



Creating More Affordable Housing In Toronto

TKS x SIDEWALK LABS

Executive Summary

Creating More Affordable Housing In Toronto



The Problem.

Due to inefficient material and construction use, poor optimization of space and flawed rental systems, the average price of living in a condo is \$651K. This is more than 2x the cost it was only a decade ago.



The Solution.

A three part resolution, covering all aspects and inefficiencies in condos by utilizing Factory Based Pre-Fabrication, Floor Space Optimization and Principal Residence Rental Optimization.



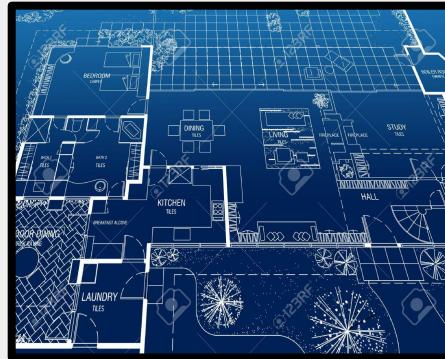
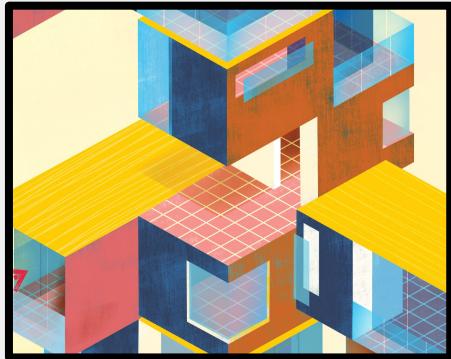
The Outcome.

A 50% more affordable and a significantly more sustainable housing industry throughout the supply chain, as well as a 5-10% reduction in land costs.

OBJECTIVE

What are the main problems we are solving?

Creating More Affordable Housing In Toronto



Factory Based Pre-Fabrication

Traditional construction methods are wasteful, tedious and expensive. Without a definitive plan, developers are forced to guess costs and timelines of projects. With a multi-pronged approach, we will be able to prefabricate modular condos, allowing Sidewalk Labs to build personalised and better designed condos in a more efficient, affordable and sustainable fashion.

Pages 5 - 13

Floor Space Optimization

Traditional architectural design methods take large amounts of time and effort for floor plan layout. In addition, there is no framework for creating a design system with optimizations based on certain restraints. By creating a generative design program for floor plan designing, Sidewalk Labs will be able to save millions of dollars and a lot of time in the design process.

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Principal Residence Rental Optimization

An increasing number of households are financially unstable due to uncontrollable factors, and are selling their units due to fiscal inflexibility over time. By providing lower-income homeowners with an option to rent out portions of their apartment, they can achieve financial freedom. This will reduce the cost to live at Quayside on an individual scale by thousands of dollars a month.

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FACTORY BASED PRE-FABRICATION

1. Mass Timber
2. Pre-Fabrication Factories
3. Transportation

Summary: Factory Based Prefabrication

Factory Based Prefabrication is a method of construction in which the bulk of fabrication and assembly of building components takes place in a controlled setting optimized for manufacturing. The process of design, manufacturing and construction are more integrated, capturing efficiencies not achievable through conventional methods, and allowing for more effective quality assurance. This recommendation consists of three key components - leveraging mass timber, the prefabrication factories themselves and optimizing for transportation

Factory based prefabrication is 20% more cost-effective across the supply chain in total.



Factory based pre-fabrication results in 75% less waste across the supply chain.



#1 - Mass Timber

Mass Timber is a highly sustainable, durable and easy to manufacture emerging building material. We recommend using Cross Laminated Timber panels (CLT) for buildings reaching a height of 12 storeys, and Glue Laminated Timber beams (Glulam) for buildings reaching anything in-between 12 and 30 storeys.

#2 - Pre-Fabrication Factories

Using pre-fabrication factories, we can pre-fabricate libraries of customizable building parts. In this fashion, we can allocate more resources to the unique designs required to fit the unique challenges of each building. This model would allow for reduced costs, reduced waste as well as faster, more predictable timelines.

#3 - Transportation

We recommend utilizing air bag lift systems where CSA Z-240.10.1 foundations are approved in the place of expensive cranes, as well as barges, which can be used to transport multiple units at a time to coastal areas, to save time and money. Space saving structures such as prefab panels, stackable or folding modules, can be more efficient to transport by truck.

Problems With The Current Construction Process

In the last 20 years, **77% of new housing stock in Toronto has been condos.** The biggest factors contributing to that cost are: Land costs, City-imposed costs, labour costs and the one which we'd like to tackle, construction costs.

The Current Construction Process:

1. Making sure the ground is graded and prepared correctly.
2. The foundation is placed. The type of foundation that is installed is determined by the type of the building.
3. The framing is set up, which serves the purpose of acting as a skeleton for the structure.
4. A contractor will drywall the framing and install all the windows and doors.
5. The roof and utilities such as electrical and the plumbing are installed, and the walls are painted.



Material Waste

An **average of 10-15% of materials are wasted per project.** That's 3.9 pounds of waste per square foot! This is largely due to the fact that there are no definitive projections with on-site construction and the required amount of resources for said project are frequently inaccurate.

Cost And Timelines

Currently, condo construction timelines are monumental at a whopping average of 20 months per project. Costs of construction are even more substantial, clocking in at \$743 per square foot.

Mass Timber

Cross Laminated Timber (CLT)

1

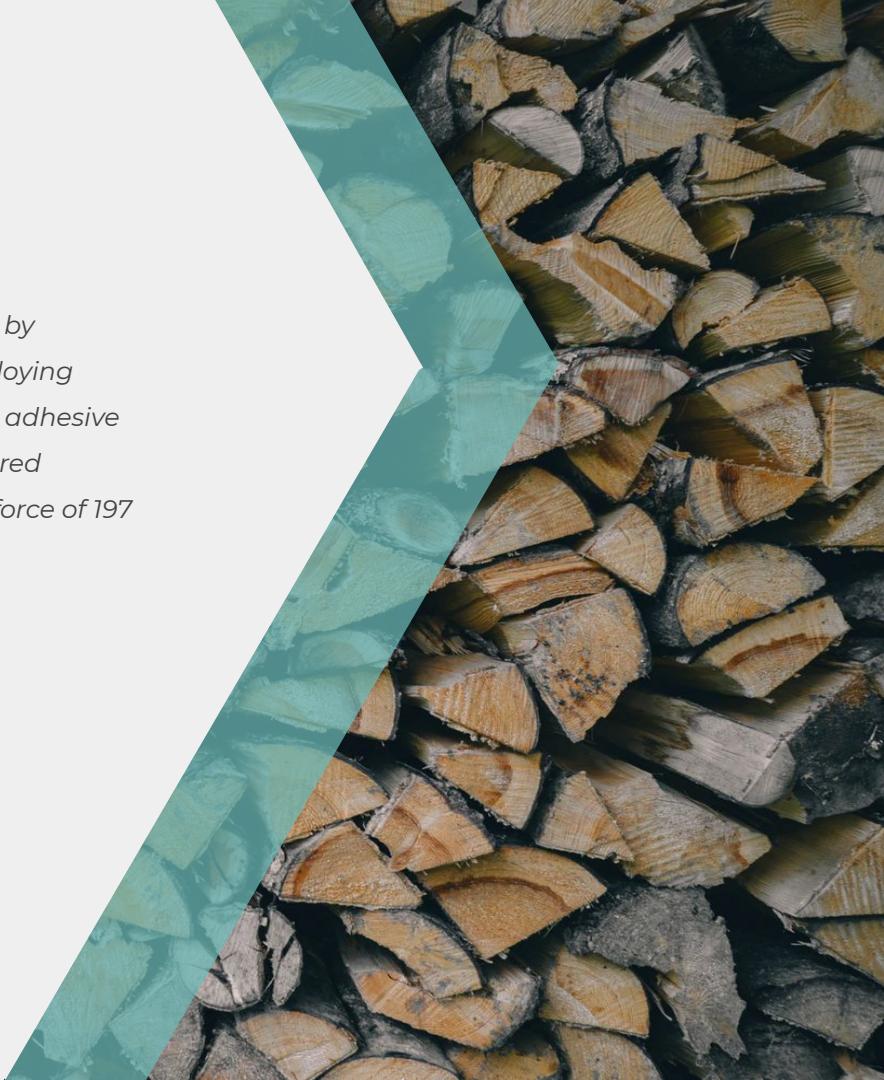
What Is Cross Laminated Timber (CLT)?

Cross Laminated Timber is an emerging building material created by compressing 3-7 milled wood pieces perpendicularly through employing polyurethane-based glue to create a panel up to 4 - 18 meters. The adhesive ensures low toxicity and potential reusability. Because of CLT's layered arrangement, A typical wall panel is capable of bearing a vertical force of 197 kN/meter.

2

Benefits Of Cross Laminated Timber (CLT)

CLT is as strong as steel and twice as strong as concrete by weight — yet far easier to manufacture and faster to assemble. Its walls and panels can safely support 12-storey buildings without the need of structural beams and posts, freeing up lots of indoor space within condos. CLT assembly speeds are extremely fast because there is no need for structural support. CLT is also extremely sustainable; trees sequester carbon as they grow — trapping 1 tonne of carbon dioxide in every cubic metre of timber.



Mass Timber

Glued Laminated Timber (GLT)

1

What Is Glued Laminated Timber (GLT)?

Glued Laminated Timber is another form of Mass Timber similar to CLT, however it's optimized for buildings that exceed the 12 storey limitation of CLT. GLT is compressed with the timber grains oriented in the same long direction, giving it immense strength across the length of the beam. For this reason, the most conventional use of GLT is in the form of beams and posts to support skyscrapers.

2

Benefits Of Glued Laminated Timber (GLT)

With the help of CLT floor panels, GLT beams and posts could help support up to 30 storey tall buildings. GLT also poses a lot of the same benefits that CLT does such as its manipulability, lightweight and carbon removing properties.



Pre-Fabrication Factories

Modular Construction

1

What Are Pre-Fabrication Factories?

Pre-fabrication is an effective method of manufacturing buildings parts off-site. Factories cut and prepare materials into assembly-ready wall panels, floors, beams, and posts. A library of building parts could be personalized in different ways to ensure design excellence and to develop a digital management system that coordinates the entire supply chain. Building Information Modeling could be employed to facilitate this.

2

Benefits Of Pre-Fabrication Factories

The easier on-site assembly of prefabricated mass timber parts would accelerate project speeds, saving time and reducing project management costs and site operational costs during the construction period. Pre-determined components could create more predictable, shortened timelines for sourcing and procurement. A pre-designed library of parts would reduce time spent on designing, allowing for a more detailed and thought-out pre-established strategy around technical details, dramatically reduce overall design time and cost. Finishing parts in a factory would capture waste for recycling and nearly eliminate on-site waste. Off-site factory conditions would improve productivity and reduce on-site supervision needs, while also reducing risks of injury.



Transportation

Current challenge with prefab

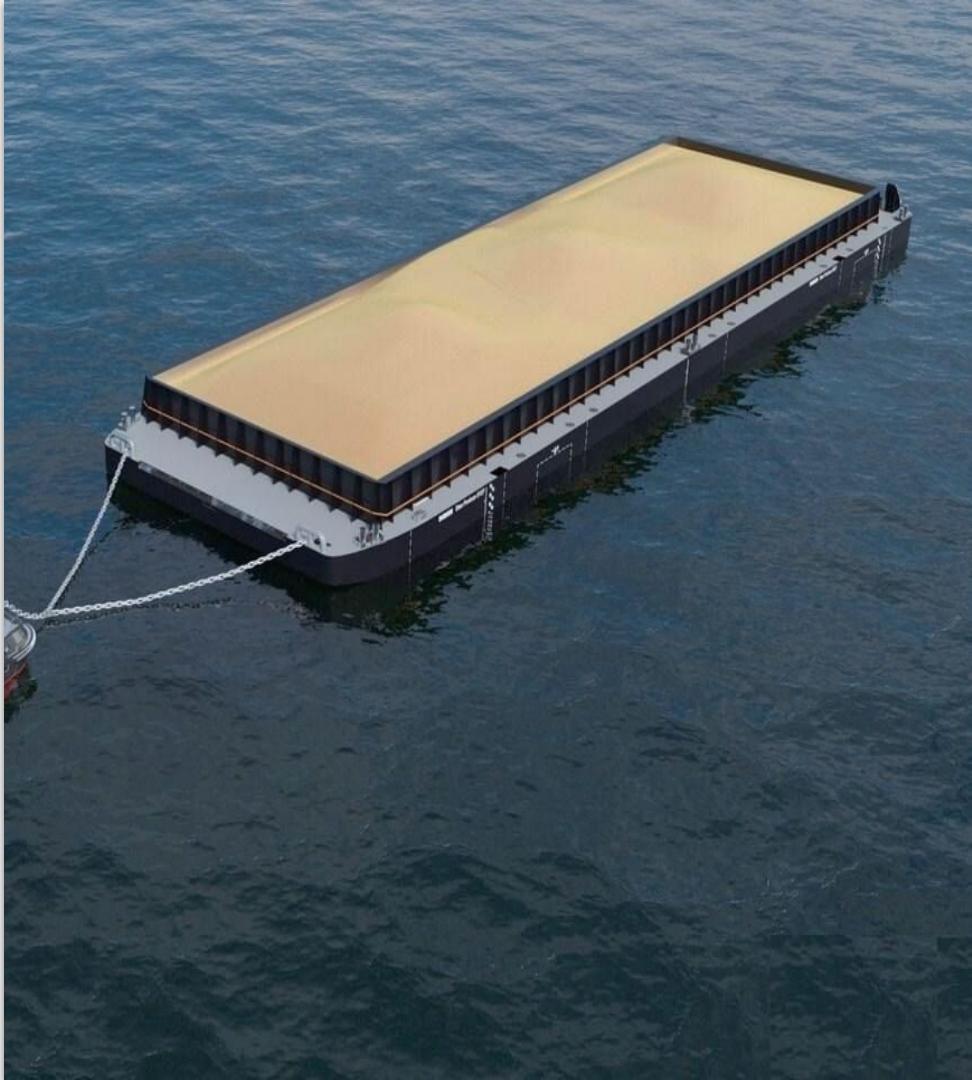
Our Plan

Although pre-fabrication is cheaper than building condos on-site, transporting prefabricated pieces can be far more expensive than traditional methods. This being said, there are some potential solutions.

The pre-fabricated library of building parts could be designed to maximize shipping efficiency, reducing transportation costs. Because of the personalization offered with pre-fab construction, mass timber can be manufactured to fit a standard articulating truck. We can also optimize for truck transportation by utilising several space-saving structures such as panelized, stackable and folding modules.

According to industry experts from Eco Structures Design Build In., the optimum modular size of modules is a module for transportation with a width of 14.4 feet, length of 77 feet, and height of 13 feet, giving a floor area of roughly just over 900 square feet.

Air bag lift systems can be used where CSA Z-240.10.1 foundations are approved in the place of expensive cranes. Barges can also be used to transport multiple units at a time, to save time and money.



PROCESS

Our Vision In Place

Harvesting Timber



Spruce trees from the boreal forests of Ontario and Québec, and Douglas fir trees from British-Columbia would be harvested by local foresters

Local Sawmills



The wood would then be compressed into CLT and GLT pieces by local sawmills

Prefab Factory



Wood would be cut and prepared into assembly-ready panels, floors, beams, posts and library buildings library components in prefab factories

Transportation



Mass timber pieces would be transported efficiently via trucks and barges to the construction site where they would be unloaded.

Construction Site



Mass timber pieces would be equipped with a metal cleat system to furthermore speed up the assembly process before being assembled together by construction workers on-site.

IMPACT

Construction Efficiency

Using factory-based prefabrication and mass timber, we estimate that construction timelines would be reduced by 35% (reduction of 7 months). We also estimate that the total value created by factory based prefabrication could result in \$1B for below-market housing through 2048, resulting in approximately 7000 units of affordable housing. Factories would also have an immense impact on labour, generating more high-paying jobs and 79% less injuries. (1% of construction workers injured vs. 0.6% of factory workers injured)

Environmental Efficiency

We estimate that there will be a waste reduction of 75%. The manufacturing process nearly eliminates its waste, because the prefabricated mass timber pieces are designed as perfect fits, and new sizes can easily become standardized over time. If mass timber is fully incorporated in all building developments, we estimate that Quayside developments will remove a total of 250,000 tonnes of carbon dioxide out of the atmosphere. (1t of CO₂ / m³)

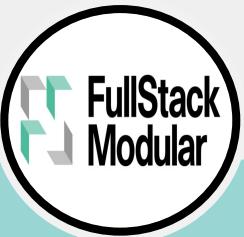
Transportation Efficiency

In utilizing several strategies for transportation optimization such as panelized, stackable and folding modules, Factory Based Prefabrication can reduce the total number of deliveries to sites by 90%, and decrease the average travel distance of workers to the site by 75%, according to BuildingGreen.

Economical Efficiency

Prefab factories would result in reduced material procurement costs, design costs, assembly costs, transportation costs, waste costs, labour costs and contingency costs. Collectively, this would result in 20% reduced total costs. Popularizing prefab factories would also develop a new industry, creating ~200,000 jobs in forestering, according to William A. Fischel's "An Economic History of Zoning and a Cure for its Exclusionary Effects."

Action Plan



FullStack Modular

This is FullStack Modular. They're the first fully integrated modular solution for design, manufacturing, and construction. Adopt their utilization of BIM software to perfectly calculate the costs, timelines and develop a detailed digital modular design for your condos.

Mass Timber Institute

This is the Mass Timber Institute. They are an ambitious and unique public-private collaboration focused on ground-breaking research and development. Adopt their strategy for efficiently implementing mass timber tall wood buildings and the use of advanced wood products.

bld Architecture

This is bld Architecture. They utilize a design practice focused on bringing innovation and responsiveness to their clients and field. Adopt their method of architecture architecture, enabling thoughtful, essential, elegant and timeless projects.

Ecocor

This is with Ecocor. They are a construction firm that designs, manufactures, delivers, and assembles the most efficient ("High Performance") buildings on the market. Their construction details are certified Passive House. Adopt their strategies that allow them to create high performing, yet sustainable buildings.

OPTIMIZING FLOOR SPACE

1. Circulating Percentage Optimization
2. Room Layout Optimization

Summary: Floor Plan Optimization

Optimization is extremely important when creating buildings that benefit the user as much as possible, as even a small saving or extra space can make a large impact on the users.

However, architects currently use design softwares such as **BIM 360** that don't come with processes to optimize a certain part of their design. Because of this, the space inside an **affordability-oriented condo or apartment** might not be utilized to its greatest potential.

In this section, **we've outlined some methods to create an environment where the architect is able to utilize optimization methods to create a better floor plan.**

According to the Altus Group 2019 Canadian Cost Guide, it costs between **\$180-\$280** per square foot of land in a residential building.

\$180 - \$280

1

2

Minimizing Circulation Percentage

In residential buildings, circulation routes such as corridors, elevators and fire escapes comprise between **10-20%** of the net internal area. By optimizing a building to minimize the circulation percentage while maintaining user-satisfaction, there are large up-front cost savings. We recommend using constraint and evolution-based techniques such as genetic algorithms and generative design to accomplish this.

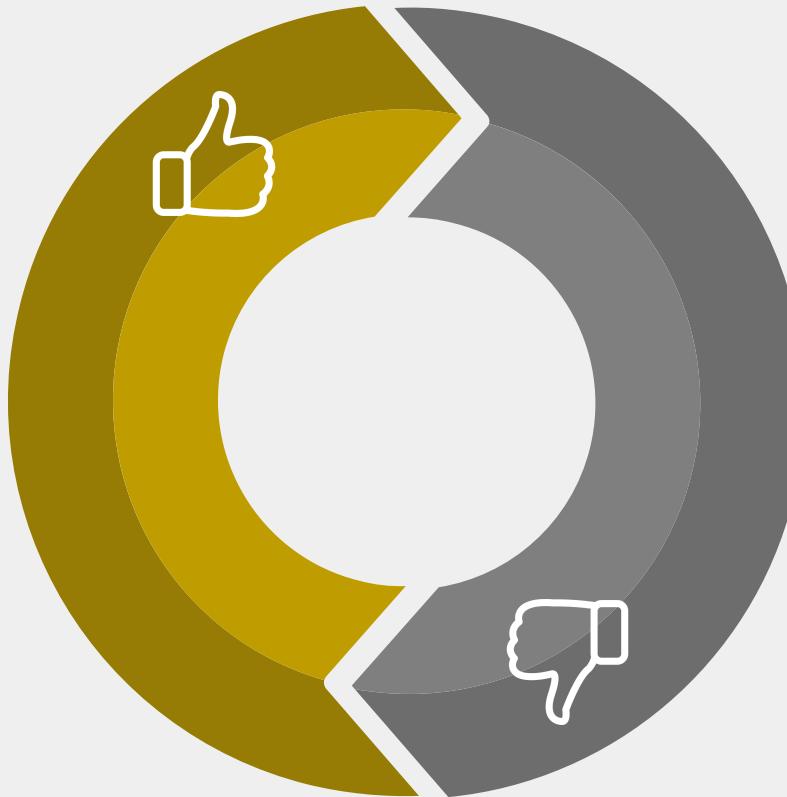
Maximizing The Number Of Rooms

In certain buildings with a number of amenities, there might not be as much living space to accommodate the needs of the demand. By maximizing the number of rooms while maintaining quality of life for users, home supply can be increased while also providing greater affordability to the rest of the people living in a building.

Existing Solutions For Circulation Design

Advantages

Manual design involves architects designing a system themselves and testing for its efficiency (on the software). This is good because the architect has **complete freedom** over the design of the building and its floors, and although it may take a long time to complete, their systems can end up being extremely complex but still viewed in a **professional and well-designed manner**.



Disadvantages

Although manual design is a good choice for freedom, a lot of well-designed buildings might still be able to remove some circulation space or space from service facilities. On top of this, architects end up taking a lot of time designing a system, and going through hundred of iterations for optimizations might not be feasible.

Existing Solutions For Circulation Design

Advantages

Some recent solutions look towards the utilization of **genetic algorithms and generative design** to create layouts, but they don't take circulation into account. Currently, most of the features existing companies try to optimize for are costs, time and energy efficiency. One such example is Spacemaker.ai, which utilize integrated machine learning systems to enhance the process undergone by architects. In one of their cases, the client ended up saving over a year of effort because of them.



Disadvantages

Most of these companies are only looking at the larger scope of the project, which would include more of the **building shape, its location and external factors, rather than the actual floor plan**. In addition, having these companies as a solution wouldn't be optimal because their practices cannot be scaled throughout the world, and it would be better if a system that integrates with current design software were created because it doesn't require additional consulting from external companies.



WHAT'S CURRENTLY BEING DONE

SPOTLIGHT: AN EXPERIMENTAL RESEARCH PROJECT

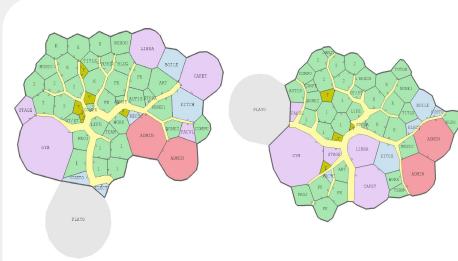
Recently, a student named **Joel Simon** created an algorithm that would optimize floor plans. This is the proof of concept for our proposed solution.



A Sample School.

Joel was working on a project to optimize floor plans, specifically targeting material usage and **corridors**, including fire exits. He started off with a floor plan from a school in Maine and tried to optimize it.

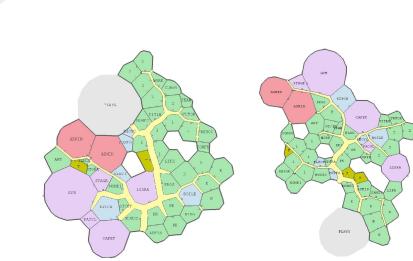
Joel used several techniques for his project, including genetic evolution, graph contraction and ant colony optimization.



Optimizations.

These are two of Joel's optimized models. The one on the left is optimized for minimum circulation percentage as well as minimum building materials, and the one on the right has also optimized its fire escape route.

These images show an optimized building layout that makes good use of the given space.



Unexpected Results.

After he had changed some parameters to get a "window" effect, Joel was able to get a much different result, which were numerous courtyards. This shows that these algorithms can do unconventional and creative things even though they don't seem like they would be able to.

PREVIOUS SUCCESSES

BGI Group.

In one case, a BGI group project ended up generating over 9 million dollars in revenue by giving the architect the responsibility of removing 5% of the original 15% circulation percentage.

Stevenson Systems.

Another company called Stevenson Systems had a client which "discovered" 240 000 additional square feet in their 12 million square feet. Because of this, their net annual operating profit increased by \$5.2, along with 87 million dollars of added value to the client's portfolio at a CAP rate of 6%.

Existing Solutions For Space Optimization

Existing Solutions



Hire a company/service to create an optimization for the general building design, not for a floor plan.



Use previously designed floors and change them based on the specific requirements of the building.



Scratch-build a design that becomes more and more optimized over several iterations.

Other fields, such as the retail and manufacturing industry have had several endeavors into optimizations. One such company is called Visual Components, and they have created a product that help manufacturers design smarter solutions. They have a track record for helping optimize spaces for clients.

Space Optimization

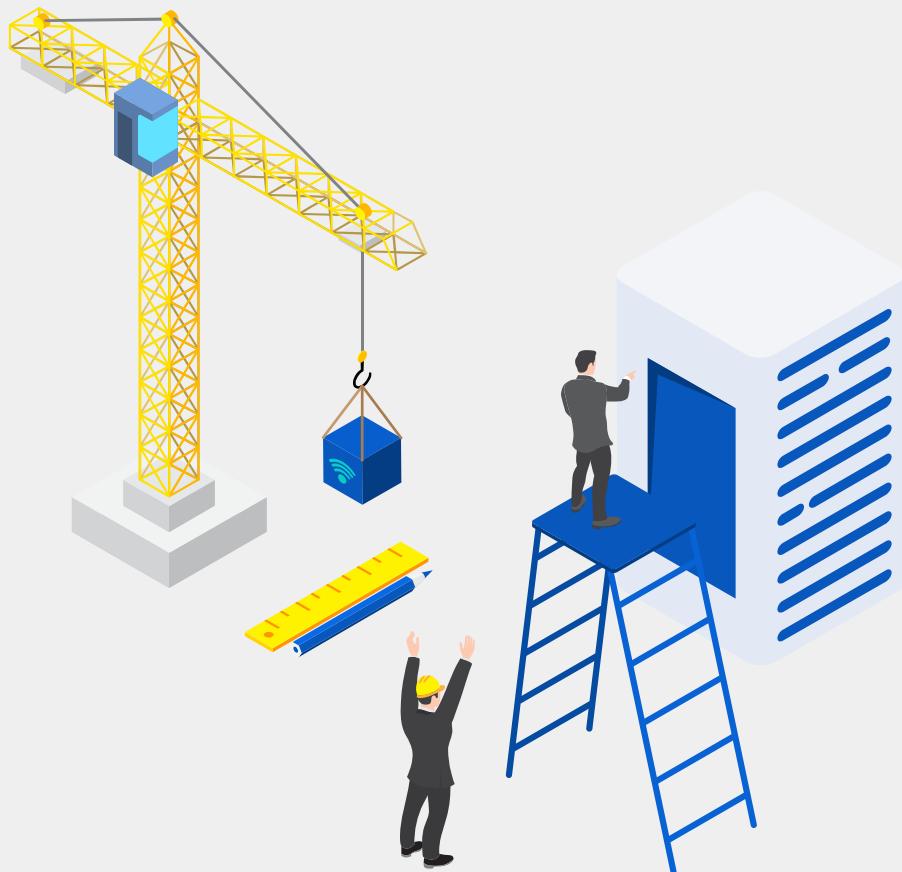
A Case Study.

One example of optimization from Visual Components is an example of their clients called Midea, which is an appliance manufacturer.

By **optimizing the layout** of their manufacturing warehouse through the **visual components product**, they were able to massively increase efficiencies. The client was able to:

- Increase production by 10%
- Improve line balance from 70% to 90
- Reduce floor area for their assembly line by 10%.

This case shows that optimization is indeed possible and has been used in many other fields to generate massive savings and revenue. This system could be used in other fields as well, including the residential field.



Optimizing Floor Spaces In Residential Buildings

Introduction To The Solution

We recommend utilizing **generative design and genetic algorithms** to create a software that can optimize floor plan layouts based on **affordability constraints**. This solution would allow for much faster design creation, as a computer would be able to work through the optimizations once given design constraints. This software could become an extension to Autodesk BIM 360 and would be accessible to all developers aiming to **optimize** their buildings for **maximum affordability** for its users while still generating a regular revenue stream.

The intent of the software is to focus on **maximizing the efficiency** of the building specifically by removing unnecessary spaces (including circulation), and using it for extra space or units within the building. These unnecessary units would include unused space for amenities, service spaces and rooms that can be combined into one (shared washrooms, shared kitchens etc.)



Optimizing Floor Spaces In Residential Buildings

Architects Perspective

The architect will create **moveable/mutable and immutable** objects, which can change size, shape but still keep certain constraints. It will then be sent to the algorithm, which will create variations and return the top performing.

If the architect likes the designs, the algorithm can continue, otherwise, the algorithm will be given more **constraints** (such as keeping a certain room(s) in place and only changing certain things). This system would create a **loop of iterations for optimization**, with the **algorithm doing the bulk** of the optimization and the architect making sure all the smaller details and requirements they want are correct.



IMPLEMENTATION DETAILS

This process would come after the architect creates their first design. By having an implementation such as this, the optimization can be monitored and changed by the architect while also having a fast implementation.

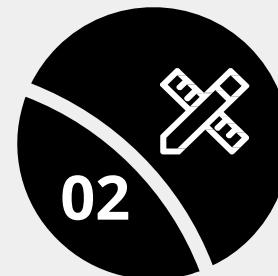
BIM DESIGN

The changes to the floor plan and overall building design are made in a design software such as BIM 360, which utilize Building Information Management. This is what is currently being done.



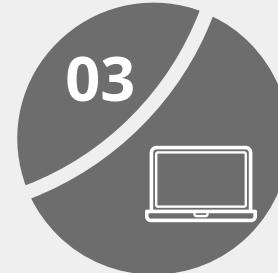
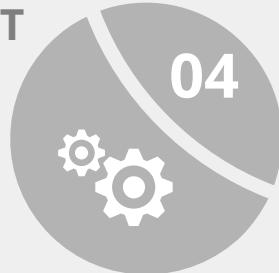
EXPORT TO ENVIRONMENT

The completed draft is prepared to be exported to the optimization algorithm. It would compile the immutable and mutable objects and factors to optimize.



SELECTION & EXPORT

The best model selection from the algorithm would be converted into an editable file and exported to the original design software.



MODEL EVOLUTION/EVALUATION

The generative design and other algorithms would train and create models based on the given constraints and input factors. The best models would be selected.

The Reasoning Behind Choosing The Solution

Our Solution

Why Did We Choose This Solution?

We decided to recommend this solution due to its potential savings should it work. We realized that having a software that is interfaceable with a current solution is likely the best way to go because the architects wouldn't need to learn as much to use it.

In terms of utilizing genetic algorithms for optimizations, we saw that similar things had already been done, but no one had gotten very far even though the underlying idea behind their projects had a lot of potential. For example, Joel Simon's design and Stanislas Chaillou, who both used software to generate floor plans had made good progress and proofs for approaching similar design problems, but didn't see full completion with it. However, we do not know exactly how much the space optimization will save, and it can only be determined by the efficiency of the genetic algorithm that will be used. We decided to recommend this solution because we thought that it could be implemented much more easily due to Sidewalk Labs' larger-scale endeavors into the field of housing.



IMPACT

Economical Efficiency

Using computer-optimized methods to design floor plans with a reduction of 5% in space, approximately 7.4 million dollars could be saved, or an extra 750 square feet of space (per floor) could be added for a 15000 sqft 40 floor building, assuming the building price is \$260/sqft. Depending on the amount of space allocated, between 1.5% and 4% of the cost of units for everyone could be removed.

Time Efficiency

Due to the speed efficiency of computers compared to humans, a lot of time will be reduced trying to optimize designs. Although we don't have a specific time, one company working at a larger-scale level called Spacemaker AI has saved between 3 months and 1 year for its clients in the design process. We expect our recommendation to provide similar efficiencies.

Space Efficiency

By increasing the amount of allocated space for housing by 10%, approximately 1500 square feet could be brought back and added into existing homes or be used to create new ones. This could add between 2-3 new homes per floor. In addition, the space optimization might add more, but it cannot be said initially because no big studies have been conducted with it.

Who To Contact



Joel Simon. Morphogen.

Gain model creation insights and advice on creating a system of this type, since he was one of the people who have built similar systems.



Stanislas Chaillou, Spacemaker.AI

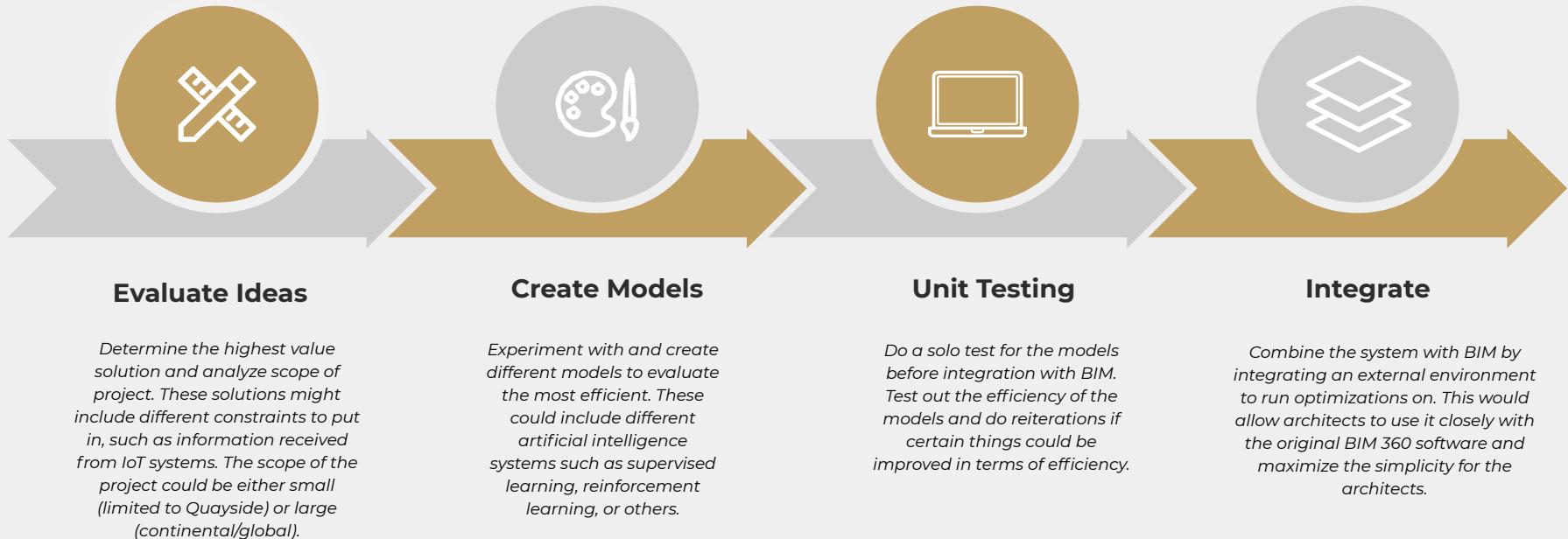
Spacemaker.AI is a company that creates optimized building solutions. You can learn about how their processes work from a technical standpoint, as they have a lot of experience with similar technologies just applied on another field.



Architects.

*Get user feedback and time-specific information in terms of inefficiencies within designing solutions, such as the amount of time involved in designing buildings, as well as what parts take more time in designing solutions. **These architects could be the people who are designing the SWL buildings.***

Action Plan





PRINCIPAL RESIDENCE RENTAL OPTIMIZATION

1. Financial Instability
2. Current Principal Residence Rentals
3. Principle Resident Rentals At SWL
4. Next Steps

Summary: Optimizing the Principal Residence Rental Process

An increasing number of households are becoming financially unstable due to several uncontrollable factors, such as rapidly changing markets. This forces residents to sell their units as they are becoming less affordable.

Considering that almost half of all canadians are \$200 away from insolvency, every dollar counts, and people need to find a way to maximize the efficiency of their homes.

By offering to rent out part of their dwelling as a principal resident rental unit, the homeowner could gain a second source of income to offset the price of owning a home, and in turn, the long term affordability of the unit increases.

The process connecting the renter and the rentee is quite flawed, we are going to be bridging that gap with a UI that allows you to track the status of your property, and choose a suitable tenant.

Your financial freedom shouldn't be the factor dictating whether or not you can stay in your home.



Financial Instability

As households become more financially unstable, their financial freedom goes down along with their long-term affordability.

#2 - Current Principal Residence Rentals

Especially during a fiscal crisis, an extra source of income can be unimaginably powerful, however, current renting systems don't deliver privacy and optimized pricing for renters and rentees.

#3 - Principal Residence Rental At SWL

We recommend creating an interface where the tenant/owner of a unit can view the price of their unit real time and modify their unit as they deem fit, optimizing for affordability and privacy.



“

It's so crazy that my entire life can turn upside down, because of a decision I had no control over. Was a condo even a good decision?

Meet Sudipta Gupta

For the past 18 years, Sudipta Gupta has been living in Canada, and in that time, he has lived in many houses/condos. However, recently he faced uncertainty with his home and future in Toronto.

Here is the problem that Sudipta is currently facing in Toronto:

- 1 Sudipta agreed to purchase a condo from Mr.Chen in Toronto, and paid the deposit. Mr. Chen in turn placed a deposit for his future condo which he will move in to, once his previous condo is sold to Sudipta.
- 2 In the 2nd half of 2017, the housing market crashed, and when the bank appraised the condo that Sudipta was buying, they estimated the value \$200,000 lower than the purchase price agreed. The bank hence offered a lower mortgage \$160,000 less than the original estimated mortgage receivable.
- 3 Now Sudipta was short of funds on the closing date and could not buy the condo. Meanwhile, Mr. Chen could not buy the property he put a deposit on either, due to the fact his condo did not sell. Because of this, Sudipta lost the deposit he paid to acquire the condo and was sued by Mr. Chen.
- 4 Sudipta lost the lawsuit that Mr. Chen had filed against him, and the court passed a judgement to pay a damage of \$280,000 to Mr. Chen.

Sudipta's life has turned upside down to due to this tragic housing situation.

PRINCIPAL RESIDENCE RENTALS

THE SOLUTION

What Is It?

Principal residence rentals are when owners of either homes or rentals rent, or sublet rooms or parts of their dwelling to gain an extra source of revenue.

Drawbacks

As of right now the two biggest problems with primary residence rentals are:

1. Privacy. Having a stranger live in the same dwelling as you intrudes on your privacy
2. Finding the right rentee is especially tough, as one can never know what a person is like.

If these two issues are solved, then primary residence rentals are ideal.



Benefits

Participation in principal residence rentals can offset the price of owning the home for the homeowner, but also offer the rentee a cheaper room, as the price is based on what percent of the dwelling they are renting.

Outcome

Primary residence rentals can increase the amount of financial freedom a person has by providing them with a second source of income that they can use to pay for their mortgage and for their rental price. For shared equity owners, it can do both!

PEOPLE ARE LOSING FINANCIAL FREEDOM

The Problem



Homes Are Not Accommodating

When a person's financial situation changes, they can't always change the financial plan of their home. The mortgages and interest rates of a person's home are constantly rising regardless of one's financial stability.



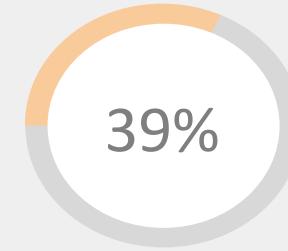
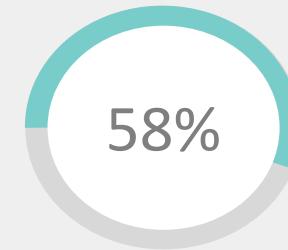
Financial Situations Change

As with Sudipta's case, life cannot be predicted. People are constantly changing fiscally, and the biggest asset by far of each person is their home. Our lifestyles are changing because of our financial situations this is a problem, as when our financial situations are changing our lifestyle should not change with them.



Owning A Home Is A Huge Financial Investment

Purchasing a home is very expensive, but because of sporadic costs from mortgage rates, the costs of owning a home are exponentially higher.



CANADIAN HOUSING AND MORTGAGE CORPORATION

58% of first time buyers with **concerns** or **uncertainty** about buying a home are about unforeseen costs.

CHARTERED PROFESSIONAL ACCOUNTANTS

39% of all buyers indicate that a significant rise in interest rates would make it challenging to keep up on their mortgage and/or debt payments

STATISTICS CANADA

Between 2012 and 2016, 100% of the increase in debt was due to mortgages while consumer debt remained constant.

What Are People Going Through?

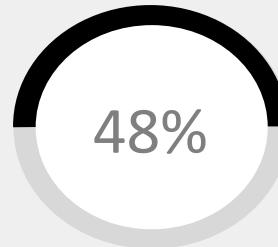
The Problem

Affordability is **long-term** - it is a lifestyle. Affordability shouldn't end after a person has bought/rented their home, it should continue to stay affordable in perpetuity

The average Canadian is only a few hundred dollars away from becoming financially challenged, and with their homes restricting them even more via rising mortgage and interest rates, their primary income is no longer financially supportive enough.

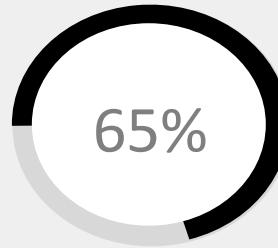
When surveying Torontonians, we found that quite a few people (20%) are not utilizing their living spaces in the most efficient way, and manner.

Financial issues are a huge reason as to why people choose to sell their residence, as they can't afford to pay their mortgage.



ALMOST HALF OF ALL CANADIANS ARE 200\$ AWAY FROM FINANCIAL INSOLVENCY

IPSOS reports that almost half of all Canadians are \$200 away from financial insolvency, and that people have to compromise on their lifestyle to live. Small changes in finance can lead to significant consequences in their life.



THE PERCENT OF PEOPLE WHO CITED A FINANCIAL ISSUE TO BE WHY THEY REGRET PURCHASING THEIR HOUSE

81% of homeowners between 18 and 34 years old have at least one regret about their home, compared with 65% of those 55 years and older, a recent Zillow survey shows. Out of that 65% of all participants cited a financial issue to be the reason that they had regrets, ranging from having too high of a mortgage, to believing that interest rates were too high.

“

My financial situation is constantly changing, and my income can't support me alone.

SUDIPTA GUPTA

CURRENT PRINCIPAL RESIDENCE RENTALS

Right now principal residence rentals are very common in condos. Below are some of the things that people are currently doing in order to obtain a second source of income and achieve long term financial freedom.



Short Term Rental

Right now short-term rentals are allowed in a select few condos downtown, and they have several restrictions to them, including:

- Each rent has a maximum of 28 days
- Restriction of 180 rented days per year
- Hosts would have to pay an annual \$50 fee and register with the city.
- Can only be operated as a principal residence rental.



Long Term Rental

Renting your primary residence long-term in Toronto is much of the same process that renting a normal condo is, although it really depends on the specific building regulations and what the buildings allow.

- Municipal bylaws require no more than 1 person per 9 square meters of livable floor space.
- These are extremely variable, simply based on what the specific building permits.



The Problems

Short term rental companies such as AirBnB are controversial in condo buildings, due to the majority of complaints being about the noise and the mess that short term renters create in the condo unit. The number of complaints about short term rental were just 9 in 2010, while now it's 317

The main problem with long term rentals with principal residences is privacy, and finding a suitable rentee..

THE SOLUTION

OPTIMIZING THE PRINCIPAL RESIDENCE RENTAL PROCESS

PURPOSE BUILT RENTALS

Through a process known as subletting, tenants can choose to rent out a portion of their home. By doing this, the renter can earn a second source of revenue to pay off their rent, and in turn make the rent of the rentee cheaper.

OWNERSHIP

Homeowners have the opportunity to rent out a portion of their home, and by renting out a portion of their home, they can pay for a part of their mortgage. As a byproduct of this, the rentee also gets reduced prices.

SHARED-EQUITY

Shared equity households have to pay both a mortgage and a rental fee, by renting out multiple rooms, and getting a second source of revenue. They can then use that revenue to pay part of the mortgage and part of the rent.



Subletting At Sidewalk Labs

The Solution

Families Want Short-Term Returns

*Subletting part of your principal residence should be an easy experience. It should be **a very straightforward and simple process** to choose who you want and don't want to live with.*

As opposed to traditional ownership rental, subletting allows you to achieve more financial freedom through receiving a secondary source of income to pay for your rental cost.

An example of this would be a 3 bedroom unit with a monthly rental cost of 1,800 dollars, by subletting two of the rooms, you can save a monumental 2/3s of the price, only having to pay 600\$ in rent, with your rentees only having to pay the same amount. it's a win-win situation.

This solution will make housing more affordable for all allowing people to save money without compromising on their privacy.



SHARED EQUITY PRIMARY RESIDENCE RENTALS

The Solution

How The Solution Would Work.

Principal residence rentals in shared equity homes can lead to more financial freedom in those households by providing a secondary income to supplement the owner's main income. Shared equity rentals differ from both traditional ownership and traditional rental because you are both subletting and renting out your dwelling at the same time. Providing people with options for long term affordability is just as important as short term affordability.

- Shared equity principal residence rentals can be used to pay for either the mortgage or the rent of the unit.
- For example, If you were to rent two rooms out of a portion of a three-bedroom shared equity unit (20% ownership), you would ideally get 2/3s of what you paid for your monthly payment (mortgage+rent) back.
- You would then be able to use this to pay off 2/3 of your mortgage and rent for that month, allowing you to achieve more financial freedom.



Traditional Ownership

The Solution

Families want short-term returns. With traditional ownership, the money that the renter makes, goes to paying the mortgage of the house.

For example, with a 3 bedroom unit that has a mortgage of 2,500\$ a month, the cost could be split three ways, coming out at an approximate 833\$. This isn't the most ideal scenario, but providing options for different financial models is the best way to stimulate affordability.

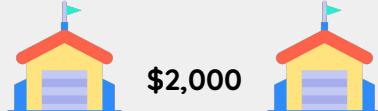
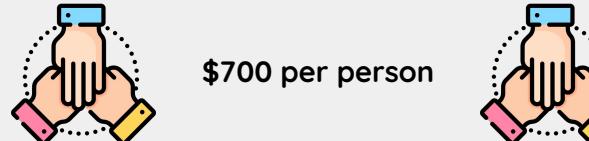
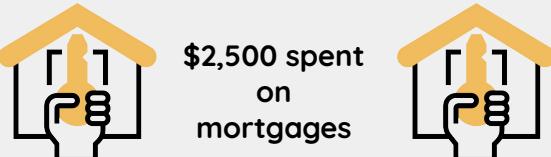
Owning a home has never been more expensive. This is due to the cost being at an all time high. However, providing options for affordability to those who can afford a home is the best way to ensure that they can remain in their home.



97%

97% of homeowners stated they wished they had factored in other obligations before buying, such as property taxes, maintenance costs, and "overall lifestyle experiences".



| Original Monthly Payment | | MONTHLY PAYMENT WITH TWO PRINCIPAL RESIDENCE RENTALS | |
|--------------------------|--|--|--|
| RENTALS |  \$2,000 |  \$667 per person | |
| SHARED-EQUITY |  \$2,100 on a \$500 mortgage and a \$1,600 rent. | |  \$700 per person |
| TRADITIONAL OWNERSHIP |  \$2,500 spent on mortgages | |  \$833 per person |

UI/UX DESIGN

When optimizing principal residence rentals, we found that the best way to approach the task was through a UI app of sorts. The benefit of having a user interface is that the tenant actually gets to interact with what they need. It's tangible and it is hands on.

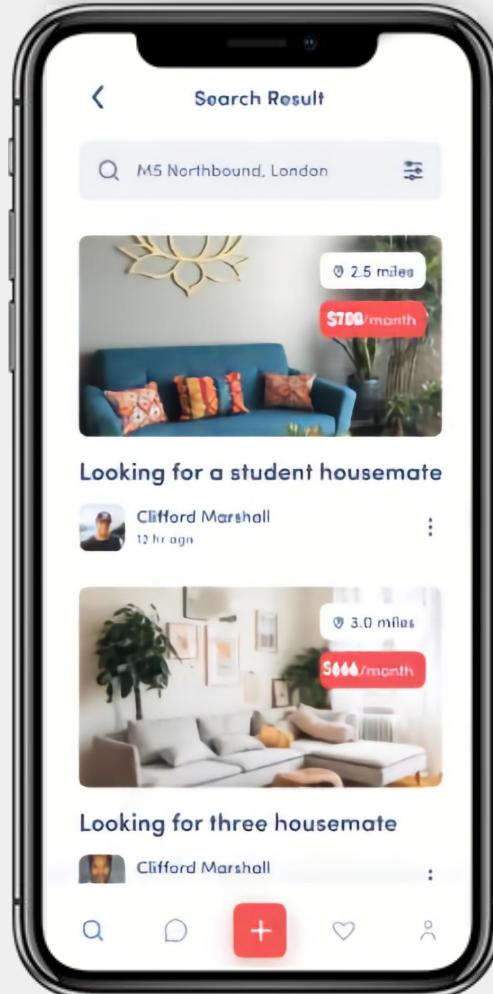
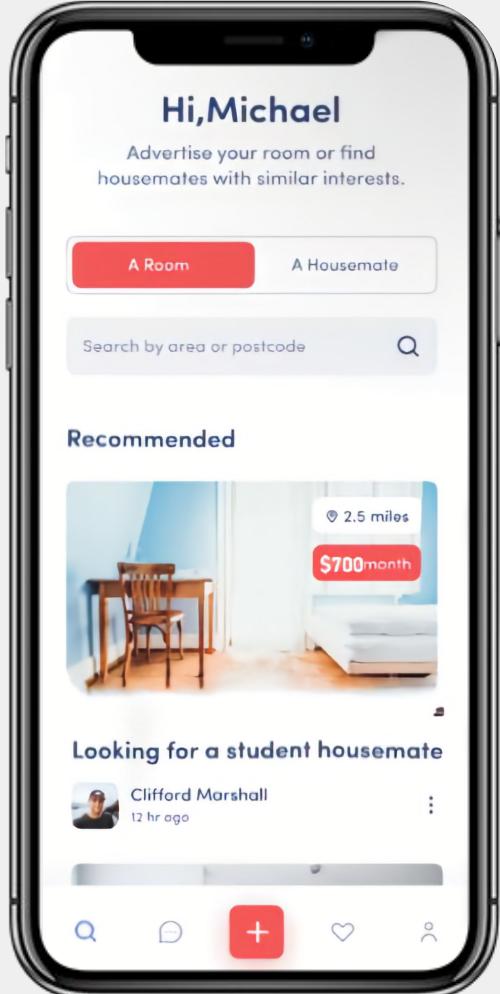
With the design of the app, there were several goals in mind:

1. Making it easier for the renter to find the right tenant.
2. Making it easier for the tenant to find the right price and accommodations
3. Making sure that the space is liveable for both parties involved

With these three guiding goals in mind, we designed a prospective UI that could make the process of principal residence rentals easier for both the renter and the rentee by recommending tenants and accommodations based on need for the rentee, and creating a platform where they could both add input about the design of the space.

In addition to this there is also a feature to design the space of your home to accommodate the extra tenant, one which implements flexible walls to expedite the process of getting the renter in the unit.





IMPACT

Financial Longevity And Freedom

By providing a supplementary source of income to people facing financial hardship, people will be able to stay in their houses for longer periods of time. The amount of time that a person stays in a home can be extended (from 2 to 10) by providing a greater sense of financial freedom.

Split Costs

*By splitting the cost of living equally between the renter and the rentee, it becomes a win-win scenario, with both the renter and rentee paying less than they typically would. **We could see the price per person go down by between 50-75% depending on the number of rooms being rented out.***

Greater Choices

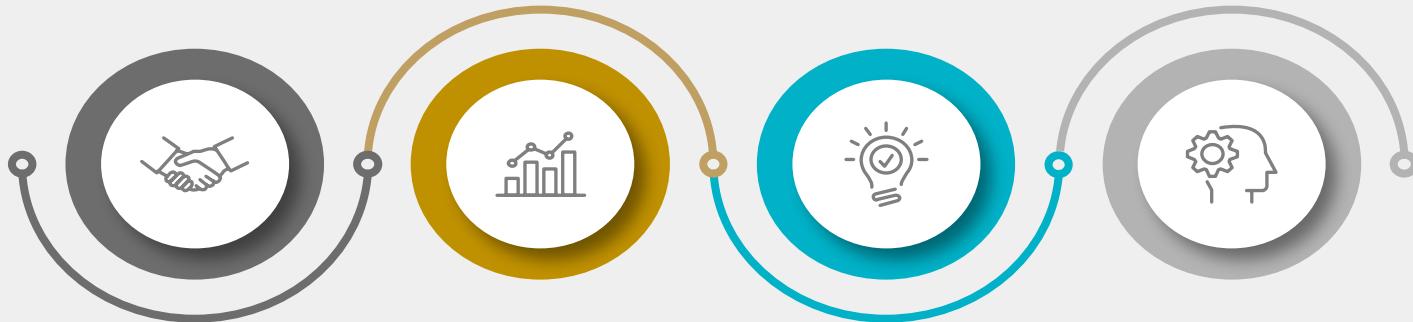
By allowing more choice and financial freedom to the tenant, we could lower total cost by several hundreds of dollars on a monthly basis per person, allowing the tenant to stay for longer. When people can choose to rent out a portion of their space, they can achieve greater affordability

Improved Privacy

Through flexible walls and living spaces, you can use the app to provide privacy to both the renter and the rentee, instead of traditional principal residence rental processes where privacy is a second thought,. For example, residences are usually only separated by a door.

NEXT STEPS

What can we do to implement the recommendation?



Awareness

By making people more aware of the financial choice that they have. People will be more likely to implement it.

Ways to increase awareness:

- Campaigns
- Advertisements
- Talking To People

Feedback

There are numerous people who you can talk to and receive feedback. You can talk to real-estate agents, people who rent out their primary residence, and experts on subletting and principal residence rentals in condos a great way to get feedback.

Consulting

Consulting is an important part of innovation. You can consult companies working on renting platforms, the city about their guidelines and, people who have lived in primary residence rentals. It is super valuable to get their opinion and use it to build on, similar to feedback.

Pilot Project

Before the project officially opens it is important to try this project on a small scale. Demo the application and work on logistics based on the results of the project on the small scale. Then once the results of the pilot project are in, you can launch it on a large scale.

Who To Contact Or Work With



OLEKSIY LUBINSKY

CEO of Rentberry, Oleksiy Lubinsky owns the world's biggest rental platform. You can get insights on how to create an effective rental platform and work with them, using some of their backend in order to enhance SWL's.



RENTBERRY

Rentberry is a worldwide organization that focuses on the implementation of an easier long-term rental platform. Very useful company to work with due to their well-built platform.



CMHC

Canadian Mortgage and Housing Corporation has many valuable insights regarding subletting in shared-equity homes. Speaking to them will give valuable knowledge on this topic.



AIRBNB

AirBnB is very experienced in short-term rentals. Speaking to them about short-term rentals can be more efficient for SWL's use.

Summary Of Recommendations

Creating More Affordable Housing In Toronto

Factory Based Pre-Fabrication

Construction is extremely limiting and inefficient as costs are unpredictable, timelines are inaccurate and slow, and status-quo materials are becoming more expensive to source. With our approach of fully employing mass timber as material of choice, popularizing prefab factories and optimizing builds for transportation, housing will become more affordable

Floor Space Optimization

The price of housing is not going to decrease anytime soon, and Sidewalk Labs needs a solution that can aid in affordability at its core level. By optimizing floor space, not only can workloads on the architects could be massively reduced, but millions of dollars be saved up-front and long-term.

Principal Residence Rental Optimization

People are generally facing more financial stress now than ever, and as a result of this, their housing accommodations are sporadic and unpredictable. By providing a second source of income through optimizing the principal residence rental process, the long term financial freedom and stability of tenants is increased.

On A More Personal Note

We'd like to thank you for giving us the opportunity to contribute to Sidewalk Lab's potential strategies in creating more affordable housing in Toronto. We appreciate your commitment of providing us with an abundance of information, as well as the time spent in order to make this opportunity available to us.

We sincerely hope that we were able to aid you for future decisions Sidewalk Labs makes concerning tackling the housing crisis. Please feel free to reach out to the us if you have any questions or comments about our recommendation.

The four of us are extremely excited to see the company strive and become a service that will massively impact millions people in Toronto by providing affordable housing!

Thank you!

Arnav, Ankur, Krish, and Siddhesh



Arnav Shah



Ankur Boyed



Krish Chandarana



Siddhesh Mittra

