Co-build vertical community

A bottom up vertical community based on a modular leasing system in vacant office building
1 Problem
2 Research
3 Design
4 CONCLUSION
1 Introduction
Problem 1: **Middle - income housing pressure**

**Definition**
- Income per year: €35,000-70,000
- Rent per month: €725 - 1,000
Problem Statement

1. Not eligible for social housing
2. (80%) Demand >> Supply (5.6%) in the housing market
Net migration into the four major cities, 2001-2014, by age category (De Nederlandsche Bank. 2017)
Office vacancy problem in Amsterdam

Unused Office space (m²)
- Amsterdam - 680,000
- Den Haag - 591,000
- Rotterdam - 724,000
- Utrecht - 620,000

Dutch Office Market Report 2018
Bak Property Research/Knight Frank
A top-down framework facilitating a residents bottom-up approach

Flexible react to residents and neighborhood requirement
How can we design a system in the redevelopment process to balance the bottom up and top down design method in order to reach a maximum shared value in a vertical community?
1 Problem
2 Research
What can we learn from precedents solutions and products to **elevate the design of Open Building plumbing solution** to reach the maximum adaptability in floor layout design in renovation project?
Open Building Concept

Theory

- Base + Support (Fit out)
- User involvement & Customization
- Upgrade infill
Sub-question:
1) What are the current common plumbing solutions in Open Building project and which one could be best fit into the context of the design project?
2) During the transformation process from office space into multifamily apartment, what is the technical advantages and limitations?
3) Which design aspect should be considered in the comparison between previous solutions? And what kind of criteria should be considered under each aspects?
4) What can we learn from the cross case study to elevate the current solutions?
## Part 1: conventional plumbing system solution in open building

<table>
<thead>
<tr>
<th></th>
<th>Cabinet</th>
<th>Fixed Shaft</th>
<th>Matura System</th>
<th>Raised Floor</th>
<th>Floor Trench</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Position</strong></td>
<td><strong>Supply pipes</strong></td>
<td><strong>Grey drainage pipes</strong></td>
<td><strong>Black drainage pipes</strong></td>
<td><strong>in Matrix Tiles</strong></td>
<td><strong>in hollow raised floor</strong></td>
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<tr>
<td></td>
<td>in floors and walls or ceilings</td>
<td>in floors and walls</td>
<td>in Matrix Tiles</td>
<td>in or between walls</td>
<td>in floor trench or raised floor</td>
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<td>in floor trench with floor covering</td>
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<td><strong>Slope (Min)</strong></td>
<td><strong>Grey drainage pipes</strong></td>
<td><strong>Grey drainage pipes</strong></td>
<td><strong>Black drainage pipes</strong></td>
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<tr>
<td><strong>Space Needed</strong></td>
<td><strong>20cm extra wall thick and max</strong></td>
<td><strong>20cm extra thick for the double</strong></td>
<td><strong>10cm height on the floor of the whole dwelling</strong></td>
<td><strong>max height 40cm for the raised floor</strong></td>
<td><strong>min height 40cm or more for the raised floor</strong></td>
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<tr>
<td></td>
<td>40cm floor height</td>
<td>wall</td>
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<tr>
<td><strong>Reference project</strong></td>
<td><strong>Tilla (1)</strong></td>
<td><strong>Solids (2)</strong></td>
<td><strong>Voorbrug Renovation Project (3)</strong></td>
<td><strong>Japan Dwelling</strong></td>
<td><strong>NEXT 21 (4)</strong></td>
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<tr>
<td><strong>Floor Layout Flexibility</strong></td>
<td>● ● ● ● ○ ○ ○ ○ ○ ○ ○ ○ ○</td>
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<td>raised floor</td>
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<td>in or between walls</td>
<td>Matura 1</td>
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<td></td>
<td>Matura 2</td>
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<td></td>
<td>Raised Floor</td>
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<td>Staalframe</td>
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<td>2%</td>
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<td>max height</td>
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<tr>
<td>the floor of the whole</td>
<td>40cm for the</td>
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</tr>
<tr>
<td>dwelling</td>
<td>raised floor</td>
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</tr>
<tr>
<td>Voorbrug Renovation Project</td>
<td>Slimline</td>
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<tr>
<td>Japan Dwelling</td>
<td>Flexvloer</td>
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</tbody>
</table>
### Design aspects & criteria

<table>
<thead>
<tr>
<th>Connection</th>
<th>Joint</th>
<th>Pipe Flexibility</th>
<th>Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel - Partition Walls</td>
<td>Support - Main Floor</td>
<td></td>
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</tr>
<tr>
<td><img src="image1.png" alt="Diagram" /></td>
<td><img src="image2.png" alt="Diagram" /></td>
<td><img src="image3.png" alt="Diagram" /></td>
<td><img src="image4.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

- thermal quality
- acoustic quality
- finishing
- disassembly

- structure safety
- amount of elements
- dis/assembly
- adaptability

- installation
- pipe numbers
- adaptability

- amount of elements
- accessibility
- adaptability
- finishing
RESEARCH SUMMARY

Matura System

Tech Solution

Design
SUPPLY CHAIN MANAGEMENT

Conventional

Manufacture
Production

Assembly

Components

Trade
Delivery

Components

End-user

Components

Matrix tile system

Manufacture

Components

Assembly

Components

Installation

Components

Recycle

Re-Use

Re-Manufacturing

Components

Components

Components

Disposal
Matrix tile system

- Prefabricate
- Modular
- Batch production
- Improved sound and thermal isolation between floors

- Prefabricate
- Modular
- Batch production
- Improved sound and thermal isolation between floors

- Light weight
- Faster insulation

- Light construction onsite
- Faster insulation

- Easier maintenance
  (all plumbing is within a unit)
- Support / Accessories flexible
1. Problem
2. Research
3. Design
<table>
<thead>
<tr>
<th>Initiative</th>
<th>Transformation Possibility Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transformation Potential Measurement Tool</td>
<td></td>
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</tbody>
</table>

**TOP DOWN**

<table>
<thead>
<tr>
<th>Support Design</th>
<th>Principle Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Zoning &amp; plot division</td>
<td></td>
</tr>
<tr>
<td>2. Facade &amp; climate</td>
<td></td>
</tr>
<tr>
<td>3. Communal space ...</td>
<td></td>
</tr>
</tbody>
</table>

**TOP DOWN**

<table>
<thead>
<tr>
<th>Fit-out Design</th>
<th>User - participate design process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instant feedback modular rent system</td>
<td></td>
</tr>
</tbody>
</table>

**BOTTOM UP**
Initiative

Transformation Possibility Assessment

Transformation Potential Measurement Tool

TOP DOWN
Transformation Possibility Assessment

City

Neighborhood

Building
Mapping Potential Area

High vacancy area + Middle income housing developing area

Nieuwe West
Facility: 1KM
Transportation: 200m
Decisive Factor for Target Building

500m
Technical

Shaft?

- Plumbing
- Floor heating & cooling
- Electricity Partition Wall

Reinforced concrete floor
? steel trusses
Technical Solution

Extra shaft on the facade

Existing Central Shaft

Plumbing

Floor heating & cooling
Technical Solution

Metalstud Partition Wall

Placo® Easycable

Electricity Partition Wall
Facade

Office < Apartment

Aesthetic

Thermal Insulation
Building Information:
Built Year: 1968
Floor Area: 9500 m2
Floors: 12
Location:
Rijswijkstraat 175 in Amsterdam
"Missing" function
Technical Solution

Extra shaft on the facade

Existing Central Shaft
Support Design

Principle Design

1. Zoning & plot division
2. Facade & climate
3. Communal space ...

TOP DOWN
Target Group Analysis

Middle - income Group

- A Young / Middle-aged Single
- Shared by Singles
- Couple Only
- Couple and Child(ren)
- Single Parent and Child(ren)

Future reconfiguration possibility
(Family Group)

- 28 ~ 66 years old
- Renting
- Social Network
- City Life
- Middle Income Housing Program & Market Research

**Family models**

- A Young / Middle-aged Single
- Shared by Singles
- Couple Only
- Couple and Child(ren)
- Single Parent and Child(ren)

**Wish & Needs**

- Child - raising
- Family Support (Facility's use)

**Category of household (Middle - income leasing customer)**

- Networking of individuals
- Diversification of work styles
- Privacy for individual members
**- Middle Income Housing Program & Market Research**

<table>
<thead>
<tr>
<th>Floor area per quality level and type</th>
<th>Standard</th>
<th>Plus</th>
<th>Extra</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studio</td>
<td>&lt;50</td>
<td>&lt;50</td>
<td>&lt;50</td>
</tr>
<tr>
<td>1 Room</td>
<td>50 - 60</td>
<td>50 - 60</td>
<td>50 - 60</td>
</tr>
<tr>
<td>2 Room</td>
<td>60 - 70</td>
<td>60 - 75</td>
<td>60 - 80</td>
</tr>
<tr>
<td>3 Room</td>
<td>80 - 100</td>
<td>80 - 100</td>
<td>80 - 100</td>
</tr>
</tbody>
</table>
## Customization Solution for size of families, age group...

<table>
<thead>
<tr>
<th>Program Option</th>
<th>Family models</th>
<th>Category of household (Middle - income leasing customer)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A Young / Middle-aged Single</td>
<td>1 room</td>
</tr>
<tr>
<td>Standard</td>
<td></td>
<td>&lt;50</td>
</tr>
<tr>
<td>Plus</td>
<td></td>
<td>/</td>
</tr>
<tr>
<td>Extra</td>
<td></td>
<td>/</td>
</tr>
</tbody>
</table>
Intermediate Space

Certain space on the plan are left “blank” in the beginning
Intermediate Space = Future Reconfiguration Zone

Family size change
More tenants ...

A
B
C
D
E

A
B
C
D
E

A
B
C
D
E

A
B
C
D
E

A
B
C
D
E

A
B
C
D
E

A
B
C
D
E
Case Building
Zoning Design

45m² module *10
1.8m width corridor
**Case Building Zoning Design**

**Corner Unit (1F):**
30m² “free zone”
+ social intermediate space

**Middle Unit (1 + 1F):**
15-30m² “free zone”
Corner Unit
Reconfiguration and expansion possibility

Principle 1:
Unit area + or -

Communal space: 18m²
75m² Shared Apartment
3 Person

Communal space: 24m²
60m² Shared Apartment
2 Person
+ 90m² Family Housing
1 couple + 2 children
(2F)

Communal space: 30m²
60m² Apartment
1 Couple
+ 90m² Family Housing
1 couple + 2 children
(2Floors)

Communal space: 25m²
75m² Apartment
Single Parent
+ 2 children
**Middle Unit (2 Floors)**

Reconfiguration and expansion possibility

1.0 Communal space: 15 m²

75 m² Family Housing
1 couple + 2 children (2Floors)

2.0 Communal space: 0 m²

90 m² Family Housing
1 couple + 2 children (2Floors)
Principle 2: Communal Space

Every 2 floor is a “Unit”

“Garden”

Shared Facility Space

Extra shaft added on the exterior facade
SUPPORT DESIGN

Principle 2: Communal Space

Public Space Accessibility:
Shared by nearby unit for safety reason
Typical residential (2 floor as 1 “unit“)

<table>
<thead>
<tr>
<th>Household Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Couple and Child(ren)</td>
<td>90m² *2</td>
</tr>
<tr>
<td>Couple Only</td>
<td>75m² *1</td>
</tr>
<tr>
<td>Single Parent and Child(ren)</td>
<td>75m² *1</td>
</tr>
<tr>
<td>Shared by Singles</td>
<td>75m² *1 (3 person)</td>
</tr>
</tbody>
</table>
Climate Protection + Community Social Space
Intermediate Space = Environment - Conditional Space

Outdoor

Environment-conditional space (indoor)

You can enjoy comfortable fresh air of the outdoor environment

0.5 sun shading

1st thermal protected facade

2nd thermal protected facade
You can invite guests and appreciate a sense of the season, even on a hot or chilly day.
You can optimize indoor thermal environment and close windows/doors for insulation.
Facade

Heat Recovery Unit

Winter
Summer

cclimate-protected loggia with double + single glazing

easy accessible pipework and cabling raised floor system
Materiality Reference

1st thermal protected facade

2nd thermal protected facade

0.5 sun shading
SUPPORT DESIGN
Principle Architect

Facility & Public Function Redevelopment

"Missing" function

Facility

1KM

500m

Transportation

200m

100m
Bottom Floors:
Public function serve for local neighborhood
+ Gym
+ Cafe / Recreation Space
Public function serve for residents:
+ Bike storage
+ Post box
Open ground for families and childrens
Communication with the local community
An instant feedback modular leasing system!

Fit-out Design
User - participate design process

Architect Consultant + Customer

BOTTOM UP
Fit-out Design  User - participate design process

Architect Consultant + Customer

Is there a more efficient way in the new age?
Online Modular leasing System

Frontstage

Architect

Customer

Floor plan design
Surface area / heating area

Partition wall for rent

Furniture for rent

Backstage

Housing Association
Step 1: Housing Allocation - Floor Area Confirm

Select unit position based on zoning principle
Rent: $3.24 \times 24 = \€ \text{aaa}$

Floor plan design
Surface area / heating area

Architect
Customer

Step 2: Unit layout design
Partition wall for rent

Rent:

Indoor partition wall

Facade panel

Unit Wall

1.8m

\[ \times 10 = \€ \text{ aaa} \]

\[ \times 12 = \€ \text{ aaa} \]

\[ \times 13 = \€ \text{ aaa} \]

Total \ € \text{ aaa}
Furniture Selection

Furniture for rent

Rent:

Storage
- x 1 = € a
- x 2 = € a
- x 2 = € a

Table & Chairs
- x 1 = € a
- x 1 = € a
- x 2 = € a

Beds
- x 1 = € a
- x 2 = € a

Kitchen
- x 1 = € a

Bathroom
- x 1 = € a

Total = € aaa

Architect

Customer
1 Problem
2 Research
3 Design
4 CONCLUSION
**STRATEGY**

**Initiative**
Transformation Possibility Assessment

Transformation Potential Measurement Tool

Architect + Project Developer

**Support Design**
Principle Design
1. Zoning & plot division
2. Facade & climate
3. Communal space ...

Principle Architect

**Fit-out Design**
User - participate design process

Instant feedback modular rent system

Architect Consultant + Customer

**TOP DOWN**

**BOTTOM UP**
Design Brief V1.0
Apartment unit: 42-60
Surface floor: 12450m²
Floor: 14F
Parking plot: 50
Public Function:
Cafe
Gym
Restaurant
Bike Storage
Community center
Roof garden
THANK YOU!