in ten households (91 percent) have at least one car, van, or light truck at home for personal use.[185]

The garage or carport is only counted by the American Housing Survey if it is on the same property, though not necessarily attached to the house. Off-street parking includes driveway or parking lot priviledges that are paid for as part of the rent or owned with the unit, and, although counted in the census, they belong to their own category and not to that of garages.
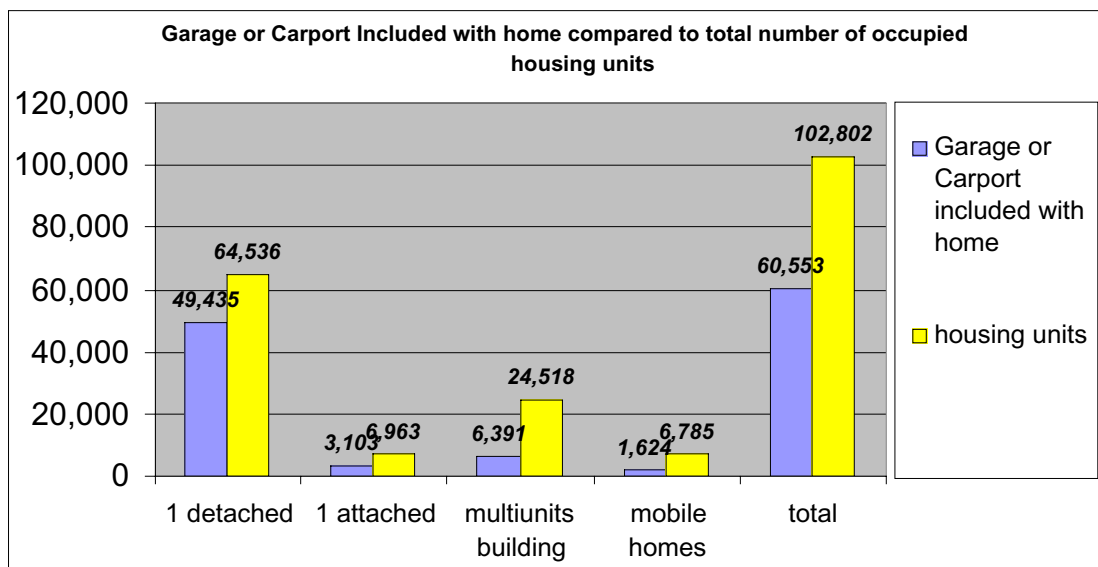
Table 14 Garage or carport presence in American households

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[185] In and Around the HomeHousing Profile*From the American Housing Survey: 1997*

Almost 60% of occupied housing units include a garage or carport.

Garages or carports are common for households living in single-detached units—just over three in four of these homes (76 percent) have a covered shelter for vehicles.

Townhouses or row houses, on the other hand, include a garage or carport less than half the time (46 percent). In both mobile homes and units in multiunit buildings, the proportion is 26 percent.

At homes without a garage or carport available, vehicles may be left either on the street or in a driveway, parking lot or other off-street space. For homes without a garage or carport, some kind of off-street space is available at 87% of the detached units, at about 75% of both the single-attached units and units in multiunit structures, and at 90% of the mobile homes.

71% of homeowners and 35% of renters have more than one vehicle, which makes the owner occupied units more dependable on parking facilities. This difference is proportionally reflected in the fact that 73% of owner occupied housing units have a garage or carpot included with the home, while only 31% of renter occupied ones have it.

2. Demographical data

a) How are the households occupied?

- More than 1 out of 4 households are composed of only one person. (26.2%)
- Almost 60% of the population lives either alone or with one more person, as 2 people households compose another 33% of the total number of households.
- 70% of couples are dual income.

Is this low occupation consistent among all the states and regions?

Region	Number of people in millions	Number of households in millions	Average people per household
Northeast:	49	20	2.45
Midwest:	58	24	2.42
West:	51	22	2.32
South:	83	36	2.31

Table 15 Average number of people per household per region

We observe that there are notorious differences between the Northeast and Midwest regions, and the West and South average occupation. Houses are highly populated in the first two.
Table 3-6 illustrates the average number of people per household in each one of the States of the U.S. It is remarkable that Utah, Hawaii, Alaska and California are the states with a highest rate of people per household, and even though, the West region has one of the lowest rates.
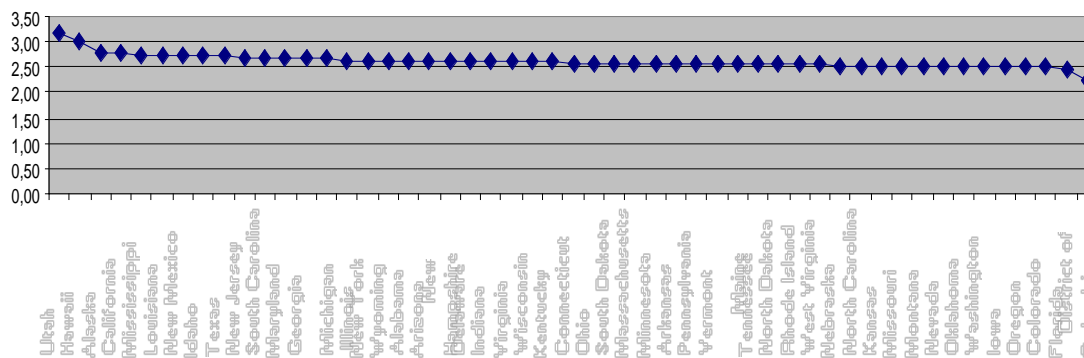
Table 16. Number of people per household in each State.

Table 17 ONE PERSON OCCUPANCY RATES IN the HISTORY of the USA
UNIVERSE: Occupied housing units from 1940-1990 Source: Census.gov

	1990	1980	1970	1960	1950	1940
US	24.6%	22.7%	17.6%	13.3%	9.3%	7.7%
AL	23.8%	20.4%	14.6%	9.5%	6.7%	5.2%
AK	22.1%	20.1%	13.7%	16.2%	17.6%	NA
AZ	24.7%	20.9%	16.5%	13.6%	12.2%	11.5%
AR	24.0%	21.3%	17.2%	12.6%	8.7%	6.3%
CA	23.4%	24.7%	21.0%	17.9%	14.0%	13.5%
CO	26.6%	23.5%	18.0%	15.5%	12.5%	11.5%
CT	24.2%	21.6%	16.0%	11.6%	7.3%	6.0%
DE	23.2%	20.9%	15.3%	10.9%	8.5%	7.2%
DC	41.5%	39.5%	32.1%	27.0%	14.3%	9.9%
FL	25.5%	23.6%	18.7%	14.5%	11.0%	9.6%
GA	22.7%	20.5%	14.4%	10.1%	6.9%	5.6%
HI	19.4%	17.1%	12.8%	12.1%	10.5%	NA
ID	22.4%	19.9%	16.5%	13.3%	10.9%	10.3%
IL	25.7%	24.0%	18.5%	14.4%	9.8%	7.6%
IN	24.1%	21.4%	16.5%	12.3%	9.2%	7.5%
IA	25.9%	23.4%	18.5%	13.8%	10.2%	8.1%
KS	25.9%	23.8%	18.4%	14.0%	11.3%	9.1%
KY	23.3%	20.0%	15.2%	10.6%	7.3%	5.7%
LA	23.7%	21.3%	16.0%	12.3%	9.2%	7.0%
ME	23.3%	21.3%	16.8%	12.6%	9.8%	8.3%
MD	22.6%	20.8%	14.9%	10.1%	7.4%	6.8%
MA	25.8%	24.4%	18.8%	14.2%	8.8%	7.2%
MI	23.7%	21.1%	15.5%	11.6%	8.1%	6.5%
MN	25.1%	23.2%	17.7%	13.7%	10.0%	8.2%
MS	23.4%	20.4%	15.4%	10.7%	7.7%	6.3%
MO	26.0%	23.8%	19.3%	15.2%	10.9%	8.3%
MT	26.3%	23.4%	19.8%	16.8%	14.4%	15.1%
NE	26.5%	24.3%	19.3%	14.2%	10.5%	8.7%
NV	25.7%	24.6%	19.4%	18.9%	16.0%	17.7%
NH	22.0%	21.2%	17.0%	13.1%	10.7%	9.2%
NJ	23.1%	21.1%	15.8%	11.3%	7.1%	5.7%
NM	23.0%	21.0%	14.9%	10.7%	9.1%	8.4%
NY	27.2%	26.0%	20.2%	15.5%	9.6%	7.6%
NC	23.7%	20.0%	13.3%	8.3%	5.4%	4.0%
ND	26.5%	22.9%	17.0%	11.9%	9.1%	7.9%
OH	25.0%	22.4%	16.6%	12.1%	8.5%	7.3%
OK	25.6%	23.4%	19.1%	15.5%	10.7%	7.4%
OR	25.3%	23.5%	19.2%	16.2%	12.9%	13.2%
PA	25.6%	22.7%	17.3%	11.9%	7.9%	6.4%
RI	26.2%	24.0%	18.2%	13.7%	8.9%	7.4%
SC	22.4%	19.2%	13.8%	9.4%	6.8%	5.8%
SD	26.4%	23.5%	18.1%	12.8%	9.9%	8.8%
TN	23.9%	20.4%	14.4%	9.7%	6.4%	5.1%
TX	23.9%	21.7%	16.3%	12.6%	8.9%	6.8%
UT	18.9%	17.2%	14.4%	12.0%	9.1%	7.9%
VT	23.4%	22.0%	16.8%	12.5%	9.4%	8.0%
VA	22.9%	20.5%	14.4%	9.4%	6.6%	5.6%
WA	25.4%	24.2%	19.6%	17.6%	14.1%	14.9%
WV	24.5%	20.7%	16.0%	10.1%	6.8%	5.1%

```
WI        24.3%    22.5%    16.9%    12.2%     8.2%     7.0%
WY        24.5%    21.3%    18.0%    14.3%    12.3%    12.8%
```

American have historically presented high rates of single occupancy.
The data also evidences the migration process from East to West during this century.

c) Bringing the data together

What types of structures accommodate 1 and 2 people households?

It is outstanding the number of 2 people households in 1 unit detached structures. They are by far the predominating combination in the United states. 1 people households are mainly located in 1 unit detached structures as well, but they are proportionately distributed among the other structure types.
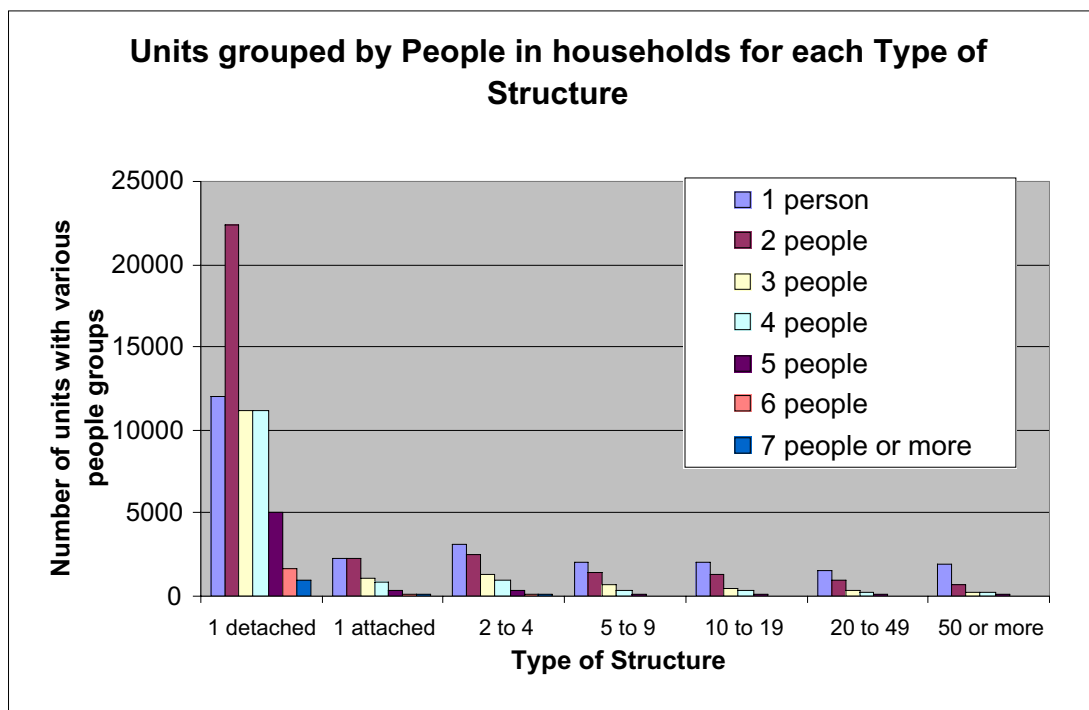
Table 18. Type of units by number of people in structure. Table built according to the data of the AHS 1997

Note:

It is useful to acknowledge that two thirds (66.9%) of all occupied housing units are occupied by their owner (68.7 million) and one third (33.1%) by renters (34 million).

3. New Construction, Annual Expenditure and Improvements

The deliverEroom is to be adapted into households some time in the future. Whether it is built into new or existing construction, this area will tend to become part of the infrastructure of the household, instead of remaining as an independent unit sitting outside the porch. There lies the importance to analyze if new construction (into which the rooms are easily built into) represents a relevant percentage of the overall number of housing units. With the same purpose, it is relevant to understand if householders invest a considerable amount of money into home improvements. A deliverEroom would certainly take some house remodeling expenses.

1. New construction

New Construction is counted by the census considering it has been built in the last 4 years. This average of 249.5 units per year, accounts for a mere 0.21% of all the existing housing units. 13% out of all new construction was built for time-sharing use.
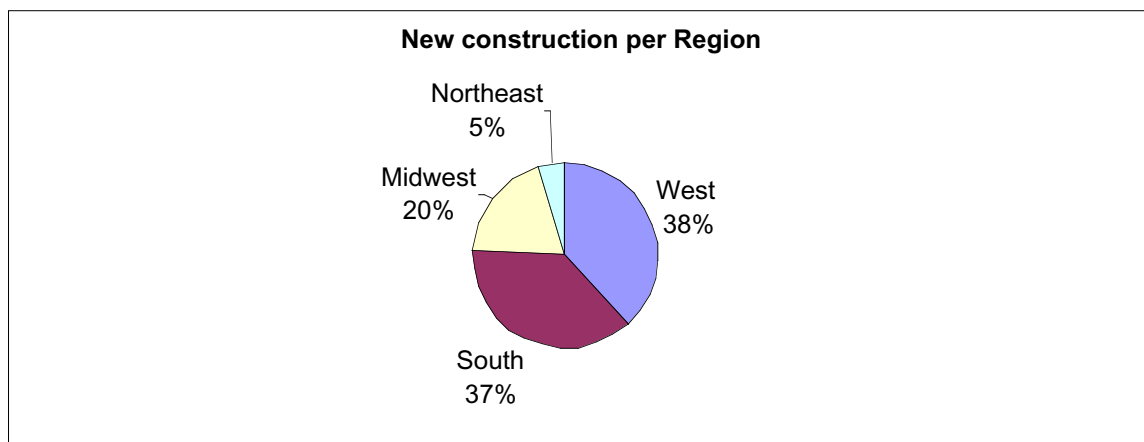
Table 19 New Construction per Geographical Region. Based on the AHS 2000

The West stands ahead for new construction, which shows that Americans are still in the process of populating this area of the country. Construction in the South is second, where most of the vacation housing is being build. A major Latin American migration to this area of the United States justifies several thousands of those new units. The Northeast area makes evident that it is the oldest area of the USA, and that despite it economic growth, It maintains a constant level of population and housing.

<u>New construction in History</u>

The period that shows the greater of houses built is that of the 1970s, when 20.5 million units were built. The decade of the 1990s only reflects 13.9 million units. These variations correspond to macro economical characteristics.

Year of Construction of Units
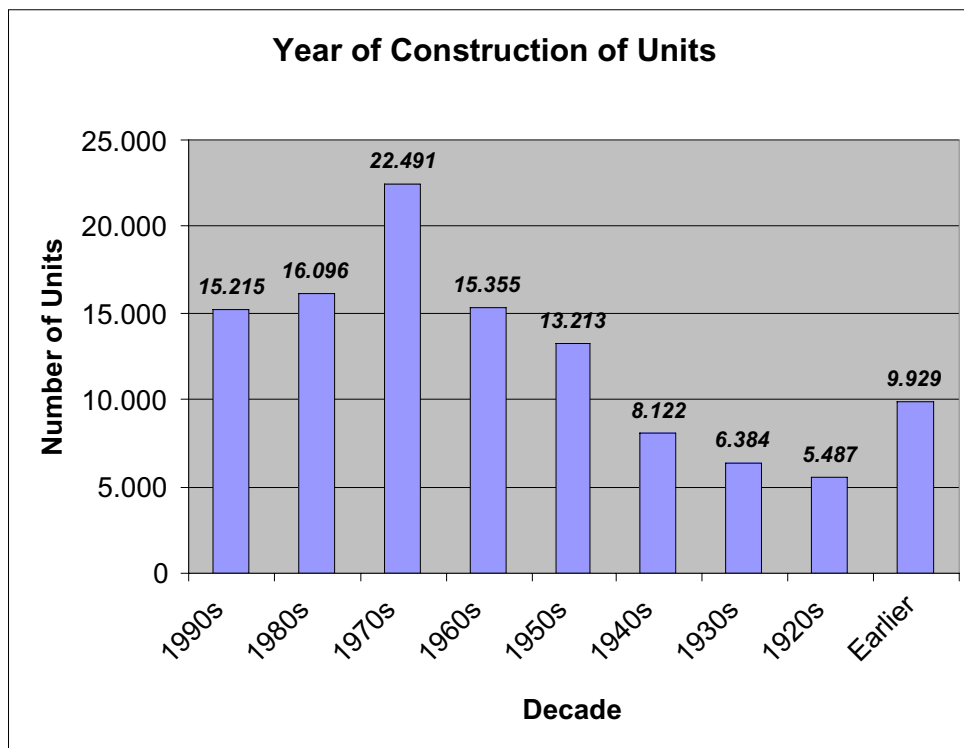
Table 20 New Construction in History

2. Improvements and Repairs:

There is no information as to the number of houses that suffer certain kind of remodels. Nevertheless, there is a tabulation for money spent, discriminated in Maintenance and Repairs and Improvements that is relevant to the question posed.

This data is better illustrated in Table below.

Total Improvements by Region & Property Type

Legend:
- Owner occupied 1 units
- Owner occupied 2 units or more
- Rental 1 unit
- Rental 2 to 4 units
- Rental 5 units or more

total money spent (in millions)

Values shown: 21,526 · 18,767 · 18,410 · 13,935 · 587 · 2,888 · 381 · 5,306 · 719 · 211 · 1,008 · 704 · 172 · 4,524 · 1,631 · 3,393 · 191 · 3,507 · 1,281 · 1,405

Region: West, South, Midwest, Northeast

Type and Ownership: Owner occupied 1 units, Owner occupied 2 units or more, Rental 1 unit, Rental 2 to 4 units, Rental 5 units or more

Table 21. Improvements by Region and property type. Based on the information of the AHS 2000

From this data it is possible to infer that the owners of households are the people who do pay money for improvements. (Have in mind that they occupy 2/3 of all housing units).

3. House expenditures per region

The West region outstands over all the other regions in expenditures for house improvements, especially for the category of 1 unit housing. It is notorious the amount spend in the Northeast for the category of 2 to 4 units and in the South region for that of 5 unit or more rental.

To clarify this, the following charts are provided:

Total money spent in occupied housing units)in thousands)	Number of occupied housing units	Average money spent per unit
Northeast	24076 19958	1.21
Midwest	21610 24360	0.89
South	28019 36389	0.77
West	26843 22096	1.21

Table 22 Average money spent by Region per unit

Total money spent in owner occupied 1 unit housing units (in thousands)	Number of 1 unit occupied housing units	Average money spent per unit
Northeast	13935 11042	1.26
Midwest	18410 15892	1.16
South	18767 21293	0.88
West	21526 11742	1.83

Table 23. Average money spent by Region for 1 unit housing

It is easy to notice that the West outstands noticeably for owner occupied 1 unit housing units. It doubles widely the south, and stands for almost 36% of all the expenditures in owner occupied housing units.

The Northeast is the region where most of the multiunit expenditure is made, and with it, it equals the average overall amount of expenditure in the West. This phenomenon can be explained by the low rate of new construction in that area. It makes sense for cities that don't build new housing spend their housing money in improvements and remodels.

APPENDIX 7

DESING FEATURES
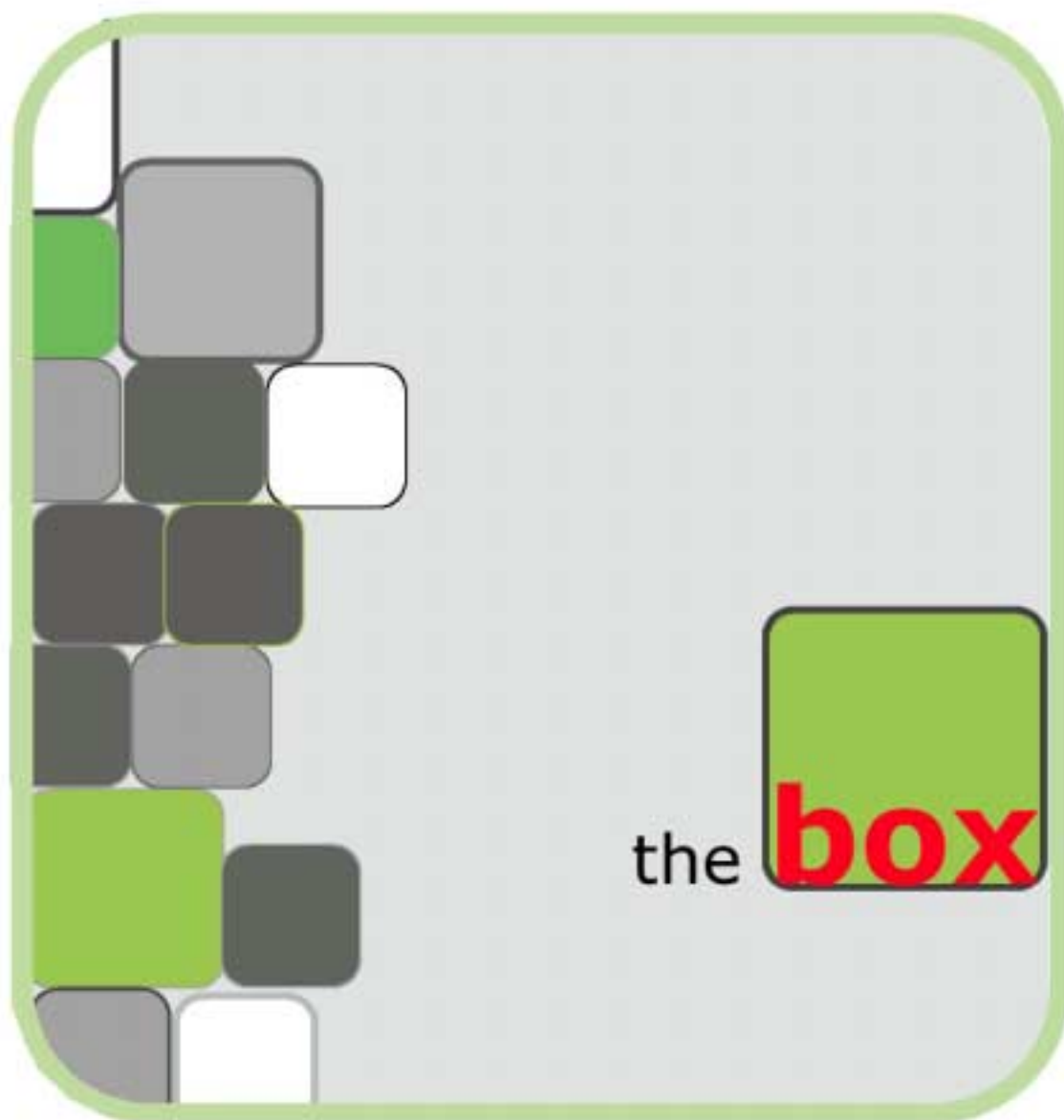
1. Analysis of similar solutions

The great majority of the companies presented hereby had not been launched in May 2000, when the thesis began. Others had not yet come out to the business world. The fact that almost 1 company per month has been created during the 3 quarters of the thesis, strongly backs up the idea that this concept is spreading widely.

a) Dvault

With a simple trap principle used for years by deliverers in their drop-off boxes, dvault has taken a step further making this product available for consumers. It solves mainly the unattended delivery problem for consumers and deliverers, providing a secure space to deposit packages, and making them retrievable only to the owners through a key-locked back door.

It solves the delivery of any kind of package, not only e-commerce packages, but does not acknowledge receipt of packages (signature). The company says to be working on that through a wireless solution.
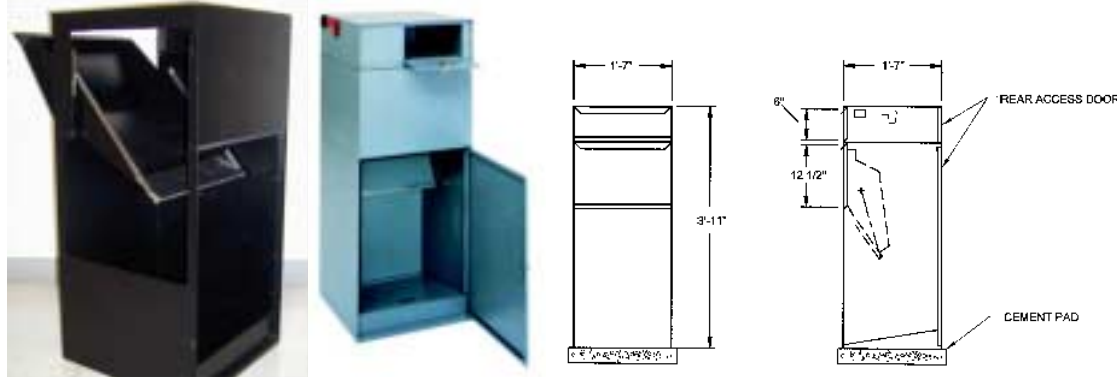
Figure 29 Dvault´s solutions

Built in type or Wall-Mounts

Dimensions - 14_"W x 17_"H x 21"D and 14_"W x 34"H x 17"
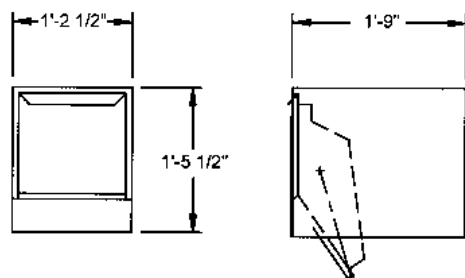
Figure 30 Dvault's embedded solutions

b) Shopper's Mailbox

Shopper's Mailbox solves the problem of unattended delivery for consumers and deliverers based 100% on consumer's participation. It has a programmable key-pad lock that the user can program with whatever he wants and leave a note to the delivery company to use any number that only them know. For example, the first 6 numbers of the 25 digit tracking number.

It is the simplest use of technology to solve the problem. It relies 100% on the consumers' need of receiving the package and does not provide safety for multiple deliveries.

- Materials: Tempered steel.

- Size: 2 available: Large 36'x24' x 20'   Built-in 20'x 24' x 10'

- Notice the thickness of the built in. While the first size could accept most online orders, the built-in only takes packages 10" deep.

- Installation: do it yourself

Figure 31 shopper´s mailbox solution

c) EBox:

This Canadian company based on Toronto and New Hampshire is targeting the entire fulfillment chain. They offer an e-shopping website, specially designed silent trucks to deliver at night, and e-boxes accessed only by their deliverers. Each eBox is equipped with a keyless and wireless entry system that is uniquely programmed, allowing entry only to the owner and the deliverer through an infrared access card (similar to the pocket transmitter that can be used to open recent car doors).

- Materials: the box is made of Linear Low Density Polyethylene, which is heavy duty plastic. (The plastic is super-tough, so that it can't be broken into easily, neither with a sledgehammer, blowtorch or saw.) The box is also insulated to R4 rating.

- Size: Although the precise dimensions of the box are not stated they are said to be approximately 18" x 18" x 24". They hold approximately 10 grocery items, but fewer if you order large items. "We will have a larger box available by the end of the pilot period.", they promise.The e-box team controls the state of occupancy of their boxes as shoppers are buying articles, so they know how much they can deliver per order.

- Installation: It is secured to a 180-pound concrete base to ensure that no one will steal it from your home. Depending on where you want to put it the base can either be bolted in place or not. They install it themselves securing it to wood, grass, concrete or brick through the base.

- Design:
  It is a simple box at a glance. There are no proofs of real boxes yet, only these drawings.

  It is secured to a 180-pound concrete base to ensure that no one will steal it from your home. Depending on where you want to put it the base can either be bolted in place or not. They install it themselves securing it to wood, grass, concrete or brick through the base.
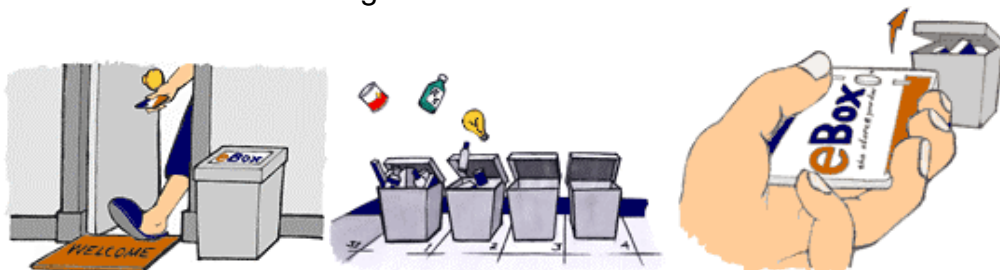
Figure 32 Ebox's solution

d) Z-box

Z-box is a consumer oriented, integral solution for the delivery problem. It allows the key-pad to be reprogrammed with one 4 digit code for the user to open the recipient always, 4 5-digit codes for the user to write down in web sites that are not part of their program, or to give them to friends and family for sporadic use. It also allows access through certain 6-digit codes that only Z-box server has access to, and that are embedded in the address line of online orders made from their browser-stlye site. This gives users the convenience of receiving multiple and repeated deliveries, and returning them.

- Dimensions: 32' x 24' h x 21'd , is said to allow the reception of 80% of online orders and 70% of double online orders.

- Materials: the zBox is made of durable, high density plastic. Its rugged design is both durable and weatherproof. "The zBox is designed with a long life in mind."

- Installation: There are 3 different possibilities to attach the zBox unit to the house. Parts are shipped according to individual requests, and users install them. Professional installation services are also available through Sears and Hub Group Distribution Services for a $50 fee.:
  o Anchor cable: like a bicycle cable to tie your box to a secure pole near your house.
  o Ground anchor: An anchor that has top be buried two feet or more into the ground with a hammer. The box is then tied to it through a cable.
  o Lag screws: the box comes with holes for screws in the bottom and back of the unit. With the help of an electric drill, the box can be screwed to any concrete, wood, asphalt or brick surface.

Figure 33. Zbox's solution

f) Brivo Systems:

Based in Arlington, VA, Brivo offers the most technologically advanced solution for the unattended delivery problem. Seeking to own all the market, they offer a wireless solution to program keypads of single units households, multiunit and businesses.

Figure 34 Smartbox solution   Figure 35. Brivo´s solutions

Brivo began buying a patent from the first original idea of this solution, called smartbox, patented in 1998.
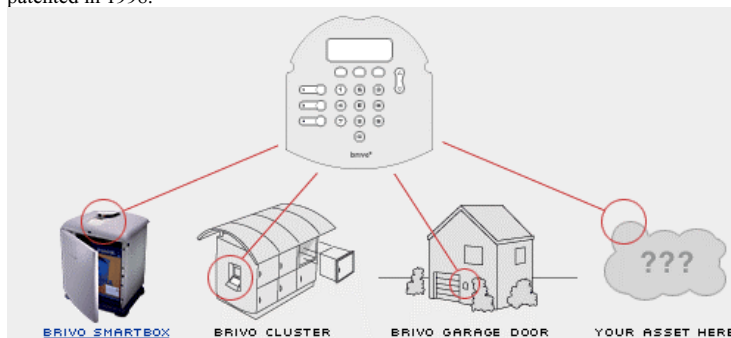
The system is operated via a website that is connected to a wireless communications network. Software architecture and business model are engineered to make it easy for an appliance company, a consumer electronics firm, a homebuilder, or any other manufacturer to design, produce and market its own products that work on their operating system. They have marketed their own product as well, the brivo box. The box's brain - a two-way wireless modem with an embedded 386 processor - tracks who delivered what and when, then alerts its owner by email, and keeps a track of the delivery.

- Materials: Steel reinforced plastic container.:
- Dimensions: A cube "about 2 _ feet high". The dimensions were established after their own research team established that "about 96% of e-commerce delivery would fit into two cubic feet of storage space", according to its founder and IDEO, industrial design firm. (Actually that is the precise quote, but what they mean is 8 cubic feet, as in 2' x 2' x 2')

Figure 36 and 37.Brivo Boxes

f) @lantes:

Direct competitor of the next company, seems to have closed their doors.
Their technology was based on wireless programming of the keypads, and smart cards given to deliverers with the codes for the day.

They were supposed to offer three types of smart box solutions. Each model was to include a module featuring a keypad, an LCD screen, and a smart-card slot. All of which would allow authorized individuals to securely access the box or the garage.

At these days they have taken away their online presence off the web.

- Materials: unknown

- Dimensions: "The boxes hold three grocery totes, making them big enough for 80 percent of e-commerce and catalog orders.

g) Ezzebox

Based in Australia, this company offers exactly the same product as the Brivo box with noticeable variations in its size. An ezzebox is a stand alone item - battery operated, has its own modem yet is completely wireless which means you can locate it wherever you choose.. It features a state of the art touch key pad and a proprietary access system that generates a unique code for each delivery.

- Materials: reinforced steel and plastic
- Dimensions: The ezzebox's internal dimensions are 40cm x 40cm x 53cm, large enough to handle two cases of wine. Exteriorly It stands 560mm in height, 430mm in width and depth.
- Installation: not announced, it is not in service yet.

Figure 38 Ezzebox solution

h) Shopper'sbox

The ShopperBox is an Internet connected multiple compartment delivery station that would be located within multi-family apartment complexes, condominium communities, gated neighborhoods and commercial complexes. They are also intended to be located in public congregation spaces, each one with an individually assigned address.

Deliverers have a universal key that opens all the boxes in an area. They may deposit in any compartment of the locker cabinet. Through the internet connection of the unit (it is connected to main electric plugs and through cable and telephone lines to the internet site), the network notifies the owner of the package by mail, pager or telephone that he has a package waiting, and provides the one time use code to open it. The service is free for members, and landlords and apartment complex owners pay for a rental fee. The company plans to charge Carriers for their service and a universal key to open all stations.

- Dimensions: Various units with varying sizes, are grouped into a locker cabinet. The biggest one is 2' by 2' by 2', according to the pictures. Nevertheless, larger units are also pictured, as long as 7' high, while much more thinner.

- Materials: Reinforced steel conventional lockers, whose access is controlled by a central computer unit. No weather-proof materials are yet announced.

- Installation: the company installs and maintains the units as part of their contract with the managers of buildings or malls.

Figure 39. Shopper'sbox solution

APPENDIX 8
*deliver**E**unit design*
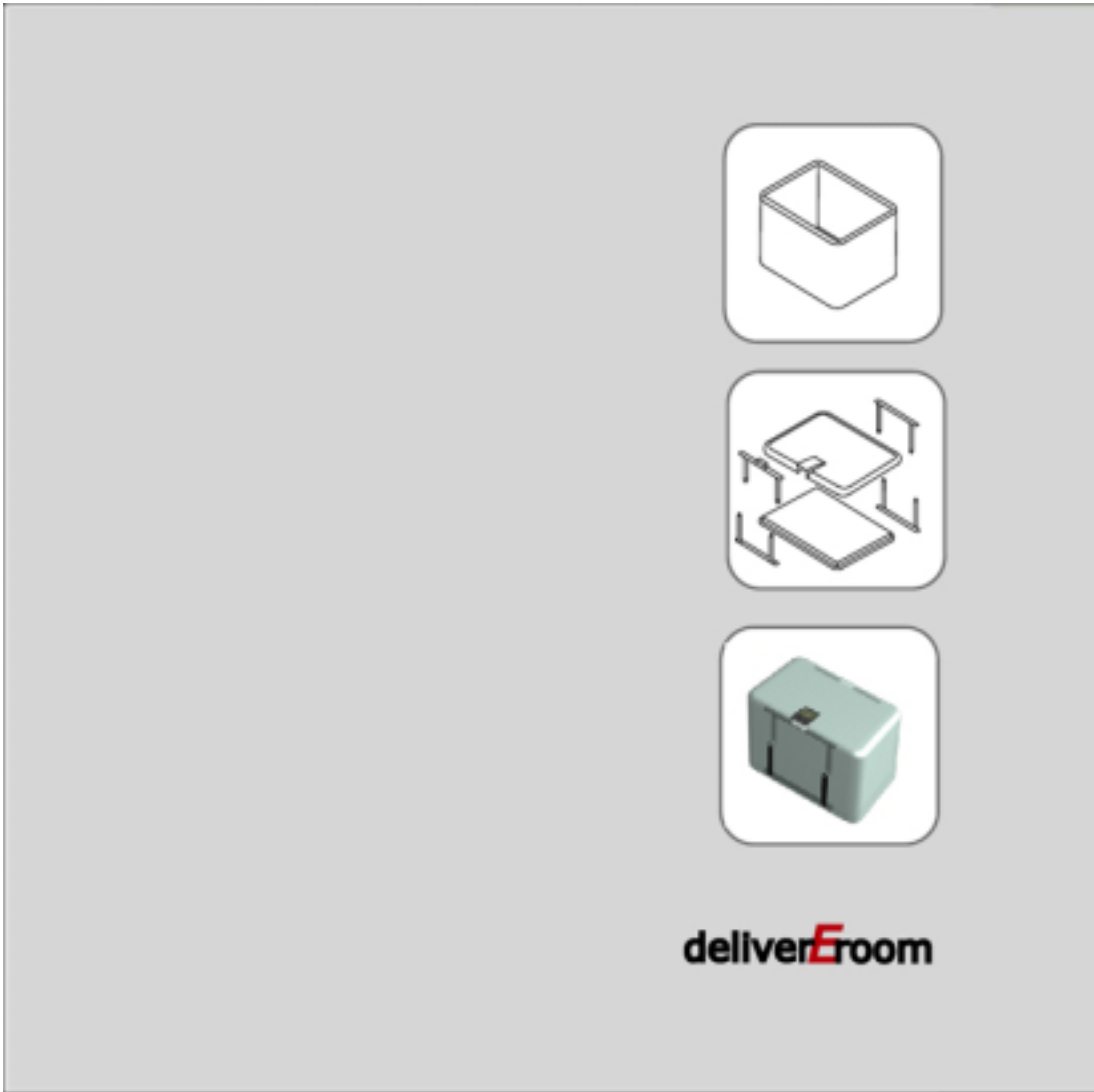
Individual components, installation procedures, and location possiblities of the deliverEunit are illustrated in the following pages.
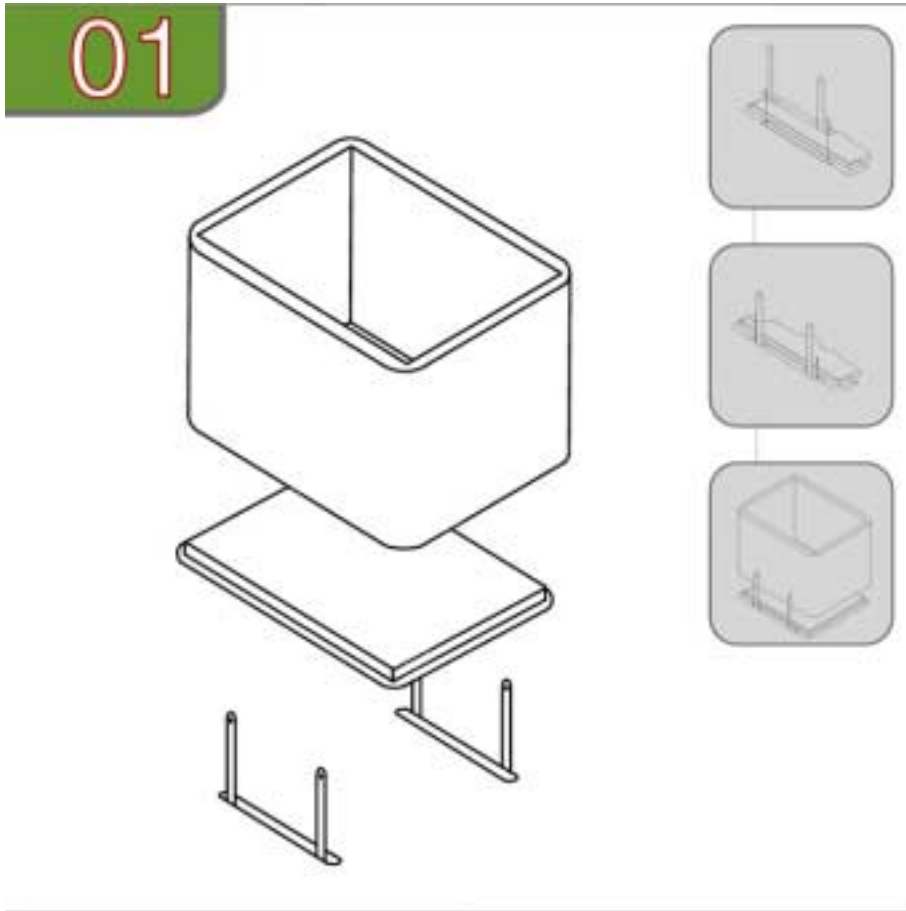
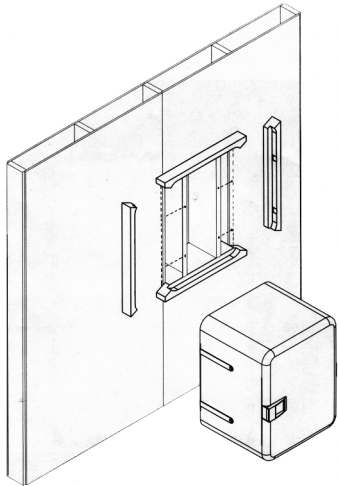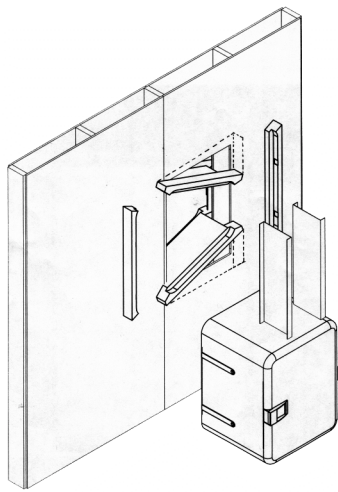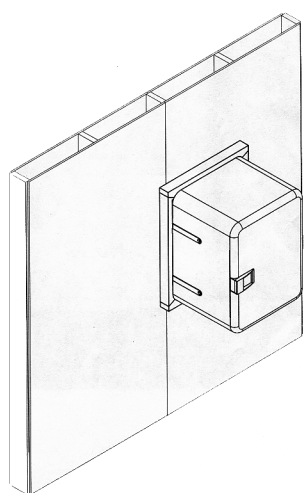Figures 39. DeliverEunit installation – sequence-1
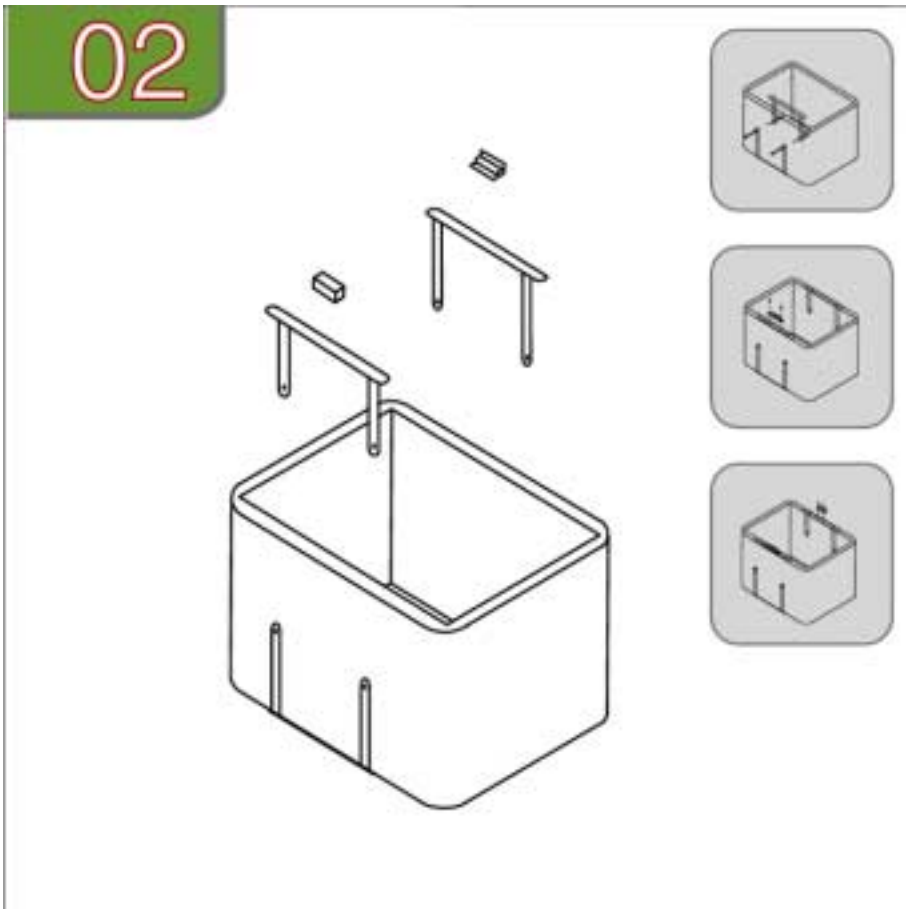
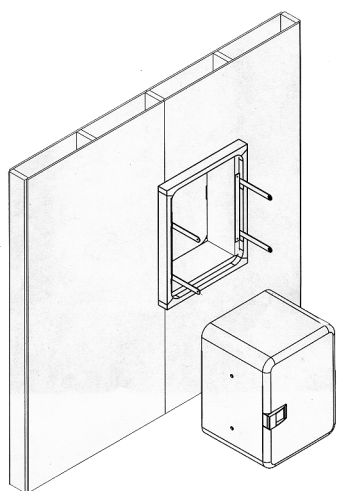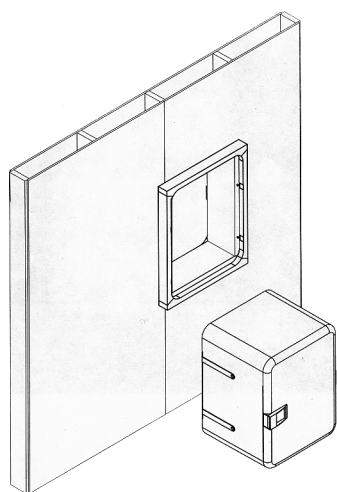Figures 40. DeliverEunit installation – sequence - 2
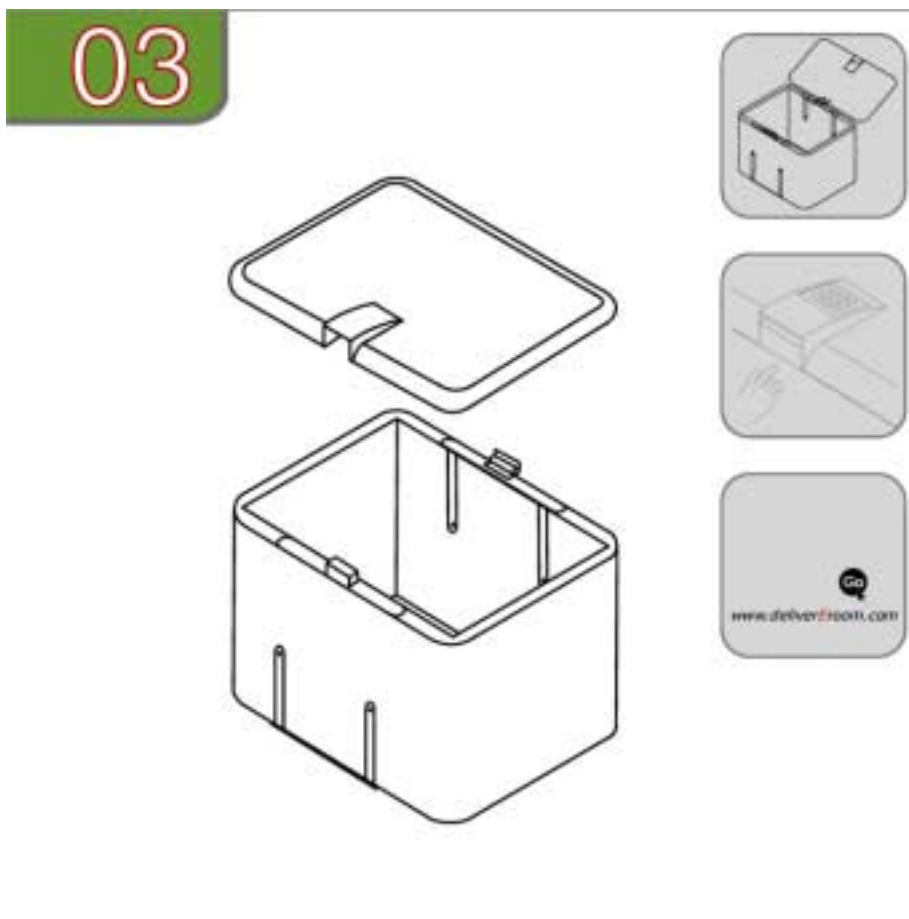
Figures 41. DeliverEunit installation – sequence - 3

Embedded deliver**E**unit installation

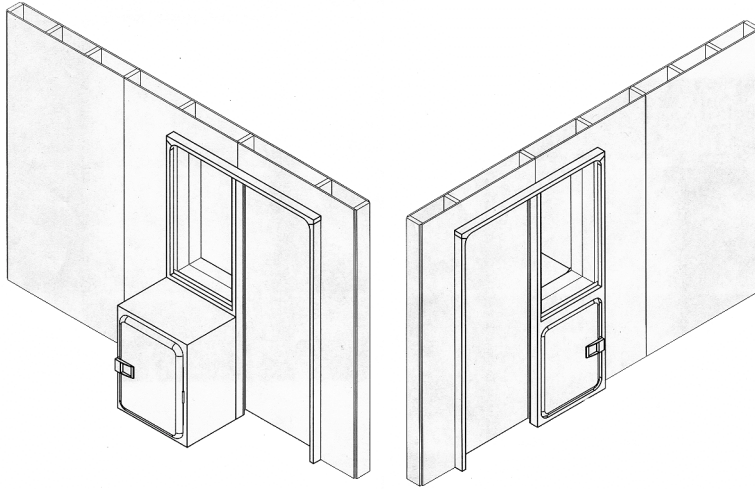Figure 42. embedded DeliverEunit installation -sequence
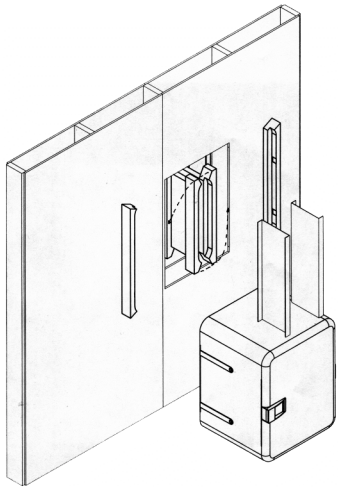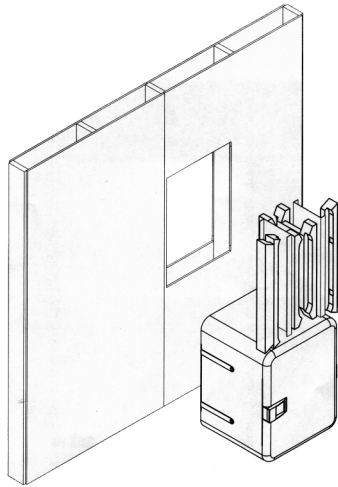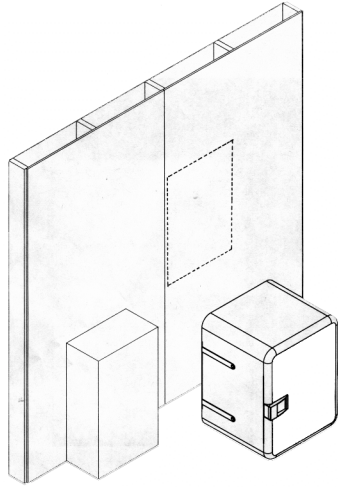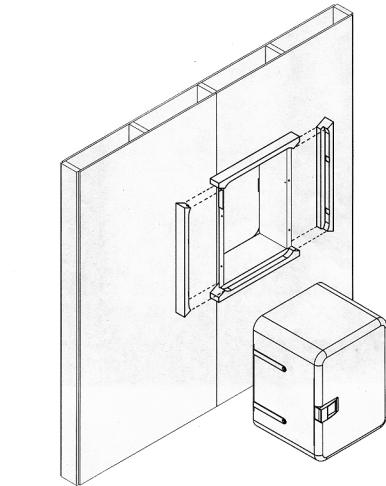
back side
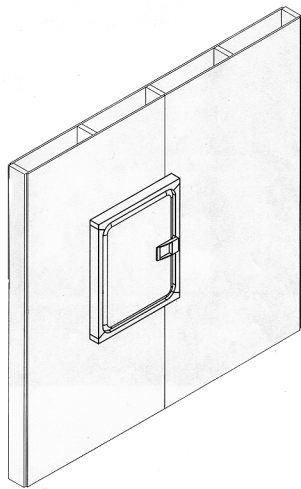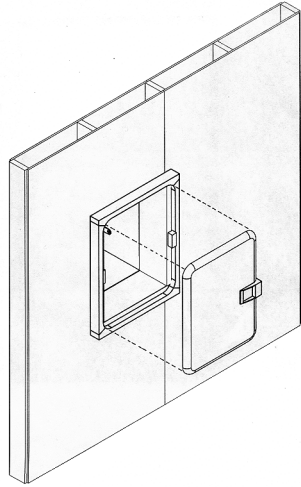
deliverEunit possible locations

Porch

Back/front Entrance

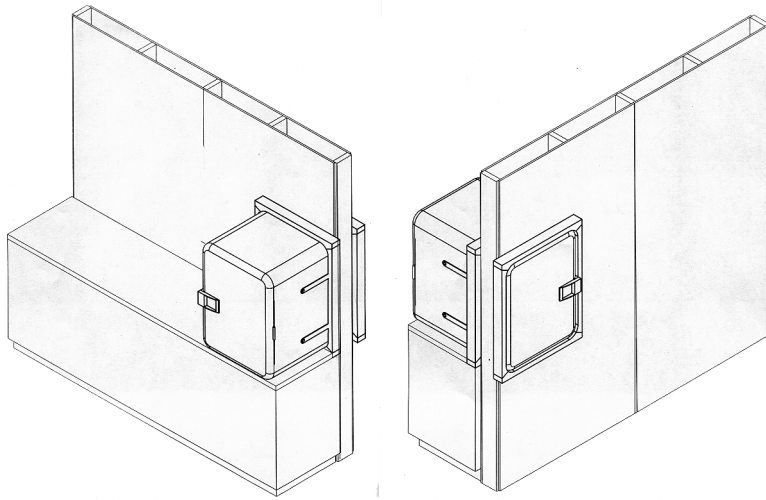Figure 43 . deliverEunit possible locations - porch

Kitchen
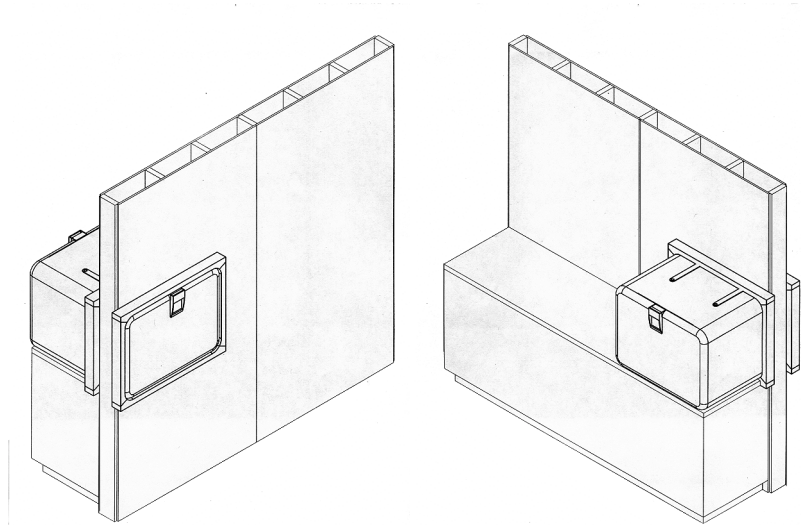
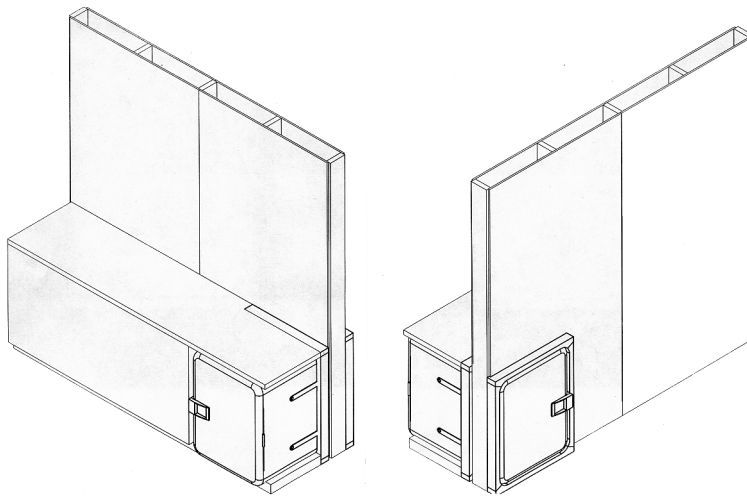### Countertop-horizontal

Figure 44 . deliverEunit possible locations - kitchen

Countertop-vertical

Figure 45 . deliverEunit possible locations - countertop

Underneath countertop

Figure 46 . deliverEunit possible locations – underneath countertop