

Addressing the mismatch:

A strategy for creating adaptable office buildings
and adding value for corporations





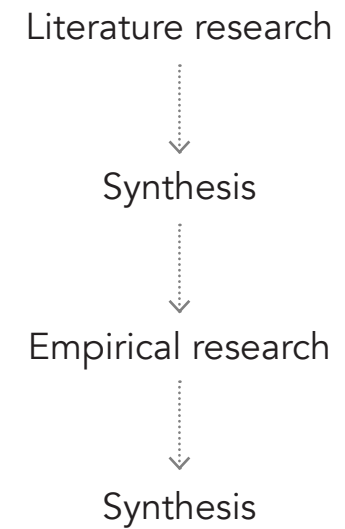
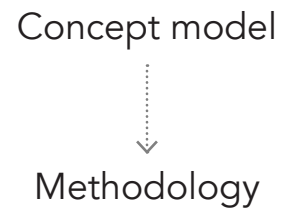
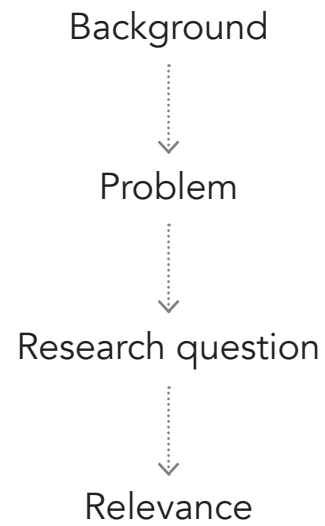
Overview

- Introduction
- Research methodology
- Literature review
 - Adaptability
 - Adaptability frameworks
 - Added value
- Synthesis - Preliminary strategy
- Empirical research
 - Cases
 - Findings - Tables analysis
 - Final strategy
 - Findings - Interviews analysis
- Conclusions
- Discussion

Overview

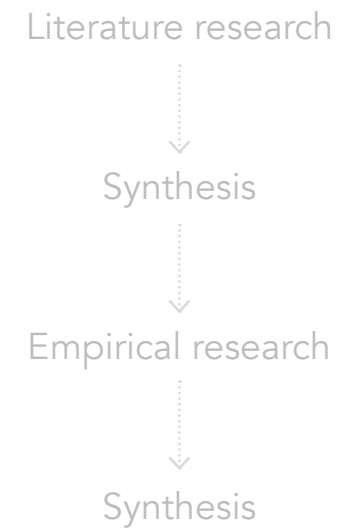
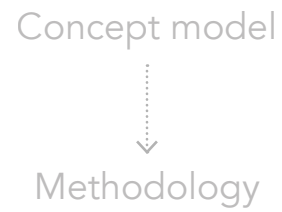
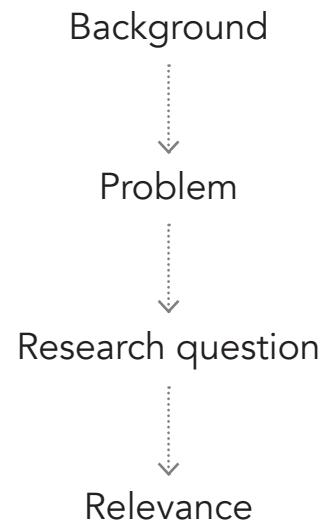


Why?> How?> What?

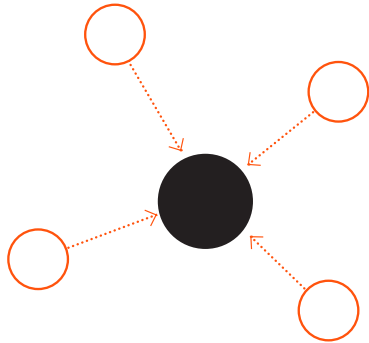




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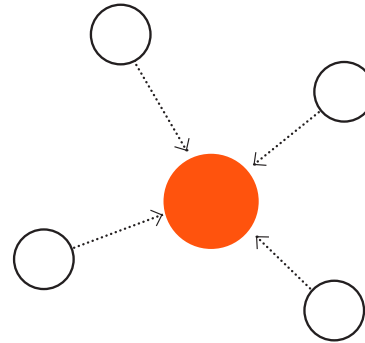


Background



Ever- evolving environment

societal, economical,
technological &
environmental changes



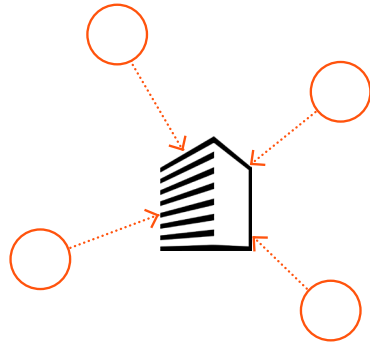
Corporations need to find ways
to cope with such changes -
support their core business



Resources contributing to
business goals: capital, people,
technology, information &
Real Estate



Background



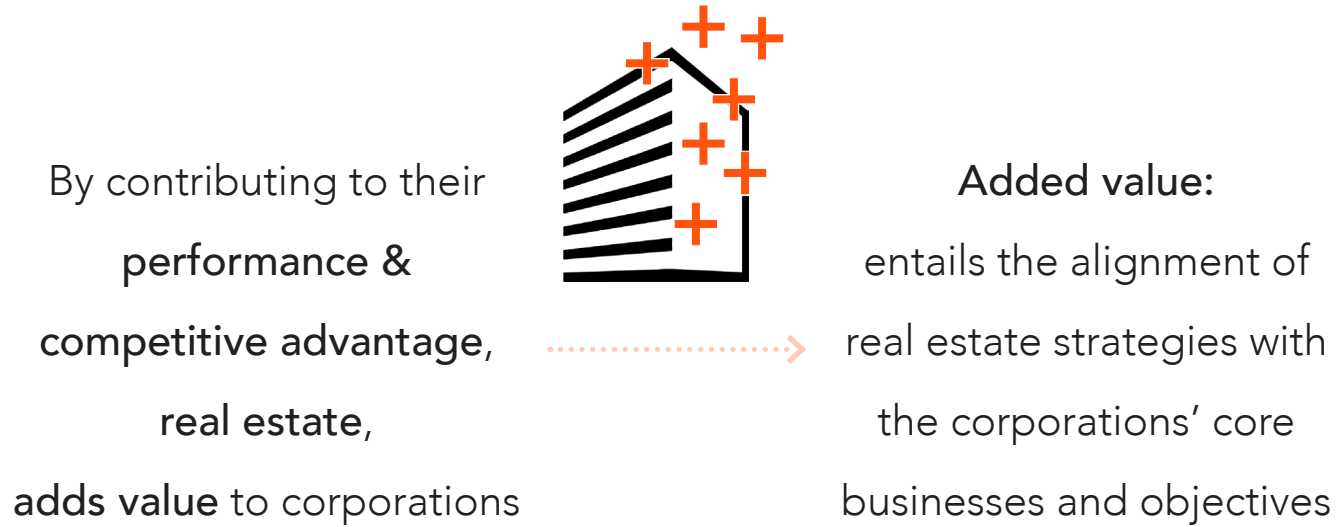
To meet changing demands
& gain optimal performance



Organisations seek for
adaptability in their Real estate



Background



Background



Organisations & users
have **qualitative** &
quantitative demands



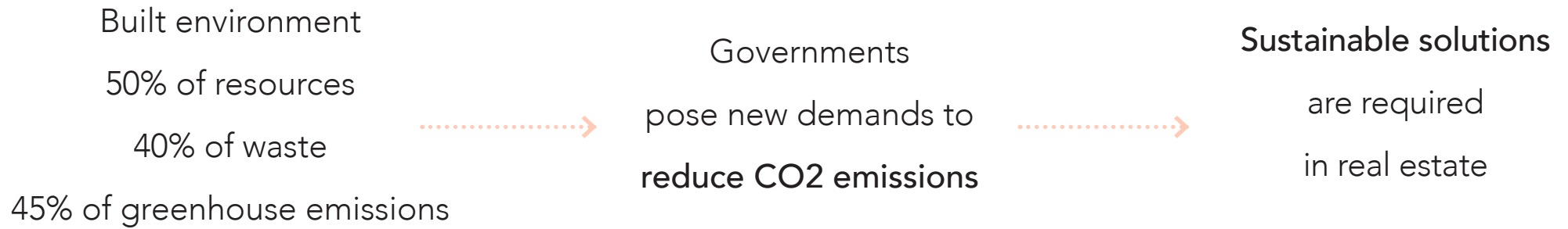
Buildings'
functional < technical
life



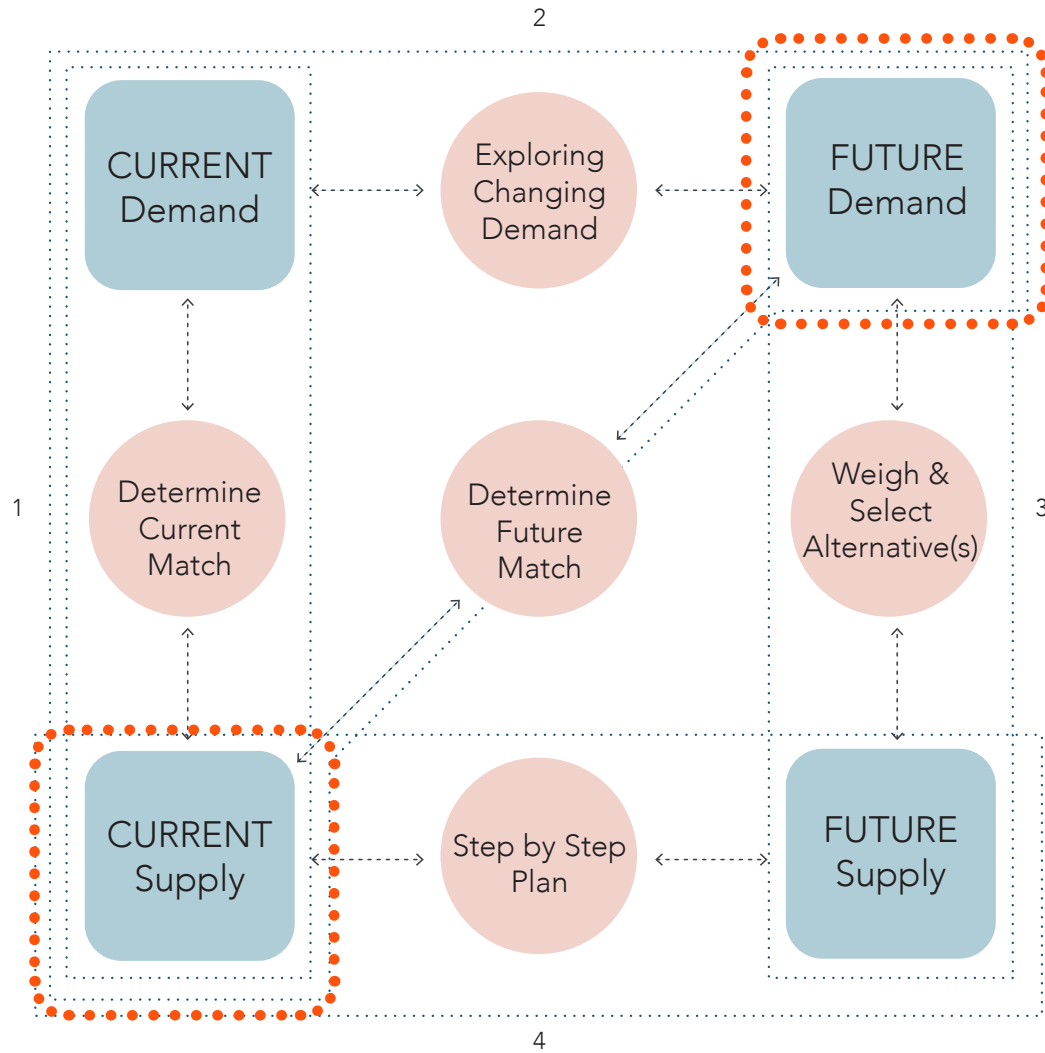
Obsolete buildings



Background



Problem definition



Why?

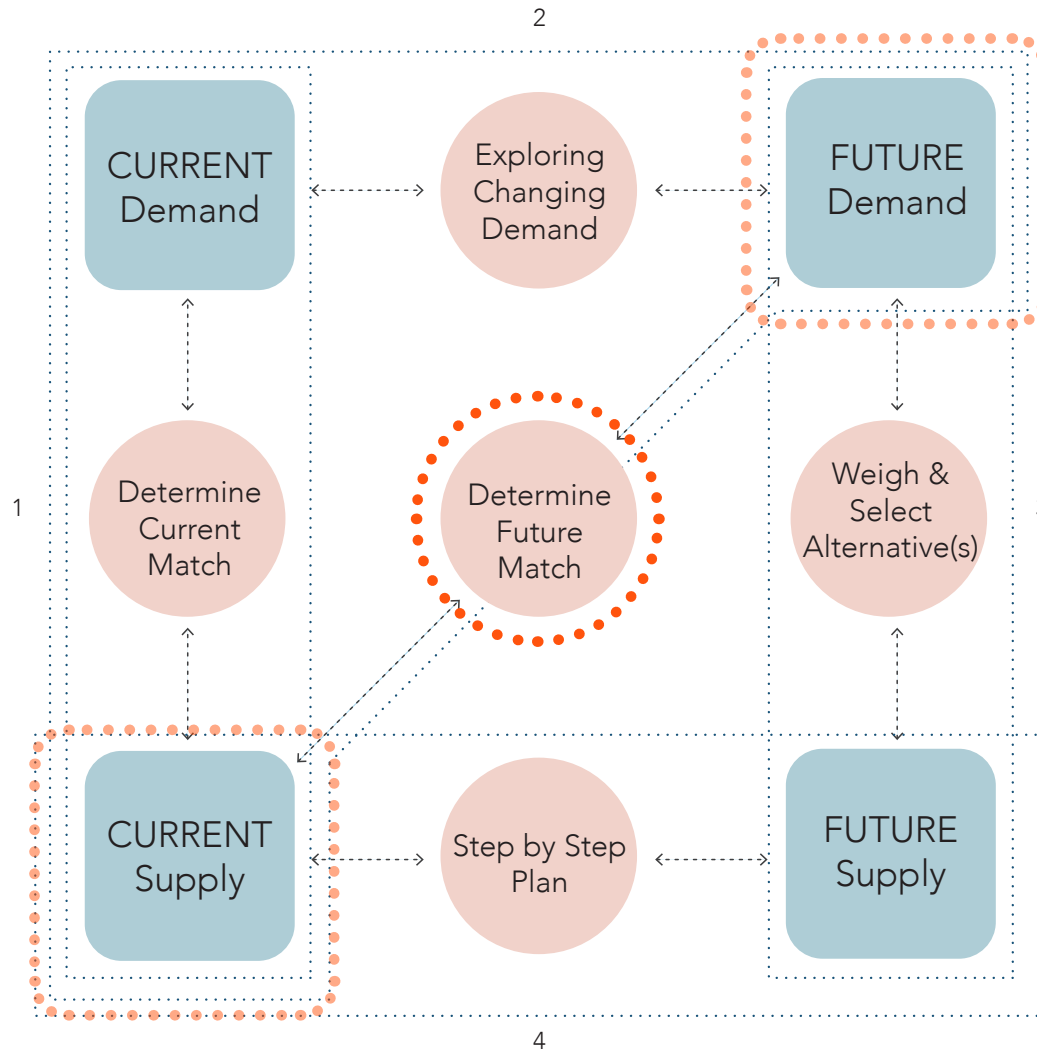


How?



What?

Problem definition



Why?



How?



What?



How can adaptability strategies be applied
in the development of new office buildings
to add value for corporations and
address the mismatch over time
between buildings and users' demands?



Applicability



CREM

- Prolong core RE lifetime
 - Responsive RE
 - Brief architects
- Control design & delivery process

Developers & investors

Develop adaptable RE
that can be leased/ sold &
result to higher returns

Architects & engineers

Apply strategy to create
more adaptable buildings
for their clients



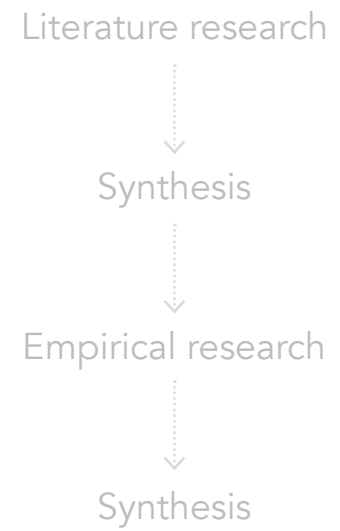
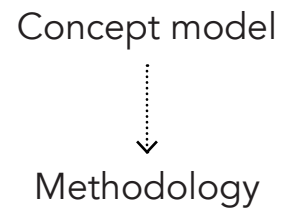
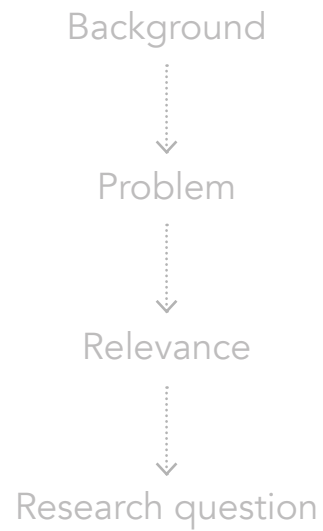
Relevance - Societal & Scientific

- Changes have a big impact in our society
 - Promote adaptability
-
- Buildings shape cities & have value for them
 - Static buildings
 - Vacant building cause problems to many actors
-
- Lack of a strategy that connects **adaptable solutions** with the **added value** for corporations

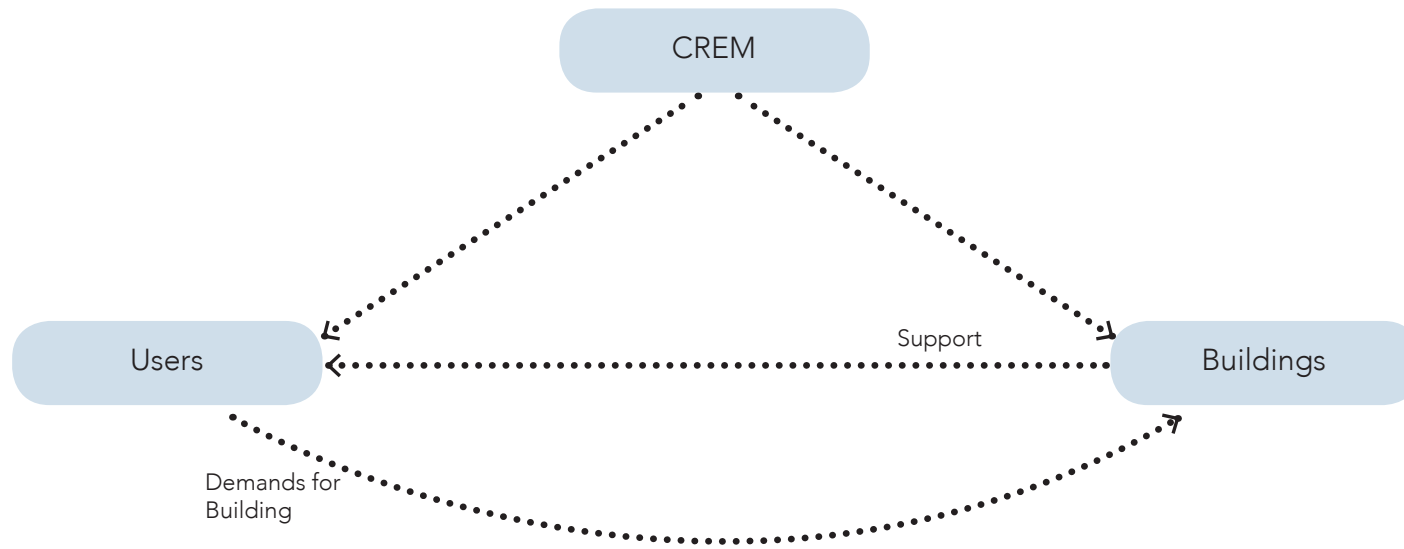




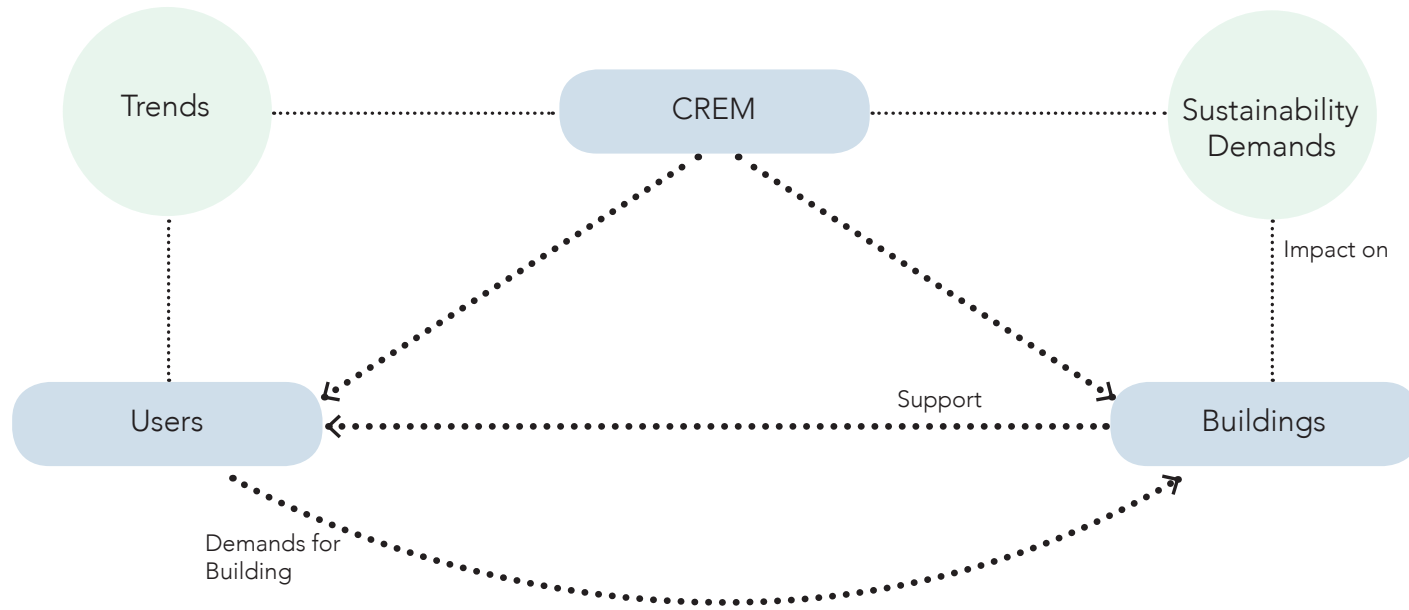
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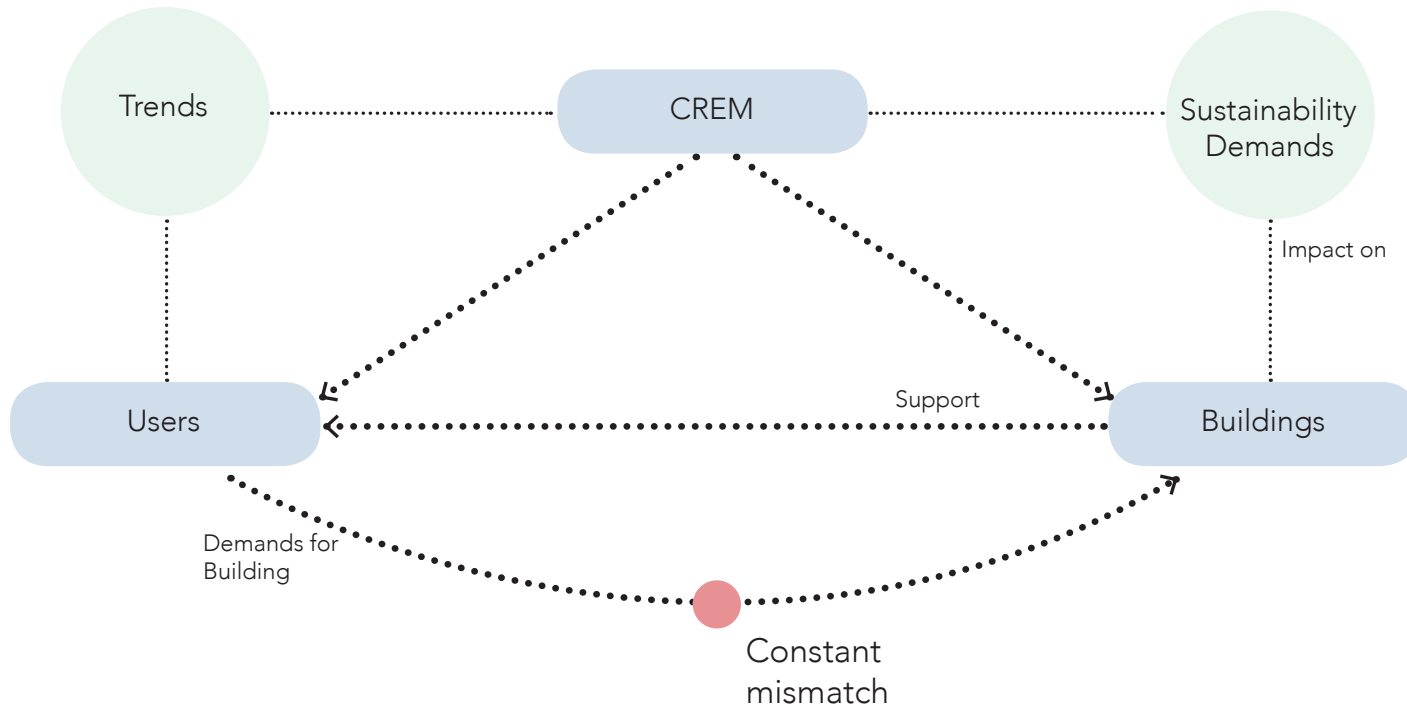
Concept model



Concept model

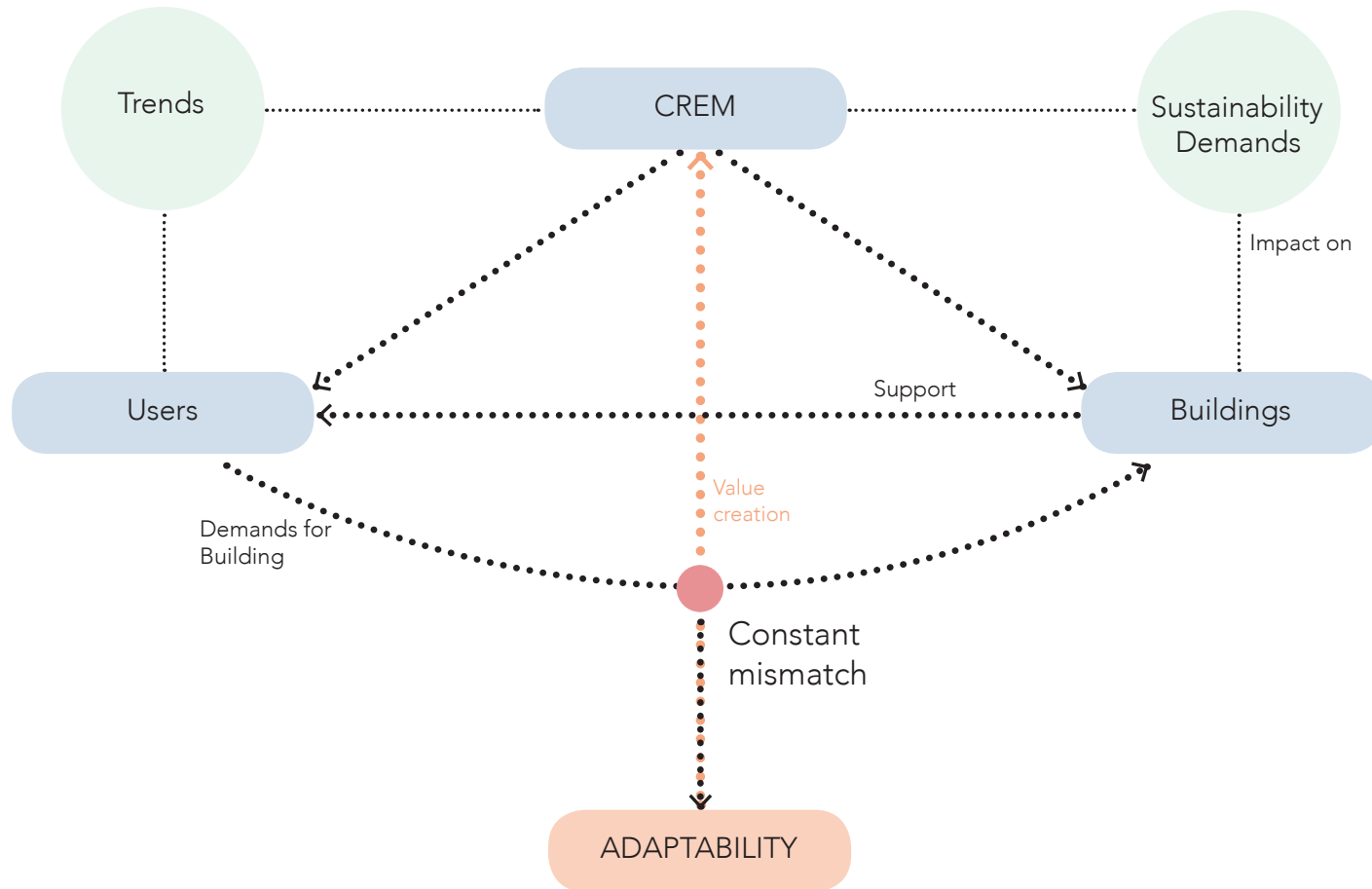


Concept model

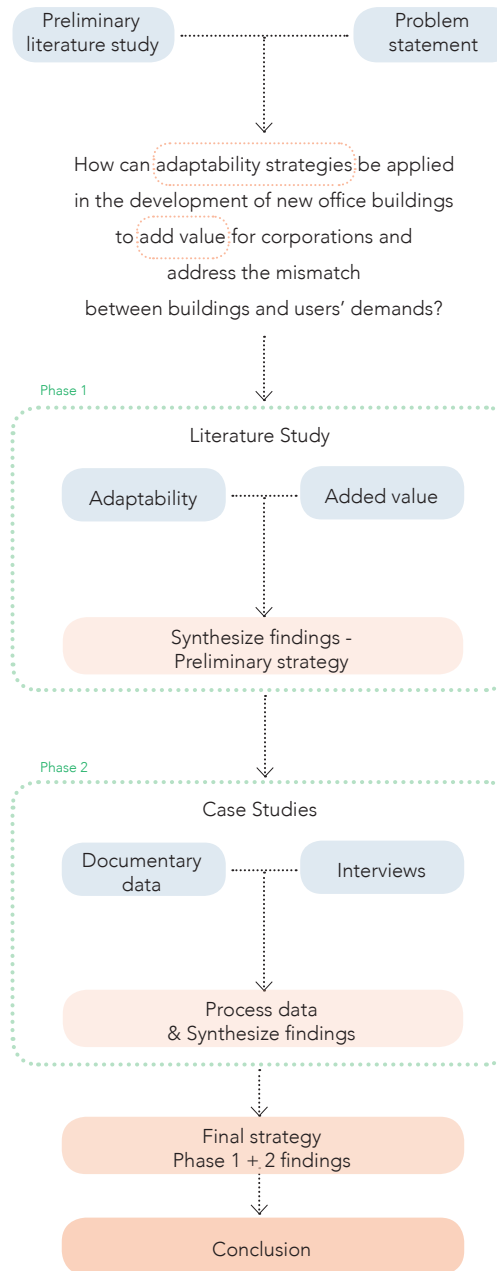




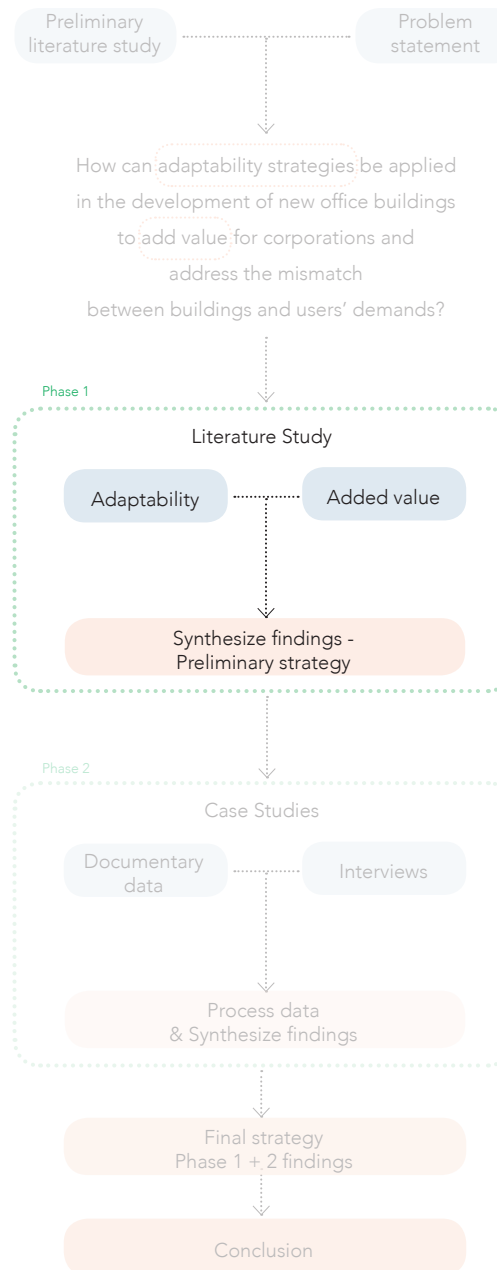
Concept model



Methodology

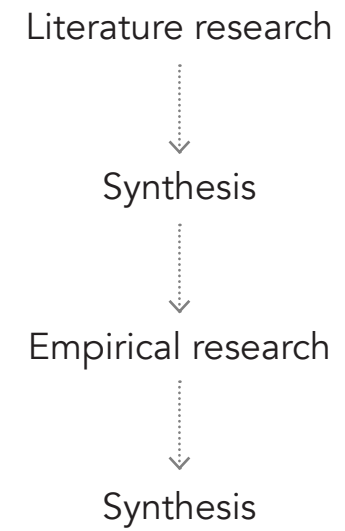
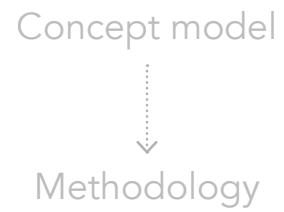
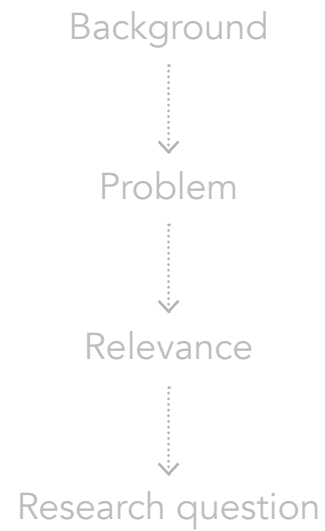


Theoretical framework





Why?> How?> What?



Theoretical framework



Adaptability Adaptability frameworks Added value



Adaptability



Concepts:

- Time (predictable & unpr. forces)
 - Context (external forces)
 - Change (nothing is static)
- Buildings (system of components)

(Schmidt III, 2014)

Promoted as a design strategy within the office sector as it **increases the performance of buildings** and consequently their **users**.

- Consider adaptability from **early design stages**
- Develop **resilient** habitats with large scale **benefits**
 - Economically, socially, environmentally **sustainable**

Definitions: Capacity to change, Reduce mismatches, Value (maximizing productive use), Time

Adaptability



“The capacity to change the building’s built-environment
in order to respond and fit to the evolving demands
of its users/ environment maximizing
value throughout its lifecycle”

(Schmidt III, Eguchi, Austin & Gibb, 2009)

Flexibility



Adaptability	Flexibility
Capability	Competence
Big scale decisions	Small scale decisions
Long time scale	Quick changes that require little cost and effort
Top down	Bottom up
	Factor of adaptability
Capacity to respond to different social uses	Building changes

Table 3.1.1
Differences between adaptability & flexibility

Physical • Functional • Financial



Adaptive capacity

Building properties allowing them to remain functional

- Provide the potential to **accommodate new functions**
- Focusing on **future value** and not on present or short-term values

- **Attractive force** for future users
- 49% of transformations are on office buildings

Adaptive capacity

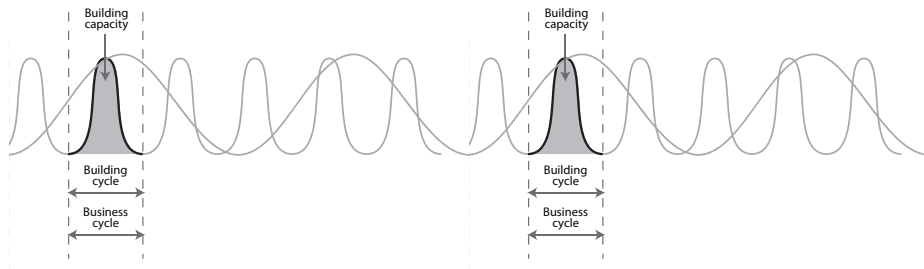


Fig 3.1.1
Building cycles (Schmidt III et al., 2009)



Fig. 3.1.2
Technical & functional lifecycle

Adaptive capacity

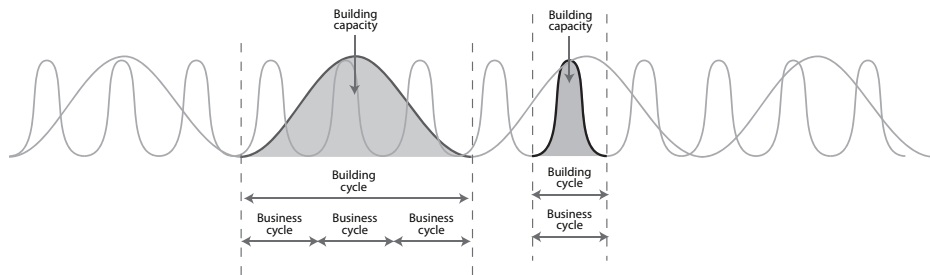


Fig 3.1.1
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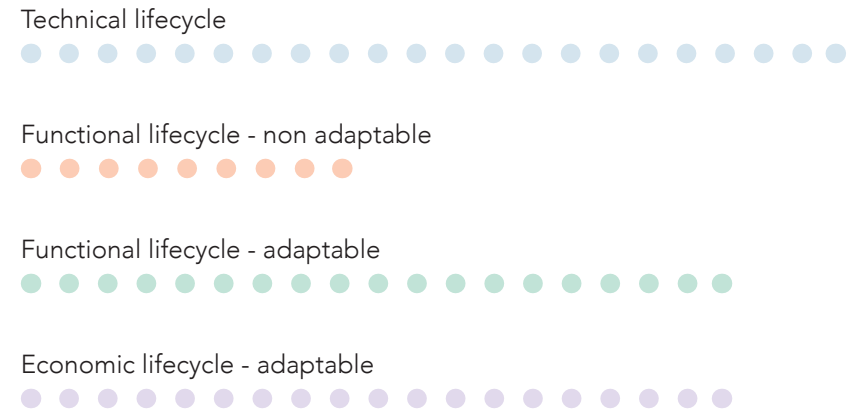


Fig. 3.1.2
Technical & functional lifecycle

Obsolescence

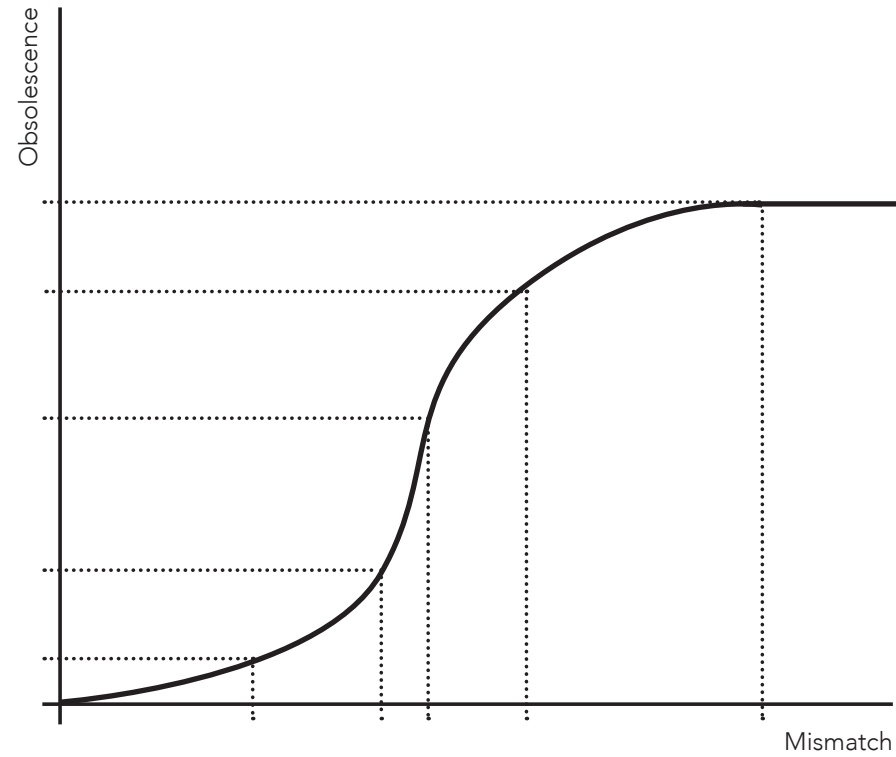


Fig. 3.1.4
Mismatch & obsolence graph

$$\text{Useful life } (L_u) = \frac{L_p}{\left(1 + \sum_{i=1}^6 O_i\right)^{L_p}}$$



Costs and benefits of adaptability

Construction phase:

- Duration of adaptable
3/4 of non adaptable

Operation phase:

- Adapt to new requirements
 - Respond to demands
 - Satisfy users
- Increase productivity & efficiency
 - Reduce downtime
- Ease of access - maintenance

Costs:

- 3% more expensive
- <3% including land price
- After first renovation: save
≈15% of initial building cost
 - Rent value: +5%
 - Sale value: +25%

Costs and benefits of adaptability

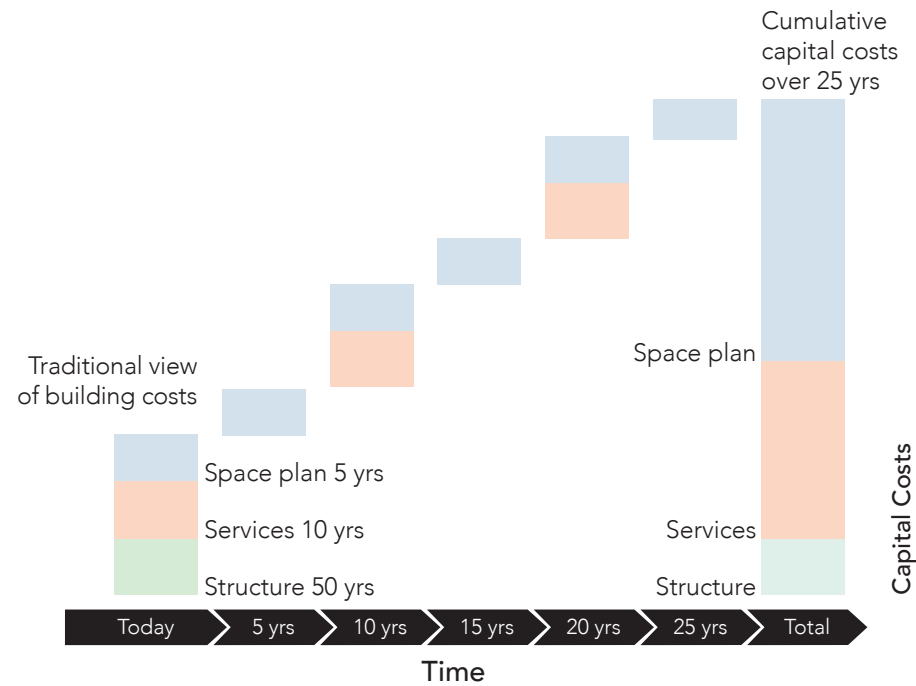


Fig. 3.1.5
Cumulative capital costs of buildings over 25 years
(adapted from Duffy & Heney, 1989).



Costs and benefits of adaptability

Owners:

- Long-term benefits
 - Invest more in adaptability
- Increase value of property

Leaseholders:

- Short-term objectives
 - Flexible contracts & interiors

Developers:

- Short-term objectives
 - Split incentive barrier
 - Adaptability premiums

Local authorities:

- Reduce building related energy consumption,
- Material consumption
- Green house emissions

Investment decision depends on **perceived benefits over time**

Adaptability: future oriented & long term perspective



Conclusions

Adaptability:

- Time
- Change
- Buildings
- Context

Building - user relationship:

- Respond to change
- Serve efficiently user organisation

Obsolete:

Public & economic problems to society & owners

Sustainable • Long term benefits • Lifecycle costing

Theoretical framework



Adaptability Adaptability frameworks Added value



Adaptability frameworks



Shearing layer	Characteristics	Life expectancy
Site	Site boundaries	Eternal
Structure	Foundations & load-bearing components	30-300 years
Skin	Cladding & roof system	20+ years
Services	Working guts of buildings	7-20 years
Space plan	Interior layout	3 years
Stuff	Furniture	<3 years

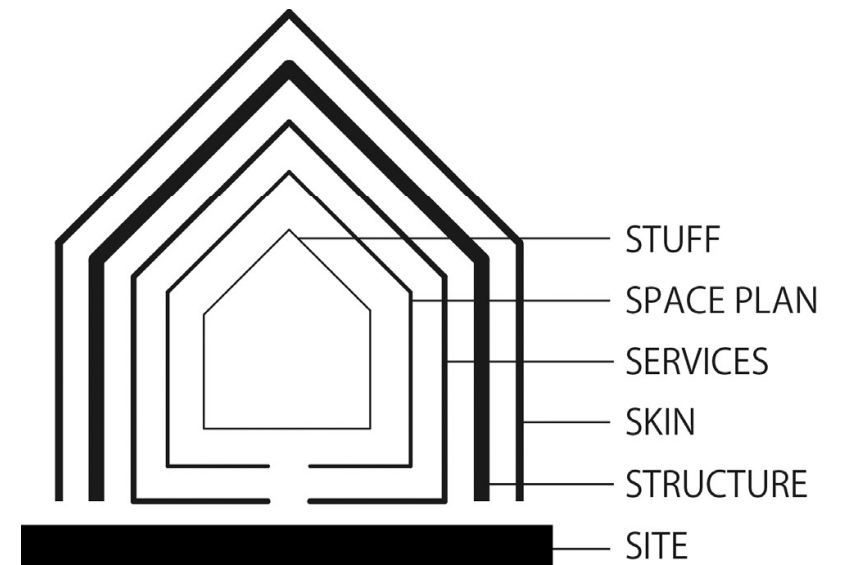


Table
Shearing layers

Fig.
(Brandt, 1994)

Adaptability frameworks



Shearing layer	Characteristics	Life expectancy
Site	Site boundaries	Eternal
Structure	Foundations & load-bearing components	30-300 years
Skin	Cladding & roof system	20+ years
Services	Working guts of buildings	7-20 years
Space plan	Interior layout	3 years
Stuff	Furniture	<3 years
Social	Humans in (users, owners) & around the building	Eternal
Surrounding	Physical context (buildings, public space, transportation)	Eternal

Table 3.2.1
Shearing layers (adapted from Schmidt III, 2014).

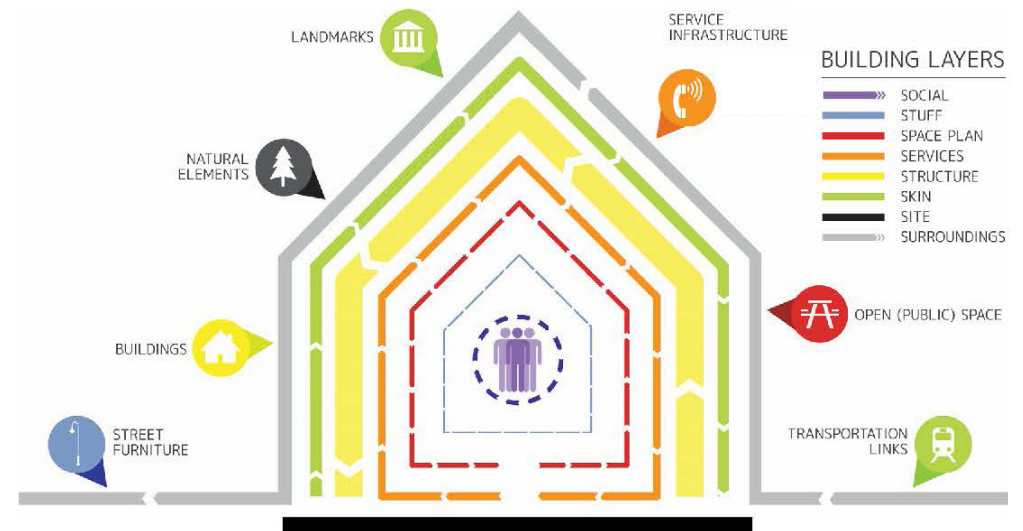


Fig. 3.2.1
Revised building layers model (Schmidt III, 2014).

Linking model



types of change			building layers						stakeholder		
strategy	social (cause)	physical (affect)	stuff	space	services	skin	structure	site	enabler	benefactor	funder
adjustable	task, user	equipment, furniture	probable						user	user	user
versatile	activity, operations	spatial arrangement	probable	probable	possible	probable	possible		FM	user	user/owner
refitable	age, technology	component		probable		possible			FM/owner	user/owner	user/owner
convertible	ownership	function		probable	possible	probable	probable		FM/owner	owner	owner/ dev
scalable	market	size, loads				possible		possible	owner	user/ owner	owner/ dev
*movable	demographics	location	possible	possible	possible	possible	possible	probable	owner	owner/ society	developer

*movable was not verified from the research and remains theoretical

Key probable possible

Fig. 3.2.3
Revised linking model (Schmidt III, 2014).

Adaptability strategies



<p>Schmidt III, 2014</p> <p>Adjustable: Plug & play elements User control Stackable Non-fixed objects Detachable connections Operable elements</p> <p>Versatile: Movable Variety of room sizes Wide corridor widths Frame construction Flexible ducts Storage space Excess service points</p> <p>Refitable: Access points Standard shapes Dry connections Coordinated systems Interchangeable components Minimize points of contact</p> <p>Convertible: Loose fit Raised floors Simplicity & legibility Dropped ceilings Multi-functional spaces Excess service capacity</p> <p>Scalable: Product platforms Local materials Known techniques Structural redundancy Modular units Extra space Dividable/ joinable rooms</p> <p>Movable: Inflatable Component weight Kit-of-parts Easy connections Collapsible Component scale</p>	<p>Schmidt III, 2014 & Schmidt III & Austin, 2016</p> <p>Space: Standardization, Big volume & locations</p> <p>Stuff: Standardised, Modular, Movable</p> <p>Space plan: Sliding walls, Demountable walls, Non-load-bearing walls, Glass walls, Raised floor system, Carpet tiles</p> <p>Services: Easy access, Removable panels, Clear ones, Capacity surplus</p> <p>Skin: Demountable Standardized Exchangeable</p> <p>Structure: Wide spans Floor to floor height Increase load capacity Prefabricated members</p>	<p>(Geraedts & Prins, 2015) (Geraedts & Prins, 2016)</p> <p>Site/location: Surplus of site space</p> <p>Structure: Surplus of building space Floor to floor height Location of stairs, elevators, core Increased load capacity Expandable horizontal & vertical</p> <p>Skin: Demountable facade</p>	<p>(Geraedts, 2016)</p> <p>Facilities: Customizable facilities Surplus of facilities & shafts Surplus facilities' capacity Disconnection of facilities</p> <p>Space plan/ finish: Distinction between infill & support Access: horizontal & vertical Removable & relocatable units Rem. & reloc. interior walls Dry connections</p>	<p>Nakib, 2010</p> <p>Guidelines: User involvement Multifunctional spaces Mobile & demountable elements Building elasticity & divisibility Modularity Buffer zones Extra spaces Expandable horizontal & vertical Structural grid span Installation location - accessibility Dry connections Prefabricated & standardized Independent envelope</p>	<p>Arge, 2005</p> <p>Generality: Building width Floor to floor height Technical grid</p> <p>Flexibility: Modularity Plug & play elements Internal space configuration</p> <p>Elasticity: Building form Space organisation Fire sprinkling Space configuration</p>
<p>New buildings</p> <p>Transformation potential</p>	<p>(Geraedts et al., 2014)</p> <p>Transformation dynamics: Change unit size Space rearrangement Change of function Facilities in & out of the building</p> <p>Layout & finishing per unit Expandable horizontal & vertical Decrease horizontal & vertical Movable building</p>	<p>Manewa, 2012</p> <p>Plan depth Floor to floor height Structural design Fire safety design Services systems Building size Building height Technical span Building proximity</p>	<p>Sadafi et al., 2014</p> <p>Increase building regularity Material & system simplicity Partitionable core Specification for connections Reduce intersystems relations Reduce intrasystems relations Modular coordinated system Prefabricated components Design over- capacity Improve flow through layout Optimise use of interior space</p>	<p>Scuderi, 2019</p> <p>Architecture, society, function: Extendible horizontal & vertical Join & divide spaces Shared, non-specific room Movable walls Folding elements - furniture Unfinished space Neutral- unlabelled space</p> <p>Structure, tech. & construction: Dry-construction systems Structural optimization Frames & grids Accessible core Prefabricated elements</p>	<p>(Remøy & van der Voordt, 2014)</p> <p>Location: Urban situation Character of urban situation Distance & quality facilities Access by public transport Access by car, parking</p> <p>Building Character of the building Facade (replaceable, operable) Expandable horizontal & vertical Structure grid (span) No load-bearing walls Entrance Floor to floor height Structural capacity Installations</p>

Table 3.2.3
Adaptability strategies



Adaptability strategies in office buildings

<p>(Geraedts & Prins, 2016)</p> <p>Site/ location: Multifunctional location Expandable location</p> <p>Structure: Entrance, elevator, stairs position Pipes & shafts position Floor to floor height Internal insulation Structural capacity of floors Column layout & grid Obstacles supporting structure Division-support infill Structural capacity Available floor area Size of floor</p> <p>Skin: Daylight entry Openable windows Insulated facade Demountable facade</p> <p>Facilities: Overcapacity of services Location of services Adjustable & modular services Demountable services</p> <p>Space plan/ finish: Accessible facility components Horizontal routing, corridors Potential for suspended ceiling Potential for elevated floor</p>	<p>(Schmidt III & Austin, 2016)</p> <p>Versatile: Movable furniture & partitions Common & open spaces Undefined spaces Open spaces/ plan Wide circulation Separate entrances Divisible services Rectangular plan Structural grid</p> <p>Refitable: Market standard Shell & core construction Unfinished spaces</p> <p>Convertible: Shallow plan depth Multiple cores & entrances Divisible services</p> <p>Scalable: Surplus of space Expandable circulation Expandable horizontal & vertical</p>	<p>(Schmidt III, 2014)</p> <p>Standardised components Dismantable components Open floor plan Mixed use potential Raised floors & dropped ceiling Moveable partitions Standard materials Simple details Atria Service access Adjustable desks Wide corridors Standard grid Wide-span structure Exposed services Standardised spaces Multi-functional exterior spaces</p>	<p>(Remøy, de Jong & Schenk, 2011)</p> <p>Structure: Facade grid dimensions Floor to floor height Width of building Type of floor structure Expandable horizontal & vertical Span of grid (structural)</p> <p>Entrances: Position of entrance Corridor- outdoor gallery Central core- circulation around Position of stairs & elevators Position of core</p> <p>Facade: Removable & adaptable Not load bearing Demountable Grid dimension Anticipate higher floors Expandable to fit other function Potential of attaching walls to facade</p> <p>Installations: Installations overcapacity Installations not integrated in structure</p> <p>Location: Mix-use locations Access - public transport Distance to city centre</p> <p>Functional: Insulation- anticipate changes Fire resistance Daylight admission</p>	<p>(Geraedts & van der Voordt, 2003)</p> <p>Location: Location character & quality Poly-functional locations Access- car & public transport Parking Facilities in the area</p> <p>Building: Image & identity Facade quality (technical) Quality of structure Quality of built-in elements Installations quality Room rearrangement Accessibility</p>		
<p>(Harris, 2015)</p> <p>Mixed use office building (retail) Higher density Space express culture Removable ceiling Exposed structure</p> <p>Provide base building Provision of amenities & services Creation of public space Public realm</p>			<p>(Blakstad, 2001)</p> <p>Structure: Building geometry Depth of floors (affect sunlight) Location of support areas, circulation zones & cores Capacity of workstations Views & orientation User involvement Potential of subdiving the space</p>	<p>(Remøy & Van der Voordt, 2014)</p> <p>Location: Access - car & public transport Facilities in area Business cluster Safety</p> <p>Building: Car parking Exterior appearance Flexible interior space Technical state Building identity - recognisable Expandable</p>	<p>(Remøy, 2010)</p> <p>Location: Mix-use locations Offices & housing facilities Access car & public transport Central locations Good quality public space</p> <p>Structure: Free floors (structural columns) Structural grid (span) Structural capacity Expandable horizontal & vertical</p> <p>Skin: Small grid facade Demountable facade</p>	<p>(Pinder et al., 2017)</p> <p>Configuration of interior spaces Config. of interior finishes Config. of space relations Change of use Expandable horizontal & vertical Decrease scale of building Adjustable furniture Universal room design Standardised rooms Modularity Shape & size of rooms Floor to floor height Services capacity Services access Component separability Building width Structural capacity</p>
<p>New buildings</p>	<p>Case studies</p>					

Table 3.2.4
Adaptability in office buildings

Adaptability Layers

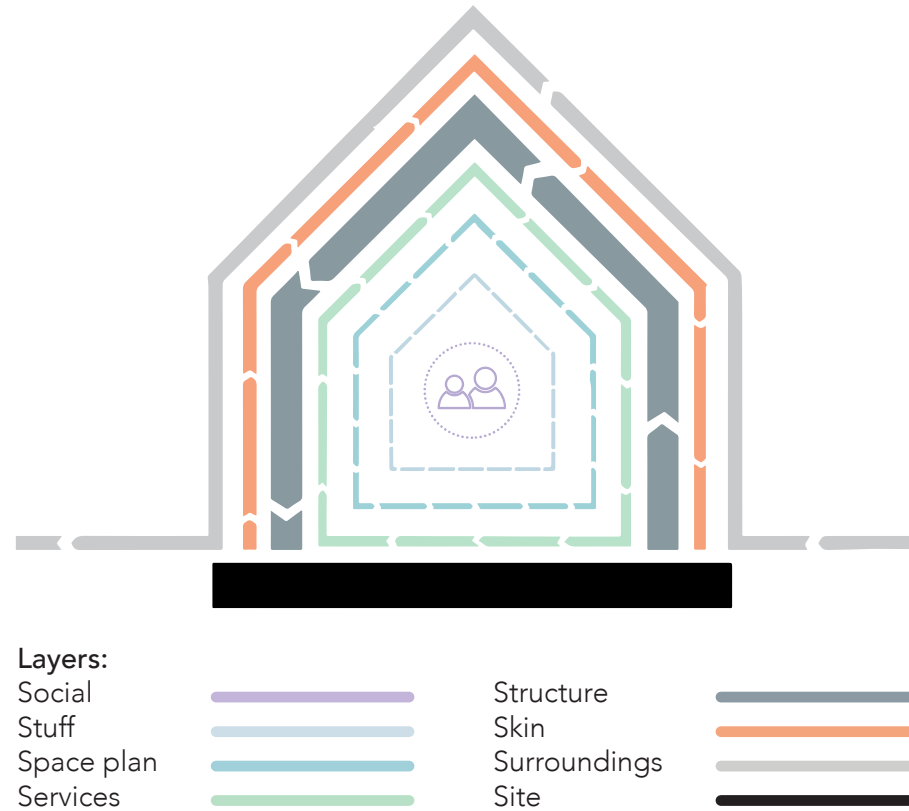


Fig. 3.2.4
Revised building layers model (adapted from Schmidt III, 2014).



Layers & strategies

Shearing layer	Adaptability type	Strategies - tactics				
<ul style="list-style-type: none"> • Site Site boundaries 	Movable Scalable	Surplus of site space	Multifunctional site - legal	Expandable location	Creation of public space	
<ul style="list-style-type: none"> • Structure Load-bearing 	Scalable Versatility Convertible Movable	Column layout & grid (span) Expandable horizontal & vertical Dry connections	Floor to floor height Reduction horizontal & vertical Exposed structure	Increased load capacity Position: stairs, elevators, entrances Modular & Prefabricated elements	Depth of floor Position: pipes & shafts Generality	Building geometry Surplus of building space
<ul style="list-style-type: none"> • Skin Facade 	Refitable Convertible Scalable Versatility Movable	Demountable Image & identity	Standardized Independent - Minimize points of contact	Facade grid dimensions (small) Daylight entry	Expandable to fit to other functions	Not load bearing
<ul style="list-style-type: none"> • Services Installations 	Refitable Convertible Scalable Versatility Movable	Accessibility - Location of services	Adjustable & modular	Capacity surplus (facilities & shafts)	Installations not integrated in structure	Exposed services
<ul style="list-style-type: none"> • Space plan Interior layout 	Versatility Refitable Convertible Scalable Movable	Demountable walls Surplus of space & buffer zones Dry connections	Communal spaces Universal & standardised rooms (size) Vertical & horizontal access	Undefined spaces Removable & relocatable units Separate entrances	Open space plan Suspended ceiling & raised floors Wide circulation	Space rearrangement Not load bearing walls
<ul style="list-style-type: none"> • Stuff Furniture 	Adjustability Versatility Movable	Standardised & modular	Movable (non-fixed)	Folding & adjus. furniture	Plug & play elements	
<ul style="list-style-type: none"> • Social Human factor 	All 6 strategy types	User involvement	Open space	Multifunctional space	Communal space	
<ul style="list-style-type: none"> • Surroundings Physical context 	Convertible Movable	Multifunctional location Good quality public places	Area express culture Access by public transport	Provision of amenities & services Access by car & parking	Distance to city centre	Proximity

Table 3.2.5
Layers & strategies

Adaptability - Preliminary strategy (part A)

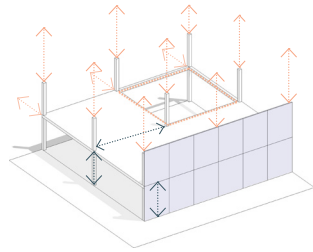


Strategy types	Layers	Strategies - tactics				
A. Multifunctional		• Floor to floor height	• Expandable horizontal & vertical	• Reduction horizontal & vertical	• Facade grid dimensions	• Grid wide span (column layout)
		• Floor depth	• Independent envelope (min. contact points)	• Position: stairs, lifts, entr. & services		
B. Building characteristics		• Building generality	• Floor depth	• Building geometry	• Image & identity (skin)	• Not load-bearing facade
		• Daylight				
C. Oversupply		• Floor to floor height	• Increased load capacity	• Expandable horizontal & vertical	• Surplus of building space & buffer zones	• Capacity surplus services
D. Buffer zones		• Undefined spaces	• Surplus of space	• Expandable horizontal & vertical	• Communal space	
E. Demountable elements & dry connections		• Dry connections (structure & plan)	• Demountable facade	• Demountable walls	• Exposed structure	• Suspended ceiling & raised floors
F. Modular & dividable		• Grid structure	• Modular & Prefabricated elements	• Standardised skin	• Facade grid dimensions	• Adjustable & modular services
G. Circulation & zoning		• Vertical & horizontal access	• Separate entrances	• Wide circulation	• Core- services	
H. Movable & portable		• Standardised & modular	• Folding & adjust. furniture	• Removable & relocatable units	• Demountable wall partitions	
I. Location selection		• Multifunctional location	• Area express culture	• Provision of amenities & services	• Distance to city centre	• Proximity
		• Good quality public places	• Access by public transp.	• Access by car & parking		
J. Site selection		• Surplus of site space	• Multifunctional site - legal	• Expandable location	• Creation of public space	
K. Human factor		• User involvement				

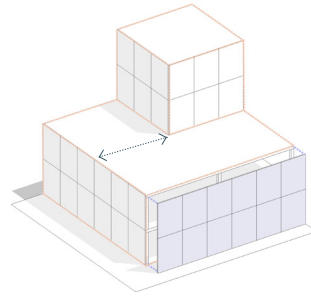
Table 3.2.6
Adaptability strategy component
Preliminary strategy (part A)



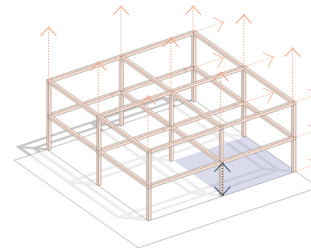
Strategy types



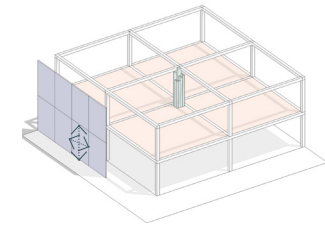
Multifunctional



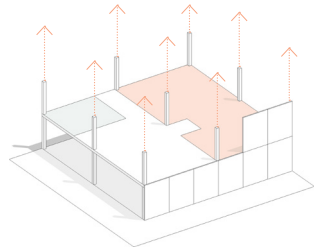
Building characteristics



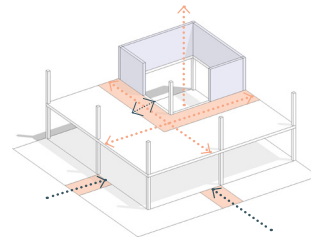
Oversupply



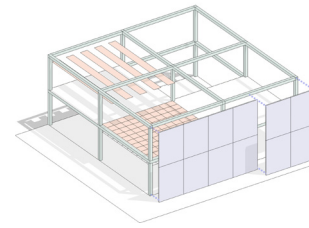
Modular & dividable



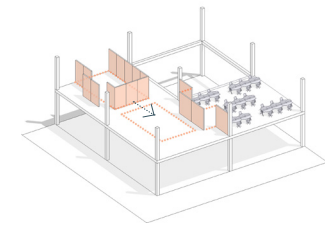
Buffer zones



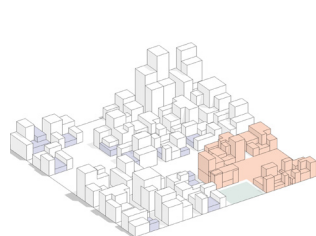
Circulation & zoning



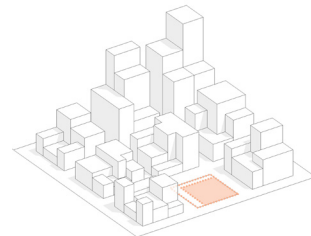
Demountable elements & dry connections



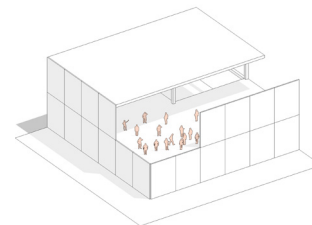
Movable & portable



Location selection



Site selection



Human factor



Conclusions

Every project is unique
as they are **designed to respond**
to specific requirements

The proposed strategy should be
adapted to **fit the clients' specific**
demands & goals

Theoretical framework



Adaptability Adaptability frameworks Added value

Why?



How?



What?

Added value



Real estate
can impact corporations'
**productivity, competitive advantage
& profitability**

- Performance:**
- Efficiency (capital reduction, space optimization)
 - Effectiveness (output: quality, satisfaction, flexibility, sustainability etc.)

Optimise
building user relationship

Alignment



Real estate strategies

Business strategies

Objectives

Alignment



Real estate strategies

Business strategies

Objectives

Value is added to the organisation's core business,
enhancing its performance and competitive advantage in the long run

Added value



**“The contribution of real estate to organisational performance
and the attainment of organisational objectives.”**

(De Vries, 2007 ; Den Heijer, 2011 in Van der Voordt, 2016).



Measuring added value

Indirect &
direct influence

Isolate their impact
from other resources
(eg. human capital & technology)

Quantify real estate
strategies' effects

Hard to measure added value



Forms of added value

Values	De Vries et al., 2008	Macmilan, 2006	Gibler & Lindholm, 2012	Den Heijer, 2011	Jensen, Nielsen & Nielsen, 2008	Voordt & Jensen, 2018
1. Control risk				Control risk	Reliability	Risk
2. Increase real estate value		Exchange	Increase value of organisation's real estate assets	Increase real estate value	Cost	Value of assets
3. Reduce costs	Cost		Reduce real estate cost	Reduce costs	Reduce cost	Cost
4. Productivity	Productivity		Increase efficiency & productivity	Support user activities	Productivity	Productivity
5. Improve quality of space				Improve quality of place	Spatial	
6. User satisfaction	Satisfaction	Use	Increase user well-being & satisfaction	Increase user satisfaction	Satisfaction	Satisfaction
7. Stimulate collaboration				Stimulate collaboration		
8. Stimulate innovation	Innovation		Support innovation & creativity	Stimulate innovation		Innovation & creativity
9. Environmental sustainability		Environmental	Support environmental sustainability	Reduce footprint	Environmental	Sustainability
10. Adaptability	Flexibility		Increase flexibility	Increase flexibility	Adaptability	Adaptability
11. Support image & culture	Image & culture	Image & culture	Promote marketing, sale & brand	Support image	Promote marketing & sale	Image
12. Social responsibility		Social			Social	Corporate social responsibility

Table 3.3.1
Added value parameters



Selection of forms of added value

Values	Relations between values	Final selection
1. Control risk	2 - 3 - 4 - 10 - 11	Adaptability
2. Increase real estate value	7 - 9 - 10 - 11	Increase real estate value
3. Reduce costs	5 - 9 - 10 - 11	Improve quality Env Sustainability Adaptability
4. Productivity	5 - 6 - 7 - 8 - 10	Productivity
5. Improve quality of space	2 - 4 - 6 - 8 - 11	Adaptability
6. User satisfaction	2 - 4 - 5 - 9 - 10	User satisfaction
7. Stimulate collaboration	4 - 8 - 10 - 11	Stimulate innovation
8. Stimulate innovation	4 - 7 - 10 - 11	Stimulate innovation
9. Environmental sustainability	2 - 3 - 4 - 6 10 - 11 - 12	Environmental sustainability
10. Adaptability	1 - 2 - 3 - 4 - 5 6 - 9 - 11 - 12	Adaptability
11. Support image & culture	5 - 6 - 9 - 10 - 12	Support image & culture
12. Social responsibility	9 - 10 - 11	Social responsibility

Table 3.3.2
Final selection of added value parameters - Preliminary strategy (part B)



Synthesis

Strategy types	Layers	Strategies - tactics				
A. Multifunctional		• Floor to floor height	• Expandable horizontal & vertical	• Reduction horizontal & vertical	• Facade grid dimensions	• Grid wide span (column layout)
		• Floor depth	• Independent envelope (min. contact points)	• Position: stairs, lifts, entr. & services		
B. Building characteristics		• Building generality	• Floor depth	• Building geometry	• Image & identity (skin)	• Not load-bearing facade
		• Daylight				
C. Oversupply		• Floor to floor height	• Increased load capacity	• Expandable horizontal & vertical	• Surplus of building space & buffer zones	• Capacity surplus services
D. Buffer zones		• Undefined spaces	• Surplus of space	• Expandable horizontal & vertical	• Communal space	
E. Demountable elements & dry connections		• Dry connections (structure & plan)	• Demountable facade	• Demountable walls	• Exposed structure	• Suspended ceiling & raised floors
F. Modular & dividable		• Grid structure	• Modular & Prefabricated elements	• Standardised skin	• Facade grid dimensions	• Adjustable & modular services
G. Circulation & zoning		• Vertical & horizontal access	• Separate entrances	• Wide circulation	• Core- services	
H. Movable & portable		• Standardised & modular	• Folding & adjust. furniture	• Removable & relocatable units	• Demountable wall partitions	
I. Location selection		• Multifunctional location	• Area express culture	• Provision of amenities & services	• Distance to city centre	• Proximity
		• Good quality public places	• Access by public transp.	• Access by car & parking		
J. Site selection		• Surplus of site space	• Multifunctional site - legal	• Expandable location	• Creation of public space	
K. Human factor		• User involvement				

Values	Relations between values	Final selection
1. Control risk	2 - 3 - 4 -10- 11	Adaptability
2. Increase real estate value	7 - 9 - 10 - 11	Increase real estate value
3. Reduce costs	5 - 9 - 10 - 11	Improve quality Env Sustainability Adaptability
4. Productivity	5 - 6 - 7 - 8 - 10	Productivity
5. Improve quality of space	2 - 4 - 6 - 8 - 11	Adaptability
6. User satisfaction	2 - 4 - 5 - 9 - 10	User satisfaction
7. Stimulate collaboration	4 - 8 - 10 - 11	Stimulate innovation
8. Stimulate innovation	4 - 7 - 10 - 11	Stimulate innovation
9. Environmental sustainability	2 - 3 - 4 - 6 10 - 11 - 12	Environmental sustainability
10. Adaptability	1 - 2 - 3 - 4 - 5 6 - 9 - 11 - 12	Adaptability
11. Support image & culture	5 - 6 - 9 - 10 - 12	Support image & culture
12. Social responsibility	9 - 10 - 11	Social responsibility

<Table 3.2.6
Adaptability strategy component
Preliminary strategy (part A)

>Table 3.3.2
Final selection of added value parameters
Preliminary strategy (part B)

Preliminary strategy

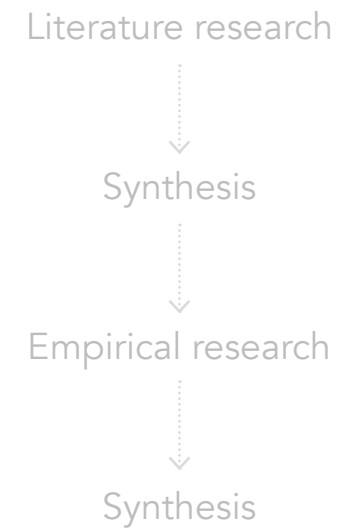
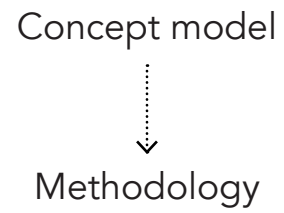
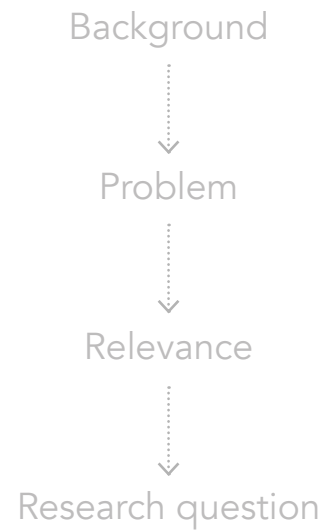


Strategy types	Increase real estate value	Productivity	User satisfaction	Stimulate innovation	Environmental sustainability	Adaptability	Image & culture	Social responsibility
A. Multifunctional	●	●	●		●	●	●	●
B. Building characteristics	●	●	●		●	●	●	●
C. Oversupply	●		●		●	●	●	●
D. Buffer zones	●	●	●	●	●	●	●	●
E. Demountable elements & dry connections	●		●		●	●	●	●
F. Modular & dividable	●	●	●	●	●	●	●	●
G. Circulation & zoning	●	●	●	●		●	●	
H. Movable & portable		●	●	●	●	●	●	
I. Location selection	●	●	●	●	●	●	●	●
J. Site selection	●	●	●	●	●	●	●	●

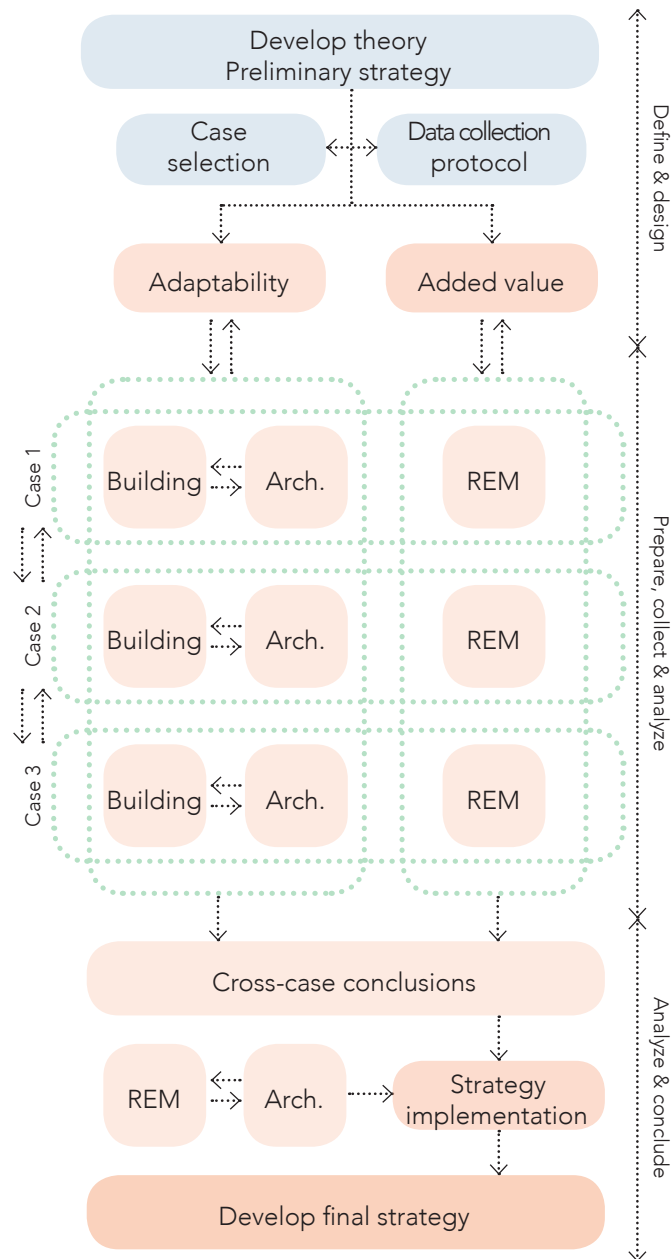
- Large impact (value added by more than half of the tactics)
- Medium impact (value added by less than half of the tactics)
- Small impact (value added by half of the tactics)



Why?> How?> What?



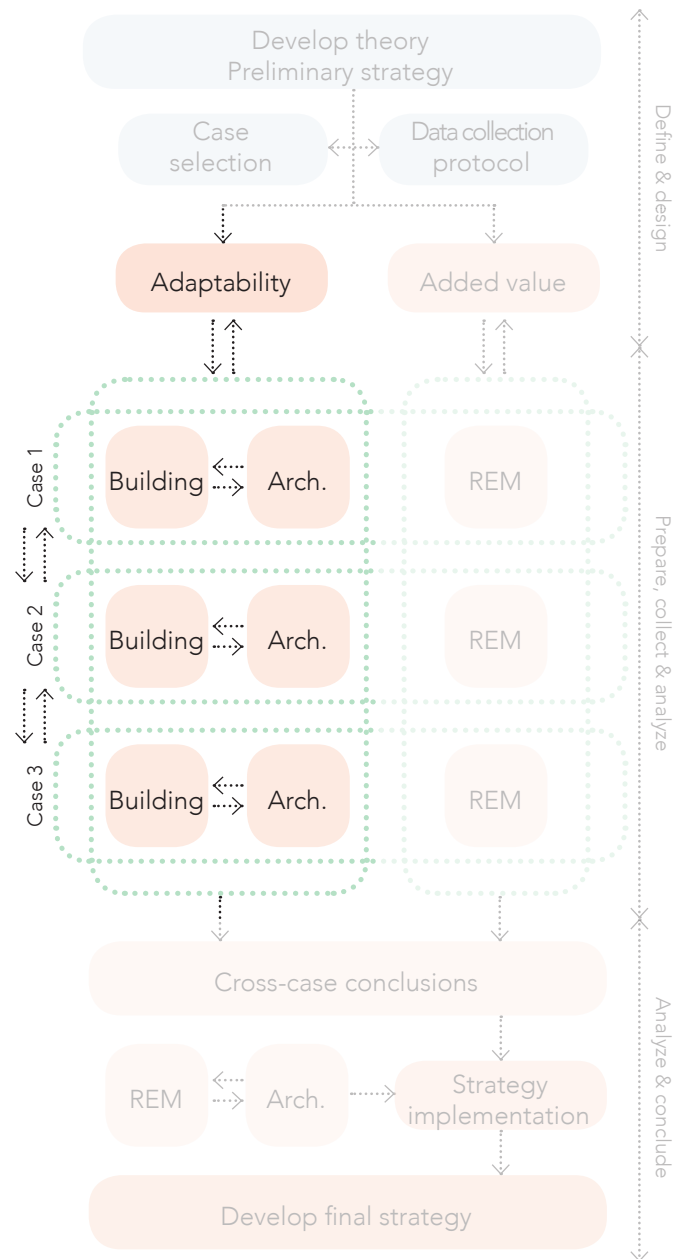
Empirical research plan



Why?> How?> What?



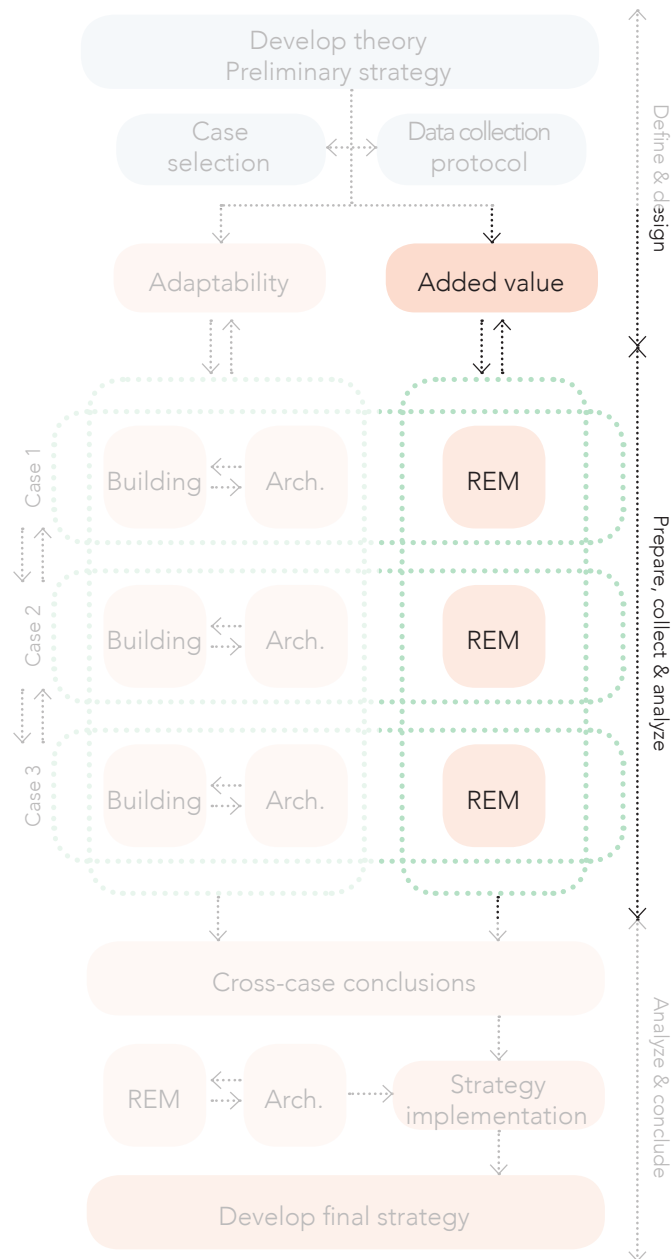
Empirical research plan



Why?> How?> What?



Empirical research plan



Why?



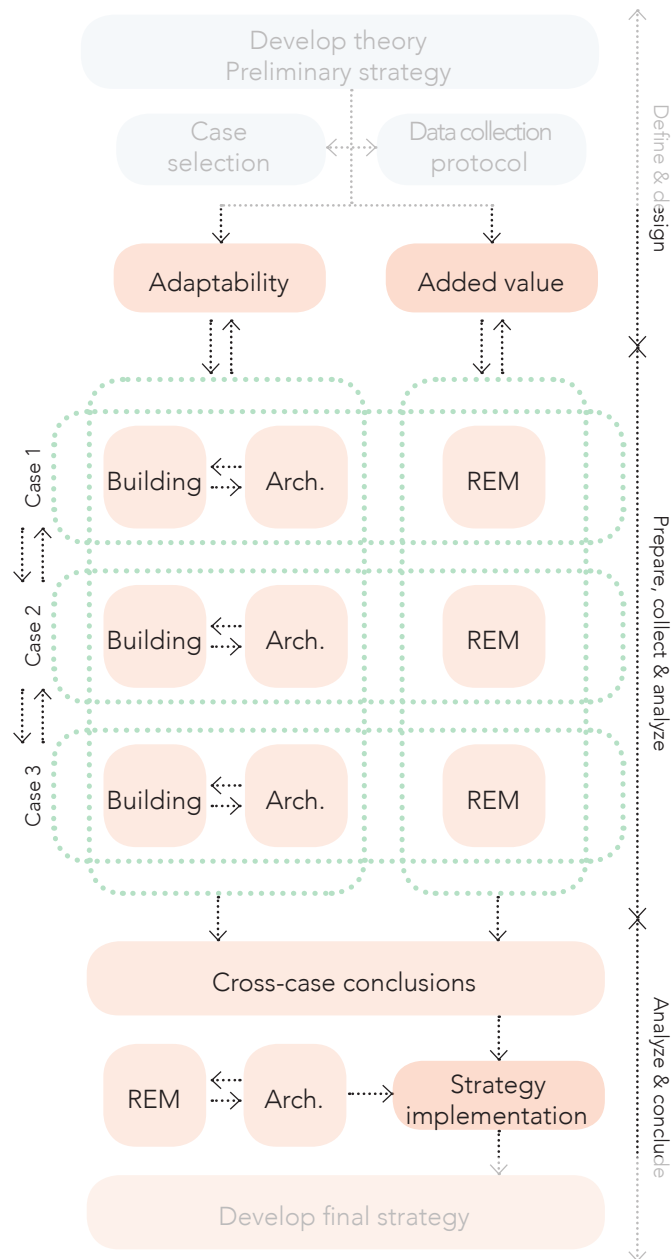
How?



What?



Empirical research plan



Why?

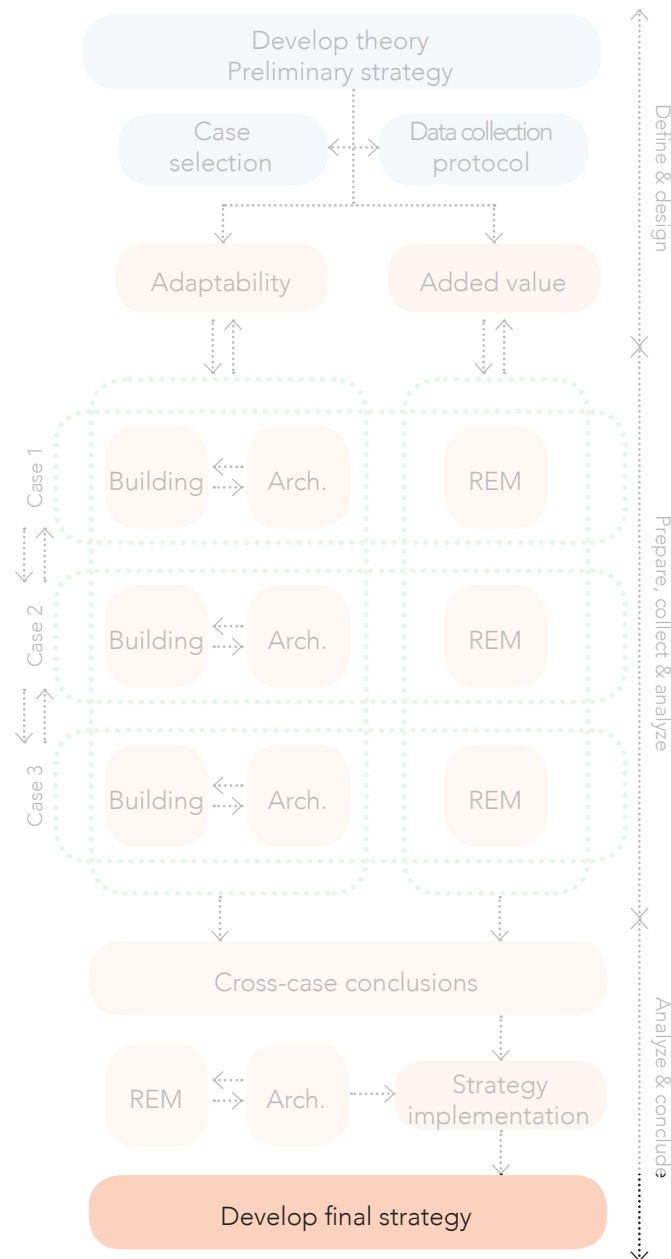


How?



What?

Empirical research plan



Why? → How? → What?



Case selection - Criteria

Location

Central

Function

Office

Designed for

adaptability

Sustainable

Branded

Date of completion

> 5 years

Size of building

>20.000 sqm



Cases



Case 1: Timmerhuis

- Documentary data
 - Architect
- Real Estate Manager



Case 2: Rijnstraat 8

- Documentary data
 - Architect
- Real Estate Manager



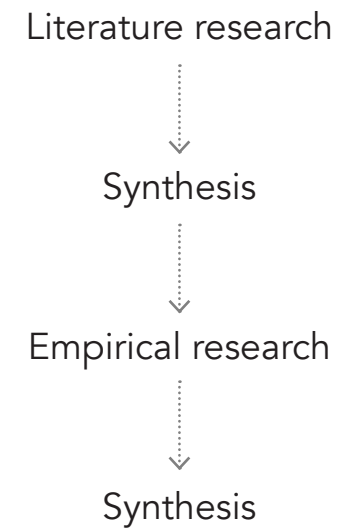
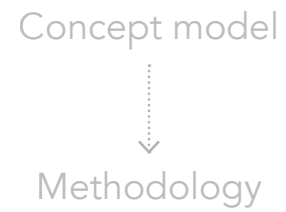
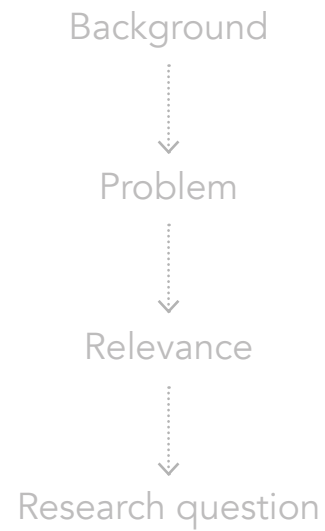
Case 3: The Edge

- Documentary data
 - Architect
- Developer (Edge Tech)





Why?> How?> What?





Timmerhuis



General

- Can adapt to residential & office
 - Must be Netherlands' most sustainable building
- Show that adaptability does not affect quality & price

Adaptability in Timmerhuis

- Can respond to downturn - easily house more tenants & change functions (especially from office to housing)
 - Go "all the way"





Timmerhuis



Risks

- Financial risk
- Prepare a lot and you never know if you will actually ever use them

The future of adaptability

- Adaptability will impact the building's financial value
- Invest now and the value will increase in the future

Added value

- Public parties focus on vision
- Deliver value not only to owners & users but to society too
- Quality - more pleasant space for users & prolong lifespan





Rijnstraat 8



General

- Office multi-tenant building
- Can house different functions
(university, library, hotel)
- 25 years after completion - did not fulfil users' needs

Adaptability in Rijnstraat 8

- 4 year - elections result in frequent changes
- Last 10 years gov. became more efficient
- Every 20-30 years big changes - before spread/ now together
- More efficient - involve users



Rijnstraat 8



Risks

- **Financial risk**
- Make sure you **provide the capacity** to accommodate changes (eg. overcapacity)

The future of adaptability

- **Technology** - can make buildings more efficient but **need time**
 - **Add financial value**
- 25 y.o. buildings require changes as the world is changing
- The last 10-20 years **people are more concerned about adapt.**

Added value

- **Public parties focus on vision**
- Set example for **sustainable & efficient buildings**
- **Quality - more pleasant space for users & prolong lifespan**





The Edge



General

- Most sustainable office building
 - 2008 had a huge impact
 - Deloitte 15 years
 - High ambitions

Adaptability in The Edge

- Recession - changeability
- Massing suitable for other functions (uni- offices- housing)
 - Adapt to new needs when needed - built for 50-100 years





The Edge



Risks

- Financial risk
- Have a reason to invest

The future of adaptability

- Investors interested in **sustainability**
- **Technology** - data - responsive
- Shift towards more **adaptable**
quite new still
- **More & more important** - world is
changing in fast pace

Added value

- **Private parties** - both devoted &
high ambitions
- **Adaptability** - **provide healthy &**
productive environment





Tactics implemented

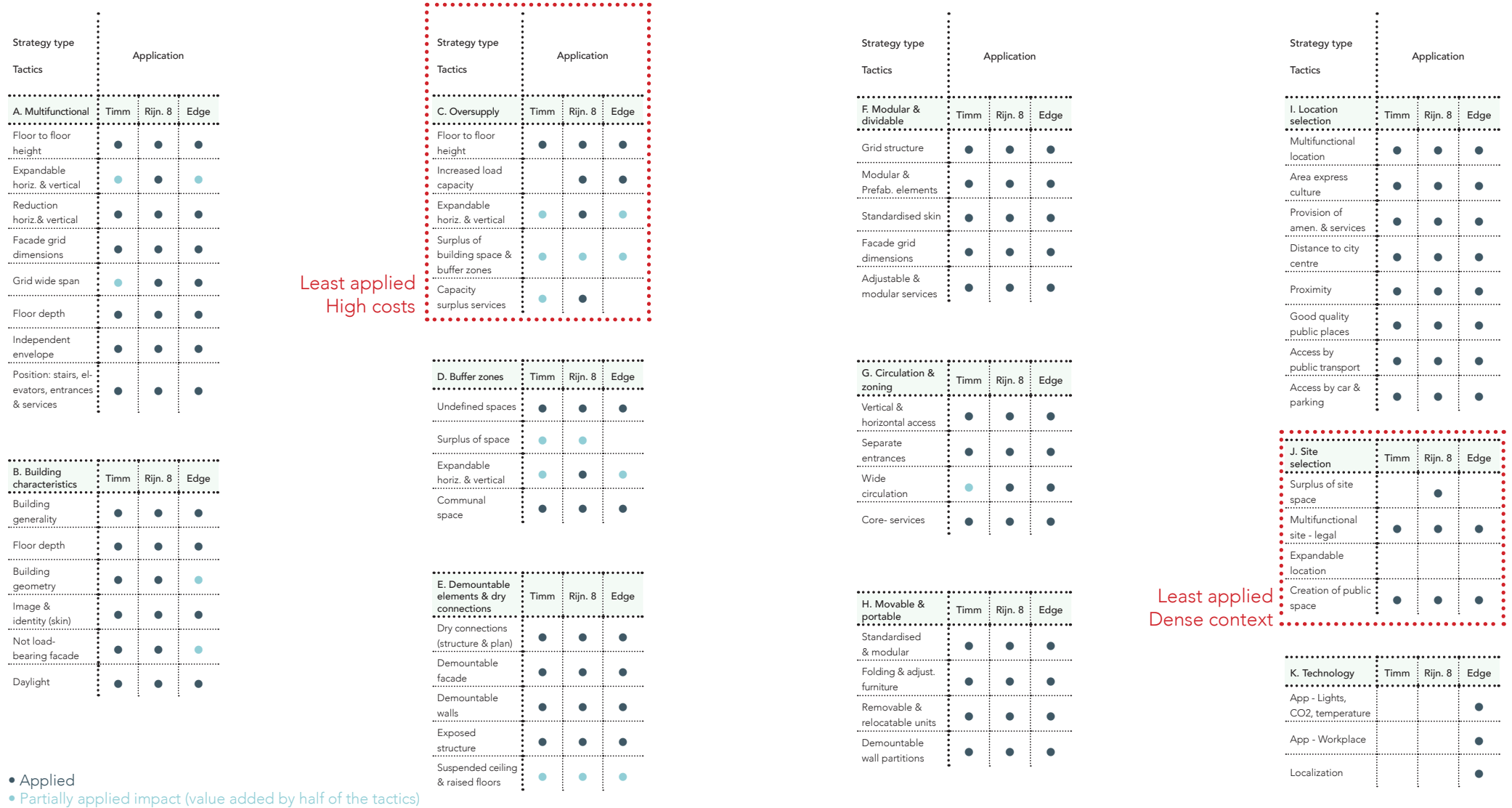


Table 10.2
Adaptability Tactics implementation A-E



Tactics implemented

Strategy type	Application		
	Timm	Rijn. 8	Edge
A. Multifunctional			
Floor to floor height	●	●	●
Expandable horiz. & vertical	●	●	●
Reduction horiz. & vertical	●	●	●
Facade grid dimensions	●	●	●
Grid wide span	●	●	●
Floor depth	●	●	●
Independent envelope	●	●	●
Position: stairs, elevators, entrances & services	●	●	●

Strategy type	Application		
	Timm	Rijn. 8	Edge
B. Building characteristics			
Building generality	●	●	●
Floor depth	●	●	●
Building geometry	●	●	●
Image & identity (skin)	●	●	●
Not load-bearing facade	●	●	●
Daylight	●	●	●

- Applied
- Partially applied impact (value added by half of the tactics)

Strategy type	Application		
	Timm	Rijn. 8	Edge
C. Oversupply			
Floor to floor height	●	●	●
Increased load capacity	●	●	●
Expandable horiz. & vertical	●	●	●
Surplus of building space & buffer zones	●	●	●
Capacity surplus services	●	●	●

Strategy type	Application		
	Timm	Rijn. 8	Edge
D. Buffer zones			
Undefined spaces	●	●	●
Surplus of space	●	●	●
Expandable horiz. & vertical	●	●	●
Communal space	●	●	●

Strategy type	Application		
	Timm	Rijn. 8	Edge
E. Demountable elements & dry connections			
Dry connections (structure & plan)	●	●	●
Demountable facade	●	●	●
Demountable walls	●	●	●
Exposed structure	●	●	●
Suspended ceiling & raised floors	●	●	●

Strategy type	Application		
	Timm	Rijn. 8	Edge
F. Modular & dividable			
Grid structure	●	●	●
Modular & Prefab. elements	●	●	●
Standardised skin	●	●	●
Facade grid dimensions	●	●	●
Adjustable & modular services	●	●	●

Strategy type	Application		
	Timm	Rijn. 8	Edge
G. Circulation & zoning			
Vertical & horizontal access	●	●	●
Separate entrances	●	●	●
Wide circulation	●	●	●
Core-services	●	●	●

Strategy type	Application		
	Timm	Rijn. 8	Edge
H. Movable & portable			
Standardised & modular	●	●	●
Folding & adjust. furniture	●	●	●
Removable & relocatable units	●	●	●
Demountable wall partitions	●	●	●

Strategy type	Application		
	Timm	Rijn. 8	Edge
I. Location selection			
Multifunctional location	●	●	●
Area express culture	●	●	●
Provision of amen. & services	●	●	●
Distance to city centre	●	●	●
Proximity	●	●	●
Good quality public places	●	●	●
Access by public transport	●	●	●
Access by car & parking	●	●	●

Most applied

Strategy type	Application		
	Timm	Rijn. 8	Edge
J. Site selection			
Surplus of site space	●	●	●
Multifunctional site - legal	●	●	●
Expandable location	●	●	●
Creation of public space	●	●	●

Strategy type	Application		
	Timm	Rijn. 8	Edge
K. Technology			
App - Lights, CO2, temperature	●	●	●
App - Workplace	●	●	●
Localization	●	●	●

Table 10.2 Adaptability Tactics implementation A-E



Tactics implemented

Strategy type	Application		
Tactics	Timm	Rijn. 8	Edge
A. Multifunctional			
Floor to floor height	●	●	●
Expandable horiz. & vertical	●	●	●
Reduction horiz. & vertical	●	●	●
Facade grid dimensions	●	●	●
Grid wide span	●	●	●
Floor depth	●	●	●
Independent envelope	●	●	●
Position: stairs, elevators, entrances & services	●	●	●
B. Building characteristics			
Building generality	●	●	●
Floor depth	●	●	●
Building geometry	●	●	●
Image & identity (skin)	●	●	●
Not load-bearing facade	●	●	●
Daylight	●	●	●
C. Oversupply			
Floor to floor height	●	●	●
Increased load capacity	●	●	●
Expandable horiz. & vertical	●	●	●
Surplus of building space & buffer zones	●	●	●
Capacity surplus services	●	●	●
D. Buffer zones			
Undefined spaces	●	●	●
Surplus of space	●	●	●
Expandable horiz. & vertical	●	●	●
Communal space	●	●	●
E. Demountable elements & dry connections			
Dry connections (structure & plan)	●	●	●
Demountable facade	●	●	●
Demountable walls	●	●	●
Exposed structure	●	●	●
Suspended ceiling & raised floors	●	●	●
F. Modular & dividable			
Grid structure	●	●	●
Modular & Prefab. elements	●	●	●
Standardised skin	●	●	●
Facade grid dimensions	●	●	●
Adjustable & modular services	●	●	●
G. Circulation & zoning			
Vertical & horizontal access	●	●	●
Separate entrances	●	●	●
Wide circulation	●	●	●
Core-services	●	●	●
H. Movable & portable			
Standardised & modular	●	●	●
Folding & adjust. furniture	●	●	●
Removable & relocatable units	●	●	●
Demountable wall partitions	●	●	●
I. Location selection			
Multifunctional location	●	●	●
Area express culture	●	●	●
Provision of amen. & services	●	●	●
Distance to city centre	●	●	●
Proximity	●	●	●
Good quality public places	●	●	●
Access by public transport	●	●	●
Access by car & parking	●	●	●
J. Site selection			
Surplus of site space	●	●	●
Multifunctional site - legal	●	●	●
Expandable location	●	●	●
Creation of public space	●	●	●
K. Technology			
App - Lights, CO2, temperature	●	●	●
App - Workplace	●	●	●
Localization	●	●	●

● Applied
 ● Partially applied impact (value added by half of the tactics)

New addition
 Future

Table 10.2
 Adaptability Tactics implementation A-E



Strategy type	Significance									Risk						Impact & Risk assessment		
	Arch			Rem			Total			Arch		Rem		Total				
	Tim.	Rijn.	Edge	Tim.	Rijn.	Edge	Aver.	S.D.	Tim.	Rijn.	Edge	Tim.	Rijn.	Edge	Aver.		S.D.	
F. Modular & dividable																		
Grid structure	5	4	5	4	4	5	4.5	0.5	1	2	1	2	3	1	1.7	0.8	2.7	
Modular & Prefab. elements	5	3	3	5	5	4	4.2	1.0	1	2	2	3	1	2	1.8	0.8	2.3	
Standardised skin	5	3	3	5	3	5	4.0	1.1	1	2	1	2	3	2	1.8	0.8	2.2	
Facade grid dimensions	5	4	3	4	4	4	4.0	0.6	1	1	1	2	2	1	1.3	0.5	3.0	
Adjustable & modular services	5	4	3	5	4	4	4.2	0.8	1	1	3	1	2	2	1.8	0.8	2.3	
Total							4.17	0.80							1.70	0.72	2.5	

G. Circulation & zoning	Significance									Risk						I & R	
	Arch			Rem			Total			Arch		Rem		Total			
	Tim.	Rijn.	Edge	Tim.	Rijn.	Edge	Aver.	S.D.	Tim.	Rijn.	Edge	Tim.	Rijn.	Edge	Aver.		S.D.
Vertical & horizontal access	5	4	5	5	5	5	4.8	0.4	1	2	1	1	2	2	1.5	0.5	3.2
Separate entrances	5	4	5	4	4	5	4.5	0.5	1	1	1	2	2	2	1.5	0.5	3.0
Wide circulation	4	4	5	5	4	5	4.5	0.5	1	2	2	2	1	3	1.8	0.8	2.5
Core- services	5	4	5	5	3	5	4.5	0.8	1	2	1	2	3	2	1.8	0.8	2.5
Total							4.58	0.59							1.67	0.65	2.8

H. Movable & portable	Significance									Risk						I & R	
	Arch			Rem			Total			Arch		Rem		Total			
	Tim.	Rijn.	Edge	Tim.	Rijn.	Edge	Ave.	S.D.	Tim.	Rijn.	Edge	Tim.	Rijn.	Edge	Ave.		S.D.
Standardised & modular	5	3	5	5	4	5	4.5	0.8	1	2	1	2	1	2	1.5	0.5	3.0
Folding & adjust. furniture	4	3	5	3	4	5	4.0	0.9	1	2	2	1	1	1	1.3	0.5	3.0
Removable & relocatable units	5	4	5	5	5	5	4.8	0.4	1	2	2	2	1	2	1.7	0.5	2.9
Demountable wall partitions	5	4	5	5	4	5	4.7	0.5	1	2	1	1	2	1	1.3	0.5	3.5
Total							4.50	0.66							1.46	0.52	3.1

Table 10.3 Adaptability strategies & tactics: Significance & risk of adaptability tactics F-K

Strategy type	Significance									Risk						Impact & Risk assessment		
	Arch			Rem			Total			Arch		Rem		Total				
	Tim.	Rijn.	Edge	Tim.	Rijn.	Edge	Aver.	S.D.	Tim.	Rijn.	Edge	Tim.	Rijn.	Edge	Aver.		S.D.	
I. Location selection																		
Multifunctional location	5	5	5	5	5	5	5.0	0.0	1	1	1	1	2	1	1.2	0.4	4.3	
Area express culture	5	4	5	5	3	5	4.5	0.8	1	2	2	1	2	2	1.7	0.5	2.7	
Provision of amen. & services	5	4	5	5	4	5	4.7	0.5	1	2	1	1	2	1	1.3	0.5	3.5	
Distance to city centre	5	5	5	5	4	5	4.8	0.4	1	1	1	1	1	1	1.0	0.0	4.8	
Proximity	5	5	5	5	5	5	5.0	0.0	1	1	1	1	1	1	1.0	0.0	5.0	
Good quality public places	5	4	5	5	5	5	4.8	0.4	1	2	1	2	1	1	1.3	0.5	3.6	
Access by public transport	5	5	5	5	5	5	5.0	0.0	1	1	2	1	1	2	1.3	0.5	3.8	
Access by car & parking	5	4	5	3	4	5	4.3	0.8	1	1	3	1	3	3	2.0	1.1	2.2	
Total							4.77	0.37							1.35	0.45	3.5	

Very important and low risk

J. Site selection	Significance									Risk						I & R	
	Arch			Rem			Total			Arch		Rem		Total			
	Tim.	Rijn.	Edge	Tim.	Rijn.	Edge	Aver.	S.D.	Tim.	Rijn.	Edge	Tim.	Rijn.	Edge	Aver.		S.D.
Surplus of site space	5	4	5	5	3	3	4.2	1.0	1	3	3	1	2	3	2.2	1.0	1.9
Multifunctional site - legal	5	4	5	5	5	3	4.5	0.8	1	1	2	2	1	1	1.3	0.5	3.4
Expandable location	4	4	5	5	4	3	4.2	0.8	1	1	1	1	1	1	1.0	0.0	4.2
Creation of public space	4	4	5	5	4	5	4.3	0.5	1	1	1	1	3	3	1.7	1.0	2.6
Total							4.29	0.77							1.54	0.63	2.8

New addition Future

K. Technology	Significance									Risk						I & R	
	Arch			Rem			Total			Arch		Rem		Total			
	Tim.	Rijn.	Edge	Tim.	Rijn.	Edge	Aver.	S.D.	Tim.	Rijn.	Edge	Tim.	Rijn.	Edge	Aver.		S.D.
App - Lights, CO2, temperature			5			3	4.0	1.4			2			5	3.5	2.1	1.1
App - Workplace			5			3	4.0	1.4			2			3	2.5	0.7	1.6
Localization			5			3	4.0	1.4			2			5	3.5	2.1	1.1
Total							4.0	1.41							3.17	1.65	1.3

*All tactics received >3 for their significance, indicating that they are all important for the development of adaptable real estate



Results comparison

Strategy types	Significance (11.3)	Risk * (11.3)	Impact & Risk assessment (11.3)	Ranking (11.4)	Stand. Dev	Average	Final Rank	
A. Multifunctional	5	5	4	3	1.0	4.25	3	Develop generic buildings that can accommodate large scale changes
B. Building characteristics	4	6	7	2	2.2	4.75	4	
C. Oversupply	7	10	10	7	1.7	8.50	9	
D. Buffer zones	9	9	9	6	1.5	8.25	8	
E. Demountable elements & dry connections	8	2	3	9	3.5	5.50	6	High standard deviation
F. Modular & dividable	10	8	8	10	1.2	9.00	10	
G. Circulation & zoning	2	7	6	4	2.2	4.75	5	
H. Movable & portable	3	3	2	5	1.3	3.25	2	Significant for small scale/ daily changes No large additional costs
I. Location selection	1	1	1	1	0.0	1.00	1	High significance Low risk Most favourable strategy type
J. Site selection	6	4	5	8	1.7	5.75	7	
K. Technology	11	11	11	11	0.0	11	11	

Table 10.5
Results comparison, Significance - Risk - Impact & Risk assessment (10.3 - 10.4)

Added value of adaptability related strategies - REM



Strategy type	Increase real estate value	Productivity	User satisfaction	Stimulate innovation	Environmental sustainability	Adaptability	Image & culture	Social responsibility
A. Multifunctional	●	●	●	●	●	●	●	●
Floor to floor height	3		3		3	3	3	2
Expandable horiz. & vertical	3				2	3	1	2
Reduction horiz. & vertical	2				2	2	1	2
Facade grid dimensions	2				1	2	1	1
Grid wide span	3	2	3	1		3		
Floor depth	3	3	3	1		3		
Independent envelope	3					3	2	1
Position: stairs, elevators, entrances & services	3	1	2		2	3		
B. Building characteristics	●	●	●	●	●	●	●	●
Building generality	3		1		2	3	2	1
Floor depth	3	3	3			3		
Building geometry	3	2	2		2	3	1	
Image & identity (skin)	3					3	2	1
Not load-bearing facade	3					3	2	
Daylight	3	3	3	2	1	3	1	1

- Large impact ($L > 2/3$ - Value added by more than two thirds of the tactics)
- Medium impact ($1/3 > M > 2/3$ - Value added by between one and two thirds of the tactics)
- Small impact ($S < 1/3$ - Value added by less than a third of the tactics)

- 1-3 Confirm - preliminary strategy
- 1-3 Additional
- 1-3 Not confirmed

Table 10.6
Added value of adaptability strategies & tactics A-B

Strategy type	Increase real estate value	Productivity	User satisfaction	Stimulate innovation	Environmental sustainability	Adaptability	Image & culture	Social responsibility
C. Oversupply	●	●	●		●	●	●	●
Floor to floor height	3		3		3	3	3	2
Increased load capacity	3				2	3		
Expandable horiz. & vertical	3				2	3	1	1
Surplus of building space & buffer zones	2	1	2			3		
Capacity surplus services	3		1			3		
D. Buffer zones	●	●	●	●	●	●	●	●
Undefined spaces			3			3		
Surplus of space	3		1			3		
Expandable horiz. & vertical	3				2	3	1	1
Communal space	2	2	3	2		3	2	3
E. Demountable elements & dry connections	●		●		●	●	●	●
Dry connections (structure & plan)	2				3	3		
Demountable facade	3				3	3	3	3
Demountable walls	3		3		1	3		
Exposed structure						3		
Suspended ceiling & raised floors	1		3			3		

Added value of adaptability related strategies - REM



Strategy type	Increase real estate value	Productivity	User satisfaction	Stimulate innovation	Environmental sustainability	Adaptability	Image & culture	Social responsibility
F. Modular & dividable	●		●		●	●	●	●
Grid structure	2		2			3		
Modular & Prefab.elements	2		2		2	3		2
Standardised skin	2				1	3	2	
Facade grid dimensions						3	2	
Adjustable & modular services	2		2		1	3		
G. Circulation & zoning	●	●	●	●		●	●	
Vertical & horizontal access	3		3			3		
Separate entrances	3		2			3	3	
Wide circulation	2	3	3	3		3		
Core-services	3					3		
H. Movable & portable	●	●	●	●	●	●		
Standardised & modular		3	3	1	3	3		
Folding & adjust. furniture		3	3	1		3		
Removable & relocatable units	1	3	3	1		3		
Demountable wall partitions	1	3	3	1		3		

Strategy type	Increase real estate value	Productivity	User satisfaction	Stimulate innovation	Environmental sustainability	Adaptability	Image & culture	Social responsibility
I. Location selection	●	●	●	●	●	●	●	●
Multifunctional location	3	2	3	2		3	2	3
Area express culture	1	1	3	2		3	3	
Provision of amen. & services	3	1	3			3		
Distance to city centre	3		3		2	3	3	
Proximity	3		3			3		
Good quality public places	3	3	3	3		3	3	3
Access by public transport	3		3		2	3		
Access by car & parking	3		3			3		
J. Site selection	●	●	●	●	●	●	●	●
Surplus of site space	3					3		
Multifunctional site - legal	3		1			3		
Expandable location	3					3		
Creation of public space	3	3	3	3	2	3	3	2
K. Technology	●	●	●	●		●	●	
App - Lights, CO2, temperature		1	1	1		1	1	
App - Workplace		1	1	1		1	1	
Localization	1	1	1	1		1	1	



Added value of adaptability related strategies - REM

Strategy types	Increase real estate value	Productivity	User satisfaction	Stimulate innovation	Environmental sustainability	Adaptability	Image & culture	Social responsibility
A. Multifunctional	●	●	●	●	●	●	●	●
B. Building characteristics	●	●	●	●	●	●	●	●
C. Oversupply	●	●	●	●	●	●	●	●
D. Buffer zones	●	●	●	●	●	●	●	●
E. Demountable elements & dry connections	●	●	●	●	●	●	●	●
F. Modular & dividable	●	●	●	●	●	●	●	●
G. Circulation & zoning	●	●	●	●	●	●	●	●
H. Movable & portable	●	●	●	●	●	●	●	●
I. Location selection	●	●	●	●	●	●	●	●
J. Site selection	●	●	●	●	●	●	●	●
K. Technology	●	●	●	●	●	●	●	●

- Large impact ($L > 2/3$ of the tactics)
- Medium impact ($1/3 > M > 2/3$ - of the tactics)
- Small impact ($S < 1/3$ - of the tactics)

■ Different from preliminary strategy

Table 10.7
Added value of adaptability strategies - Summary table & differences with Preliminary strategy



Added value of adaptability related strategies - ARCHI

Strategy types	Increase real estate value	Productivity	User satisfaction	Stimulate innovation	Environmental sustainability	Adaptability	Image & culture	Social responsibility
A. Multifunctional	7	3	5	3	6	9	7	4
B. Building characteristics	7	4	6	3	5	8	7	2
C. Oversupply	7		2		4	9	1	2
D. Buffer zones	7	3	7	6	2	7	2	2
E. Demountable elements & dry connections	5		2		6	9	3	1
F. Modular & dividable	7		4		4	7	2	1
G. Circulation & zoning	8	3	4	3		7	3	
H. Movable & portable	3	7	8	6	3	7	2	2
I. Location selection	8	4	7	2	6	9	6	3
J. Site selection	9	2	6	3	4	7	3	3
K. Technology	2	3	3	2	2	3	2	

- Large impact (value added by more than half of the tactics)
- Medium impact (value added by less than half of the tactics)
- Small impact (value added by half of the tactics)

* Grading out of 9

** K. Technology graded out of 3

Table 10.8
Added value of adaptability strategies (Architects)



Added value of adaptability related strategies - ARCHI

Strategy types	Increase real estate value	Productivity	User satisfaction	Stimulate innovation	Environmental sustainability	Adaptability	Image & culture	Social responsibility
A. Multifunctional	●	●	●	●	●	●	●	●
B. Building characteristics	●	●	●	●	●	●	●	●
C. Oversupply	●		●		●	●	●	●
D. Buffer zones	●	●	●	●	●	●	●	●
E. Demountable elements & dry connections	●		●		●	●	●	●
F. Modular & dividable	●		●		●	●	●	●
G. Circulation & zoning	●	●	●	●		●	●	
H. Movable & portable	●	●	●	●	●	●	●	●
I. Location selection	●	●	●	●	●	●	●	●
J. Site selection	●	●	●	●	●	●	●	●
K. Technology	●	●	●	●	●	●	●	

*These findings were used to evaluate the differences between the preliminary strategy and the findings from the REM tables

- Large impact ($L > 2/3$ - of the tactics)
- Medium impact ($1/3 > M > 2/3$ - of the tactics)
- Small impact ($S < 1/3$ - of the tactics)

■ Different from preliminary strategy

Table 10.8 B
Added value of adaptability strategies (Architects) -Differences with preliminary strategy



Developing the final strategy (REM + ARCHI summary table)

Strategy types	Increase real estate value	Productivity	User satisfaction	Stimulate innovation	Environmental sustainability	Adaptability	Image & culture	Social responsibility
A. Multifunctional	●	●	●	●	●	●	●	●
B. Building characteristics	●	●	●	●	●	●	●	●
C. Oversupply	●		●		●	●	●	●
D. Buffer zones	●	●	●	●	●	●	●	●
E. Demountable elements & dry connections	●		●		●	●	●	●
F. Modular & dividable	●	●	●	●	●	●	●	●
G. Circulation & zoning	●	●	●	●		●	●	
H. Movable & portable	●	●	●	●	●	●	●	
I. Location selection	●	●	●	●	●	●	●	●
J. Site selection	●	●	●	●	●	●	●	●
K. Technology	●	●	●	●	●	●	●	●

- Large impact (value added by more than half of the tactics)
- Medium impact (value added by less than half of the tactics)
- Small impact (value added by half of the tactics)

■ Change in the Preliminary strategy based on the findings from the Real estate managers & Architects interviews (11.6 & 11.7)

■ Changes in the Preliminary strategy based on the findings from the Real estate managers interviews (11.6)

Table 10.9
Developing the final strategy



Preliminary strategy

Strategy types	Increase real estate value	Productivity	User satisfaction	Stimulate innovation	Environmental sustainability	Adaptability	Image & culture	Social responsibility
A. Multifunctional	●	●	●		●	●	●	●
B. Building characteristics	●	●	●		●	●	●	●
C. Oversupply	●		●		●	●	●	●
D. Buffer zones	●	●	●	●	●	●	●	●
E. Demountable elements & dry connections	●		●		●	●	●	●
F. Modular & dividable	●	●	●	●	●	●	●	●
G. Circulation & zoning	●	●	●	●		●	●	
H. Movable & portable		●	●	●	●	●	●	
I. Location selection	●	●	●	●	●	●	●	●
J. Site selection	●	●	●	●	●	●	●	●

- Large impact (value added by more than half of the tactics)
- Medium impact (value added by less than half of the tactics)
- Small impact (value added by half of the tactics)



The Final Strategy - "The value of adaptability"

Strategy types	Significance	Risk	Impact & Risk assessment	Life expectancy	Increase real estate value	Productivity	User satisfaction	Stimulate innovation	Environmental sustainability	Adaptability	Image & culture	Social responsibility
A. Multifunctional	4.4	1.6	2.8	>20	●	●	●	●	●	●	●	●
B. Building characteristics	4.4	1.6	2.7	>20	●	●	●	●	●	●	●	●
C. Oversupply	4.3	2.6	1.6	>7	●		●		●	●	●	●
D. Buffer zones	4.2	2.2	1.9	>3	●	●	●	●	●	●	●	●
E. Demountable elements & dry connections	4.3	1.4	3.1	>3	●		●		●	●	●	●
F. Modular & dividable	4.2	1.7	2.5	>7	●		●		●	●	●	●
G. Circulation & zoning	4.6	1.7	2.8	>3	●	●	●	●		●	●	
H. Movable & portable	4.5	1.5	3.1	3<	●	●	●	●	●	●	●	
I. Location selection	4.8	1.4	3.5	/	●	●	●	●	●	●	●	●
J. Site selection	4.3	1.5	2.8	/	●	●	●	●	●	●	●	●
K. Technology	4.0	3.2	1.3	5<	●	●	●	●		●	●	

- Large impact (L >2/3 of the tactics)
- Medium impact (1/3 > M > 2/3 - of the tactics)
- Small impact (S < 1/3 - of the tactics)

Table 6.3.1
Final strategy "The value of adaptability"



Preliminary strategy - Breakdown

Strategy type	Significance	Risk	Impact & Risk assessment	Life expectancy	Increase real estate value	Productivity	User satisfaction	Stimulate innovation	Environmental sustainability	Adaptability	Image & culture	Social responsibility
A. Multifunctional	4.4	1.6	2.8	>20	●	●	●	●	●	●	●	●
Floor to floor height	4.8	1.2	4.1	>30	●		●		●	●	●	●
Expandable horiz. & vertical	4.5	2.7	1.7	>30	●				●	●	●	●
Reduction horiz. & vertical	3.0	2.0	1.5	>30	●				●	●	●	●
Facade grid dimensions	4.2	1.2	3.6	>20	●				●	●	●	●
Grid wide span	4.5	1.2	3.9	>30	●	●	●	●		●		
Floor depth	4.5	1.8	2.5	>30	●	●	●	●		●		
Independent envelope	4.5	1.5	3.0	>20	●				●	●		●
Position: stairs, elevators, entrances & services	4.8	1.2	4.1	>30	●	●	●		●	●		
B. Building characteristics	4.4	1.6	2.7	>20	●	●	●	●	●	●	●	●
Building generality	4.5	1.7	2.7	>30	●		●		●	●	●	●
Floor depth	4.5	1.8	2.5	>30	●	●	●		●	●	●	
Building geometry	4.2	1.7	2.5	>30	●	●	●		●	●	●	●
Image & identity (skin)	4.0	1.7	2.4	>20	●				●	●	●	●
Not load-bearing facade	4.5	1.7	2.7	>30	●				●	●	●	●
Daylight	5.0	1.3	3.8	>30	●	●	●	●	●	●	●	●

Strategy type	Significance	Risk	Impact & Risk assessment	Life expectancy	Increase real estate value	Productivity	User satisfaction	Stimulate innovation	Environmental sustainability	Adaptability	Image & culture	Social responsibility
C. Oversupply	4.3	2.7	1.6	>7	●		●		●	●	●	●
Floor to floor height	4.8	1.2	4.1	>30	●		●		●	●	●	●
Increased load capacity	4.3	2.7	1.6	>30	●				●	●		
Expandable horiz. & vertical	4.5	2.8	1.6	>30	●				●	●	●	●
Surplus of building space & buffer zones	4.0	3.3	1.2	>30	●		●			●		
Capacity surplus services	4.0	3.3	1.2	7-20	●		●			●		
D. Buffer zones	4.3	2.5	1.7	>3	●	●	●	●	●	●	●	●
Undefined spaces	3.8	2.0	1.9	3			●			●		
Surplus of space	4.0	3.3	1.2	>3	●		●			●		
Expandable horiz. & vertical	4.5	2.8	1.6	>30	●				●	●	●	●
Communal space	4.7	1.7	2.8	>3	●	●	●	●		●	●	●
E. Demountable elements & dry connections	4.3	1.4	3.1	>3	●		●		●	●	●	●
Dry connections (structure & plan)	4.5	1.3	3.4	>3	●				●	●		
Demountable facade	4.3	1.7	2.6	>20	●				●	●	●	●
Demountable walls	4.5	1.5	3.0	3	●		●		●	●		
Exposed structure	3.7	1.2	3.1	>30						●		
Suspended ceiling & raised floors	4.3	1.2	3.7	3	●		●			●		

Table 6.5.1 Final Strategy "The value of adaptability" - Breakdown A-E



Preliminary strategy - Breakdown

Strategy type	Significance	Risk	Impact & Risk assessment	Life expectancy	Increase real estate value	Productivity	User satisfaction	Stimulate innovation	Environmental sustainability	Adaptability	Image & culture	Social responsibility
F. Modular & dividable	4.2	1.7	2.5	>7	●	●	●	●	●	●	●	●
Grid structure	4.5	1.7	2.7	>30	●	●	●	●	●	●	●	●
Modular & Prefab. elements	4.2	1.8	2.3	>30	●	●	●	●	●	●	●	●
Standardised skin	4.0	1.8	2.2	>20	●	●	●	●	●	●	●	●
Facade grid dimensions	4.0	1.3	3.0	>20	●	●	●	●	●	●	●	●
Adjustable & modular services	4.2	1.8	2.3	7-20	●	●	●	●	●	●	●	●
G. Circulation & zoning	4.6	1.7	2.8	>3	●	●	●	●	●	●	●	●
Vertical & horizontal access	4.8	1.5	3.2	3	●	●	●	●	●	●	●	●
Separate entrances	4.5	1.5	3.0	3	●	●	●	●	●	●	●	●
Wide circulation	4.5	1.8	2.5	3	●	●	●	●	●	●	●	●
Core-services	4.5	1.8	2.5	7-20	●	●	●	●	●	●	●	●
H. Movable & portable	4.5	1.5	3.1	3<	●	●	●	●	●	●	●	●
Standardised & modular	4.5	1.5	3.0	3<	●	●	●	●	●	●	●	●
Folding & adjust. furniture	4.0	1.3	3.0	3<	●	●	●	●	●	●	●	●
Removable & relocatable units	4.8	1.7	2.9	3	●	●	●	●	●	●	●	●
Demountable wall partitions	4.7	1.3	3.5	3	●	●	●	●	●	●	●	●

Strategy type	Significance	Risk	Impact & Risk assessment	Life expectancy	Increase real estate value	Productivity	User satisfaction	Stimulate innovation	Environmental sustainability	Adaptability	Image & culture	Social responsibility
I. Location selection	4.8	1.4	3.5	/	●	●	●	●	●	●	●	●
Multifunctional location	5.0	1.2	4.3		●	●	●	●	●	●	●	●
Area express culture	4.5	1.7	2.7		●	●	●	●	●	●	●	●
Provision of amen. & services	4.7	1.3	3.5		●	●	●	●	●	●	●	●
Distance to city centre	4.8	1.0	4.8		●	●	●	●	●	●	●	●
Proximity	5.0	1.0	5.0		●	●	●	●	●	●	●	●
Good quality public places	4.8	1.3	3.6		●	●	●	●	●	●	●	●
Access by public transport	5.0	1.3	3.8		●	●	●	●	●	●	●	●
Access by car & parking	4.3	2.0	2.2		●	●	●	●	●	●	●	●
J. Site selection	4.3	1.5	2.8	/	●	●	●	●	●	●	●	●
Surplus of site space	4.2	2.2	1.9		●	●	●	●	●	●	●	●
Multifunctional site - legal	4.5	1.3	3.4		●	●	●	●	●	●	●	●
Expandable location	4.2	1.0	4.2		●	●	●	●	●	●	●	●
Creation of public space	4.3	1.7	2.6		●	●	●	●	●	●	●	●
K. Technology	4.0	3.2	1.3	5<	●	●	●	●	●	●	●	●
App - Lights, CO2, temperature	4.0	3.5	1.1	5<	●	●	●	●	●	●	●	●
App - Workplace	4.0	2.5	1.6	5<	●	●	●	●	●	●	●	●
Localization	4.0	3.5	1.1	5<	●	●	●	●	●	●	●	●

Table 6.5.1 Final Strategy "The value of adaptability" - Breakdown F-K



Strategy implementation

Step 1: Identify goals

Step 2: Link goals to added values

Step 3: Select strategy types

Step 4: Select specific strategies/ tactics

Step 5: Tactics selection

Step 6: Formulate strategy

Step 7: Evaluate & tailor strategy

Strategy implementation



Step 1: Identify goals

Step 2: Link goals to added values

Step 3: Select strategy types

Step 4: Select specific strategies/ tactics

Step 5: Tactics selection

Step 6: Formulate strategy

Step 7: Evaluate & tailor strategy

Strategy types	Significance	Risk	Impact & Risk assessment	Life expectancy	Increase real estate value	Productivity	User satisfaction	Stimulate innovation	Environmental sustainability	Adaptability	Image & culture	Social responsibility
A. Multifunctional	4.4	1.6	2.8	>20	●	●	●	●	●	●	●	●
B. Building characteristics	4.4	1.6	2.7	>20	●	●	●	●	●	●	●	●
C. Oversupply	4.3	2.6	1.6	>7	●	●	●	●	●	●	●	●
D. Buffer zones	4.2	2.2	1.9	>3	●	●	●	●	●	●	●	●
E. Demountable elements & dry connections	4.3	1.4	3.1	>3	●	●	●	●	●	●	●	●
F. Modular & dividable	4.2	1.7	2.5	>7	●	●	●	●	●	●	●	●
G. Circulation & zoning	4.6	1.7	2.8	>3	●	●	●	●	●	●	●	●
H. Movable & portable	4.5	1.5	3.1	3<	●	●	●	●	●	●	●	●
I. Location selection	4.8	1.4	3.5	/	●	●	●	●	●	●	●	●
J. Site selection	4.3	1.5	2.8	/	●	●	●	●	●	●	●	●
K. Technology	4.0	3.2	1.3	5<	●	●	●	●	●	●	●	●



Strategy implementation

Step 1: Identify goals

Step 2: Link goals to added values

Step 3: Select strategy types

Step 4: Select specific strategies/ tactics

Step 5: Tactics selection

Step 6: Formulate strategy

Step 7: Evaluate & tailor strategy

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D. Buffer zones	4.2	2.2	1.9	>3	●	●	●	●	●	●	●	●
E. Demountable elements & dry connections	4.3	1.4	3.1	>3	●	●	●	●	●	●	●	●
F. Modular & dividable	4.2	1.7	2.5	>7	●	●	●	●	●	●	●	●
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J. Site selection	4.3	1.5	2.8	/	●	●	●	●	●	●	●	●
K. Technology	4.0	3.2	1.3	5<	●	●	●	●	●	●	●	●

Strategy implementation



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A. Multifunctional	4.4	1.6	2.8	>20	●	●	●	●	●	●	●	●
Floor to floor height	4.8	1.2	4.1	>30	●		●		●	●	●	●
Expandable horiz. & vertical	4.5	2.7	1.7	>30	●				●	●	●	●
Reduction horiz. & vertical	3.0	2.0	1.5	>30	●				●	●	●	●
Facade grid dimensions	4.2	1.2	3.6	>20	●				●	●	●	●
Grid wide span	4.5	1.2	3.9	>30	●	●	●	●		●	●	●
Floor depth	4.5	1.8	2.5	>30	●	●	●	●		●	●	●
Independent envelope	4.5	1.5	3.0	>20	●					●	●	●
Position: stairs, elevators, entrances & services	4.8	1.2	4.1	>30	●	●	●		●	●	●	●

Strategy implementation



Step 1: Identify goals

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Reduction horiz.& vertical	3.0	2.0	1.5	>30	●				●	●	●	●
Facade grid dimensions	4.2	1.2	3.6	>20	●				●	●	●	●
Grid wide span	4.5	1.2	3.9	>30	●	●	●	●		●		
Floor depth	4.5	1.8	2.5	>30	●	●	●	●		●		
Independent envelope	4.5	1.5	3.0	>20	●					●	●	●
Position: stairs, elevators, entrances & services	4.8	1.2	4.1	>30	●	●	●		●	●		

- Large impact (value added by more than half of the tactics)
- Medium impact (value added by less than half of the tactics)
- Small impact (value added by half of the tactics)

Strategy implementation



Step 1: Identify goals

Step 2: Link goals to added values

Step 3: Select strategy types

Step 4: Select specific strategies/ tactics

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Step 7: Evaluate & tailor strategy

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B. Building characteristics	4.4	1.6	2.7	>20	●	●	●	●	●	●	●	●
C. Oversupply	4.3	2.6	1.6	>7	●	●	●	●	●	●	●	●
D. Buffer zones	4.2	2.2	1.9	>3	●	●	●	●	●	●	●	●
E. Demountable elements & dry connections	4.3	1.4	3.1	>3	●	●	●	●	●	●	●	●
F. Modular & dividable	4.2	1.7	2.5	>7	●	●	●	●	●	●	●	●
G. Circulation & zoning	4.6	1.7	2.8	>3	●	●	●	●	●	●	●	●
H. Movable & portable	4.5	1.5	3.1	3<	●	●	●	●	●	●	●	●
I. Location selection	4.8	1.4	3.5	/	●	●	●	●	●	●	●	●
J. Site selection	4.3	1.5	2.8	/	●	●	●	●	●	●	●	●
K. Technology	4.0	3.2	1.3	5<	●	●	●	●	●	●	●	●



Strategy evaluation

Advantages

- Strategy creates awareness from an early stage
- Useful for architects, RE managers, developers and consultants

Risks

- Project teams grow & strategy might be left out - **formally introduce it and keep repeating** the process.
- Perception of implementers more effective for owners

Improvements

- Cost factors (REM)
- BUT architect stated that **its too complicated** (initial cost, operation, replacement, end of lifecycle)
- **Strategy packages** for inexperienced actors

“You are more certain that the building you own, you have in your portfolio, you are using, or you develop, is a **much better building**, it’s much **easier to adapt**, it would be **better for your employees**, would be **better for surroundings**, for people living around it. So it should lead to a **better building, better architecture.**”
(Nicolaas, 2020-b)



Findings - Identity

Identity

- Adaptability was highly valuable for organisations' identity
- Private & public parties

Public parties

- **Illustrate benefits** of adaptability
- **Stimulate** market

Private parties

- **High ambitions** can have a big impact on the result
- **Strengthen position** in the market
 - Add commercial value
 - **Attract talent** (very important)

“If you imagine what it means to Deloitte to **attract talent** into their building, that is not even part of the equation, that it **2-3-4 times as expensive and as valuable** for a company like Deloitte than is the running costs of the building.”

(Bakker, 2020)





Findings - Developers & Investments

Developers

- Developers focus on making profit & cut down any extra cost
- Low quality & wrongly located buildings

Investments

- If you want to create adaptable buildings you need to go "all the way"
- Smart selection on what to invest

"But if you do that, it only makes sense if you do that over a sort of "all the way"
But then try to invest as much as possible in a smart way,
in making this an office building for the next twenty five years."
(Nicolaas, 2020-a)





Findings - Future

Future of adaptability

- **Increasing** in time as world is changing at a **much faster pace**
 - **Technology**

Adaptability & Financial value

- Gradually increasing
- Adaptability **becomes more important**
- **Investors are interested** in sustainability

“There can be small to big changes, and therefore adaptability and flexibility are becoming much more important. **The time we built for just one moment is over.** Everything is changing faster and faster, and so I think that **adaptability is part of the answer to this.**”
(Voncken, 2020).





Findings - BREEAM

Quality

- People love high quality buildings
 - Take care of them
 - Allow to last in time
- Should be awarded in BREEAM

BREEAM

- Points you can buy
- Not thorough - missing criteria e.g. quality, oversupply
- Does not award REAL adaptability

BREEAM

- BREEAM stimulated interest towards sustainability
- **No control after grading**
 - Focus on short-term
- Can be more future-oriented

“... There is **no BREEAM point for architectural quality** and it's kind of weird cause if you make really good buildings that people like, people love, people will look after them better, they will last the test of time.”
(Bakker & Zwaan, 2015)



Findings - Risks

Financial

- Higher **initial investments**
- Adaptive capacity of measures implemented **might never be exploited**

Objectives

- Actors' **short-term objectives**
(e.g. developers & investors)

“... Financial, it's always an investment and **you have to have a reason to invest.**”
(Bakker, 2020)





Findings - Crisis

Significance & Crisis

- Still not all actors are convinced about adaptability's importance
- One more crisis could **reflect the importance of adaptability & stimulate such projects**

Coronavirus

- Cannot yet predict its magnitude
- **Retail sector is already phasing problems**
 - Built environment **needs to be more adaptable** to respond to unexpected changes
 - The Edge - impact of crisis on outcome

"I think **we need one good crisis more to convince people** that if you have properties that you can switch easily between function, if they are adaptable then it becomes handier."
(Interviewee G, 2020)

Findings - Technology



Technology

- **New dimension** in adaptability & building layer (8 + 1)

Technology

- People do not have the knowledge of how to use it
 - **Need time to learn**

Technology

- **Need extra investments**
reason why not everyone applies it

“...This is possible thanks to a sophisticated data system that adds a new layer to the building and makes it the most sustainable in the world.”
(Tilman, 2015)

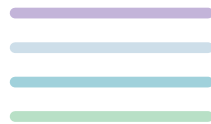


Findings - Technology



Layers:

- Social
- Stuff
- Space plan
- Services



- Structure
- Skin
- Surroundings
- Site



Findings - Technology



Layers:

Social



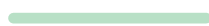
Stuff



Space plan



Services



Technology



Structure



Skin



Surroundings



Site





Why?> How?> What?



Conclusions - Adaptability

- Buildings' long-term capacity to respond to changing demands
- Adopting a sustainable approach allows buildings to meet present demands without compromising the ability of future generations to meet theirs'
- A number of strategies & frameworks have been developed in order to explain the concept and benefits of adaptability
- Adaptability entails risks that one cannot neglect (costs, changes, location, goals etc.)
- **Becoming more important** as the pace the world is changing increases
- People need to become more flexible and adaptable too



Conclusions - Added value

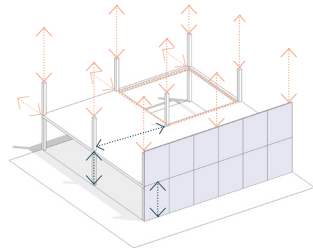
- Align RE strategies with corporations' goals & users demands
 - Enhances users' satisfaction, performance, productivity and competitive advantage
 - Many forms of indirect value
- Indirect value is more important, though its hard to measure

In conclusion

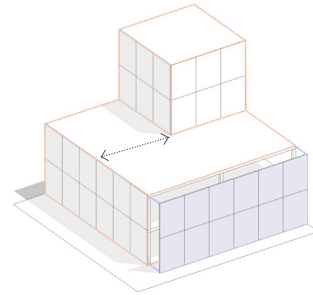


How can adaptability strategies be applied
in the development of new office buildings
to add value for corporations and
address the mismatch over time
between buildings and users' demands?

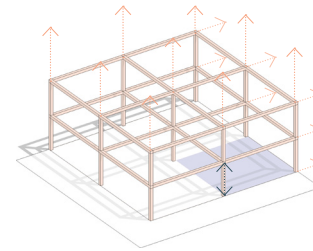
In conclusion



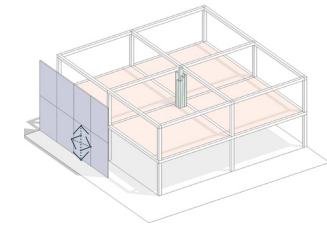
Multifunctional



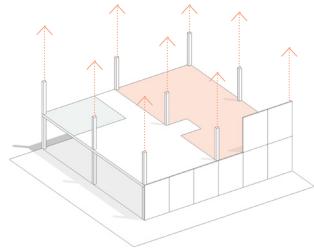
Building characteristics



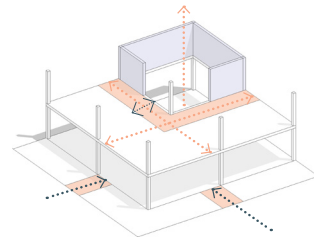
Oversupply



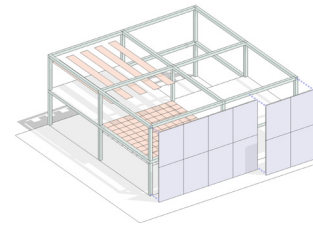
Modular & dividable



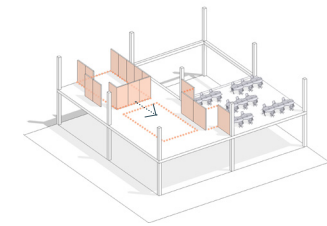
Buffer zones



Circulation & zoning



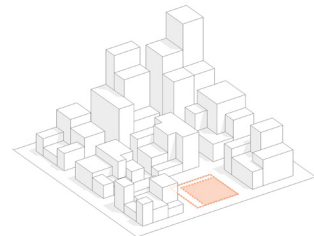
Demountable elements & dry connections



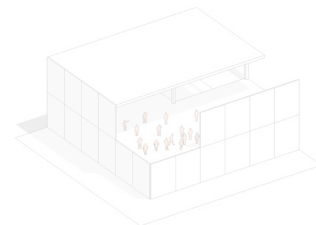
Movable & portable



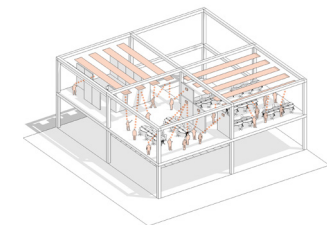
Location selection



Site selection

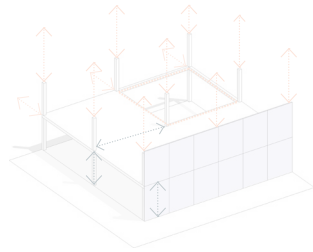


Human factor

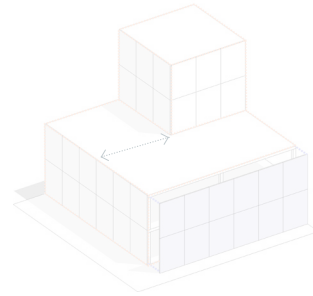


Technology

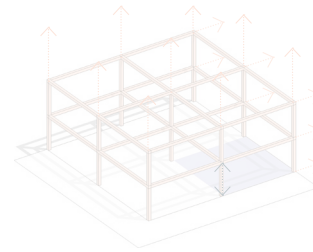
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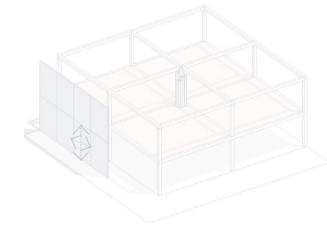
Multifunctional



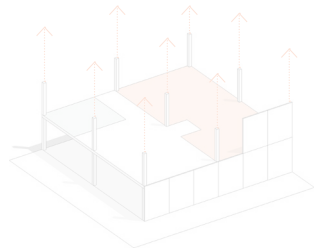
Building characteristics



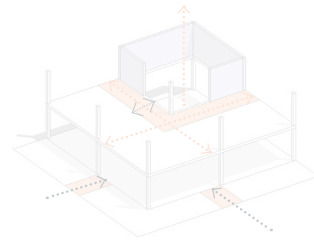
Oversupply



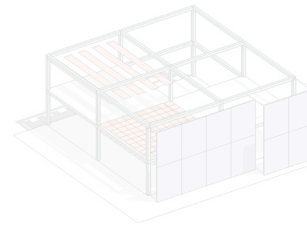
Modular & dividable



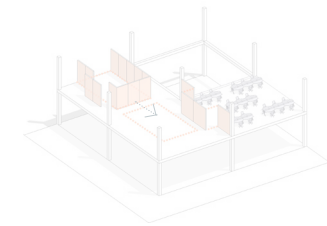
Buffer zones



Circulation & zoning



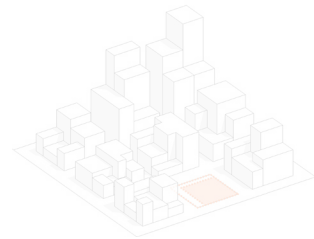
Demountable elements & dry connections



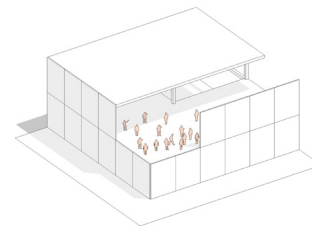
Movable & portable



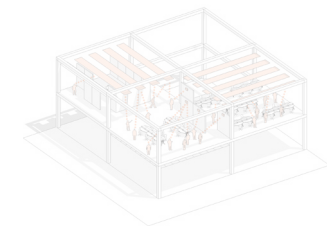
Location selection



Site selection



Human factor



Technology

In conclusion



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H. Movable & portable	4.5	1.5	3.1	3<	●	●	●	●	●	●	●	
I. Location selection	4.8	1.4	3.5	/	●	●	●	●	●	●	●	●
J. Site selection	4.3	1.5	2.8	/	●	●	●	●	●	●	●	●
K. Technology	4.0	3.2	1.3	5<	●	●	●	●		●	●	



In conclusion

“The value of Adaptability”

constitutes a highly flexible **strategy** that illustrates how does adaptability add value to the implementers:

- Allows actors to **understand the value it entails**
- **Stimulate** the development of adaptable real estate
- Assist in the creation of an **adaptable & sustainable future**

Discussion



This is the **first attempt of creating a tool** that actors can use to develop adaptable buildings

- **People need time to adapt.**
Although the ambition is there we are only in the beginning
- The crisis we are currently experiencing can **assist in the shift** towards a more responsive environment



Recommendations - Further research

Indicate the **magnitude of the link** between strategies & forms of added value
(more cases + quantitative)

Qualitative research on developers' short-term perspective

Technology & Adaptability



Recommendations - Practice

Involve the **actual users** of the space in the briefing & design phases

Develop a **future-oriented perspective** and focus on **long-term value**

In the **Netherlands** sustainability is highly valued and actors should **take advantage of this mentality** and accelerate this transition

Thank you

