# Healthlink 2030

*"A Web of Care" Future Healthcare Building in Gothenburg Area*

Mengyao Hou

Examiner: Peter Fröst
Tutor: Christine Hammarling

Chalmers School of Architecture
Department of Architecture and Civil Engineering

CHALMERS

Master Thesis

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Master Program of Architecture and Urban Design
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# Content

# 1

# Overview

*In the overview chapter, there are abstract for this whole Master Thesis, background that is also the start point for me to do this thesis, as well as the goal of thie MT work. I also came up with some research questions as my direction of what would the result be of this Master Thesis.*

# 1.1 Abstract

As an older western society, where a lot of studies and research have been done, Sweden's health and elderly care systems are known as being among the best in the world. But the co-ordination of care between hospitals, primary care and local authorities are becoming the biggest challenge to the continued excellence of Sweden's health and social care system.

The purpose of this Master Thesis is to formulate a building network of healthcare within a community in the near future to find a better way for cooperation between different facilities as well as dealing with people's health problem, especially for elderly people. It aims to develop future scenarios for reflection of how healthcare may evolve and what future needs of elderly people and various building types are for healthcare.

In this case, the Master Thesis is a research for design project, which in order to create an ambitious pioneering prototype for the integrated urban healthcare network within a local community scale for the future. The design result can be described as an integrated healthcare mall or a healthcare complex, which consist of different functions relating to health care based on future needs of different stakeholders, as well as a senior housing for elderly people. It is not a real project but shows a possibility of future healthcare building in a web of care.

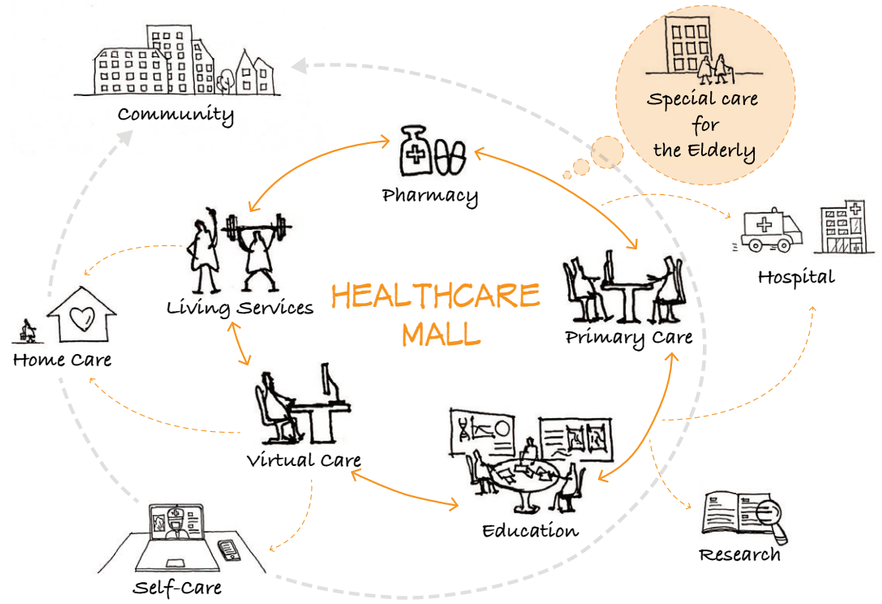



*Figure 1.* Abstract Picture. Author's own copyright.

## 1.2 Background

Due to the rapidly increasing and ageing population, most area in the world has a strongly expanding need for more, and better-consolidated healthcare facilities. Either elderly or healthcare are both significant topics not only in architecture field but also for the whole global society. As an older western society, where a lot of studies and research have been done, Sweden is ahead of most countries in this area, and the next step may lead the way in tackling the future problems of healthcare.

Sweden's health and elderly care systems are know as being among the best in the world. But the co-ordination of care for patients with complex needs is less good. Co-ordination of care between hospitals, primary carers and local authorities is becoming the biggest challenge to the continued excellence of Sweden's health and social care system, according to the OECD's report, 2013.

The reason of choosing this subject is on one hand based on my previous experience. I have done a research project during my bachelor about aging society in China and new-coined mixed community for the elderly. In that research, there is a masterplan including normal housing, senior housing, rental apartments, nursing house, healthcare center, day-care center, activity center, etc. And, some detailed design proposals of some key buildings. So, I suppose I can take this chance to go deeper of the research as well as design, with a focus on healthcare network.

In addition, I have taken the senior housing studio last year, so I have some knowledge about design for elderly people in Sweden. I have also done a hospital design project during my undergraduate study in China. But I have not taken the healthcare studio, so it will be a challenge for me to figure out how this type of architecture works in Sweden.

## 1.3 Goal & Research Questions

The purpose is to formulate a network of healthcare within a mixed community in the future to find a better way for cooperation between different facilities as well as dealing with people's health problem, especially elderly people. Mixed community here means that the community built for all ages but with a special focus on the elderly. This Master Thesis will also investigate how healthcare will be led to an innovation in the near future.

**Main aim:**

- The aim of this Master Thesis is to develop different scenarios for reflection of how healthcare facility may evolve and what future needs of various building types are. Also design a key building of healthcare which focus on improving the co-ordination within the network, with especial attention for the elderly.

**Relevant aims:**

- To rethink current healthcare facilities and explore the future possibilities.
- To design an ambitious pioneering prototype for the integrated urban healthcare network in a local community scale for the future.
- To create an active, efficient framework for the various communal activities and services of healthcare in the future.
- To investigate how this advancing prototype in western world can be transformed into the eastern world view.

**Research questions:**

Based on the general goals, I came up with three research questions at the very beginning, which also indicated the direction of this Master Thesis I was up to.

1. What will the future vision of healthcare system/network could be to make it work well?
2. If there is a new propotype of healthcare building in the future to fit into the new healthcare system, what will that be like?
3. How does the building possibly look like and what future scenarios will happen in this building?

2

# Research

*I did both literature studies and case studies, to explore how the healthcare system is in Sweden now, and how it will be in the future, as well as some relevant practical examples. The aim is to formulate the future healthcare system diagram and what architectural elements I would like to emphasize in the building design.*

## 2.1.1 Healthcare in Sweden

Healthcare in Sweden is a system that allow everyone has equal access to health care services. Swedish healthcare system has been among the best in the world in recent years.

Sweden's health care system is organized and managed on three levels: national, regional and local. At the national level, the Ministry of Health and Social Affairs establishes principles and guidelines for care and sets the political agenda for health and medical care. At the regional level, responsibility for financing and providing health care is decentralized to the 21 county councils. And at the local level, municipalities are responsible for maintaining the immediate environment of citizens such as water supply and social welfare services. (https://en.wikipedia.org/wiki/Healthcare_in_Sweden)

The health care system consists of 7 sectors, including "close-to-home care" (primary care, maternity care, out-patient psychiatric care, etc.), out-patient care, in-patient care, emergency care, elective care, specialist care and dental care. (Mittag, 2009)

Sweden's health care system is often seen as a model by other countries. Patients enjoy the shortest hospital stays, compared to wealthier nations such as the US, western Europe, Canada, Japan and Australia. (The Local Client Studio, 2013) All residents have access to publically financed healthcare services.

In 2013, OECD (Organisation for Economic Co-operation and Development) has published a report of Health Care Quality Review of Sweden. The OECD noted that Sweden's health and elderly care systems deserve their reputation as being among the best in the world. However, the co-ordination of care between hospitals, primary cares and local authorities is becoming the biggest challenge. (OECD, 2013)

## 2.1.2 Primary care

From 2010, Swedish citizens can choose their own primary care provider, either public or private. However, for elderly people, who are an important target group in primary care, are not as mobile as young people with regards to their increasing age. So, for these patients, short distances are significantly important if primary care is to be perceived as geographically available. (Ahgren, 2010)

Primary care plays an important role in healthcare system not only in Sweden but also in other developed countries such as the US, Canada and European countries. It is because primary care is assumed to be the main contact between patients and the healthcare system that the doctor has an overall understanding of patient needs and desires. So, it is a significant issue that people can get smooth access from where they live to healthcare. That is why community-based healthcare is important and valuable.

The main goal for primary care centers is to help people stay healthy and manage their own health condition in their own community, which can also be an essential solution to the challenges presented by an aging population. The more primary care center fits into the community, the more functional it will be and the more it will contribute to overall health and wellness. (Bowerman, 2006)

As we all know, healthcare facilities aim at healing people's illness and help people become healthier in the future. With the developing technologies and improving awareness for health, people should have less illness and be much healthier. So, a significant part of primary care center is facilities for self-care. Activities like health assessment and follow-up for healthy individuals can happen in such facilities. On the other hand, education should also be emphasized in this part, since this is a sustainable way to keep people stay healthy. Other healthcare services such as examination, treatment and clinics are also needed. It is necessary for healthcare professionals in primary care center to help people who are already at their best possible health condition stay that way and to ensure the patients who need examination and treatment receive the proper care and return them to the self-care domain.

In addition to medical services, there will be a range of social services on site provided for the whole community as well as healthcare professionals. The integrated primary care facility with both medical services and social services maximize the possibility of meeting the needs of health care for residents live in the community.

## 2.1.3 Elderly care

Life expectancy in Sweden is now 83.7 for women and 80.1 for men. According to forecasts from Statistics Sweden the proportion of the elderly is expected to increase by 30 percent between 2010 and 2050, meaning that a quarter of population will be 65 years old or more by the year 2050. (Brouwers, 2014)

Sweden's municipalities are responsible for care for the elderly in the home or in special accommodation. Seven out of ten dependent elderly people in Sweden receive care in their own homes, where it is generally most wanted.

According to the report published by Swedish National Institute of Public Health, "In 2006 there were around 32500 active medical doctors in the health service. This is equivalent to 0.4 doctors per 100 people. The number of doctors needs to be increased by 26-28 per cent by 2050 to meet the needs of the aging population." (Swedish National Institute of Public Health, 2009)

Good quality for elderly care is in turn of great significant to the well-being of elderly people and can also reduce their needs for medical care. So, care for the elderly has an impact on the need of health care and vice-versa. Elderly care is playing a more and more important role in healthcare system. According to the National Board of Health and Welfare of Sweden, the coordination of care needs to be improved and there are great opportunities to work across professional boundaries. In addition, it is possible to improve the efficiency in health and elderly care by resolute and structural efforts with a longer planning horizon, which will be further discussed in this Master Thesis later. (Government Offices of Sweden, 2010)

## 2.1.4 E-Health

The concept of E-health defined by the World Health Organisation (WHO) is the use of information and communication technologies (ICT) for health. According to Sweden National Board: "With health refers to physical, mental and social well-being. E-health is the use of digital tools and share information digitally to achieve and maintain health".

E-health includes:
E-prescriptions,
E-services, such as appointment on reception and CBT treatment via the web,
Virtual visit to the doctor where the patient meets the doctor via video,
Medical equipment used in operating rooms, in the monitoring of heart rate and so on. Also the health apps, activity wristband and other equipment. (https://www.ehalsomyndigheten.se/om-oss/vad-ar-e-halsa/)

E-health can be used to improve cooperation and communication between doctors and patients, as well as allow patients to be more involved in their own healthcare. So, the future of E-health is a transformation from paper-based care to individual-centred care. The biggest advantage of individual-centred care is that it can be customized to people's own needs and circumstances. According to studies, many patients are open to move a part of healthcare from hospitals and health centres to home. E-health will improve efficiency of healthcare for residents, patients and doctors, so that the healthcare system can be streamlined and works more seamless.

The Government vision is clear. "In 2025, Sweden will be best in the world at using the opportunities offered by digitisation and eHealth to make it easier for people to achieve good and equal health and welfare, and to develop and strengthen their own resources for increased independence and participation in the life of society."() The development of E-health is high on the international agenda and has been identified by the EU as one of the strongest areas of growth in Europe. (eHälsomyndigheten, 2016)

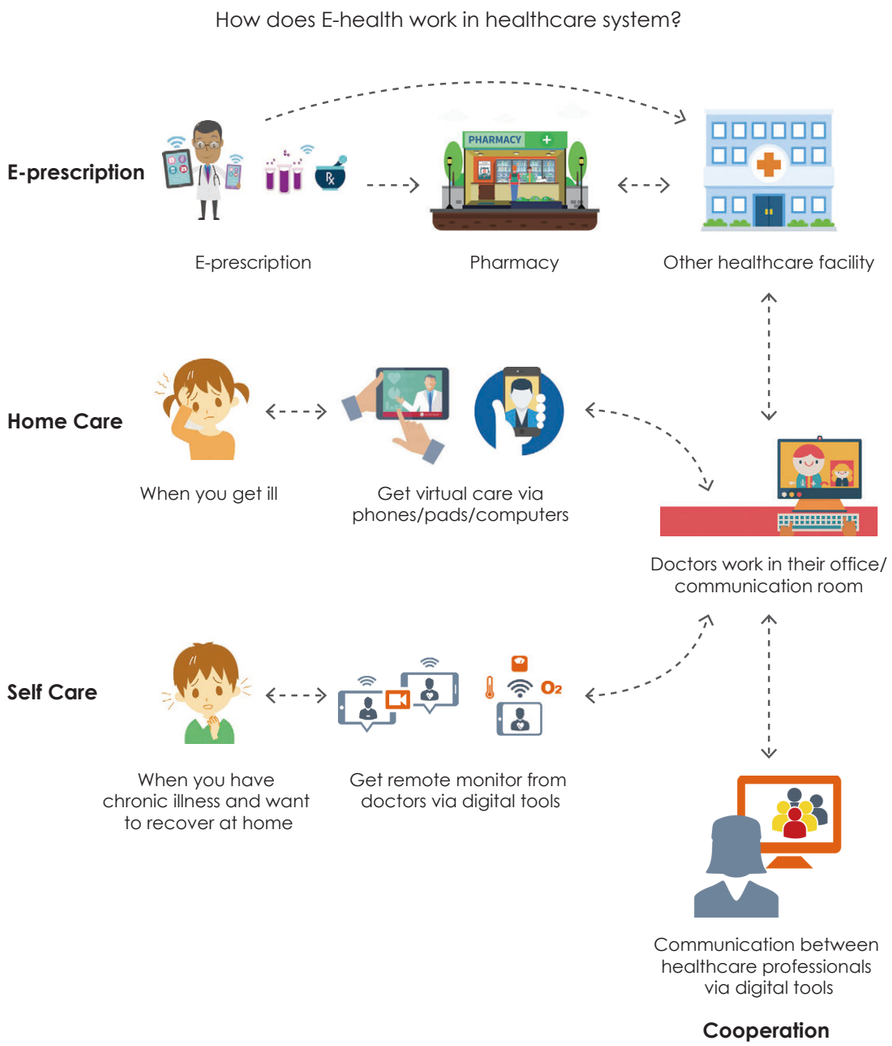



*Figure 2.* Process of how does E-health work. Author's own copyright.

## 2.1.5 Future healthcare

Although Swedish healthcare system has a good reputation in the world, it is still facing the problems when it comes to the easiest and toughest cases. For the easiest cases, patients have difficulties to access healthcare service quickly. For the toughest cases, the problem is that patients sometimes are involved in different healthcare services.

There is a shift towards healthcare system, with fewer but more competent healthcare centers. Facilities are also becoming more integrated by collocating spaces for treatment, care and research around a case type or body organ, rather than by conventional departments.

The healthcare system in the future will look very different, with a crucial change being the move to "person-centered" healthcare, allowing citizens to have much more responsibility for managing their healthcare and that of their families. (World Economic Forum, 2016) The advantage of consumer-centric healthcare is that people can choose their own location of care. In that way, maybe the home will become an important new place of healthcare system, and thus the structure of the system will look different.

With the help of digital tools, patients and doctors can get in touch with each other through virtual care, which will also help broaden access. There will also be more 'living services', integrated with healthcare and social services, that will enable the residents living the community take a more active role in managing their own healthcare. The relevant program of living services will be discussed later in Program part.

Compared with previous diagram of healthcare system in Sweden, I formulate a new system of healthcare in Sweden which can be realized in 30 years:

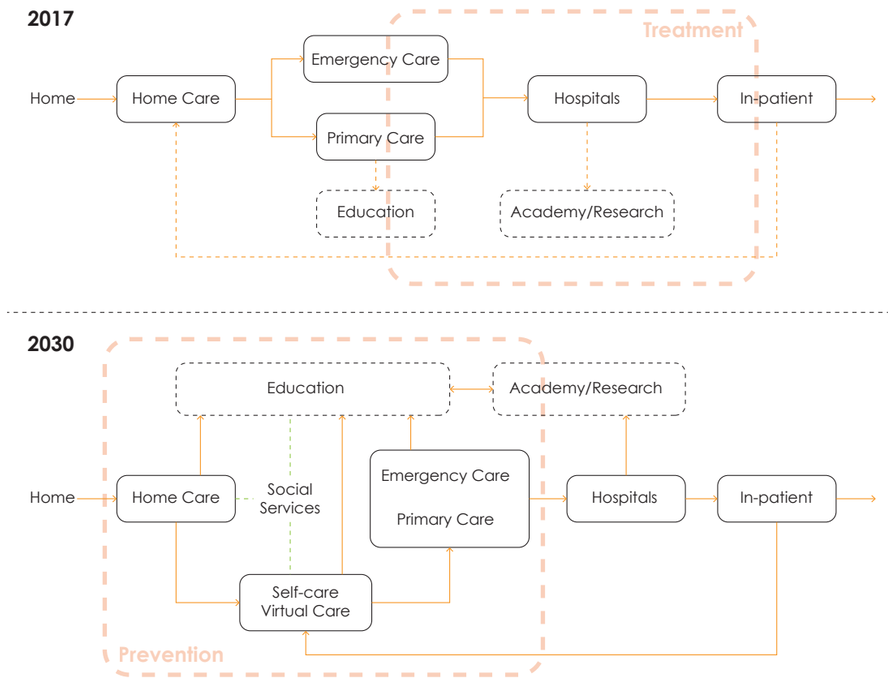



*Figure 3.* Future Healthcare System. Author's own copyright.

There are some points in this system that should be explained.

**Virtual care:** people receive real-time information that allow for more meaningful and productive interactions with doctors. For relatively healthy residents, they can use virtual care to get personalized medical advice or plans without having to travel to a physical clinic. Patients will use virtual care instead of going to the emergency department and hospitals. For elderly people, virtual care is more valuable since those people are somehow not as movable as young generations, so virtual care can monitor their well-being at home and keep them in touch with the doctors. With easier and more frequent access to primary healthcare through virtual care, the physician-patient relationship is enhanced.

**Living services:** programs including personalized well-being plan, health checks and fitness assessments, and facilities like gym, running club and supermarket that selling healthy food. The purpose of these living services is to monitor residents' health and help prevent chronic diseases by encouraging people to live healthy and make the right lifestyle decisions. (World Economic Forum, 2016)

Perhaps the most noticeable changes for a resident would be that significantly fewer trips to a hospital would be required. Residents would become more engaged to manage their own health and care. Through self-care and monitoring of vital signs, and individual's health could be continuously tracked. If needed, a virtual care consultation could be arranged, so that citizens could receive medical advice without leaving their homes. Should further medical care be necessary, the treatment plan would be personalized for each individual, maximizing the chances of a successful outcome. (World Economic Forum, 2016)

## 2.1.6 Conclusion

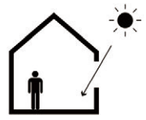
With the rapid development of modern technologies, E-health will play an important role in healthcare system and gradually replace some physical functions in primary care unit. Primary care will gradually move to people's own homes due to this change. People will get health care at home and doctors can also talk with their patients in a virtual consultation room. That means, when design a primary care unit in the near future, I must take this possibility of changing into consideration. So, a priority is flexibility. In addition, the organization of different people involved and activities accured here also need to be taken into account.

Nowadays, the main point of healthcare system is how to give a better medical treatment to patients, so there are many hospitals being built. However, if we talked about the ideal state of healthcare, it would be let people be healthy and nobody should be ill. But we cannot make this dream come true, so, the keynote of future healthcare system is to prevent illness. To achieve that, everyone should make an effort. Residents need to learn how to live a healthy life; community need to spread the knowledge of healthy lifestyle; healthcare professionals need to enhance the cooperation with each other and share knowledge to improve themselves and to be more capable of their work. In this project, the functional program is a point to express this reflection. The idea is to combine education and social service with primary care unit, to ensure a smooth collaberation, thus, they can gradually have an influence on people's real life.

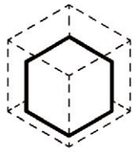
## 2.2 Case Studies

After the literature studies, I also did some case studies based on real projects or architecture competition. The first two projects give me some inspiration of what architectural elements should be expressed in this design project. The last two projects shows that the future healthcare system could be communitybased and there could be a centre in the community.

Here are some common features in these project as follows:



**Sunlight**
Sunlight gives people the feeling of warm and happiness. Introducing sunlight into the building enable people calm down and not to feel nervous when wait in the building.



**Small scale**
Hospitals are usually very large in scale because of the complicated functions, so create a small scale building enable people feel comfortable.

**Home-like**
A home-like building gives people the welcome feeling, which will benefit health prevention in a way.

## 2.2.1 Nye Vardheim

Type: Competition – 1 price
Client: Randaberg municipality
Architect: 3RW Architects & Nord Architects
Location: Randaberg, Norway
Size: 12 000 m2
Period: 2013 - 2020
Status: Ongoing

This new healthcare center, Nye Vardheim, will be located in Randaberg, Norway. The architects wanted to reform healthcare facility to be more integrated, in which people can get treatment, recreate and be nursed. The new healthcare center offers a large range of different programs under one roof from nursing homes to doctors' consultations and therapy. The building measures 11,000 sqm but looks like much smaller thanks to a design where the building is scaled down to smaller entities.

Programs including primary care like examination rooms, treatment, offices, meeting romms, and nursing home on the top floors, as well as other places for socializing. And two inner courtyards create some greenery area for people to access to nature. The building also offers many meeting places for residents in the community, unlike traditional healthcare facilities, this one seems much more welcoming.

*Figure 4.* Retrieved from http://www.archdaily.com/342294/new-healthcare-center-winning-proposal-nord-architects-3rw-architects

**Reflection**

This is an interesting project of how healthcare building can be, and also shows how Danish architects design for healthcare. Not like the normal hospitals which are large in scale and look like very technical and serious, this building really give people an expression of home-like comfortable feelings. Nye Vardheim Helsecenter is built as a community of houses, making the optimal connection between the different functions in the building.


*Figure 5.* Retrieved from http://www.archdaily.com/342294/new-healthcare-center-winning-proposal-nord-architects-3rw-architects

## 2.2.2 Ballarat Community Health Primary Care Centre

Architects: DesignInc
Location: Lucas VIC, Australia
Area: 2850.0 sqm
Project Year: 2014
Photographs: Dianna Snape

This is a new approach for healthcare center in Australia, funded jointly with the Commonwealth Government of Australia, through the Health and Hospitals Fund. The concept for the site and building aimed to maximise the potential for the building to engage with the community. A central double-height atrium spine runs through the centre of the building, making the whole building brighter and closer to nature. The central area in the atium also offers a place for social activities.

When standing in the building, people will feel like very welcoming and engaging, because of not only the human scale, but also the light and nature which can be seen through the internal gardens in primary care unit. The design team challenged the initial briefed spaces and areas, resulting in a generous atrium and garden voids that have become the primary identity for the project. The centre is home to a full suite of services including general practice of primary care, multifunctional consultation rooms accommodating a range of health and wellbeing services, as well as a gymnasium, conference, meeting rooms and commercial facilities on the ground floor, and administration and office facilities for over 100 staff  on the first floor.

### Reflection

This is a simple primary care center with a suitable scale which I had the opportunity to learn how different functions and flows are organized in the building and the possible area of each room. The building is also an good example of expressing a welcoming and engaging atmosphere in healthcare buildings through introducing sunlight into space.

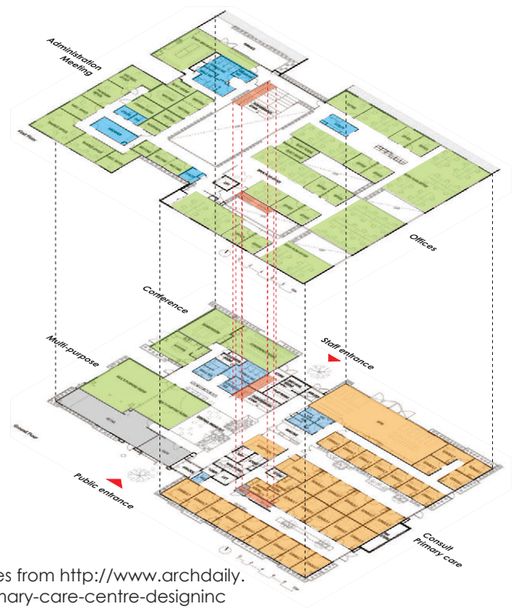



*Figure 6.* Flow Organization. Based on pictures from http://www.archdaily.com/632489/ballarat-community-health-primary-care-centre-designinc


*Figure 7.* Floor Plan. Based on pictures from http://www.archdaily.com/632489/ballarat-community-health-primary-care-centre-designinc

*Figure 8.* Retrieved from http://www.archdaily.com/632489/ballarat-community-health-primary-care-centre-designinc

## 2.2.3 Bunny Hill Customer Service Centre

Architect: Space Architects
Completion date: Jan 2006
Size: 3075 m²
Commercial experience: Health
Location: Sunderland, United Kingdom

The project is one of the largest multi-purpose centers in the UK, which comprised of a large community centre joined seamlessly with a substantial primary care health facility to provide a fully integrated one-stop shop for the local community.

The three storey building accommodates a variety of different functions including:
Customer service center, for general enquiries of council services; Childern's center, including a number of play and learning facilities for childern; Community cafe, where residents can meet others for eating and drinking; Learning center, providing a full range of courses and activities and the rooms can also be hired; Library, including everything a person would expect from a modern library; Wellness center, aimming at improving individual's health and well-being through the provision of physical activity opportunities, lifestyle advice and education within Wellness Centres and in the community. And NHS Primary Care Centre, providing a range of health services in Sunderland, including GP practice, minor injuries and illness unit, planned care which offering minor surgery, and a retail pharmacy.

### Reflection

This is an example that how primary care unit can integrate with other social services and how does it work. Although there are several different services come together with primary care unit, the whole building is still about healthcare and serve individuals with professional healthcare services.

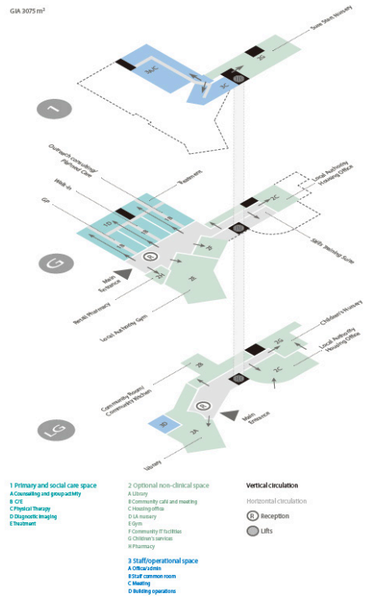



*Figure 9.* Retrieved from Health Building Note 11-01: Facilities for primary and community care services

This is the arrangement of consulting suites and treatment suites at Bunny Hill Customer Service Centre. We can see that there are three clusters of consulting rooms combined with one cluster of treatment rooms, and one puclic area (waiting and reception). Flow is clear from waiting to cousultation then to threatment (if needed). This project gave me an overview of how does it work within primary care unit.

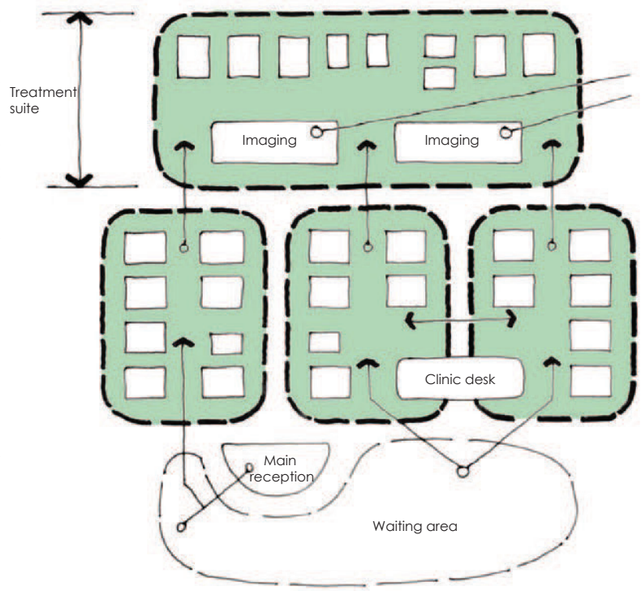



*Figure 10.* Retrieved from Health Building Note 11-01: Facilities for primary and community care services

*Figure 11.* Retrieved from Health Building Note 11-01: Facilities for primary and community care services

## 2.2.4 Healthcare 2025: “Fair Care – Care Fair”

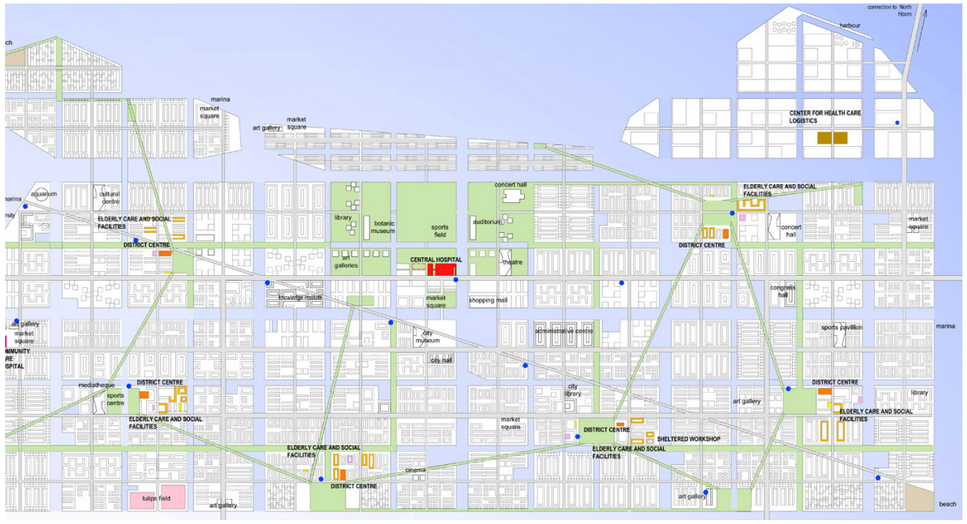
Architect: Harris-Kjisik Architects
Type: Competitions, Public, Urban Design
Client: Bouwcollege
Scope: international competition, shared 1st prize
Size: floor area: 100 000 m2
Time: 2007

1st prize (shared)of the competition "Healthcare 2025". Assignment to envision a city of 160 000 inhabitants in The Netherlands on reclaimed land, create a concept for the healthcare system and the buildings involved. The new healthcare system consists of main Asclepieion, community care hospital and many community clusters (including district centers, day care for childern, home care, elderly care and social facilities). "Asclepieion" as a starting point: buildings (mainly central hospital) located in the heart of the city, synergy from other functions in the city. Flexibility and modularity.

**Reflection**

It is a first prize work of the competition ten years ago, but with the same topic as this Master Thesis. The proposal was set in the Netherlands in 2025. Ten years after this proposal was published, some strategies the architects used in this project is still suitable for today's situation and will also work for the near future.

*Figure 12.* Retrieved from http://h-k.fi/wp-content/uploads/holland1.jpg



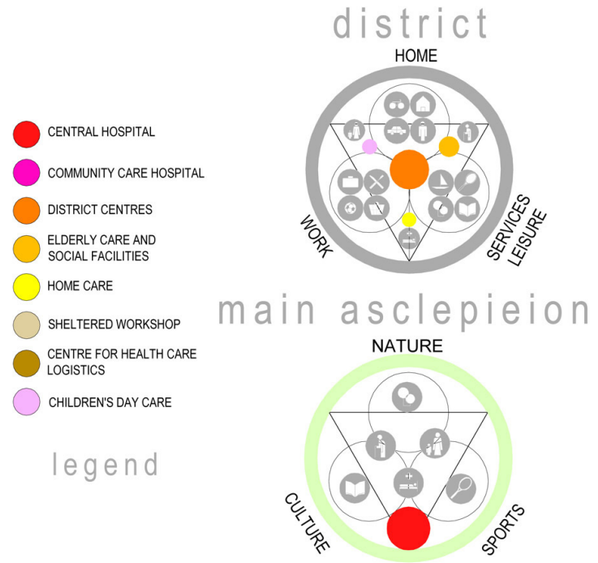




*Figure 13.* Retrieved from http://h-k.fi/wp-content/uploads/holland3.jpg

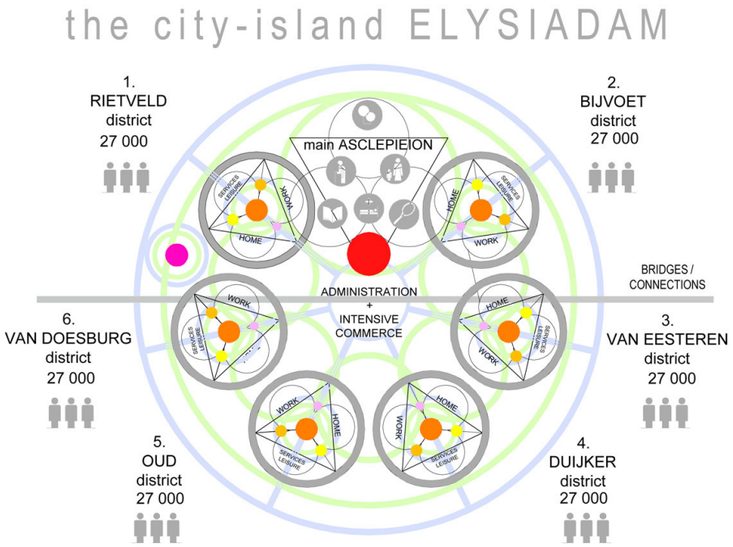



*Figure 14.* Retrieved from http://h-k.fi/wp-content/uploads/holland2.jpg

# 3

# Conceptual Design

*In this part, I listed some general design principles as basic set of this project, which can be used as a prototype of further building design. For example, the program of different functions, how to distribute space, how different scenarios will be.*

## 3.1 Program

Because this is not a real practical project, so I have to make a functional program by myself. Before that, there are some other questions need to be cleared.

First, which stakeholders will be involved in this building and how will they cooperate with each other.

I assume all stakeholders involved in primary care include:
Healthcare professionals (including doctors, researchers, other healthcare facilities in the system)
Community (including healthy residents and patients)
Other providers.

This diagram shows that how the cooperation / relation will be like among these stakeholders:

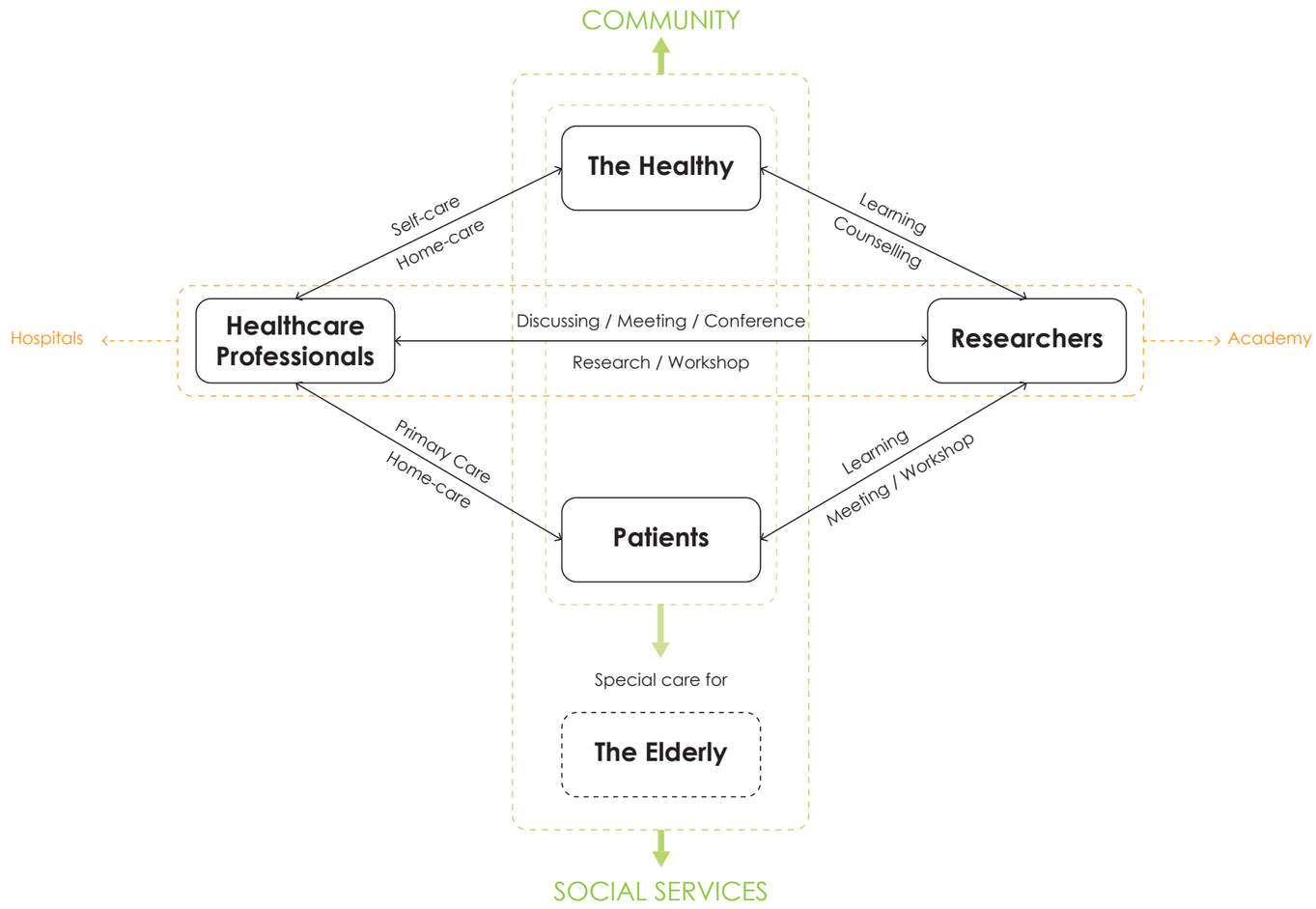



*Figure 15.* Cooperation Relationship. Author's own copyright.

Then, based on this diagram and former studies, I made a general program which includes five parts:

**Primary care:** to provide general medical practice by booking an appointment as well as drop-in visits in specific area and emergency care such as infections, wounds that need stitching or light burns that need treatment. Open weekdays during the day.

**Pharmacy:** to provide medicines as well as some hygiene products. Prescriptions are often handled electronically. There are also retail clinics where people can get basic medical care of some simple illness, such as cold and fever, etc.

**Self-care & Home care:** to provide a place for home care / self-care staff to work and for residents to do health assessment. Also, there is a show room to show how do these home care / self-care facilities work. You can also get help regarding problems about these facilities here.

**Living services:** a place where people can socialize with others and get advice about how to live a healthy life. You can work out in the gym, or have a meal in the restaurant, or have fika with friend in the cafe, or just buy some healthy food in the market. (To some extent, pharmacy can also be included in Living Services unit)

**Education:** a place for both residents to learn some health knowledge, for healthcare professionals to discuss health issues or have a meeting / conference.

On the right is a diagram of relation of these five parts.

These five parts can be divided into two main groups. One is healthcare services, the other is social services. The goal of this design project is to figure out the best way of organizing different functions and how they can enhance people's health consciousness.

Basiclly, this integrated building will be like a small complex for health care (mainly primary care not hospital) to improve prevention rather than treatment. So, I call it "**Healthcare Mall**".

Next page is the specific program list:

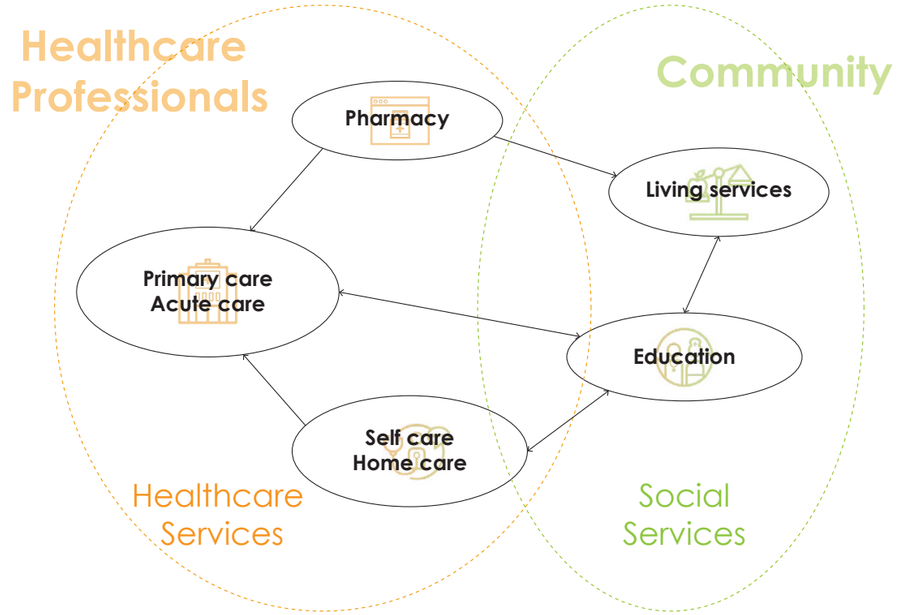



*Figure 16.* Program Relationship. Author's own copyright.

## Primary Care

ca 1800m²

### *Sampling & Imaging*

| | |
|---|---|
| Sampling room | 12m² × 4 |
| Lab | 32m² × 1 |
| Storage | 16m² × 1 |
| Changing room | 8m² × 2 |
| Staff changing room | 16m² × 1 |
| Image handling | 8m² × 1 |
| Image review | 8m² × 1 |
| CT/MRI | 50m² × 2 |
| Control room | 20m² × 1 |
| X-Ray | 40m² × 2 |
| Control room | 12m² × 1 |
| Waiting area | 50m² × 1 |
| Office | 12m² × 5 |

### *Care Unit*

| | |
|---|---|
| Consultation | 12m² × 16 |
| Examination/Treatment | 16m² × 5 |
| Quiet room | 8m² × 4 |
| Emergency | 16m² × 2 |
| Utility/Disinfection | 12m² × 5 |
| Waiting area | 40m² × 3 |
| Small group room | 16m² × 1 |
| Large group room | 32m² × 1 |

### *Administration*

| | |
|---|---|
| Indivisual office | 12m² × 6 |
| Meeting room | 16m² × 4 |
| Changing room | 16m² × 2 |
| Open office/Shared office | 100m² × 2 |
| Staff room/Lunch room | 48m² × 2 |
| Printer room | 12m² × 2 |
| Storage | 16m² × 2 |

### *Others*

| | |
|---|---|
| Lobby | 80m² × 1 |
| Reception | 30m² × 1 |
| Toilet | 2m² × 15 |
| Accessible toilet | 5m² × 6 |

## Senior Housing (additional)

ca 2615m²

### *Apartments*

| | |
|---|---|
| 2 room apartment | 50m² × 25 |
| 3 room apartment | 75m² × 5 |
| 1.5 room apartment | 40m² × 5 |
| Guest room | 30m² × 5 |
| Laundry/Utility for homecare | 20m² × 5 |
| Storage | 30m² × 5 |

### *Common Space*

| | |
|---|---|
| Public kitchen | 200m² × 1 |
| Activity room | 80m² × 1 |
| Library | 100m² × 1 |
| Accessible toilet | 5m² × 2 |

## Education
ca 354m²

| | |
|---|---|
| Learning room | 32m² × 3 |
| Multi-purpose room | 64m² × 1 |
| Office | 16m² × 5 |
| Meeting room | 16m² × 2 |
| Staff room/Lunch room | 64m² × 1 |
| Toilet | 2m² × 4 |
| Accessible toilet | 5m² × 2 |

## Homecare
ca 267m²

| | |
|---|---|
| Show room | 100m² × 1 |
| Technical support | 16m² × 2 |
| Office | 12m² × 3 |
| Meeting room | 16m² × 2 |
| Staff room/Lunch room | 45m² × 1 |
| Toilet | 2m² × 6 |
| Accessible toilet | 5m² × 2 |

## Living Services
ca 669m²

| | |
|---|---|
| Parmacy (inl. offices & storage) | 160m² × 1 |
| Clinic | 12m² × 2 |
| Health check/Assessment | 32m² × 1 |
| Counselling room | 12m² × 4 |
| Cafe | 60m² × 1 |
| Restaurant | 120m² × 1 |
| Gym | 150m² × 1 |
| Office | 12m² × 4 |
| Meeting room | 16m² × 1 |
| Toilet | 2m² × 3 |
| Accessible toilet | 5m² × 1 |

## Staff Gathering Area
ca 251m²

| | |
|---|---|
| Conference | 150m² × 1 |
| Staff room | 90m² × 2 |
| Toilet | 2m² × 3 |
| Accessible toilet | 5m² × 1 |

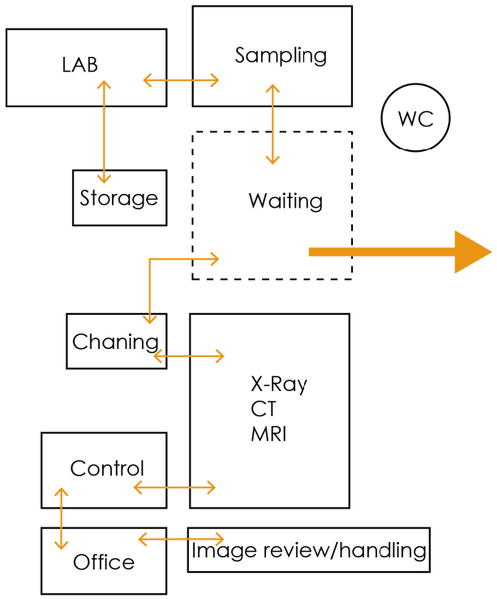
**Total** (exl. circulation) ca 6000m²

## 3.2 Unit Design

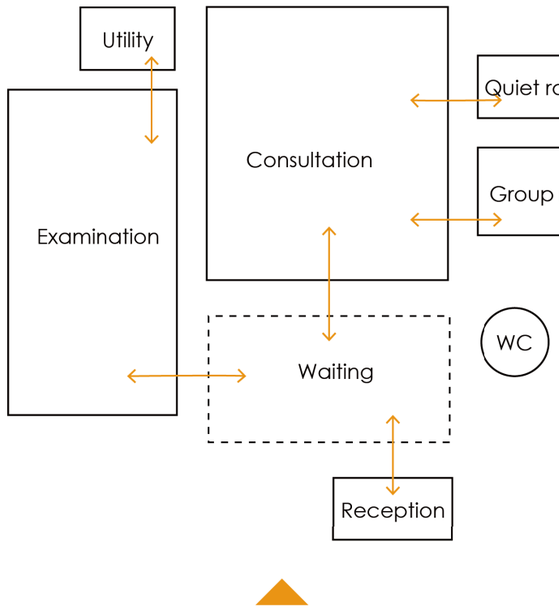
Here are detailed functional sketches for each part. As these parts are independent but connected to some extent, the diagram shows not only how different functions can be organized in each part, but also what other unit it will connected to in this healthcare mall.

### Primary care unit

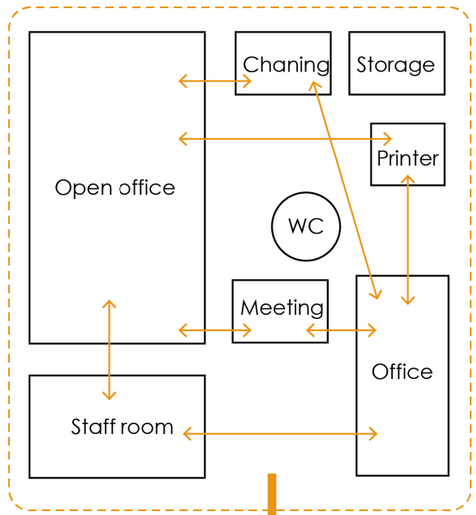
**Sampling & Imaging**




**Care unit**

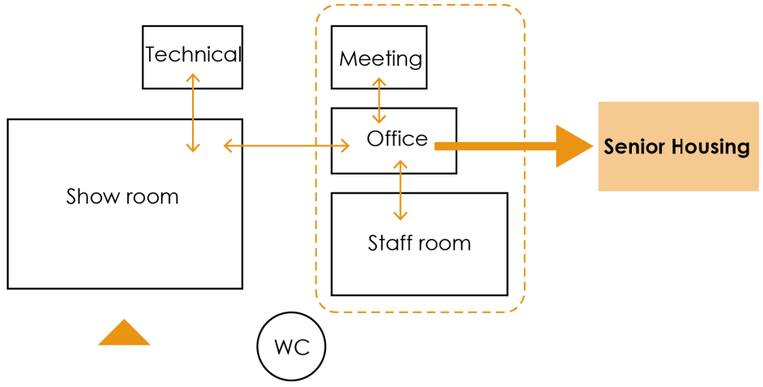



**Administration**

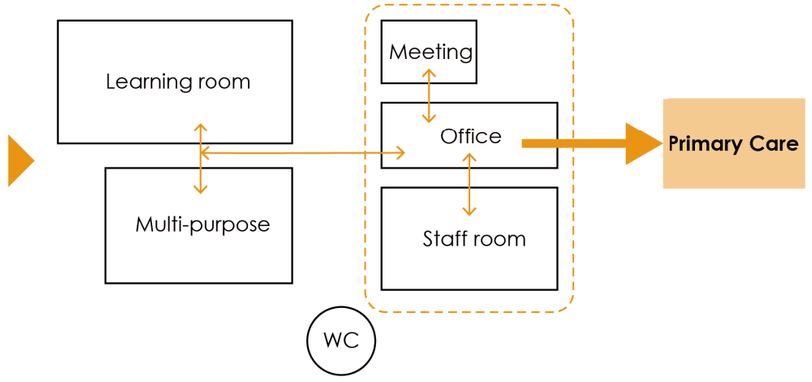



**Common Staff**
**Living Service**
**Education**
**Home Care**

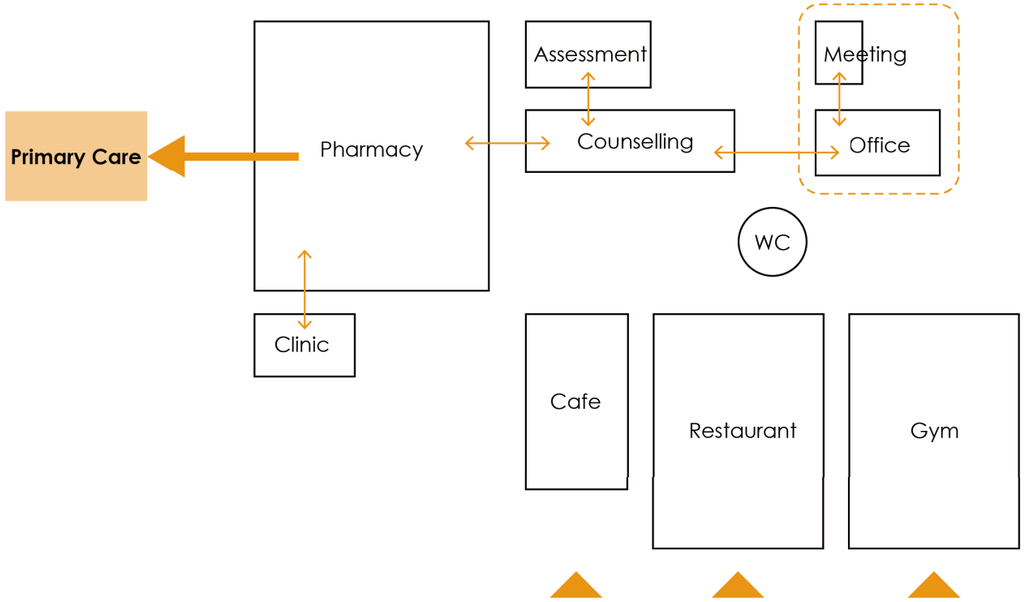
## Home care unit




## Education unit




## Living services




## Staff gathering area

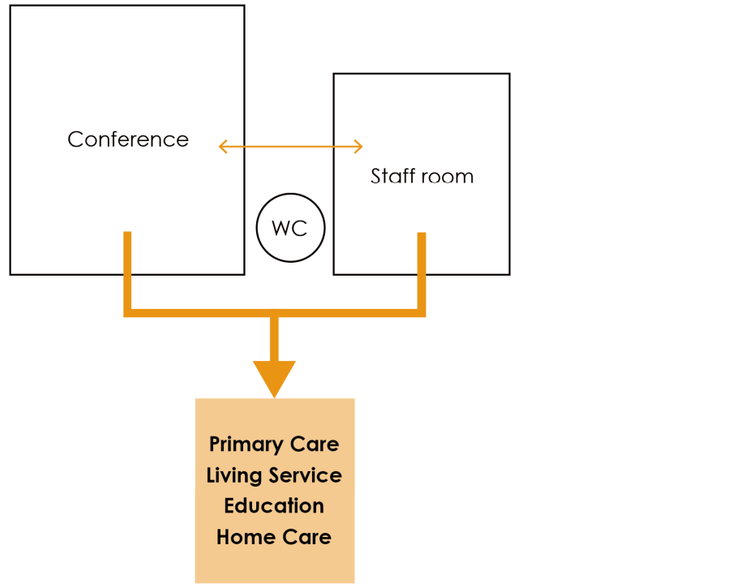
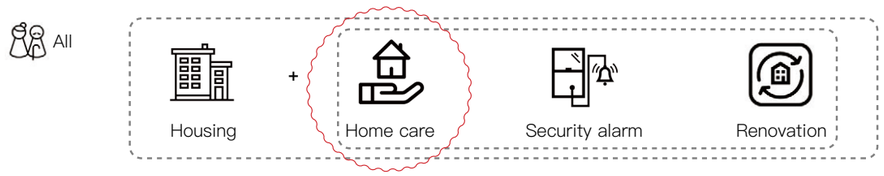



*Figure 17.* Unit Design. Author's own copyright.

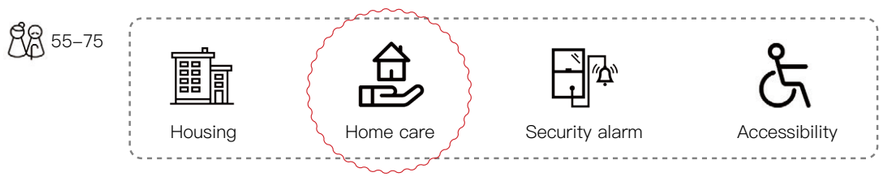
## 3.3 Elderly Care Design

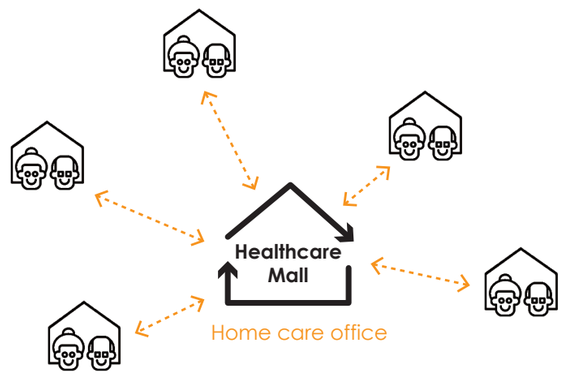
There are some kinds of housing for elderly people and each of them has their own need for elderly care or health care. Using the knowledge I have learned from Senior Housing Studio, I made the diagram below shows that the differences between these different building typologies and their solution of need for care.

**Kvarbostäder | Stay in Ordinary Housing**



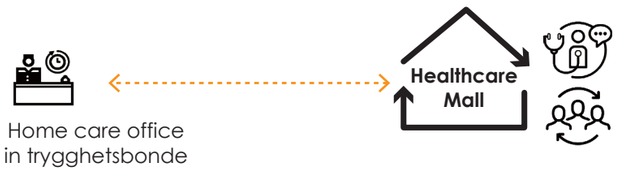

**Seniorbostäder | Senior Housing**




In ordinary or even senior housing, there is no space for home care staff to work or stay. The elderly can call a home care staff when they need care. So, home care staff will work at home care office in the healthcare mall.

**Trygghetsbostäder | Sheltered Housing/Safe-haven Residence**


In trygghetsbonde, healthcare staffs have their own space, and they can stay there when they are on duty.There is also space for meeting and office in the healthcare mall.

**Vård- och omsorgsbostäder | Nursing and Care Homes**



In nursing homes there are nurses and doctors stay there around the clock, so they only need to have meeting in the healthcare mall sometimes.

*Figure 18.* Different Typologies of Senior Housing. Author's own copyright.

# 4

*This part shows the whole project design proposal, from the site to the building drawings, including plans, sections, renderings, etc. And also diagrams which show how the building design process is and how does the building work. In the end, there are also some story boards to show activities' scenarios of different stakeholders that could happen in this building.*

# Design Proposal

## 4.1.1 Site

Gothenburg is in the process of unprecedented expansion. And Frihamnen is being developed in connection with this – a brand new segment of the city centre uniting Gothenburg across the river. This development of Frihamnen will double the size of the city centre, and 1000 new homes are planned for the area ahead of the city's 400th anniversary in 2021.

Frihamnen will be a city district where everyone feels welcome, regardless of age, background or income. Businesses and services will also be characterised by diversity, and lively and vibrant environments and meeting places will be created. In brief: Frihamnen aims to be a mixed city for everyone. The development of Frihamnen will not be fully planned. Instead it will be a test arena for innovative urban development, which means that the municipality intend to dare to test new untried methods in order to create a compact, sustainable and modern city district. So, I chose Frihamnen as my location of site.

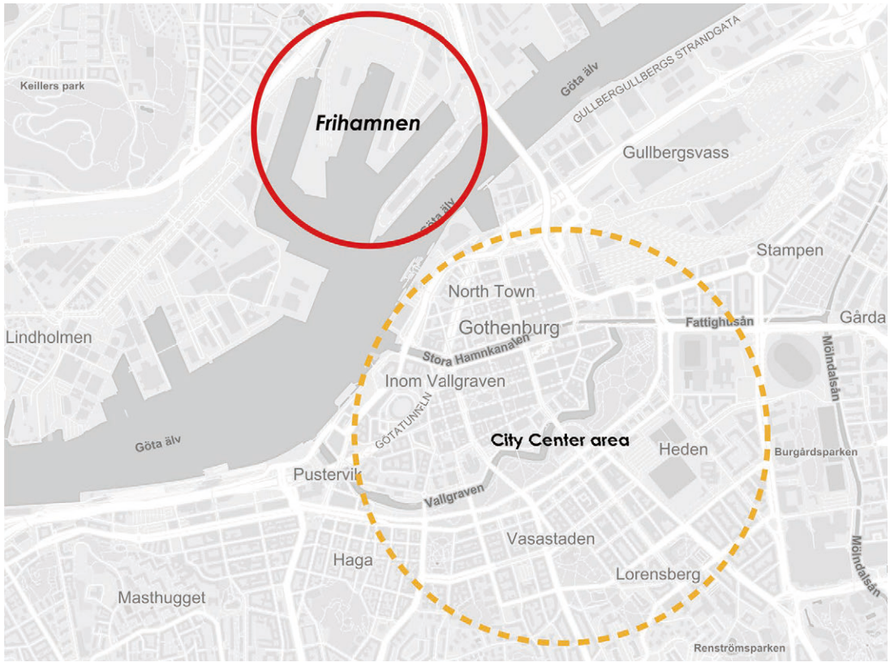



*Figure 19.* Map of Gothenburg City Center and Frinhamnen. Based on Google Maps.

## 4.1.2 Future Planning

The Frihamnen of the future will combine thousands of homes with restaurants, offices, hotels, hospital, cultural facilities, schools and services right beside the water. In the future, around 15,000 people will live here, and an equal number will work here. The future planning make Frimannen area a modern community. Most buildings are apartments of 4 to 15 floors, but the detailed building planning is not settled. So, there are not too many restriction regarding this Master Thesis project.

A city district is never truly completed, but evolves over time with its residents. However, the first residents are expected to move in by 2021, as 1,000 homes and an equal number of workplaces will be completed by then. Development of Frihamnen will consist of a total of five stages, and the area is expected to be fully expanded by 2040.


*Figure 20.* Future Planning of Gothenburg (Göteborgs Stad, 2016).

## 4.1.3 Site Analysis

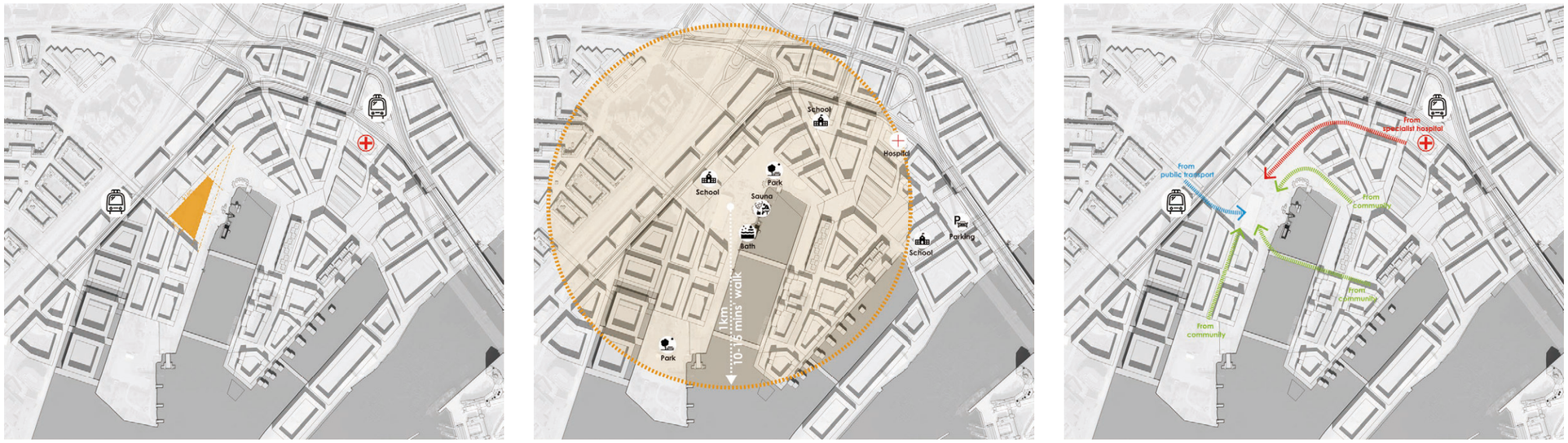



*Figure 21.* Site Analyses. Author's own copyright.

### Plot

I come up with my own building plot and it located in the green area. To make it fit into the whole area, I studied the surrouding streets, which are between 14-24m of width. With regard to this plot, there are two main street around. To the southwest is the main street of 24m width, and to the northwest is another street of 16m of width. After made the boundary, we can see the plot is following the urban fabric pattern.

### Surrounding facilities

This plot is a part of temperary green area in the park. However, since this is not a real project and other plots are already be planned, so I decided to see it as an usable empty plot. Almost all the housing are located within 1 km to this site, as well as the new specialist hospital, which provide more professional health care and treatments. The location will minimize the distance for people to get basic healthcare. The Healthcare Mall can be also used as the community centre for all the residents.

### Direction

This image illustrate that how different groups of people come to this site, where could they most possiblely come from, thus to decide the location of the five parts in site and where are the entrances. Residents who live here can go to this site from both northeast and south. Others like healthcare professionals who are not live here may come by public transport, which is located to the west. So basiclly, the main entrance should better be in the more public side, that is the downside in this picture.

## 4.1.4 Daylight Analysis

There are the sunlight analysis shows the shading range from 9.00 in the morning to 5.00 in the afternoon. Sunlight analysis is aim to test is this plot a suitable place to build. We can see from the picture that in summer, the plot almost always get direct sunlight, however, in winter, the plot is largely shaded during working hours. Spring and autumn show the most reliable results, that is the south part is shaded some time during a day whereas the north part is under the sun.

According to this result, the housing part should be in the place that can get most sunlight, which is the north. Then, the public healthcare facility will be located in the south.

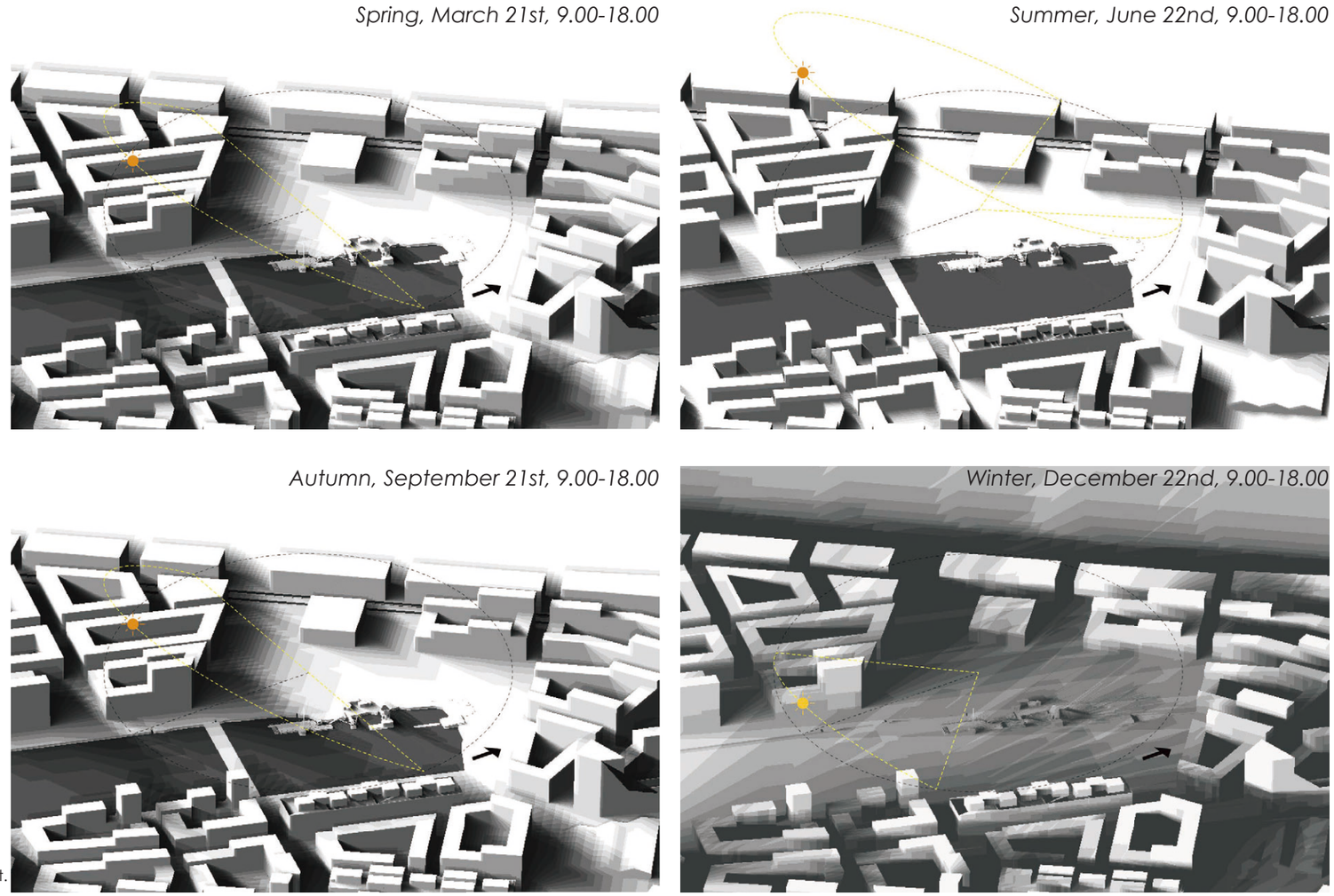
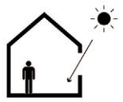



*Figure 22.* Snulight Analysis. Author's own copyright.

## 4.2.1 Concept

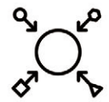


### Sunlight

Sunlight gives people the feeling of warm and happiness. Introducing sunlight into the building enable people calm down and not to feel nervous when wait in the building.

### Home-like

A home-like building gives people the welcome feeling, which will benefit health prevention in a way. Suitable scale, fine materials and good scenery view/connection will give people the feeling of home and welcomed.



### Integrated

This healthcare mall is a complex which consist of both health care service and social service. It is not just physically put different functions together. Functional and spacial integration is more important.

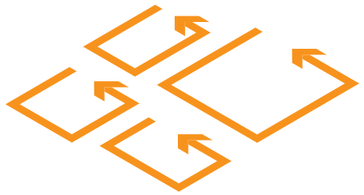
### Common space

As a public building which involving various groups of people, there is space everyone could go and others not. Use of different level of common space will make seperate units integrate with each other.

### Smooth cooperation

Although staffs will work digitally in the future, there is still some time that they would like to have some physical contact during working time or after. So, to ensure the smooth cooperation there should better be a smooth circulation within different functions.

The whole facility will be an integrated building with a common space that everyone can get into, and also a circulation that allow people get around in the building without going outside.

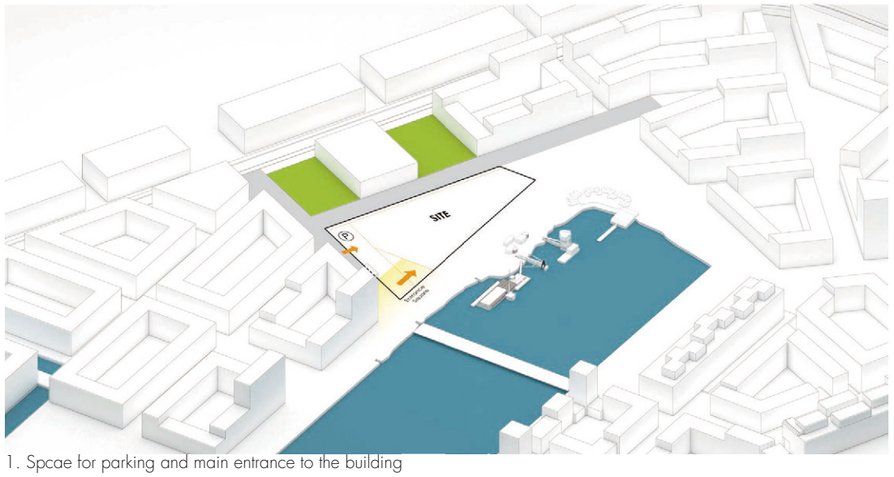


Different units should be seperated from each other and have their own circulation and/or courtyard.

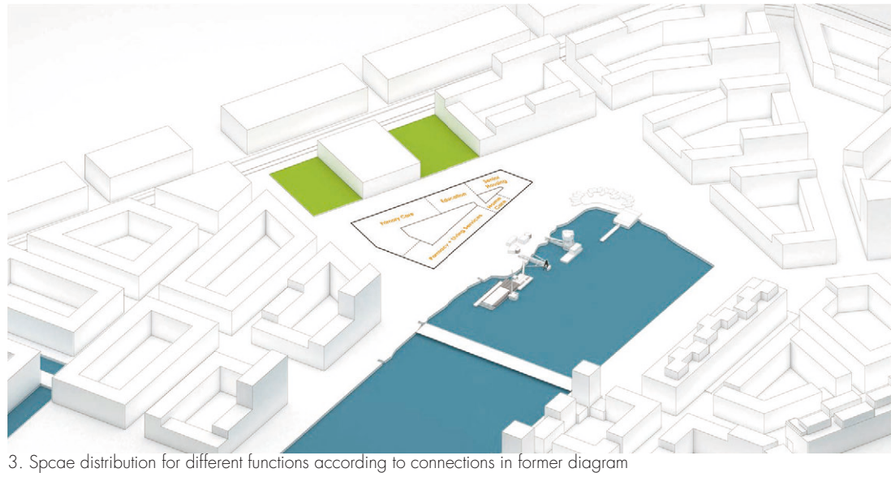
Connect different unit together with the common space and each unit can still function seperately.

*Figure 23.* Concept. Author's own copyright.

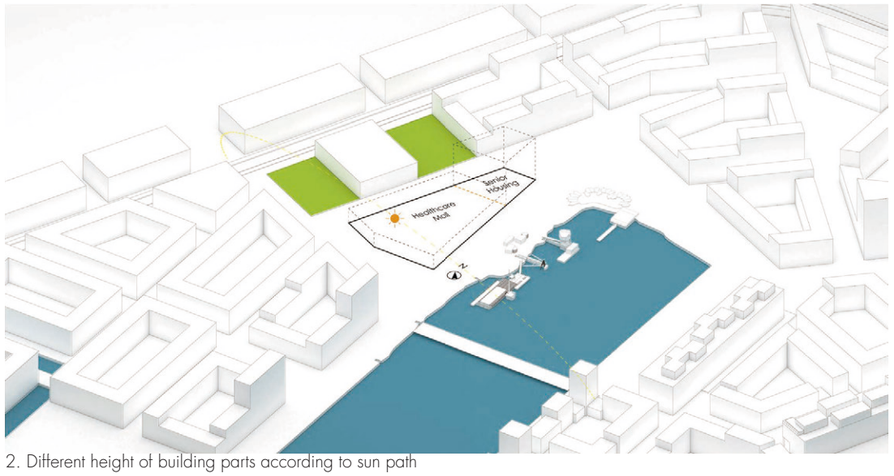
## 4.2.2 Form



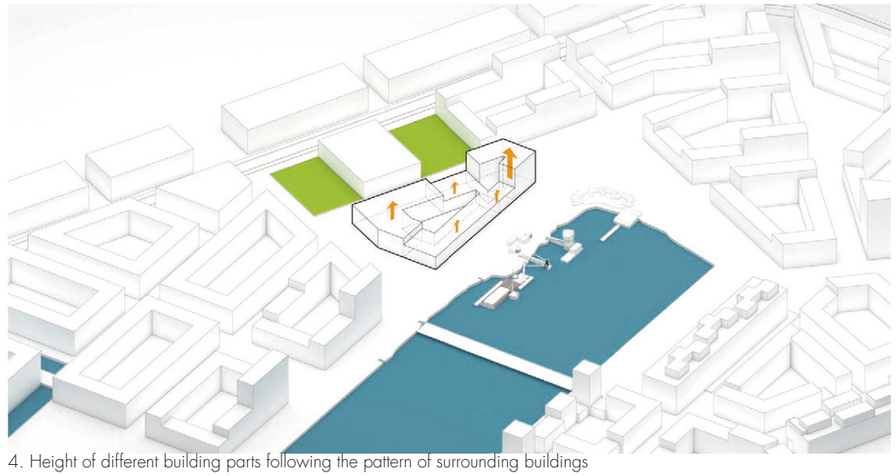

1. Spcae for parking and main entrance to the building



3. Spcae distribution for different functions according to connections in former diagram

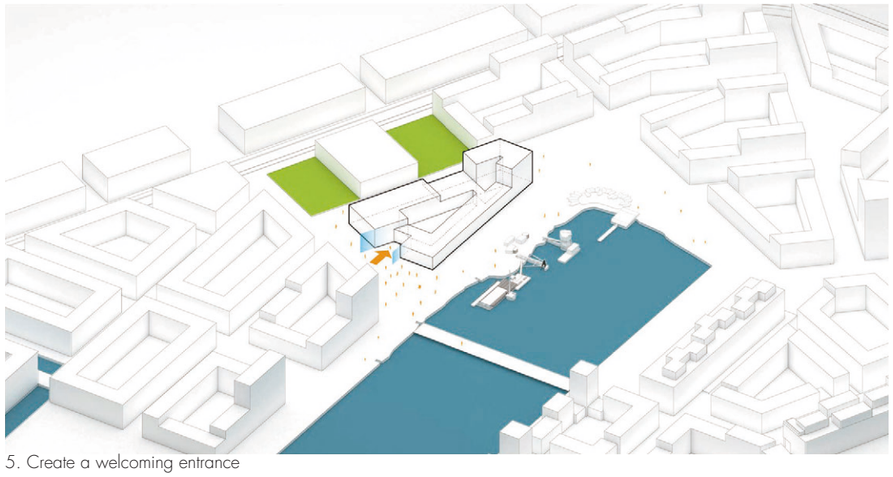



2. Different height of building parts according to sun path

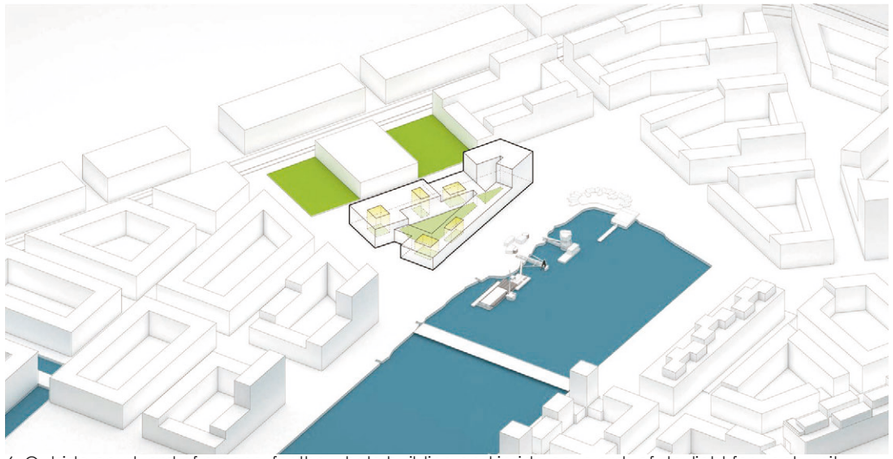


4. Height of different building parts following the pattern of surrounding buildings

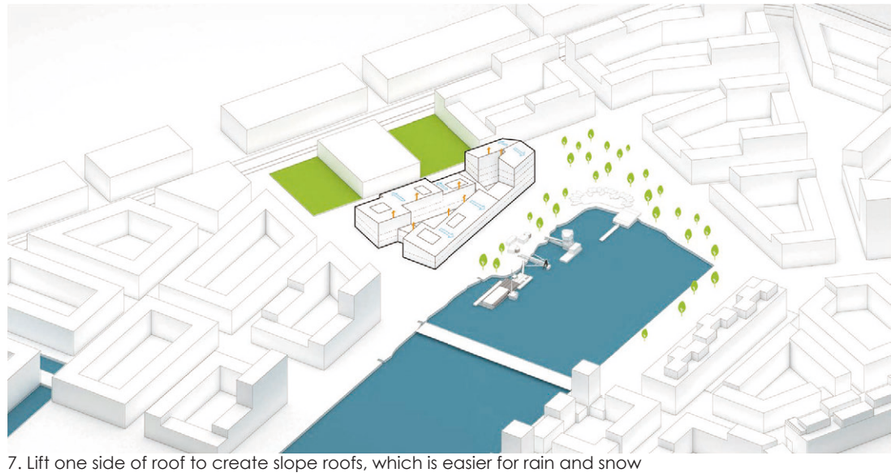
## 4.2.2 Form



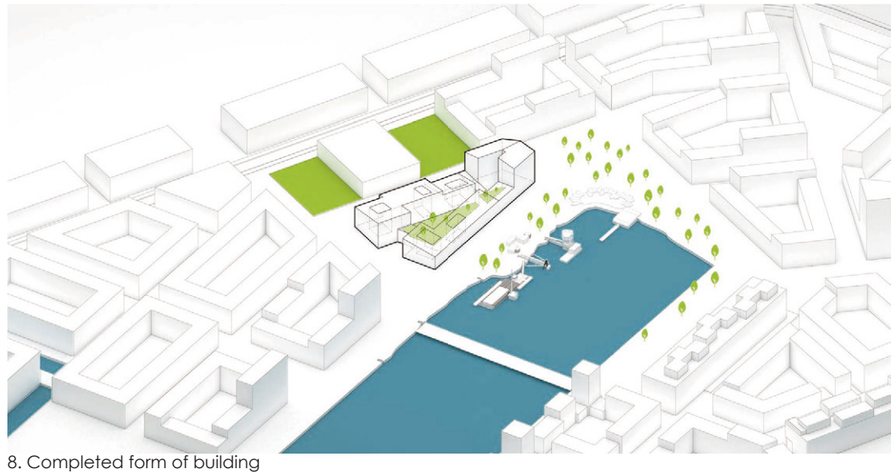
5. Create a welcoming entrance



6. Outside courtyard of greenry for the whole building and inside couryards of daylight for each unit



7. Lift one side of roof to create slope roofs, which is easier for rain and snow



8. Completed form of building

*Figure* 24. Form. Author's own copyright.

## 4.2.3 Site Plan 1:1000

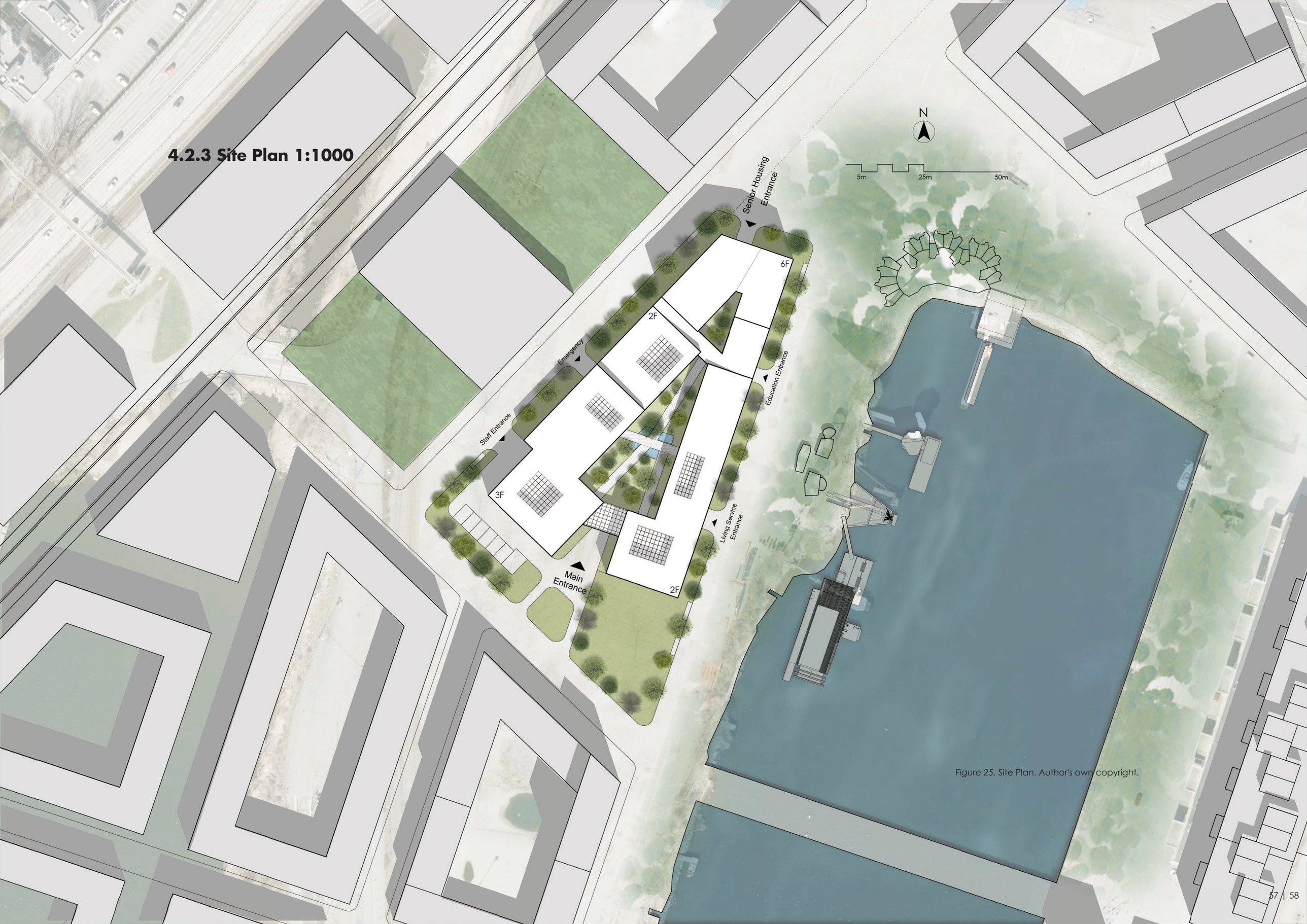



*Figure 25.* Site Plan. Author's own copyright.

## 4.2.4 Plans

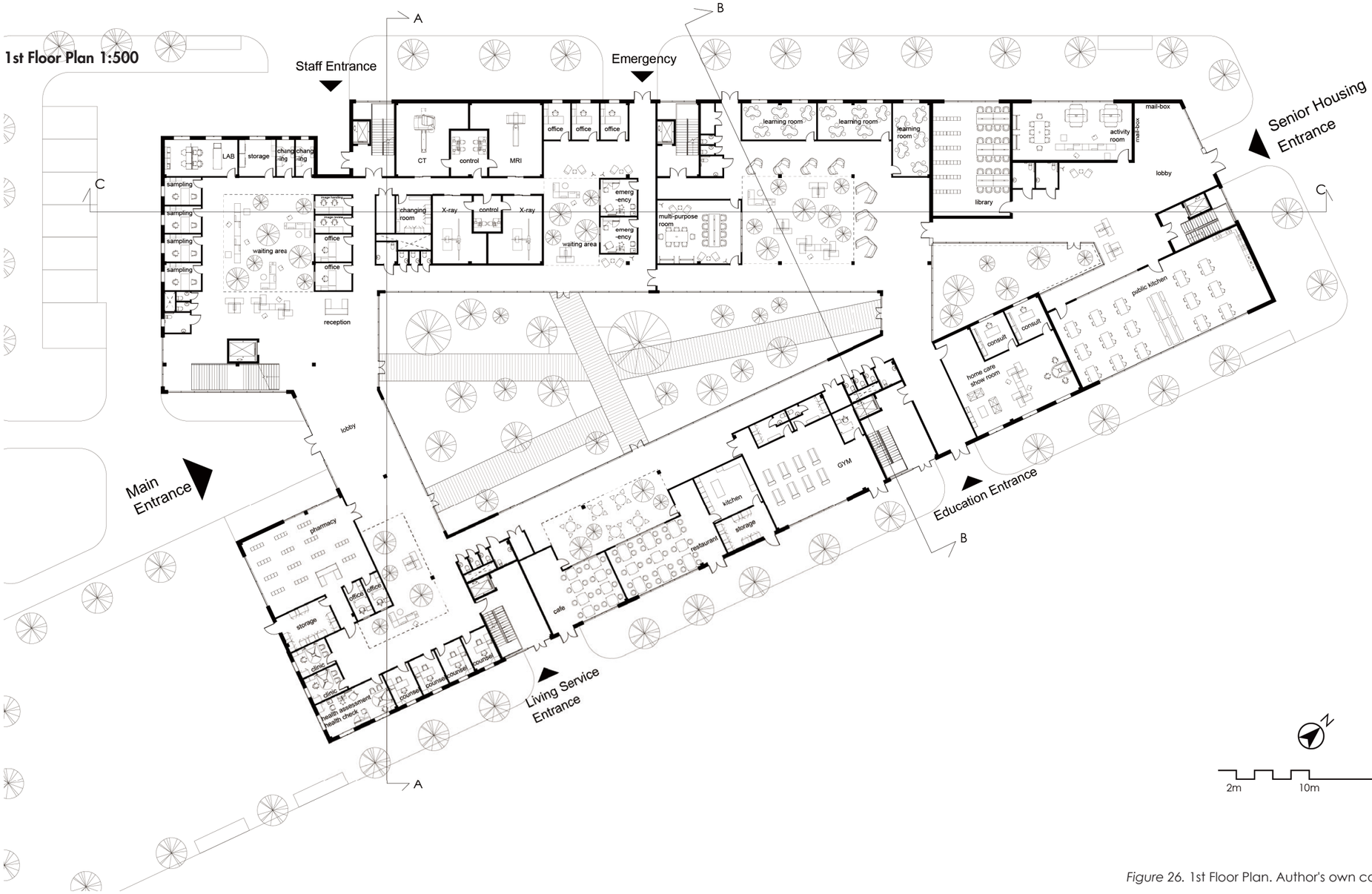



*Figure 26.* 1st Floor Plan. Author's own copyright.

## 4.2.4 Plans

### 2nd Floor Plan 1:500


*Figure 27.* 2nd Floor Plan. Author's own copyright.

## 4.2.4 Plans

### 3rd Floor Plan 1:500

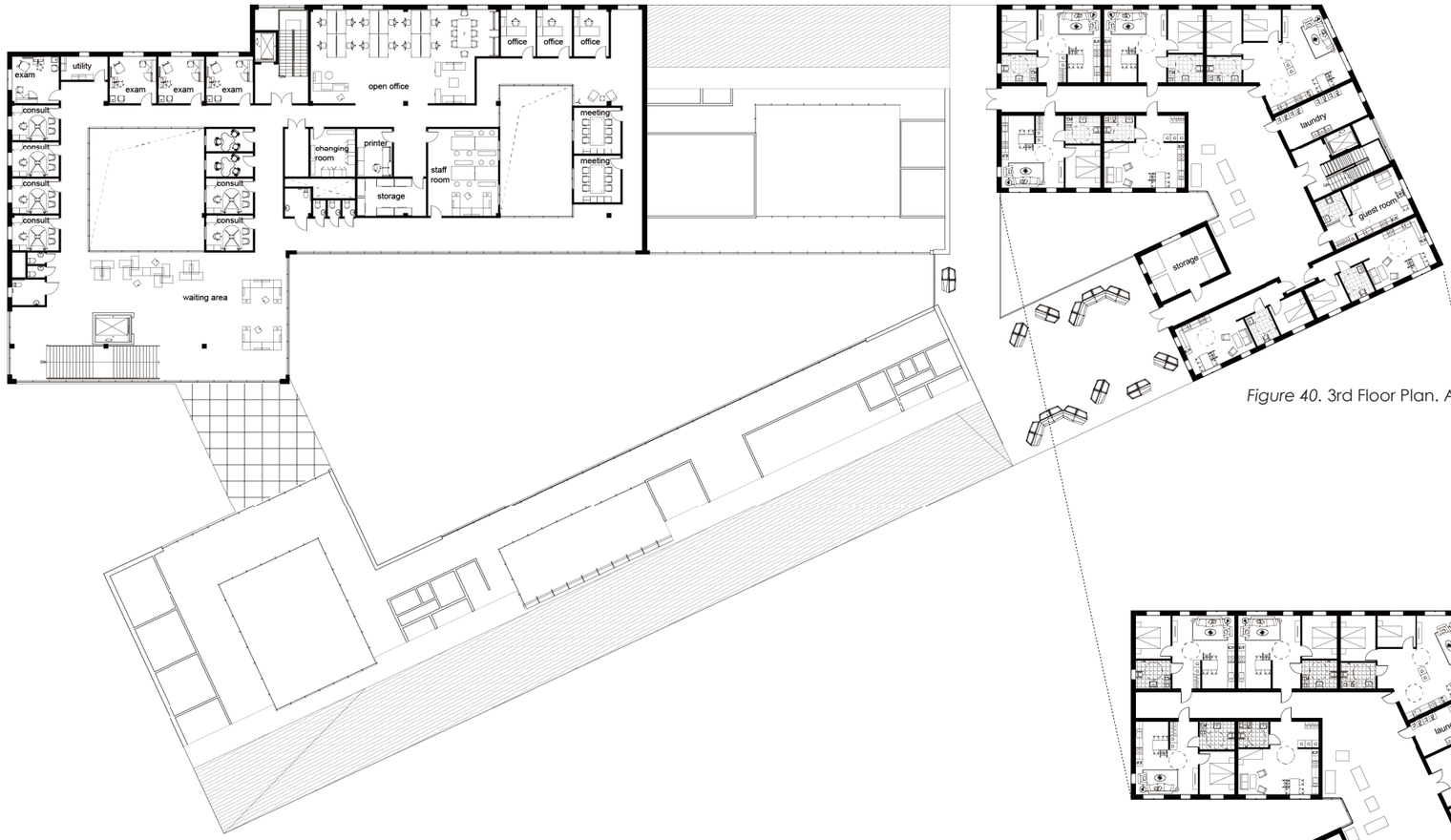
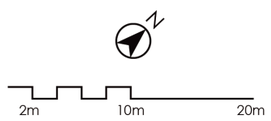



*Figure 40.* 3rd Floor Plan. Author's own copyright.




### 4-6th Floor Plan 1:400


*Figure 28.* 4-6th Floor Plan. Author's own copyright.

## 4.2.5 Facades and Sections

East Facade 1:500

South Facade 1:500

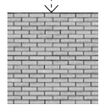
*Figure 29.* Facades. Author's own copyright.

**Material** The reason to choose different materials is to :
1. Give people a clear expression and the way of distinguishing different functions.
2. Make the building look like "small scale" of seperate parts and actually it is one building.

Primary care unit:
Granite

Living service unit:
Wood panel

Home care unit:
Terracotta tile panel



Senior housing:
Grey brick

## 4.2.5 Facades and Sections

**A-A Section 1:500**


**B-B Section 1:500**


**C-C Section 1:500**

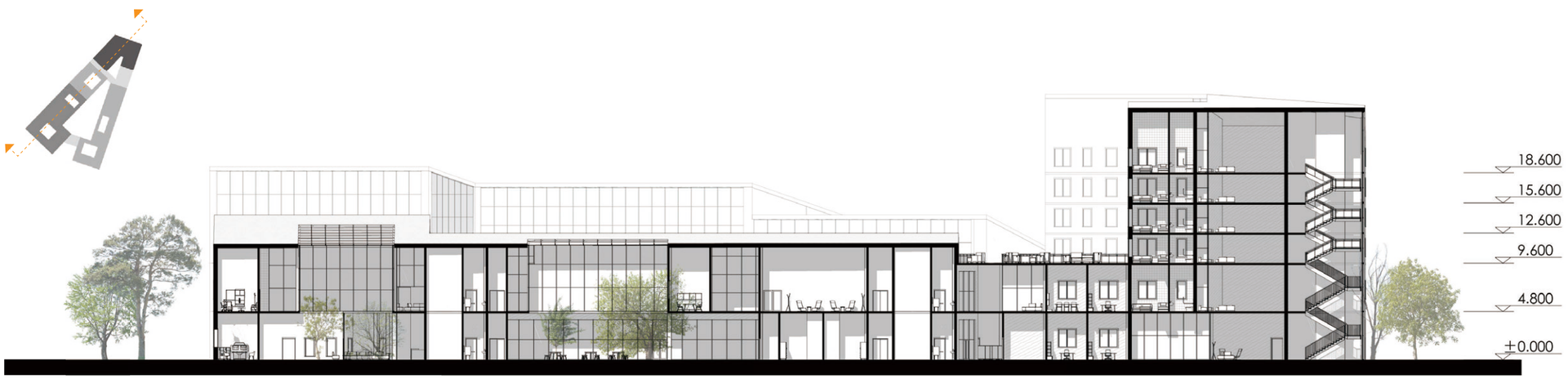



*Figure 30.* Sections. Author's own copyright.

## 4.2.6 Renderings

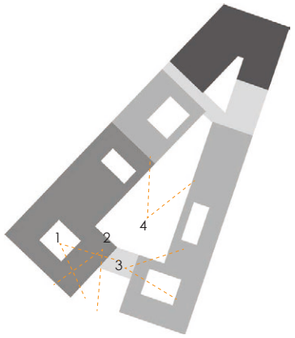
*Figure 31.* Exterior Perspective Rendering. Author's own copyright.

## 4.2.6 Renderings

**Perspective - Interior views**

1

2




3

4

*Figure 32.* Interior Perspective Renderings. Author's own copyright.

## 4.2.7 Models

## 4.2.8 Site Circulation

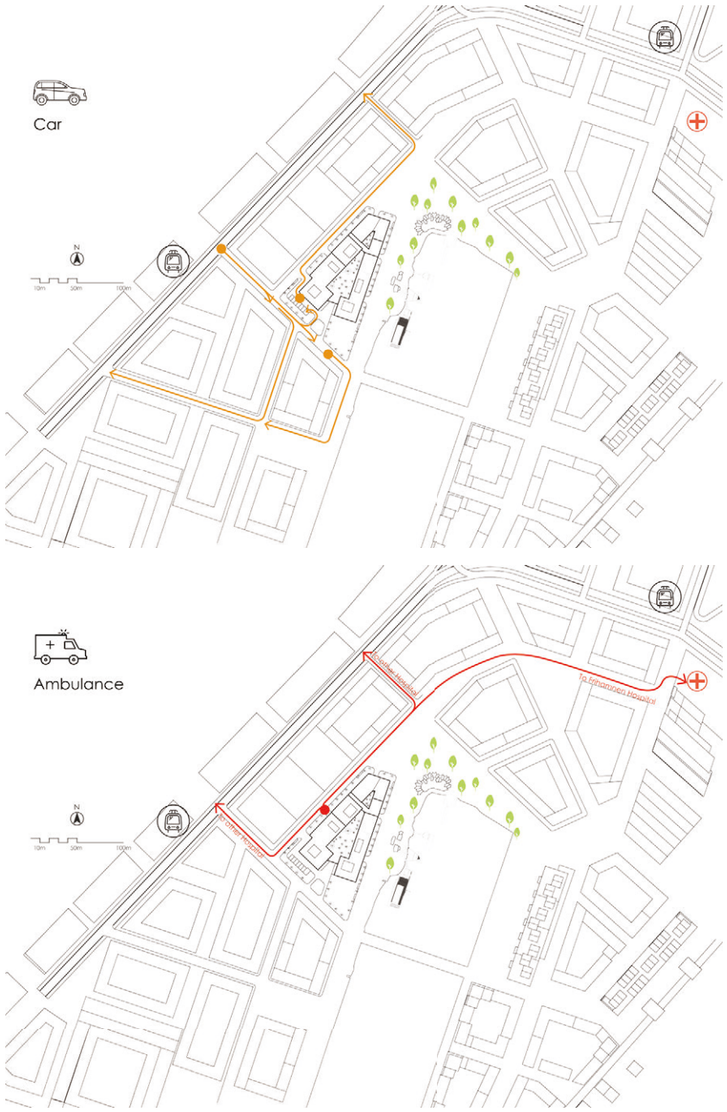
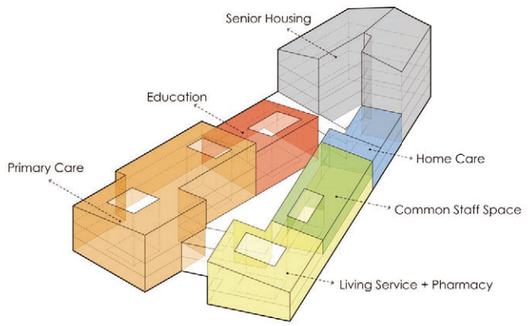


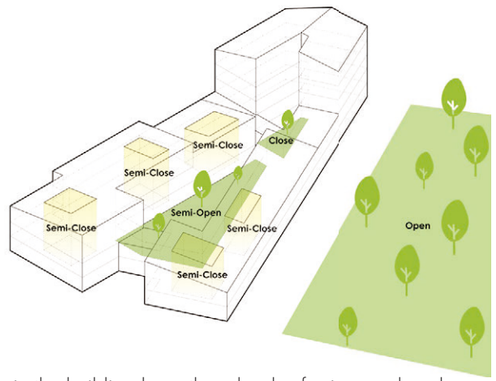


*Figure 33.* Site Circulation. Author's own copyright.

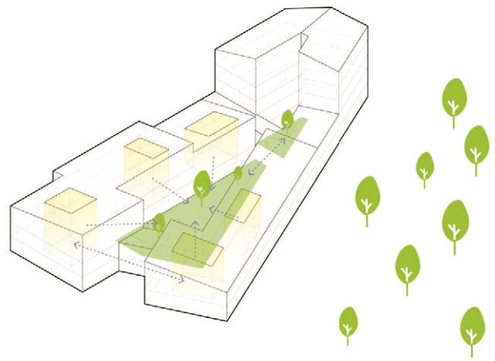
## 4.2.9 Space and Co-operation



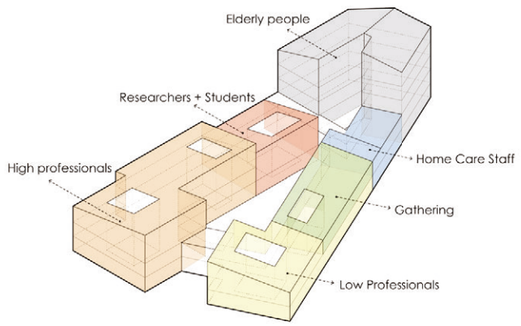

1. Function distribution in the building



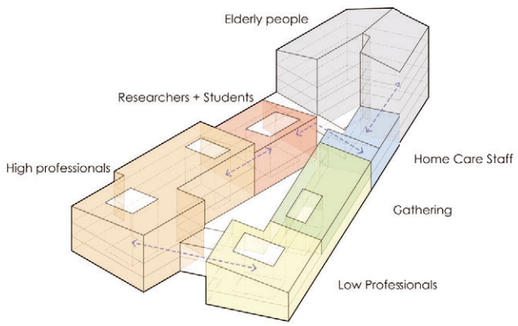

2. Courtyards in the building have three levels of privacy: closed, semi-cloded and semi-open, compared to the totally open space outside the building.



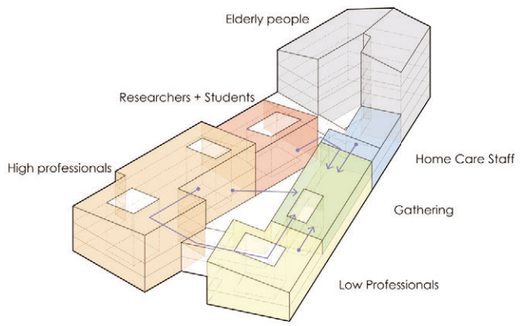
3. View connections between indoor courtyards and outdoor couryards.




4. Stakeholders distribution in the building (who work or live in the building, mainly to show healthcare professionals)




5. Possibility of co-operation between different group of healthcare staff who work here as well as elderly people who live here.

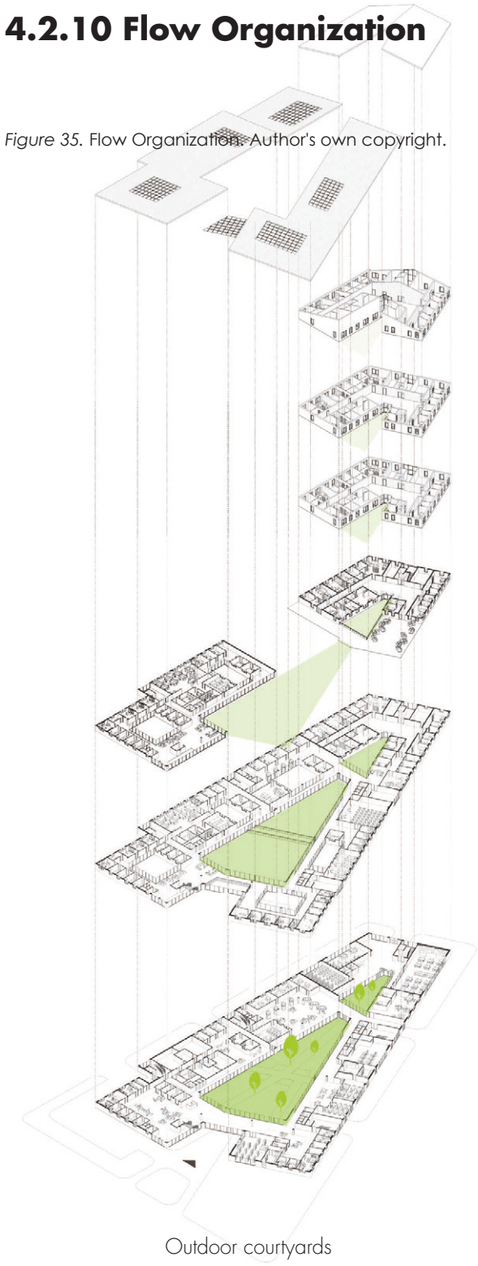



6. Circulation of physical connection between different units (in the second floor) that allow staffs to work together or meet each other.

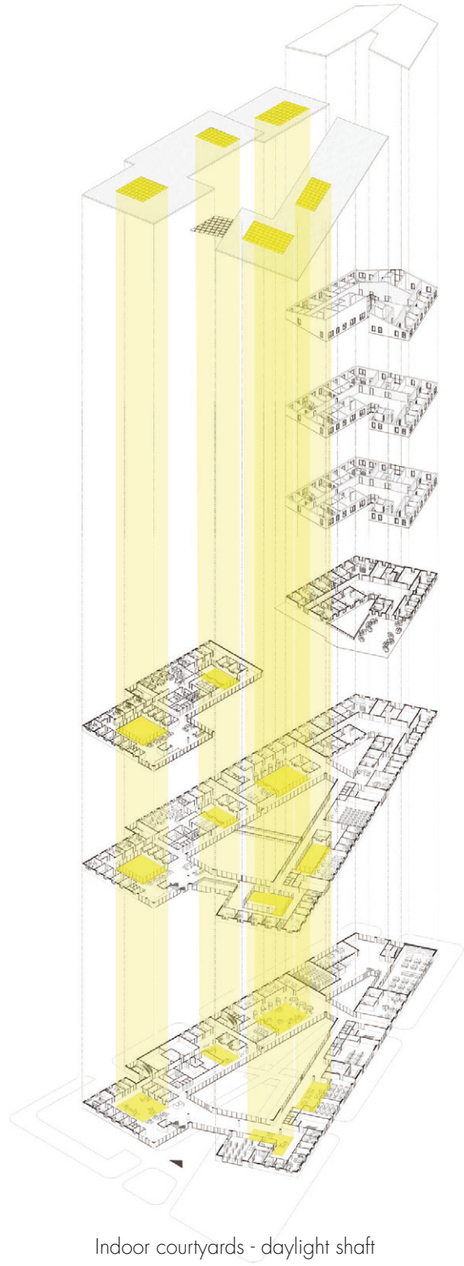
*Figure 34.* Space Analysis. Author's own copyright.

## 4.2.10 Flow Organization

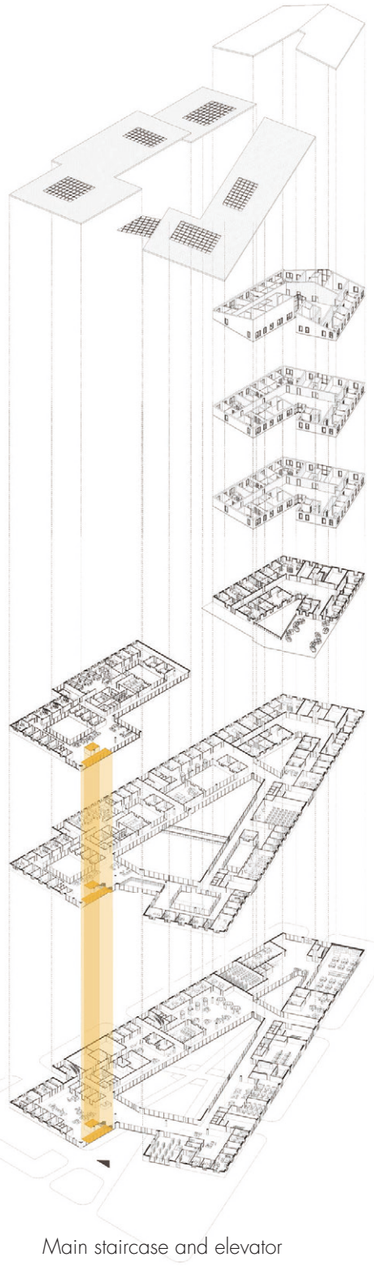
*Figure 35.* Flow Organization. Author's own copyright.



Outdoor courtyards

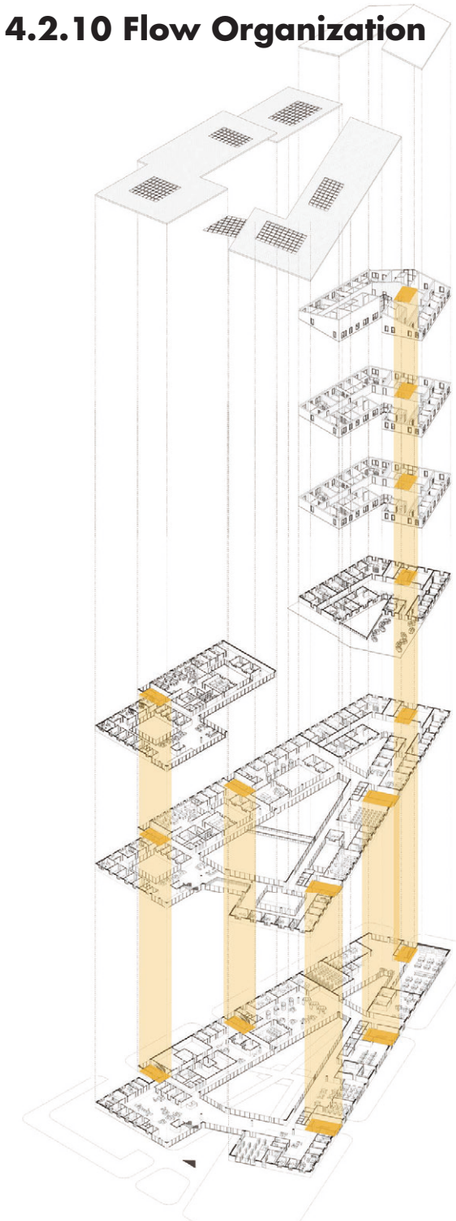


Indoor courtyards - daylight shaft

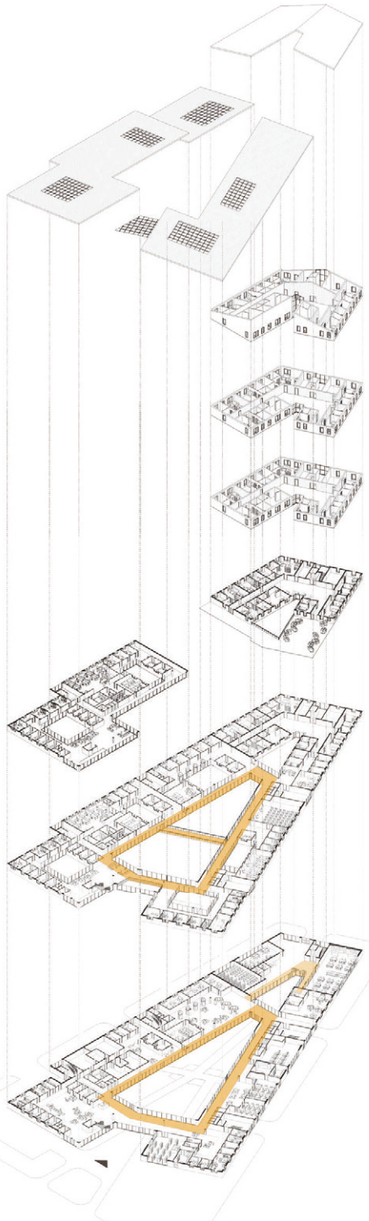


Main staircase and elevator

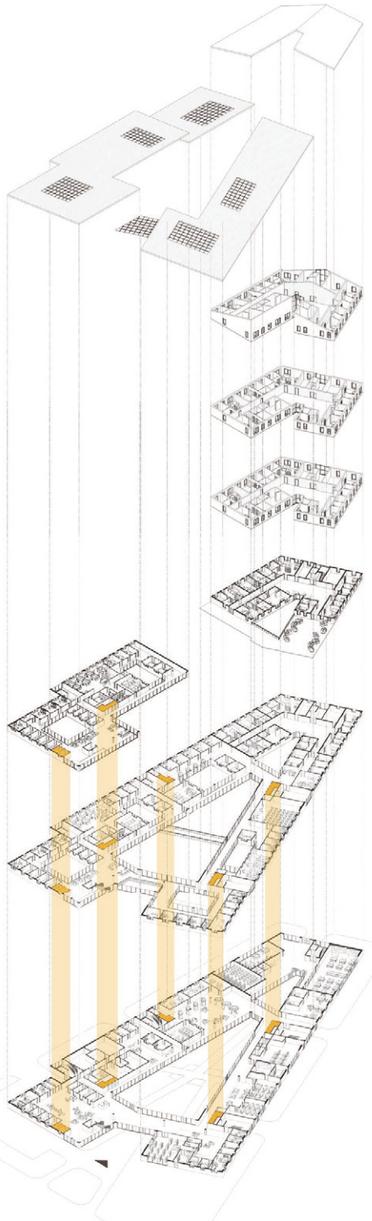
## 4.2.10 Flow Organization



Staircases and elevators

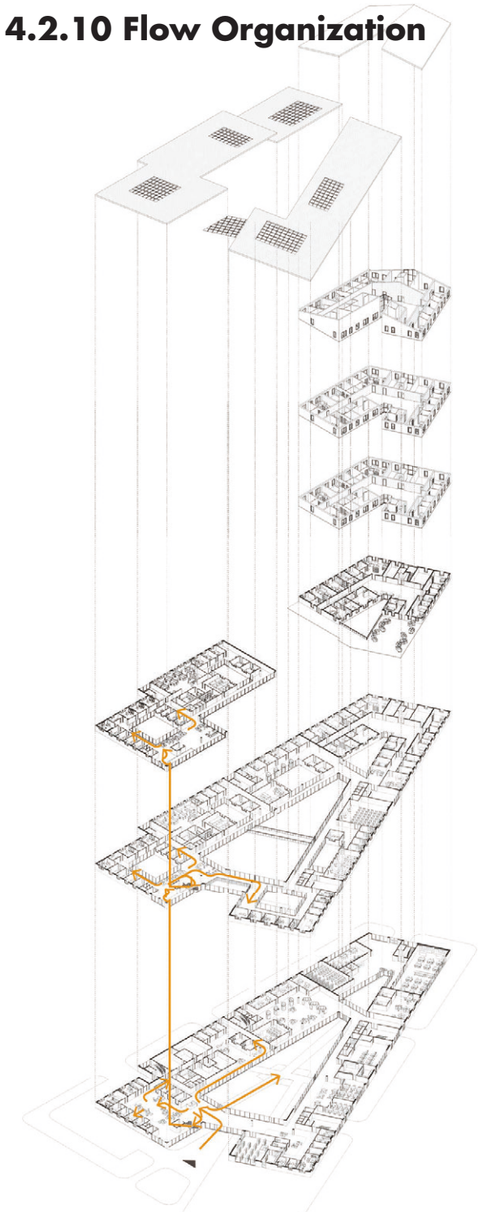


Public passage

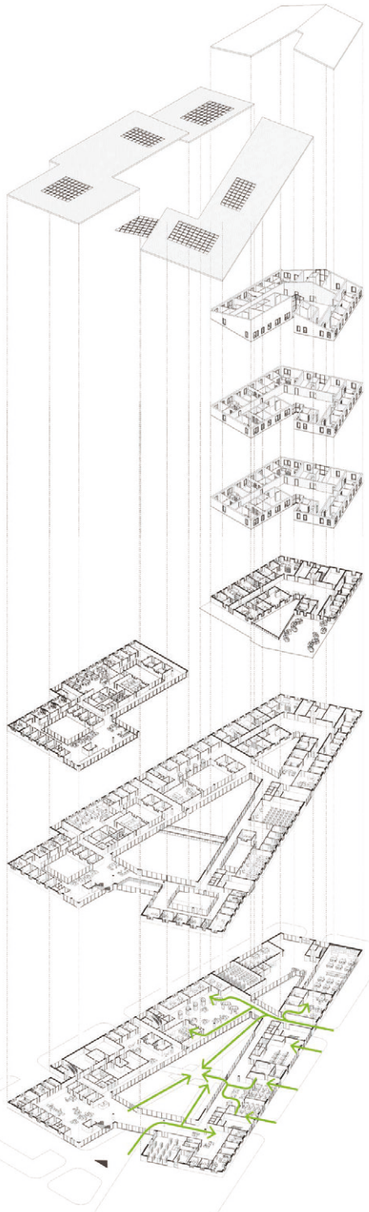


Toilets distribution

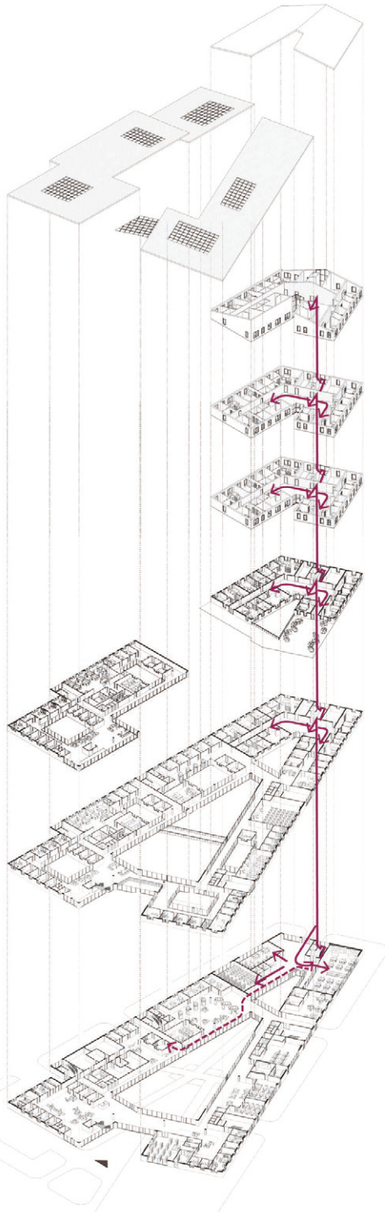
## 4.2.10 Flow Organization



Patients flow

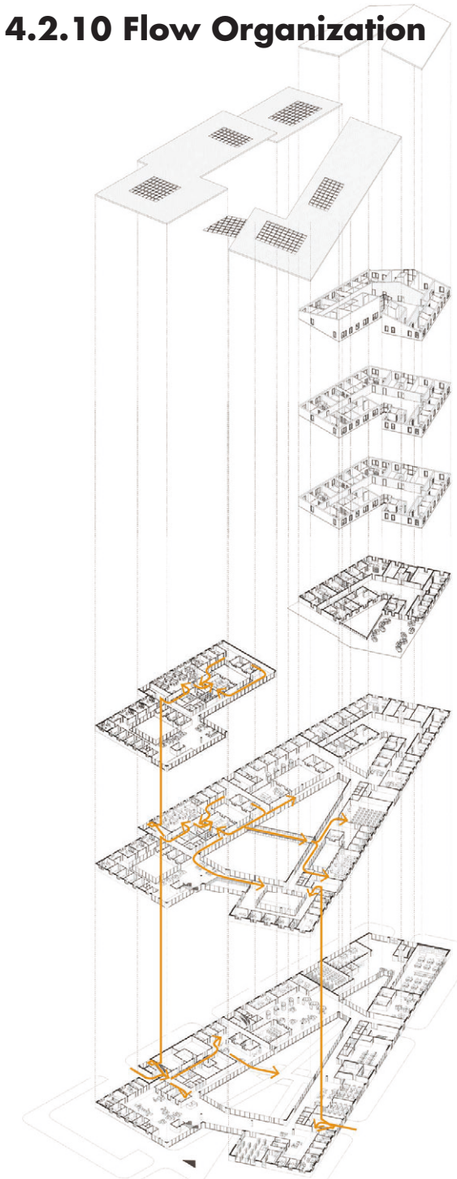


Other residents flow

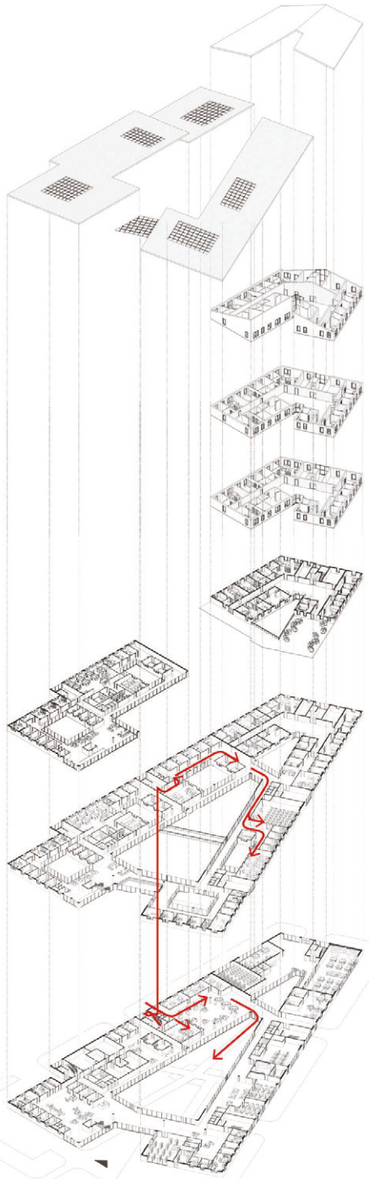


Elderly people flow

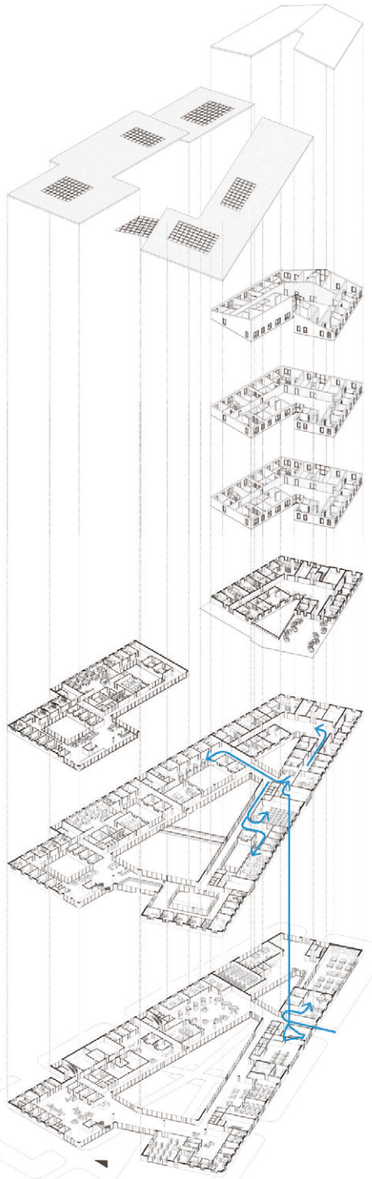
## 4.2.10 Flow Organization



Healthcare staffs flow



Researchers & students flow



Homecare staff flow

## 4.2.11 Flexibility

These are different areas of room space according to the program. I listed room functions with relation to healthcare space,staff space and support space, which will be the main space in the building. This means most rooms are flexible and can be further reformed if needed.

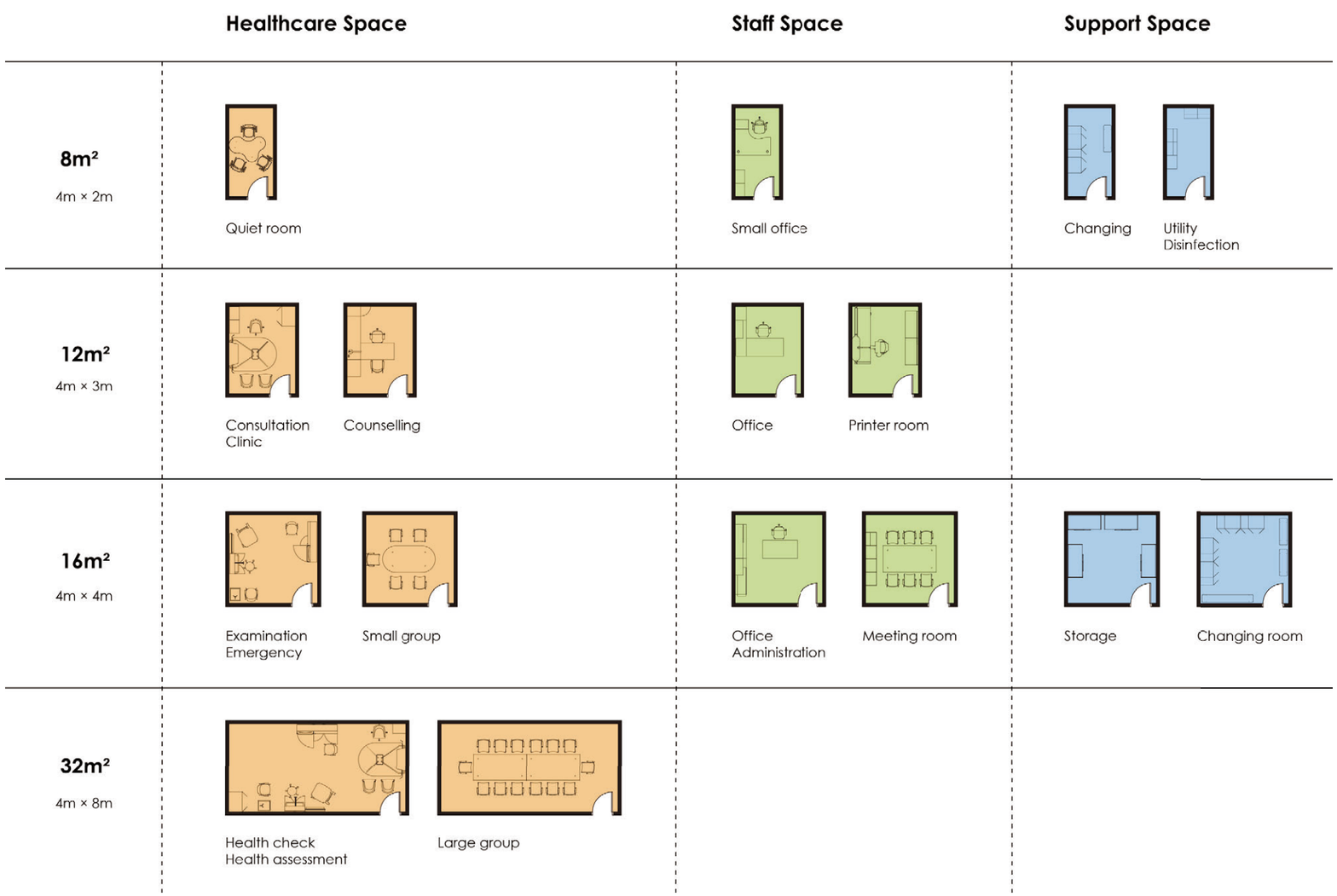



*Figure 36.* Room Sizes. Author's own copyright.

## 4.2.11 Flexibility

Flexibility is an important issue in future healthcare facilities. As the main function space can fit into the same or similar area, transformation will be made through moving some furnitures or removing/ adding walls, as well as changing equipments and technical installations.

In the future, primary care will mostly move to people's own homes. That is to say, for healthcare staffs, the healthcare facility is mainly a place to work but not meet patients that often. They will work here and have virtual communication with their patients as well as remote meeting with other colleages. For visitors (both patients and healthy people), they go to the facility to have ezamination or treatment as well as regular health condition check/assessment, after having virtual care at home through digital tools with their doctors.

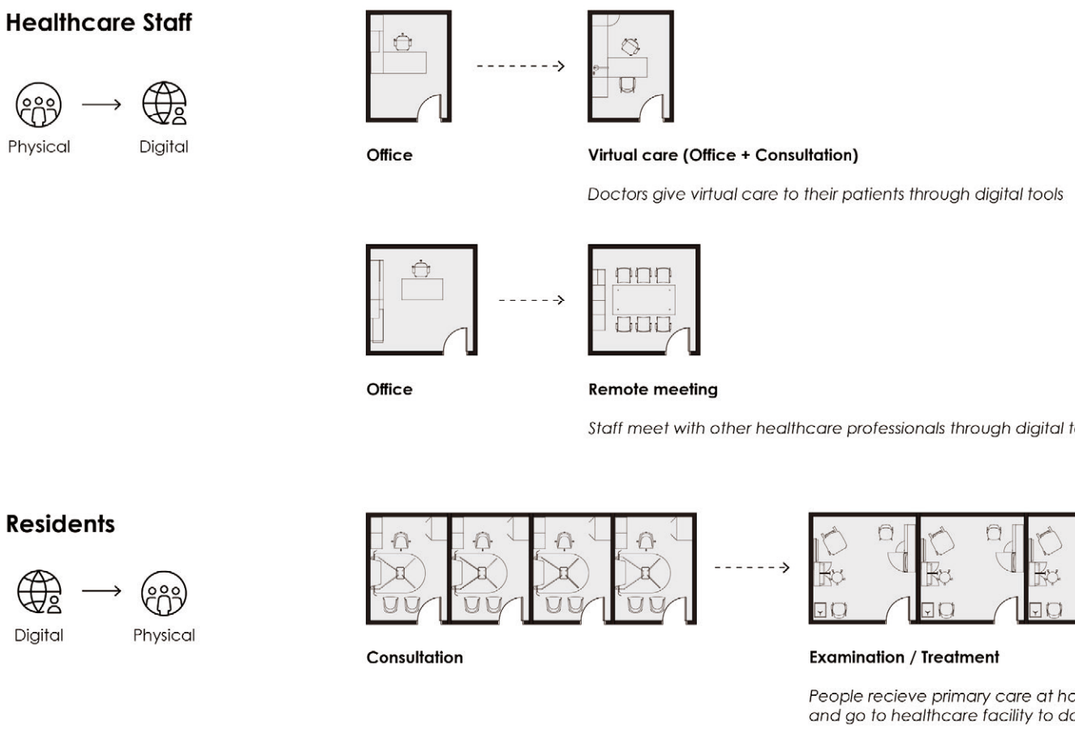



*Figure 37.* Flexibility. Author's own copyright.

## 4.2.12 Story Board

**Patient**

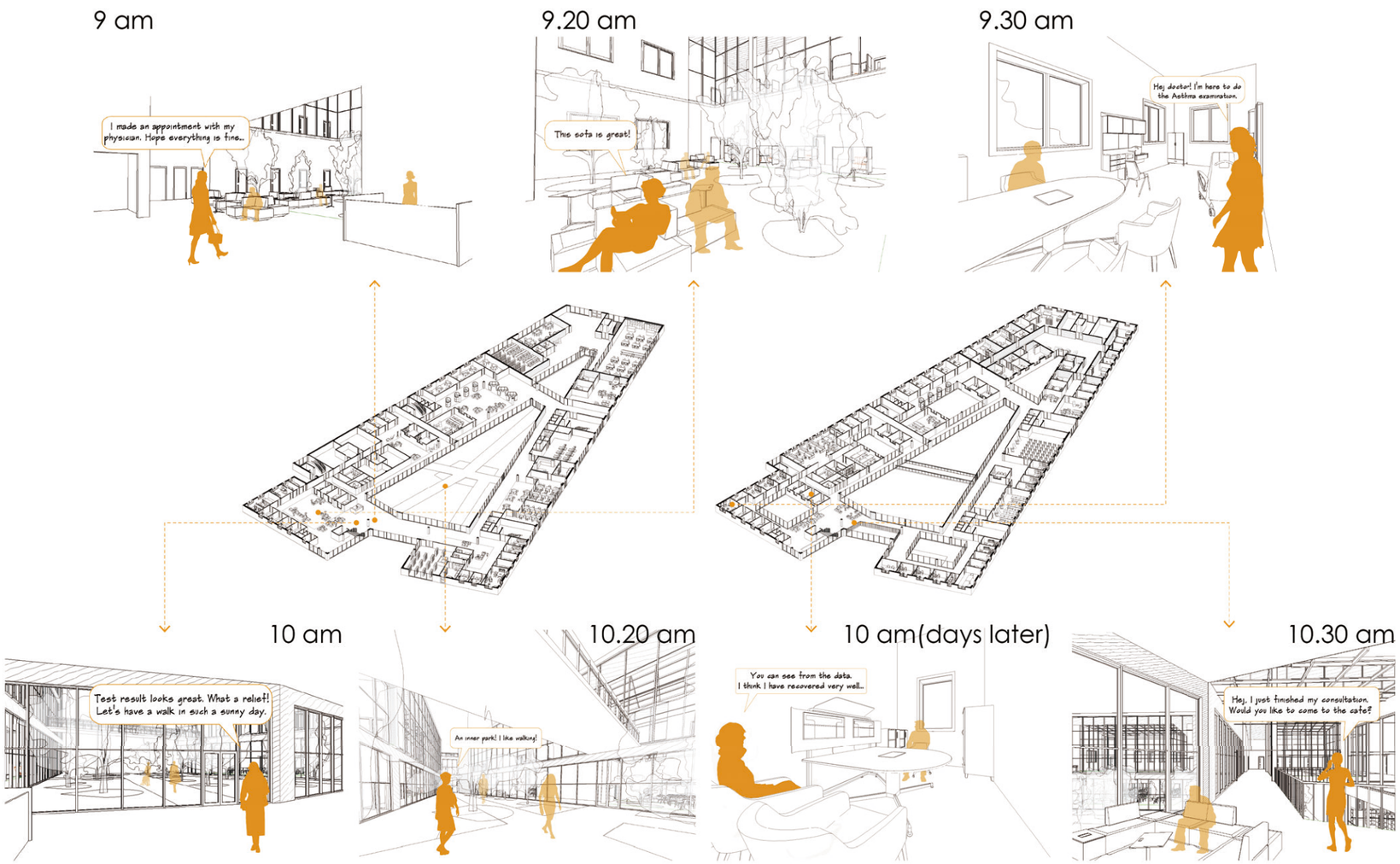



*Figure 38.* Story Board of Patient. Author's own copyright.

## 4.2.12 Story Board

**Healthy residents**

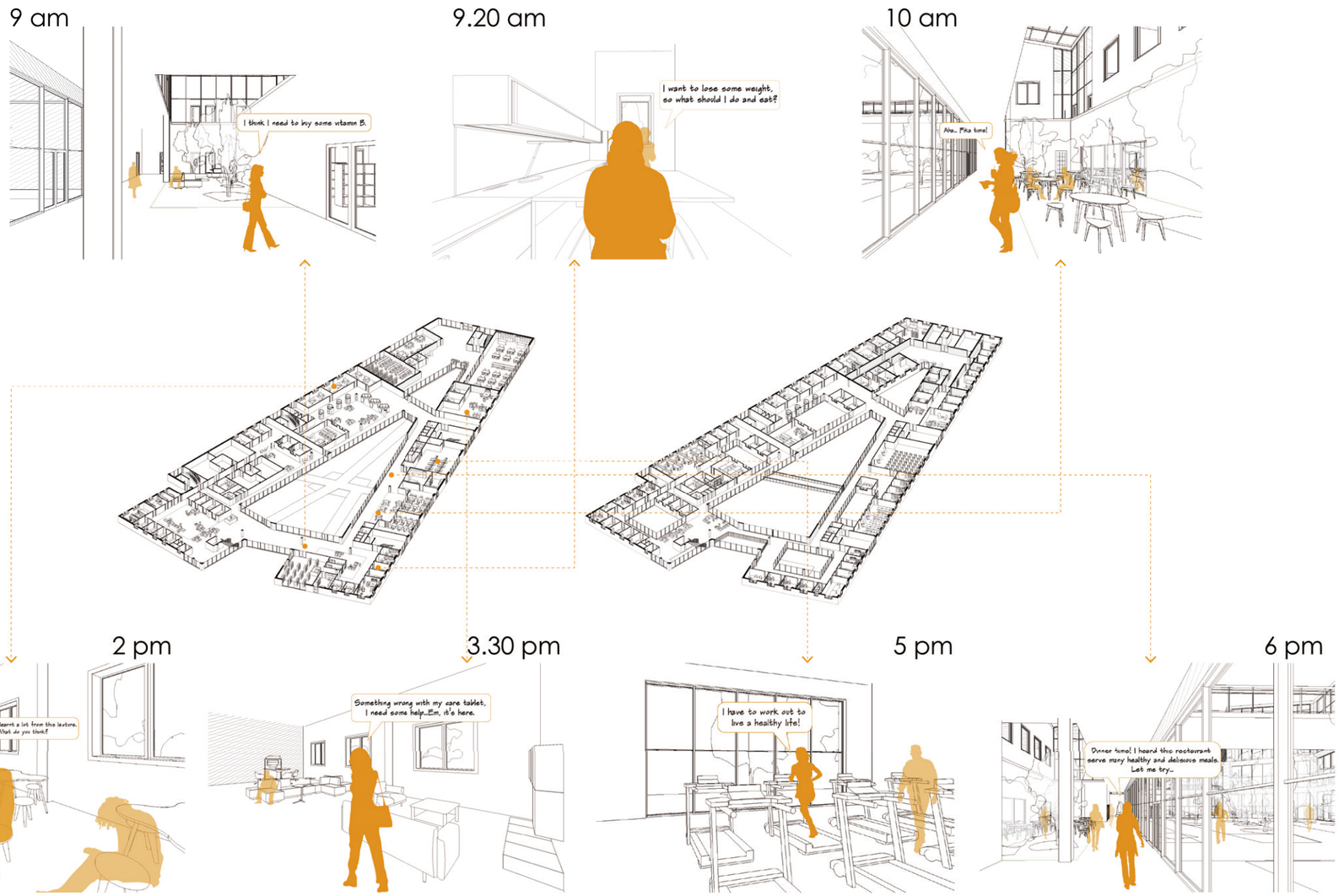



*Figure 39*. Story Board of Healthy Residents. Author's own copyright.

## 4.2.12 Story Board

**Healthcare staffs**

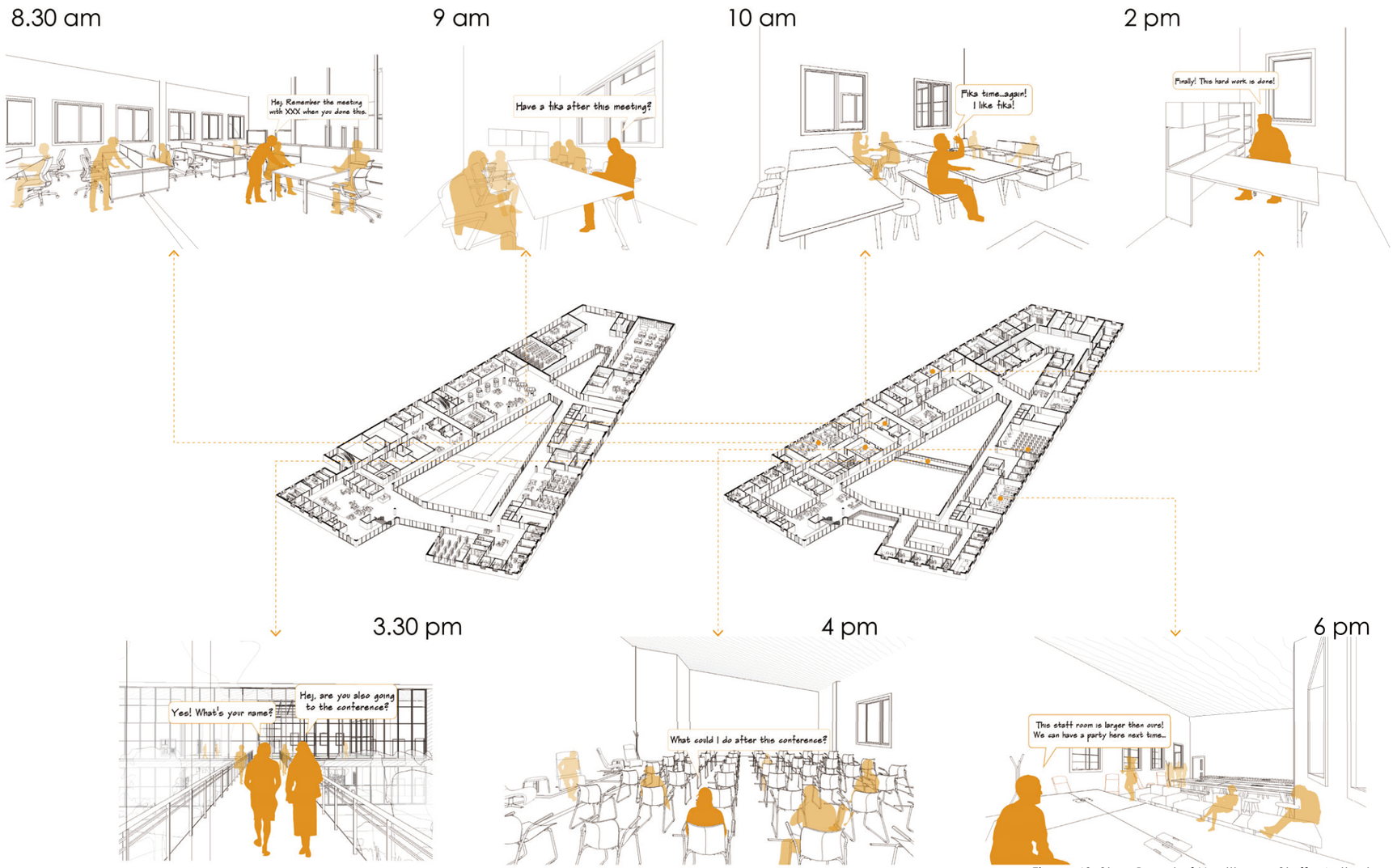



*Figure 40.* Story Board of Healthcare Staffs. Author's own copyright.

## 4.2.12 Story Board

**Elderly people**

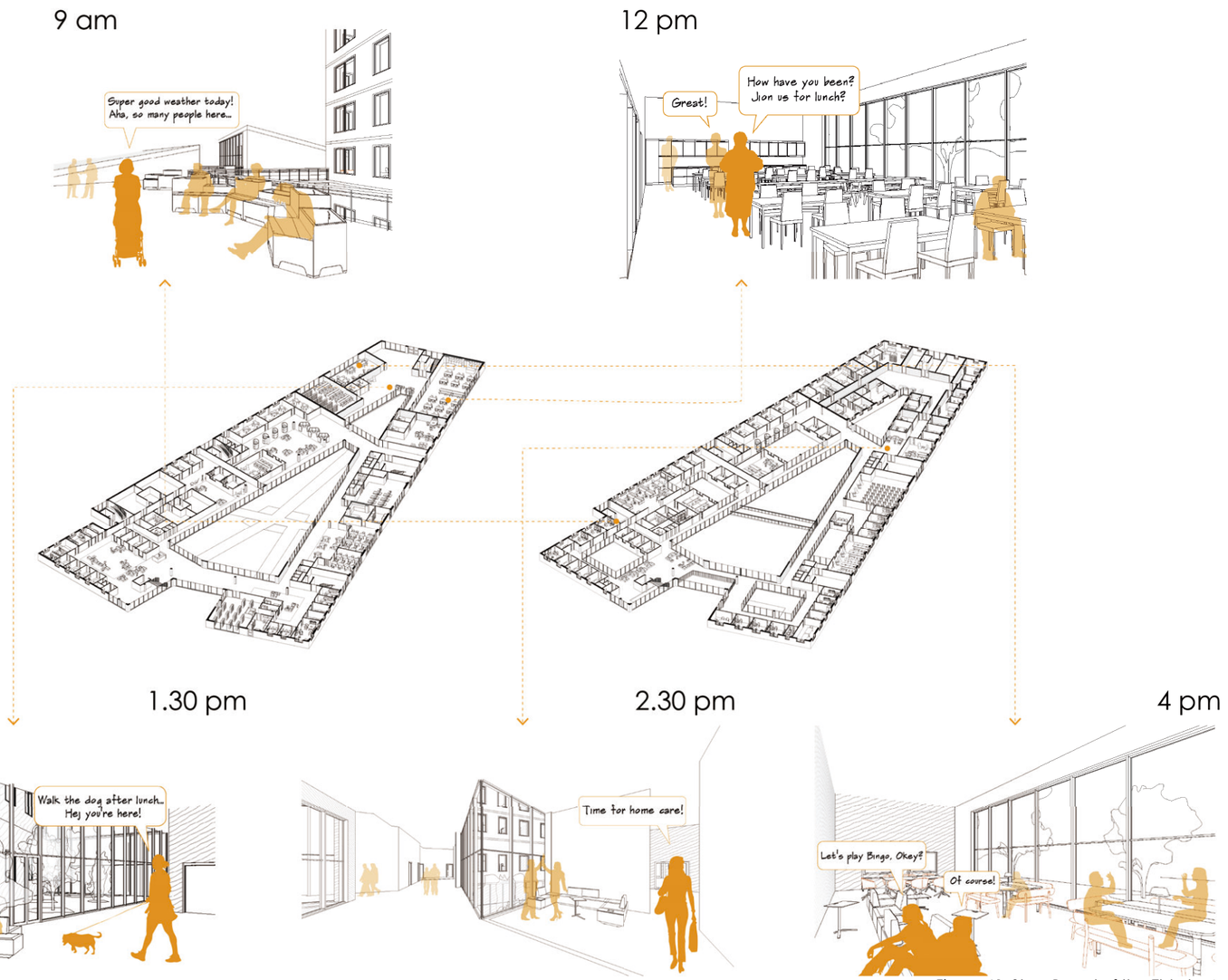



*Figure 41.* Story Board of the Elderly. Author's own copyright.

# 5

# Conclusion

*To see if this Master Thesis achieved the goal, therefore answered the research questions:*

*1. What will the future vision of healthcare system/network could be to make it work well? —— New web/system*

*2. If there is a new propotype of healthcare building in the future to fit into the new healthcare system, what will that be like? —— New prototype*

*3. How does the building possibly look like and what future scenarios will happen in this building? —— New building*

## 5.1 New Web/System

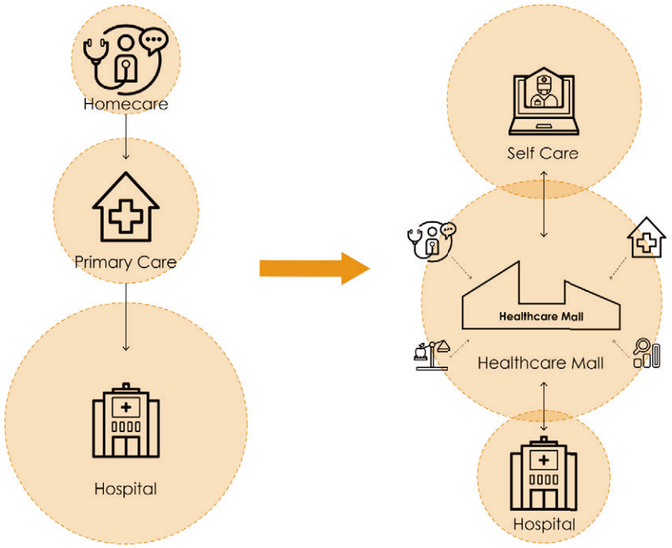



*Figure 42.* New System. Author's own copyright.

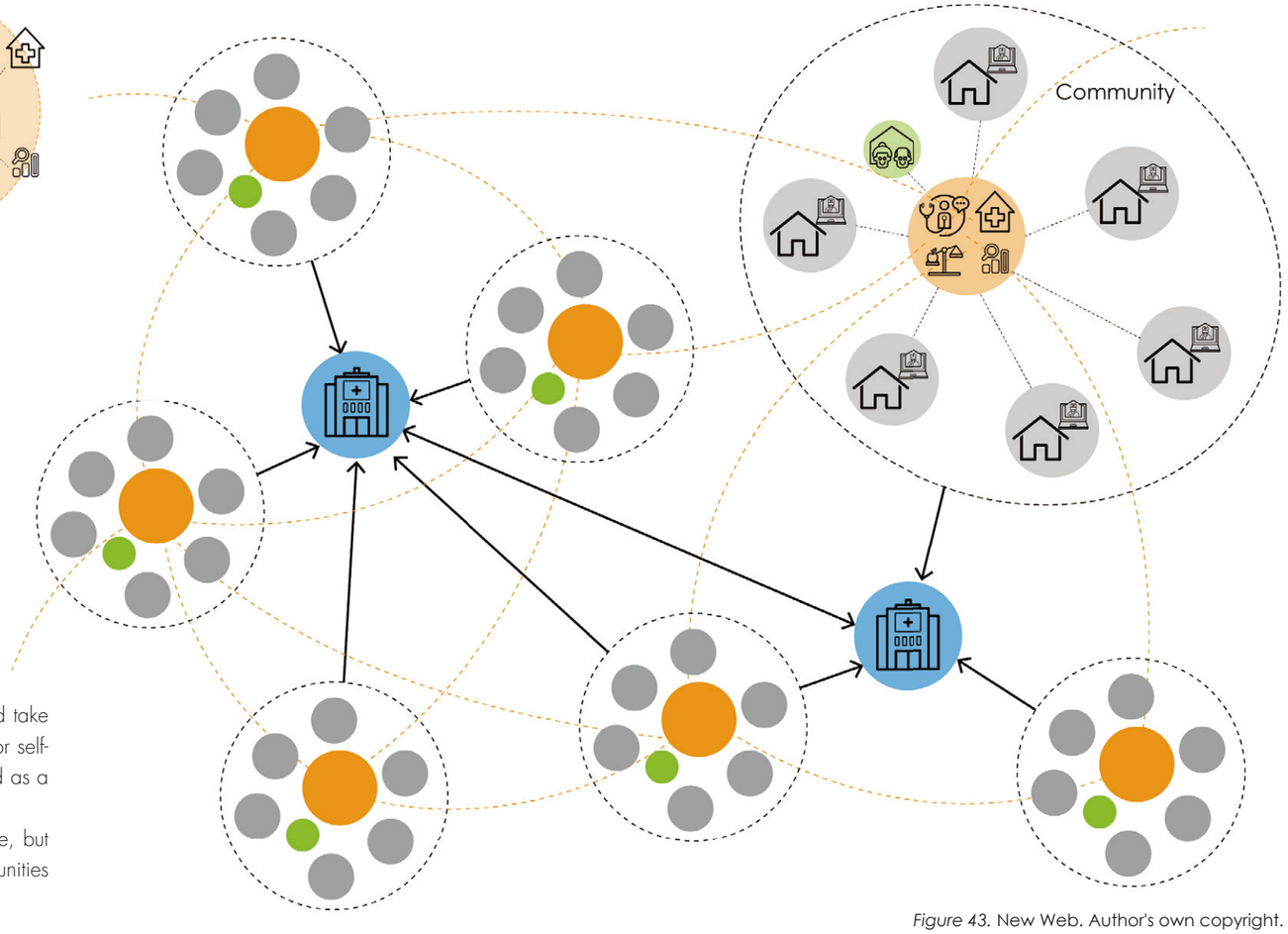



*Figure 43.* New Web. Author's own copyright.

In the future, primary care will mostly move to people's own home and take up a less propotion in the whole healthcare system, while home care or self-care become more important. So, the healthcare mall can be regarded as a transition when this change happen.
For the large scale, links between healthcare facilities are still out there, but there will also be invisible links via digital tools that connect all communities and healthcare facilities.

## 5.2 New Prototype

The new prototype is an integrated building combined with different functions related to healthcare. Not only provide all people user spaces, but also offer workspace for healthcare staffs of all kinds. Focus on primary care, but more than that.

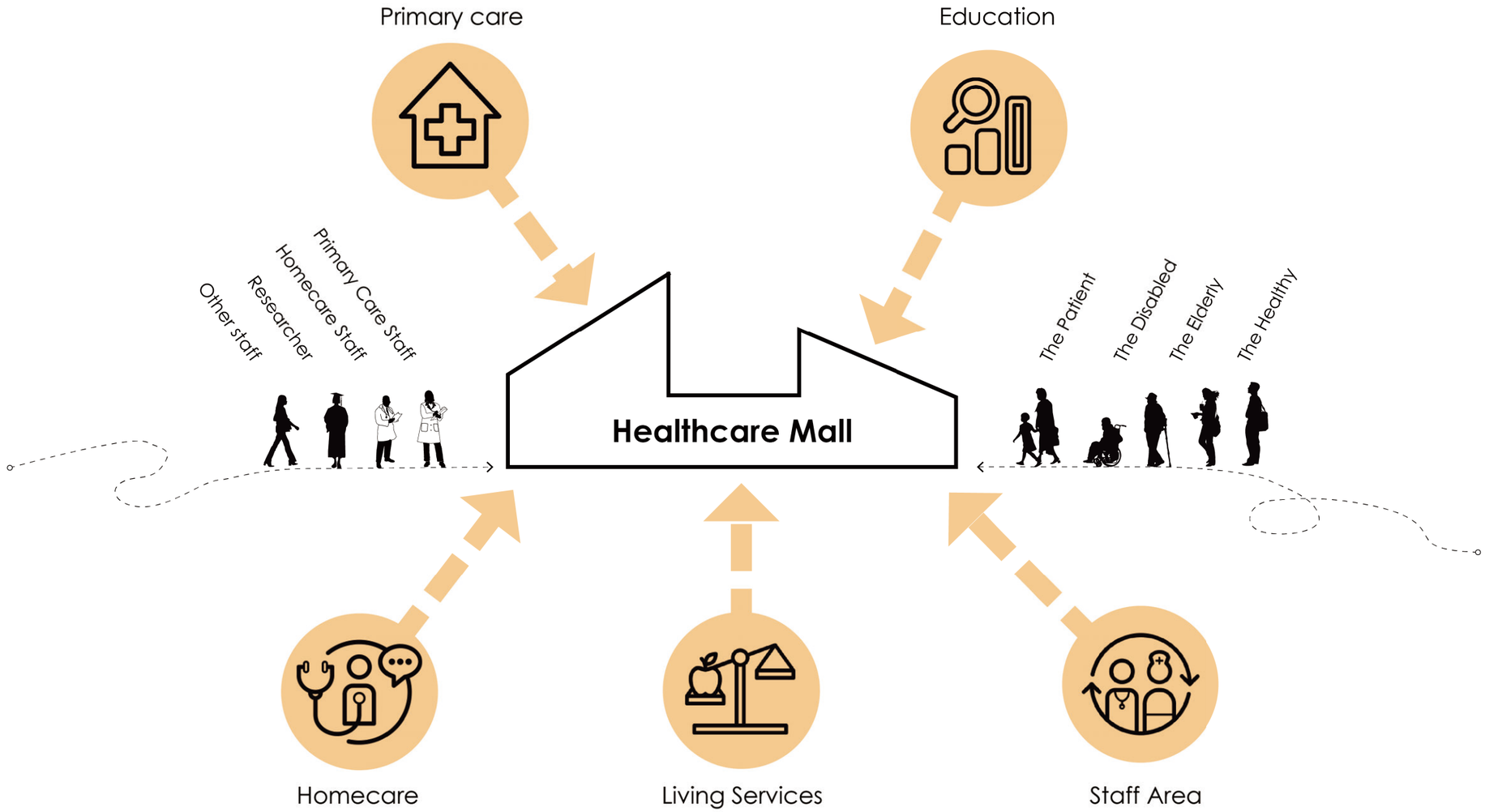



*Figure 44.* New Prototype. Author's own copyright.

## 5.3 New Building

I have to say this building project is only one possibility of applying the prototype to architecture. It adjust to fit into this context. But still, some elements can be used in other projects and the concept of integrated and cooperation will also work well.

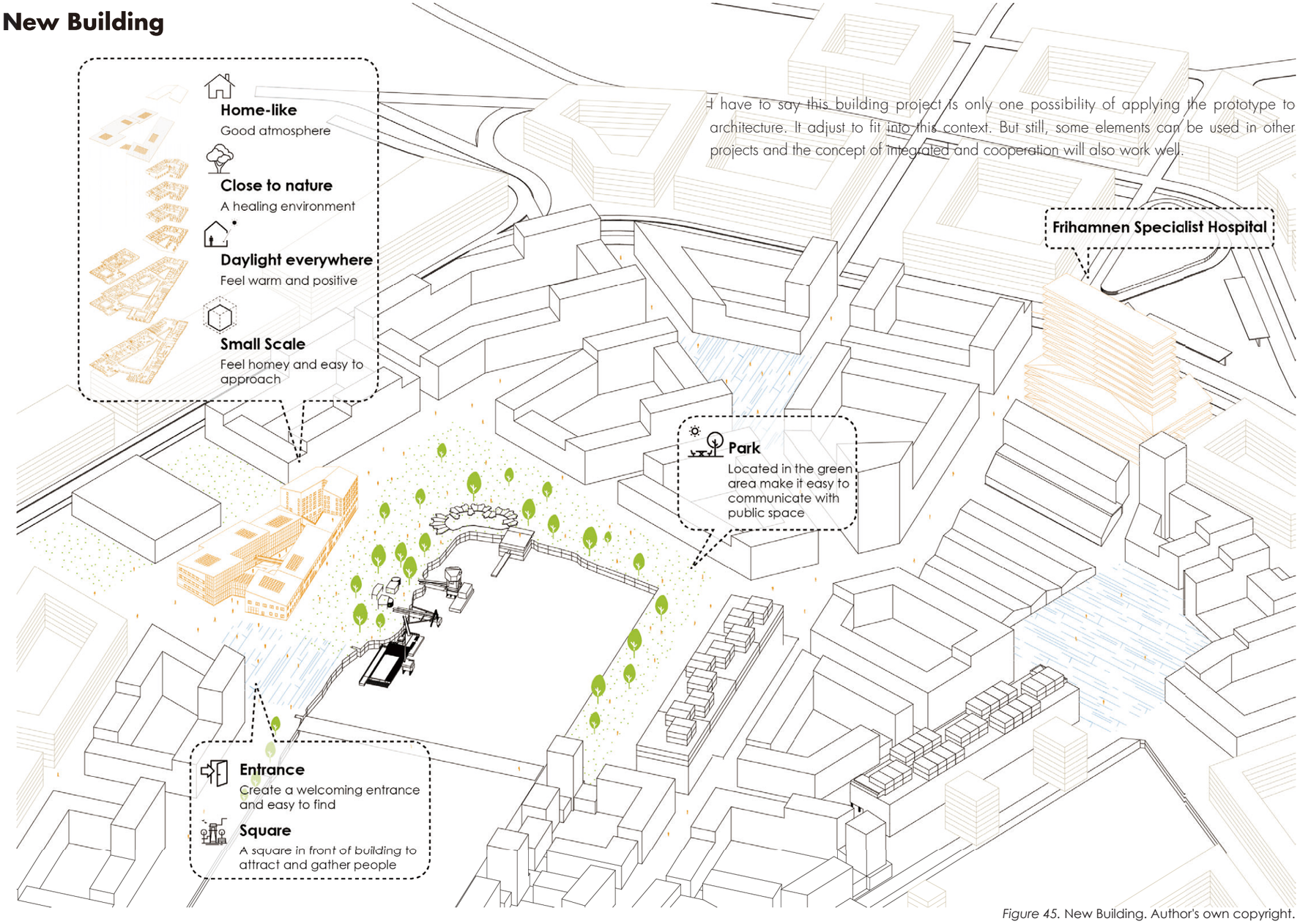



*Figure 45.* New Building. Author's own copyright.

# Reference


Mittag, Ann-Marie (2008-11-25). *"Hälso- och sjukvård"* (in Swedish). Archived from the original on 2009-03-15. Retrieved 2009-03-15.

The Local Client Studio. (2013). *Swedish healthcare: all you need to know*. Retreived from https://www.thelocal.se/20130327/46910

OECD (2013), *OECD Reviews of Health Care Quality: Sweden 2013*, OECD Publishing, Paris. DOI: http://dx.doi.org/10.1787/9789264204799-en

Ahgren B. (2010) *Competition and integration in Swedish health care, Health Policy;* 96(2):91–97.

Bowerman, J. (2006). Designing the primary health care centre of the future: A community experience. *Leadership in Health Services, 19*(4), 16-23. doi:10.1108/13660750610705553

Brouwers, Lisa; Ellegård, Lina Maria; Janlöv, Nils; Johansson, Pontus; Mossler, Karin and Ekholm, Anders. (2014). *In New Pathways in Microsimulation* p.41-60

Swedish National Institute of Public Health. *Det är aldrig för sent! Förbättra äldres hälsa med möten, mat och aktivitet (It's never too late! Improving the health of the elderly with meetings, food and activity).* Report 2009:18. Östersund. 2009.

Government Offices of Sweden. (2010). *The future need for care* (Results from the LEV project). Retrieved from http://www.government.se/49b757/contentassets/2822031a7caa456a9dbfea39f8eb640c/the-future-need-for-care–results-from-the-lev-project-s2010.021

EHälsomyndigheten. (2016). *Vision for eHealth 2025 – common starting points for digitisation of social services and health care*. Retrieved from https://www.ehalsomyndigheten.se/globalassets/dokument/vision/vision-for-ehealth-2025.pdf

World Economic Forum. (2016). *World Economic Forum White Paper* (Digital Transformation of Industries: In collaboration with Accenture). Retrieved from http://reports.weforum.org/digital-transformation/wp-content/blogs.dir/94/mp/files/pages/files/digital-enterprise-narrative-final-january-2016.pdf


CHALMERS

Master Thesis

Mengyao Hou

Healthlink 2030

*"A Web of Care" Future Healthcare Building in Gothenburg Area*